KIPS
ENTRY TESTS
SERIES

PRACT BOO

BIOLOG

NATIONA
MDCAT

- Topic-wise Practice MCQs
- Answer Keys
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TABLE OF CONTENT

1 CELL STRUCTURE AND FUNCTION

TOPIC PRACTICE EXERCISE

TOPIC-WISE MCQs

CELL WALL

Q.1 The layers of cellulosic fibers in cell wall are arranged with each other at:
A) Obtuse angle
B) Right angle
C) Parallel angle
D) Horizontal angle

Q.2 Which of the following is related to prokaryotic cell wall?
A) Murein
B) Peptidoglycan
C) Sacculus
D) All A, B, C

Q.3 It is absent in secondary cell wall:
A) Silica
B) Waxes
C) Pectin
D) Cutin

PLASMA MEMBRANE

Q.4 All of following are common molecules in membrane of all type of cells except:
A) Globular protein
B) Cholesterol
C) Traces of carbohydrates
D) Phospholipid

Q.5 Hydrophobic portion of plasma membrane is present in/at:
A) Towards extracellular matrix
B) Towards cytoplasm
C) Inner core of plasma membrane
D) Towards the cytoskeleton

Q.6 Which of the following describes the fluid mosaic model of plasma membrane structure?
A) Phospholipid monolayer with embedded proteins
B) Phospholipid bilayer with embedded proteins
C) Triglyceride bilayer with embedded proteins
D) Triglyceride monolayer with embedded proteins

Q.7 In plasma membrane, carbohydrates combine with the lipids and proteins to form glycolipids and glycoproteins and are oriented:
A) Towards inside
B) Towards outside
C) Towards inside and outside
D) Randomly distributed

Q.8 Which of the following is not a characteristic feature of animal cell membrane?
A) Provides mechanical shape
B) Maintain cellular homeostasis
C) Regulate passage of molecules
D) Prevent from osmotic lysis

Q.9 Which of the following acts as receptor site on plasma membrane?
A) Head of phospholipid molecules
B) Cholesterol molecules
C) Tail of phospholipid molecules
D) Glycoprotein

Q.10 Which structure is the most important for cellular life?
A) Nucleus
B) Chromosome
C) Cell membrane
D) Mitochondria

CYTOPLASM

Q.11 Peripheral parts of the cell are often like:
A) Sol
B) Solid
C) Gel
D) None of these

RIBOSOSMES

Q.12 All of the following organelles contain DNA except:
A) Ribosomes
B) Chloroplast
C) Nucleus
D) Mitochondria

Q.13 40S is the smaller ribosomal sub-unit associated with _____.
A) *E. coli*
B) *C. botulinum*
C) Yeast
D) *T. pallidum*

Q.14 Identify non-membranous organelle from the following:
A) Endoplasmic reticulum
B) Ribosome
C) Nucleus
D) Chloroplast

ENDOPLASMIC RETICULUM

Q.15 Which of the following best describes the function of RER in eukaryotic cells?
A) Glycosylation of proteins
B) Synthesis of lipids
C) Synthesis of proteins
D) Synthesis of ribosomes

Q.16 Which of the following statement is incorrect regarding endoplasmic reticulum?
A) Plasma cells have RER in abundance
B) RBCs lack both RER and SER
C) RER is more than SER in adipose tissue
D) Hepatocytes has both RER and SER

Q.17 A function that is not related to smooth endoplasmic reticulum:
A) Calcium storage
B) Steroid synthesis
C) Enzyme synthesis
D) Mechanical support

Q.18 Which of the following organelle is associated with the single membrane?
A) Mitochondria
B) Endoplasmic Reticulum
C) Nucleus
D) Chloroplast

Q.19 Which of the following function is performed by both types of endoplasmic reticulum?
A) Protein synthesis
B) Mechanical support
C) Muscle contraction
D) Detoxification of harmful drugs

Q.20 Which of the following organelle is responsible for the production of steroid hormones?
A) Mitochondria
B) Golgi bodies
C) Smooth endoplasmic reticulum
D) Rough endoplasmic reticulum

GOLGI APPARATUS

Q.21 Identify the correct pair from the following options:
A) DNA replication - Ribosome
B) Protein synthesis - SER
C) Anaerobic respiration - Cristae
D) Modification - Golgi apparatus

Q.22 Modification of proteins and lipids into glycoproteins and glycolipids is the function of:
A) Mitochondria
B) Rough endoplasmic reticulum
C) Smooth endoplasmic reticulum
D) Golgi apparatus

Q.23 Golgi complex is involved in the formation of _____.
A) Lysosomes
B) RER
C) Vacuoles
D) SER

Q.24 The transport of secretory proteins takes place through organelles in which of the following order?
A) RER→SER→ Golgi apparatus→ Secretory vesicles
B) SER→ RER→ Golgi apparatus→ Secretory vesicles
C) RER→ SER→ Secretory vesicles→ Golgi apparatus
D) RER→ Golgi apparatus→ Secretory vesicles→ SER

LYSOSOME

Q.25 Which of the following organelle is most abundant in those animal cells which exhibit phagocytic activity?
A) Glyoxisomes
B) Microbodies
C) Lysosomes
D) Peroxisomes

Q.26 Strictly speaking, autophagosomes are actually:
A) Primary lysosomes
B) Secondary lysosomes
C) Tertiary lysosomes
D) Quaternary lysosomes

Q.27 It is a disease characterized by the accumulation of lipids in the brain cells leading to mental retardation and even death:
A) Grave's disease
B) Addison's disease
C) Glycogenosis type II disease
D) Tay-Sach's disease

PEROXISOMES AND GLYOXISOMES

Q.28 The organelle not found in yeast:
A) Mitochondria
B) Peroxisome
C) Golgi apparatus
D) Glyoxisome

Q.29 The organelle of eukaryotes that is formed for short period of time depending upon need and then disappear:
A) Peroxisome
B) Mitochondria
C) Glyoxysome
D) Chloroplast

Q.30 The organelle responsible for protection of cell from reactive oxygen molecules:
A) Lysosome
B) Vacuole
C) Peroxisome
D) Mitochondria

Q.31 Glyoxysomes are not expected to be rich in the seedlings of _____.
A) Caster bean
B) Soya bean
C) Sunflower
D) Potatoes

VACUOLES

Q.32 _____ provides support for the individual plant cell and contributes to the turgidity of the leaves and younger parts of plants.
A) Vacuole
B) Golgi apparatus
C) Endoplasmic reticulum
D) Cytoskeleton

Q.33 What is the specific name given to biological membrane that surrounds the vacuoles?
A) Plasma membrane
B) Endomembrane
C) Plasmalemma
D) Tonoplast

MITOCHONDRIA

Q.34 Which of the following cell organelle can be viewed with the help of high power light microscope?
A) Endoplasmic reticulum
B) Ribosomes
C) Mitochondria
D) Golgi apparatus

Q.35 It is the correct location of ATP synthase in mitochondria:
A) Mitochondrial matrix
B) Inner mitochondrial membrane
C) Outer mitochondrial membrane
D) Inter membrane space

Q.36 Which of the following structure is involved in oxidative phosphorylation?
A) Inner mitochondrial membrane
B) Mitochondrial matrix
C) Outer mitochondrial membrane
D) Thylakoid membrane

Q.37 Krebs cycle occurs in _____ of mitochondria.
A) Matrix
B) F_1 particles
C) Stroma
D) Cristae

Q.38 Which of the following cell type is more appropriate to study mitochondria?
A) RBC
B) Muscle cell
C) Mesophyll cell
D) *E. coli*

PLASTIDS

Q.39 Which of the following eukaryotic organelle has symbiotic origin with bacteria?
A) Endoplasmic reticulum
B) Chloroplast
C) Lysosomes
D) Golgi apparatus

Q.40 Chlorophyll molecule resembles with:
A) Carotenoids
B) Xanthophylls
C) Globin chains of hemoglobin
D) Haem part of hemoglobin

Q.41 Which of the following statement is incorrect?
A) CO_2 fixation occurs in stroma
B) Inter-granum is photosynthetic
C) Chloroplasts are self-replicating
D) Chloroplasts have 70S ribosomes

NUCLEUS

Q.42 Nucleolus is visible in:
A) Interphase
B) Mitotic phase
C) Metaphase
D) Anaphase

Q.43 Which of the following organelle have a continuous connection with nuclear membrane?
A) Golgi Apparatus
B) Lysosomes
C) RER
D) SER

Q.44 It precisely describes the function of nucleoli:
A) Formation and breakdown of nuclear envelope
B) Formation of centromere
C) Formation of ribosomes
D) Organization of spindle during nuclear division

Q.45 rRNA is actively synthesized in:
A) Lysosome
B) Nucleolus
C) Nucleoplasm
D) Ribosomes

Q.46 How many nuclear pores are present a typical differentiated cells such as RBCs?
A) About 30,00 per nucleus
B) About 30,000 per nucleus
C) About 1-2 per nucleus
D) About 3-4 per nucleus

PLANT AND ANIMAL CELL(COMPARISON)

Q.47 Plant cells are distinguishable from animal cells in containing:
A) Mitochondria
B) Ribosomes
C) Endoplasmic reticulum
D) Cell wall

Q.48 Pick the correct one w.r.t plant cell:

	Mitochondria	Peroxisome	Centrioles
A	✓	×	✓
B	✓	✓	×
C	×	✓	✓
D	×	✓	×

PROKARYOTIC AND EUKARYOTIC CELL (COMPARISON)

Q.49 Which of the following statement is true?
A) Prokaryotic cells are bigger than eukaryotic cells
B) Prokaryotic cells evolved before eukaryotic cells
C) Eukaryotic cells do not have a nucleus, prokaryotic cell do
D) Eukaryotic cells are simple, prokaryotic cells are complex

Q.50 What is the main difference between prokaryotes and eukaryotes?
A) Prokaryotes cannot undergo cell division
B) Prokaryotes have no DNA
C) Prokaryotes do not have internal membranes
D) Prokaryotes have no cytosol

Q.51 Prokaryotic and eukaryotic cells generally have which of the following feature in common?
A) A membrane bounded nucleus
B) Presence of ribosomes
C) A cell wall made up cellulose
D) Linear genome

Q.52 The distinguishing feature of prokaryotic cell is its:
A) Chemical nature of DNA
B) Cell wall
C) Ribosomes
D) Cytoplasmic Streaming movement

PAST PAPER MCQs

2008

Q.1 Which of the following modifies proteins and lipids by adding carbohydrates?
A) Golgi Apparatus
B) Polysome
C) Plasma membrane
D) None of these

Q.2 Which one of the following is most slender in structure?
A) Microtubules
B) Microfilaments
C) Intermediate filaments
D) Both A and B

Q.3 Which of the following are colorless?
A) Chloroplasts
B) Chromoplasts
C) Leucoplasts
D) None of these

Q.4 Which of the following has 40 chromosomes?
A) Corn
B) Sugarcane
C) Frog
D) Mouse

2009

Q.5 Detoxification of harmful drugs within the cell is done by:
A) Nucleolus
B) Smooth surface endoplasmic reticulum
C) Ribosomes
D) Food vacuoles

Q.6 A group of ribosomes attached to messenger RNA is known as:
A) Ribosome
B) Lysosome
C) Nucleosome
D) Polysome

2010

Q.7 Microtubules of spindle fibers are composed of a protein called:
A) Tubulin
B) Actin
C) Myosin
D) Troponin

Q.8 In prokaryotic cell, wall strengthening material is:
A) Cellulose
B) Silica
C) Chitin
D) Peptidoglycan

Q.9 The entire cell wall of bacteria is often regarded as a single huge molecule or molecular complex called:
A) Capsule
B) Secondary wall
C) Slime capsule
D) Sacculus

2011

Q.10 Which of the following organelles is concerned with the cell secretion?
A) Ribosomes
B) Golgi apparatus
C) Lysosomes
D) Mitochondria

Q.11 The inner membrane of mitochondria is folded to form finger like structure called:
A) Cristae
B) Vesicle
C) Matrix
D) Cisternae

Q.12 Interior of chloroplast is divided into heterogeneous structure, embedded in the matrix known as:
A) Grana
B) Stroma
C) Thylakoids
D) Cisternae

Q.13 Which of the following contains peptidoglycan cell wall?
A) *Penicillium*
B) Bacterium
C) *Adiantum*
D) *Polytrichum*

2012

Q.14 Plastids are only found in the:
A) Animals and Plants
B) Animals
C) Plants
D) Viruses

Q.15 Plasma membrane is chemically composed of:
A) Phospholipids only
B) Lipids and proteins
C) Lipids and carbohydrates
D) Glycoproteins

Q.16 Endoplasmic reticulum contains a system of flattened membrane-bounded sac which are named as:
A) Cristae
B) Marks
C) Cisternae
D) Tubules

Q.17 Lipid synthesis/metabolism takes place in which of the following organelle?
A) Mitochondria
B) Vacuole
C) Rough endoplasmic reticulum
D) Smooth endoplasmic reticulum

Q.18 Ribosomes exist in two forms, either attached with RER or freely dispersed in the:
A) Tonoplast
B) Golgi bodies
C) Cytoplasm
D) SER

Q.19 The ribosomal RNA is synthesized and stored in:
A) Endoplasmic reticulum
B) Nucleolus
C) Golgi complex
D) Chromosomes

2013

Q.20 The _____ model of plasma membrane suggests that proteins are embedded in lipid bilayer.
A) Unit membrane
B) Fluid mosaic
C) Permeable
D) Ultracentrifuge

Q.21 Lipid metabolism is the function of:
A) Mitochondria
B) Sarcoplasmic reticulum
C) RER
D) SER

Q.22 The enzymes of lysosomes are synthesized on:
A) RER
B) SER
C) Chloroplast
D) Golgi apparatus

Q.23 The process by which unwanted substances within the cell are engulfed and digeste within the lysosome is known as:
A) Endocytosis
B) Exocytosis
C) Hydrolysis
D) Autophagy

Q.24 Centriole is made up of _____ microtubules.
A) 9
B) 27
C) 3
D) 12

Q.25 Which of the following structure is absent in higher plants and found in animal cells?
A) Centriole
B) Cytoskeleton
C) Mitochondria
D) Cytoplasm

Q.26 The outer membrane of the nuclear envelope is at places continuous with the:
A) Golgi apparatus
B) Endoplasmic Reticulum
C) Lysozymes
D) Peroxisomes

Q.27 The function of nucleolus is to make:
A) rDNA
B) Ribosomes
C) RNA
D) Chromosomes

2014

Q.28 The intake of liquid materials across the cell membrane is:
A) Phagocytosis
B) Endocytosis
C) Pinocytosis
D) Exocytosis

Q.29 Which component of the cell is concerned with cell secretions?
A) Plasma membrane
B) Golgi complex
C) Cytoskeleton
D) Mitochondria

Q.30 During animal cell division, the spindle fibers are formed from:
A) Mitochondria
B) Centrioles
C) Ribosomes
D) Lysosomes

Q.31 In mitochondria, small knob-like structures called F_1 particles are found in:
A) Outer membrane
B) Outer compartment
C) Inner membrane
D) Inner compartment

Q.32 Organelle involved in the synthesis of ATP is:
A) Ribosome
B) Mitochondria
C) Nucleus
D) Centriole

Q.33 Peptidoglycan or murein is a special or distinctive feature of cell wall in:
A) Algae
B) Fungi
C) Bacteria
D) Plants

Q.34 How many triplets of microtubules are present in centriole?
A) Ten
B) Eight
C) Nine
D) Seven

2015

Q.35 Fluid mosaic model of plasma membrane states that protein molecules float in a fluid like _____ layer.
A) Galactose
B) Phospholipids
C) Glucose
D) Carbohydrate

Q.36 Ribosomes are tiny organelles, which are involved in the synthesis of:
A) Protein
B) RNA
C) Nucleus
D) Nucleosome

Q.37 Which one of the following cell structure is involved in the synthesis of lipids?
A) Endoplasmic reticulum
B) Golgi complex
C) Centriole
D) Mitochondria

Q.38 Which organelle is bounded by two membranes?
A) Ribosome
B) Mitochondria
C) Lysosome
D) Nucleolus

2016

Q.39 The inner membrane of mitochondria forms extensive infoldings called:
A) Cristae
B) Cisternae
C) Lamella
D) Bifidae

Q.40 The rapid exchange of materials through carrier proteins across the plasma membrane is called:
A) Passive Diffusion
B) Active Transport
C) Endocytosis
D) Facilitated Diffusion

Q.41 The basic structure of plasma membrane is provided by:
A) Proteins
B) Cholesterols
C) Cytoskeleton
D) Phospholipids

Q.42 Out of the given options, choose the one which shows the structures found only in plants?
A) Vacuole, chloroplast, ribosomes
B) Chloroplast, microtubules, peroxisomes
C) Chloroplast, cell wall, vacuole
D) Chloroplast, cell wall, mitochondria

Q.43 Presence of large central vacuole is the characteristic of:
A) Prokaryotes
B) Protists
C) Fungi
D) Plants

Q.44 The organelle involved in detoxification of drugs and poisons in the liver cells:
A) Smooth Endoplasmic Reticulum
B) Rough Endoplasmic Reticulum
C) Golgi apparatus
D) Lysosomes

Q.45 Which one of the following organelle is found in both prokaryotic and eukaryotic cells?
A) Centriole
B) Endoplasmic Reticulum
C) Nucleus
D) Ribosome

2017

Q.46 Select the organelle which is only present in animal cells:
A) Centrioles
B) R.E.R
C) Microtubules
D) Ribosomes

Q.47 Ribosomes present in prokaryotes are:
A) 80S
B) 60S
C) 50S
D) 70S

Q.48 Functionally, mesosomes can be compared with:
A) Ribosomes
B) Mitochondria
C) Polysomes
D) Golgi bodies

Q.49 Which of the following structure is present in both plant and animal cells but is absent in prokaryotic cells?
A) Centrioles
B) Microtubule
C) Plastids
D) Sieve tubes

Q.50 DNA molecule in prokaryotes is:
A) Single, circular, double stranded molecule not bound by membrane
B) Double, circular molecule
C) Linear, double stranded molecule
D) Single, circular, double stranded and membrane bound

2017-RETAKE

Q.51 Organelle involved in aerobic respiration:
A) Mitochondria
B) Lysosome
C) Plastids
D) Ribosome

Q.52 Inner membrane of mitochondria is called:
A) Cisternae
B) Cristae
C) Lemma
D) Tonoplast

Q.53 Group of ribosomes attached to mRNA is called:
A) Polyploid
B) Polysome
C) Polynucleotide
D) Polysaccharide

Q.54 Which of the following organelle consist of two subunits?
A) Golgi body
B) Mitochondria
C) Ribosome
D) Plastid

Q.55 Ribosome present in prokaryotes are of:
A) 70S
B) 80S
C) 60S
D) 40S

Q.56 Taking in of solid particle by cell is called:
A) Phagocytosis
B) Pinocytosis
C) Exocytosis
D) Endocytosis

Q.57 Self-eating of lysosomes is called:
A) Phagocytosis
B) Pinocytosis
C) Autophagy
D) Exocytosis

Q.58 Nuclear membrane is continuous with:
A) E.R
B) Golgi Body
C) Lysosome
D) Peroxisome

Q.59 Ribosomal RNA is synthesized in:
A) Nucleolus
B) Peroxisome
C) Golgi body
D) Nucleoplasm

2018

Q.60 The ability to distinguish between two separate points/objects is:
A) Magnification
B) Fractionation
C) Centrifugation
D) Resolution

Q.61 Lipid synthesis or lipid metabolism is the function of:
A) Smooth endoplasmic reticulum
B) Rough endoplasmic reticulum
C) Mitochondria
D) Golgi complex

Q.62 Site of protein synthesis in cell is:
A) Ribosome
B) Endoplasmic reticulum
C) Nucleolus
D) Smooth endoplasmic reticulum

Q.63 Ribosomes are made up of _____ and _____.
A) RNA and proteins
B) RNA and lipids
C) RNA and carbohydrates
D) Proteins and carbohydrates

Q.64 Tonoplast bounds which organelle:
A) Golgi complex
B) Nucleus
C) Endoplasmic reticulum
D) Vacuoles

Q.65 These structures are involved in the breakdown of old organelles:
A) Leucoplasts
B) Lysosomes
C) Glyoxysomes
D) Peroxisomes

Q.66 In cross section, each centriole consists of nine (each in triplets) of:
A) Microfilaments
B) Microvilli
C) Microtubules
D) Intermediate filaments

Q.67 The cisternae break up into vesicles from _____ and _____ of Golgi complex.
A) Convex, forming face
B) Concave, forming face
C) Convex, maturing face
D) Concave, maturing face

Q.68 Which statement is correct about mitochondria and chloroplast?
A) Chloroplast and mitochondria cannot live independently
B) 70S ribosome is attached with the inner membrane of mitochondria and chloroplast
C) Chloroplast and mitochondria are single membrane structure
D) Number of mitochondria and chloroplast are same in all cells

2019

Q.69 If 15 μm size object is observed under light microscope using 5X eyepieces and 10X objective, its magnified image size will be:

A) 250 μm
B) 50 μm
C) 750 μm
D) 500 μm

Q.70 Passive processes for the movement of molecules across cell surface membrane are:

A) Facilitated diffusion and osmosis
B) Pinocytosis and facilitated diffusion
C) Diffusion and exocytosis
D) Osmosis and phagocytosis

Q.71 Smooth endoplasmic reticulum is responsible for the metabolism of:

A) Carbohydrates
B) Proteins
C) Nucleic acids
D) Lipids

Q.72 Site of protein synthesis is:

A) Ribosomes
B) Lysosomes
C) Golgi body
D) Cisternae

Q.73 Which cell organelle is responsible for cell secretion?

A) Mitochondrion
B) Chloroplast
C) Ribosomes
D) Golgi body

Q.74 The finger like infoldings which are formed by inner membrane of mitochondria are called:

A) Matrix
B) Porins
C) Cristae
D) Ribosomes

Q.75 Among followings which cellular organelle contains circular DNA similar to those found in bacteria?

A) Ribosome
B) Lysosome
C) Chloroplast
D) Nucleus

Q.76 The structure present in a eukaryotic cell but absent in prokaryotic cells is:

A) Nucleus
B) DNA
C) Ribosomes
D) Cell surface membrane

Q.77 The prokaryotes possess small ribosomes of size:

A) 40S
B) 70S
C) 65S
D) 60S

2020

Q.78 In which type of cells, cell wall is not present:

A) Plant cells
B) Fungal cells
C) Bacterial cells
D) Liver cells

Q.79 70S sized ribosomes are found in the cells of:

A) Algae
B) Fungi
C) Protozoans
D) Bacteria

Q.80 According to the fluid mosaic model of cell membrane, which zone is embedded inside?

A) Hydrophobic
B) Hydrophilic
C) Globular
D) Filamentous

Q.81 The membrane separating the vacuole from cytoplasm is called:

A) Cristae
B) Cisternae
C) Tonoplast
D) Vacuolar membrane

Q.82 Select the one which is not a function of smooth endoplasmic reticulum (SER):
A) Metabolism of lipids
B) Transmission of impulses
C) Transport of materials
D) Processing of glycoproteins

Q.83 Which of the following organelles are involved in the synthesis of plant cell wall?
A) Endoplasmic reticulum
B) Golgi complex
C) Lysosomes
D) Peroxisomes

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	C	21	D	31	D	41	B	51	B
2	D	12	A	22	D	32	A	42	A	52	B
3	C	13	C	23	A	33	D	43	C		
4	B	14	B	24	A	34	C	44	C		
5	C	15	C	25	C	35	B	45	B		
6	B	16	C	26	B	36	A	46	D		
7	B	17	C	27	D	37	A	47	D		
8	D	18	B	28	D	38	B	48	B		
9	D	19	B	29	C	39	B	49	B		
10	C	20	C	30	C	40	D	50	C		

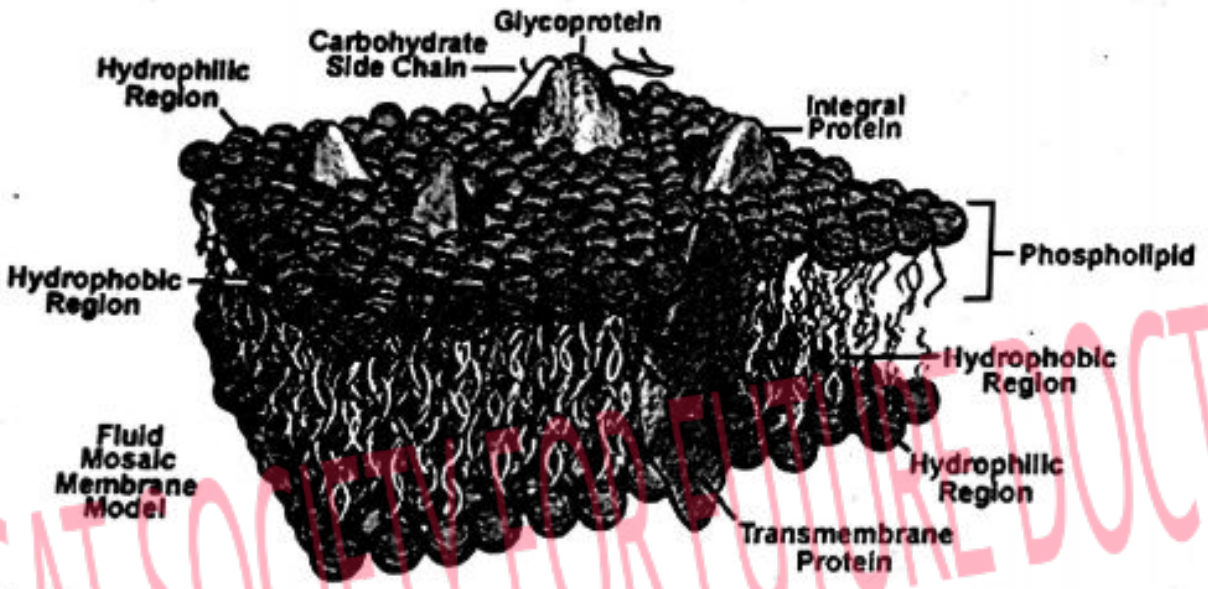
PAST PAPERS MCQs

1	A	11	A	21	D	31	C	41	D	51	A	61	A	71	D	81	C
2	B	12	A	22	A	32	B	42	C	52	B	62	A	72	A	82	D
3	C	13	B	23	D	33	C	43	D	53	B	63	A	73	D	83	B
4	D	14	C	24	B	34	C	44	A	54	C	64	D	74	C		
5	B	15	B	25	A	35	B	45	D	55	A	65	B	75	C		
6	D	16	C	26	B	36	A	46	A	56	A	66	C	76	A		
7	A	17	D	27	B	37	A	47	D	57	C	67	D	77	B		
8	D	18	C	28	C	38	B	48	B	58	A	68	B	78	D		
9	D	19	B	29	B	39	A	49	B	59	A	69	C	79	D		
10	B	20	B	30	B	40	D	50	A	60	D	70	A	80	A		

EXPLANATORY NOTES

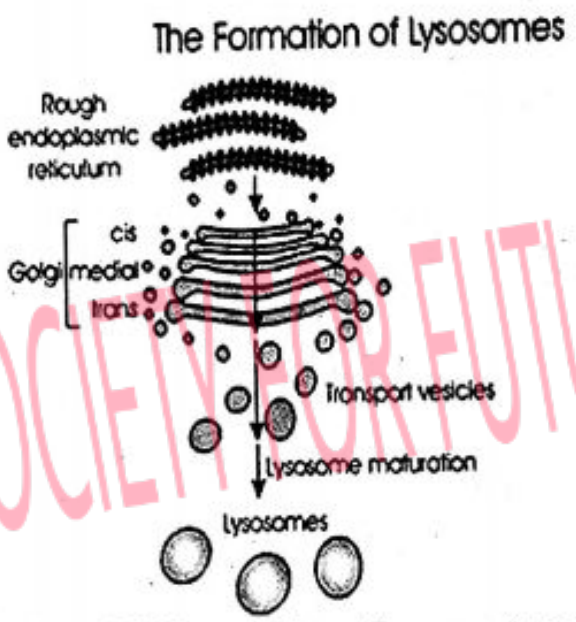
TOPIC-WISE MCQs

1. Cellulose fibers are responsible for strengthening of cell wall of plants in crisscross manner, placing them at right angle with each other gives more strength.
2. Cell wall of prokaryotes is composed of polysaccharide chains bounded to shorter chains of amino acid forming peptidoglycan or murein. The entire cell wall is often regarded as a single huge molecule called sacculus.
3. All are present in secondary cell wall except pectin as it is component of primary cell wall.
4. Globular proteins, polysaccharides and phospholipids are present in both prokaryotic and eukaryotic cell membranes while cholesterol is present only in eukaryotic cell membrane.
5. And 6

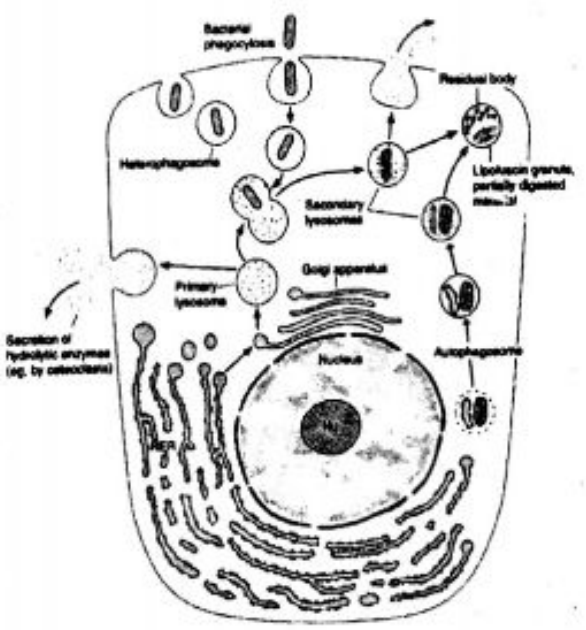


7. Glycolipids and glycoproteins are oriented towards outer surface of plasma membrane and form glycocalyx and act as receptors.
8. The animal cell membrane provides mechanical support, maintain cellular homeostasis, and regulate passage of molecules across the membrane. It does not prevent the animal cell from osmotic lysis, it is the function of cell wall, which is absent in animal cells.
9. Glycoproteins which are present on plasma membrane can act as receptors for hormones and various other molecules.
10. Cell membrane is the most important structure because it is responsible for identity and integrity of the cell.
11. Consistency of cytoplasm is both like sol and gel, but peripheral part is more gel like while central is sol like.
12. Nucleus contains genomic DNA, chloroplast and mitochondria have their own circular genomic DNA while ribosomes are made up of rRNA and protein.
13. *E. coli, C. botulinum and T. pallidum* are prokaryotic organisms having 30S smaller ribosomal subunit while yeast is eukaryotic organism having 40S smaller ribosomal subunit.
14. Ribosomes are a non-membranous organelle, while all others have membrane around them.
15. Secretory proteins are synthesized on RER, then transferred to Golgi apparatus through SER for final processing and packaging and finally released as secretory vesicles via cell membrane.
6. Adipose tissue is concerned with conversion, synthesis and storage of lipids that is why it contains more SER than RER.

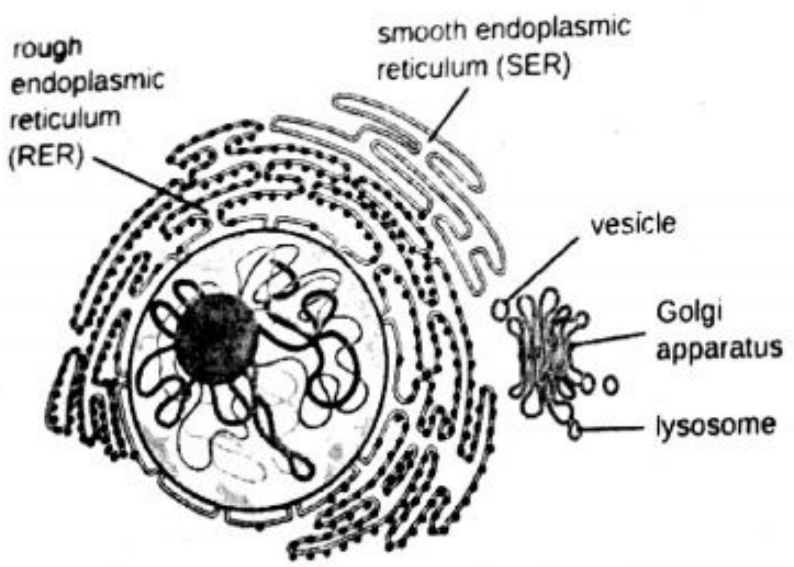
17. Calcium storage and steroid synthesis is the function of SER, while enzyme synthesis is the function of RER. Mechanical support is, however, related to both SER and RER.
18. Nucleus, chloroplast and mitochondria are double membranous organelles while endoplasmic reticulum is single membranous.
19. Role in detoxification of drugs is the function of SER while protein synthesis is the function of RER. Mechanical support, however, is the function of both RER and SER.
20. Mitochondria are responsible for fatty acid metabolism while steroid biosynthesis takes place in SER.
21. DNA replication occurs in nucleus, proteins are synthesized by RER and anaerobic respiration occurs in cytoplasm. Chemical modification of biological molecules is the function of Golgi apparatus.
22. The enzymes required for proteins glycosylation are solely found in lumen of rough endoplasmic reticulum and Golgi complex. Hence, the more appropriate answer is "D". Golgi bodies are center for modifications and packaging.
23.



24. Proteins are synthesized on RER, and then they are transported in with the help of SER. The modification of these proteins is done in Golgi complex. Modified proteins are transported out of the cell in the form of secretory vesicles.
25. Lysosomes are most abundant in those cells which are specialized for phagocytic activities, for example WBCs.
26.



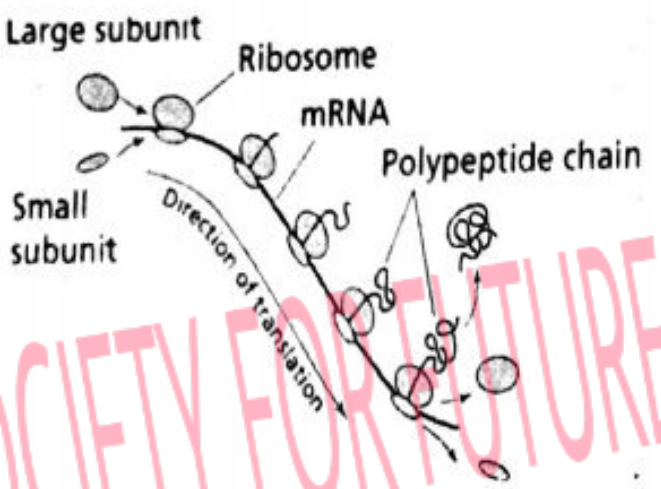
27. Storage diseases are due to the absence of lysosomal enzymes. If a lysosomal enzyme responsible for lipid metabolism is absent, it leads to the accumulation of lipids in brain cells which causes mental retardation and death. such storage disease is known as Tay-Sach's disease.
28. Glyoxysomes are related to lipid metabolism and yeast mostly deals with carbohydrate metabolism.
29. Glyoxysomes like some other organelle are produced on demand or found in selective conditions.
30. Peroxidase enzyme found in cell helps in metabolism of various reactive radicals.
31. Glyoxisomes are found in lipid rich seeds.
32. Vacuoles provide support for the individual plant cell and contribute to the turgidity of the leaves and younger parts of the plants.
33. Vacuole is single membrane bounded organelle. This single membrane around vacuole is known as tonoplast.
34. Due to large size of mitochondria as compared to endoplasmic reticulum, Golgi apparatus and ribosomes, it can be visualized easily with the help of light microscope.
35. F_1 particles are located on cristae, the infoldings of the inner mitochondrial membrane. F_1 particle is actually ATP synthase which plays important role in synthesis of ATP through chemiosmosis.
36. ETC occurs in inner mitochondrial membrane which provides the site for pumping of protons across it. Oxidative phosphorylation is associated with ETC.
37. All the enzymes which are involved in Krebs cycle are present in matrix of mitochondria. It is the most important biochemical pathway of cellular respiration. The enzymes involved in dark reactions of photosynthesis are found in stroma of chloroplasts.
38. Mitochondria are most abundant in muscle cells because of the strenuous metabolic activities. *E. coli* is a prokaryotic organism and lack mitochondria. RBC's also lack mitochondria.
39. Two most important organelles e.g. chloroplast and mitochondria, are thought to be originated from prokaryotes and are explain with the help of endosymbiont hypothesis.
40. The only difference between chlorophyll and haemoglobin is that chlorophyll has Mg^{++} while haem has Fe^{++} as the central atom.
41. Inter-granum is non green part that connects two grana. The process of photosynthesis does not occur in inter-granum because of absence of chlorophyll.
42. Nucleus and nucleolus is visible during interphase only because in mitotic phase, nuclear envelope disintegrates and mixing of nuclear contents with cytoplasm does occur.
43.



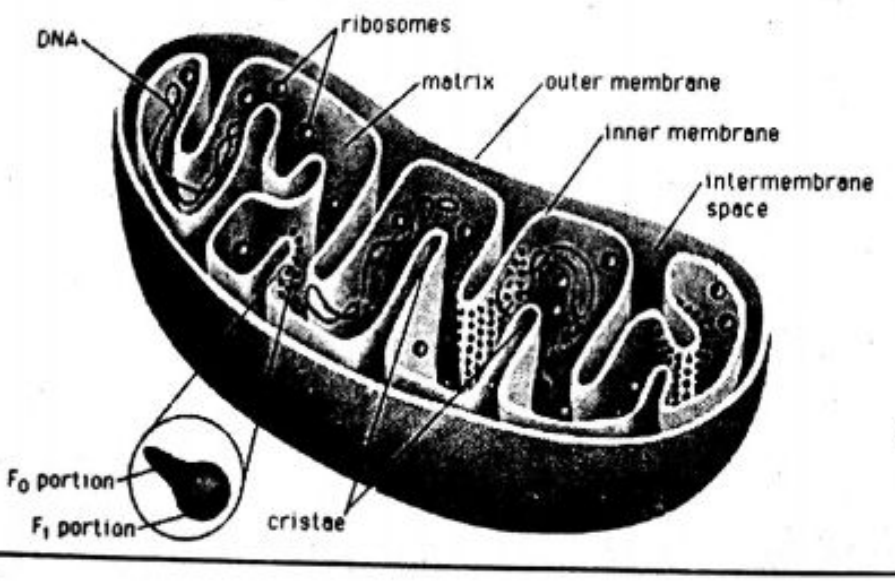
44. Nucleolus is the darkly stained area within the nucleus and without any membranous boundary to separate it from the rest of the nuclear material. These are said to be the factory of ribosomes while ribosomes are said to be the factory of protein synthesis.
45. The rRNA is synthesized and stored in nucleolus. Central fibril area of nucleolus has large molecular weight RNA and rDNA.
46. Number of nuclear pores is more in undifferentiated cells as compared to differentiated cells. Since RBCs are fully differentiated cells so they have 3-4 nuclear pores, but the number of nuclear pores in egg cells is about 30,000.
47. Plants contains cell wall as outer most membrane whereas in animal cell it is absent.
48. Centrioles are absent in higher plant cells.
49. Prokaryotic cells may have arisen more than 3.5 billion years ago while eukaryotes are thought to have first appeared about 1.5 billion years ago.
50. Besides nuclear envelope, the main difference between prokaryotic and eukaryotic cell is the absence of membrane bounded organelles.
51. Both prokaryotic and eukaryotic cells have ribosomes while membrane bound nucleus, cellulosic cell wall and linear chromosomes are found only in eukaryotic cells.
52. The most distinguished feature of a prokaryotic cell is its cell wall and chemically, it is composed of carbohydrates and short peptides. This complex molecule is called peptidoglycan/murein.

PAST PAPER MCQs

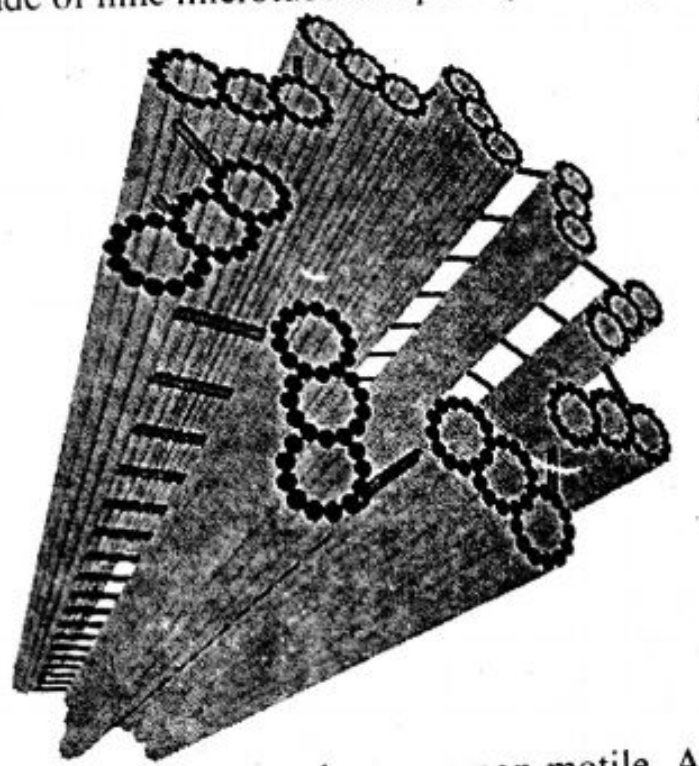
1. The enzymes required for proteins glycosylation are solely found in lumen of rough endoplasmic reticulum and Golgi complex. Hence, the more appropriate answer is "D". Golgi bodies are center for modifications and packaging.
2. Microfilaments are considerably slenderer cylinders made up of contractile actin protein, linked to the inner face of plasma membrane.
3. Chloroplasts are green in colour due to the presence of green pigment 'chlorophyll'. Chromoplasts are colored and help for pollination and seed dispersal. Leucoplasts are colorless and are found in underground parts of the plant and store food.
4. Mouse has 40, corn has 20, sugarcane has 80, and frog has 26 chromosomes in their diploid cells.
5. The detoxification of drugs is the function of SER while protein synthesis is the function of RER. Mechanical support, however, is the function of both RER and SER.
6.



7. Tubulin is the most abundant protein found in microtubules while myosin, actin and tropomyosin are found in microfilaments.
8. Bacterial cell wall is composed of peptidoglycan also called murein, which is made from polysaccharide chains cross-linked by short peptides. Bacterial cell walls are different from the cell walls of plants and fungi which are made of cellulose and chitin, respectively.
9. In case of bacterial cell, the entire cell wall is often regarded as a single huge molecule or molecular complex known as sacculus. Capsule and smile are outer covering to cell wall in some bacteria.
10. Golgi complex is considered as secretory organelle of the cell. Secretory proteins are synthesized on RER, then transferred to Golgi apparatus through SER for final processing and packaging and finally released as secretory vesicles.
11.

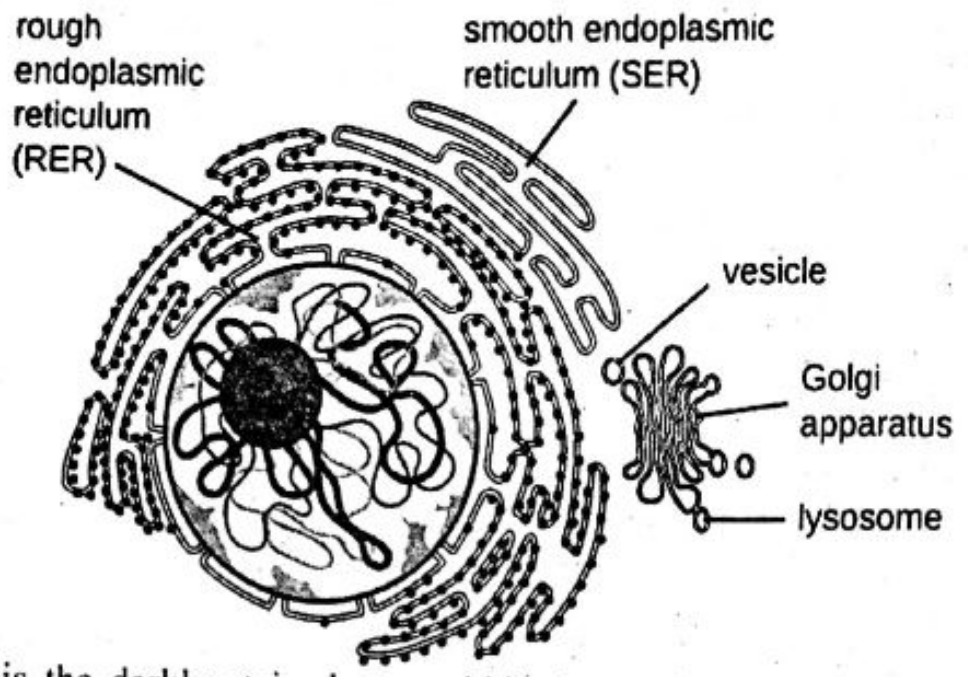


12. Thylakoids are flattened vesicles which arrange themselves in the form of grana and inter-granum. Grana are piled up in the form of coins.
13. Bacterial cell walls are made of peptidoglycan also called murein, which is made from polysaccharide chains cross-linked by short peptides. Bacterial cell walls are different from the cell walls of plants and fungi which are made of cellulose and chitin, respectively.
14. Plastids are present in autotrophic eukaryotes and multicellular organisms such as plants and algae. Animals are heterotrophs and viruses are not considered as living organisms.
15. Plasma membrane is made up 60-80% of proteins, 20-40% of lipids and very small amount of carbohydrates.
16. Material in Endoplasmic reticulum is separated from the cytoplasmic materials by the spherical or tubular membranes, called cisternae.
17. Mitochondria are responsible for fatty acid catabolism while lipid synthesis takes place in SER.
18. Ribosomes are factory of protein synthesis. The attached ribosomes are associated with RER and nuclear membrane but the free ribosomes are suspended in the cytoplasm.
19. The rRNA is synthesized and stored in nucleolus. Central fibril area of nucleolus has large molecular weight RNA and rDNA.
20. Fluid mosaic model of the plasma membrane described the arrangement of phospholipids in two layers, stabilized interiorly by the hydrophobic interactions while hydrophilic interactions at intracellular and extracellular faces with embedded proteins randomly.
21. Mitochondria are responsible for fatty acid catabolism while lipid synthesis takes place in SER.
22. All enzymes are proteins in nature. Lysosomal enzymes are synthesized on RER then transported with the help of SER towards Golgi complex from where they bud off in the form of primary lysosomes.
23. Autophagy is the natural, regulated mechanism of the cell that removes unnecessary or dysfunctional component of the cell. It allows the orderly degradation and recycling of cellular components.
24. Each centriole is made of nine microtubule triplets (9×3=27).



25. Flagella are absent in plants because plants are non-motile. As flagella are formed from centrioles so centrioles are absent in most of the plants. In case of plants, spindle fibers arise from analogous region due to the absence of centrioles.

26.



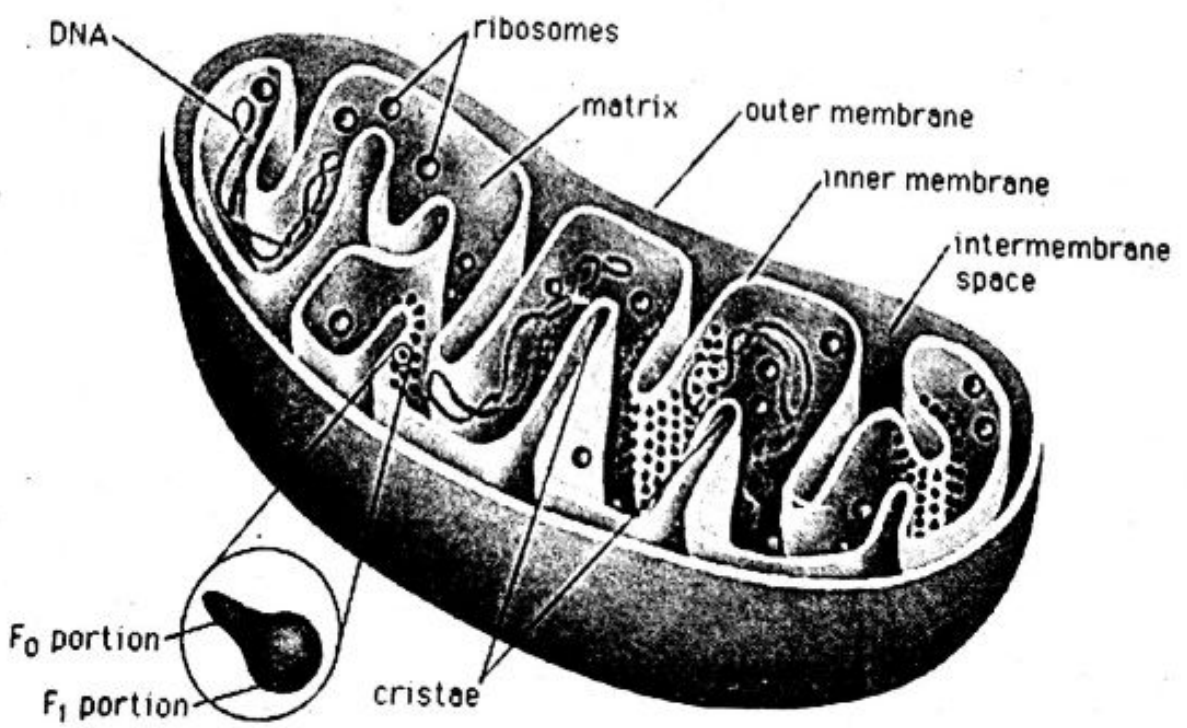
27. Nucleolus is the darkly stained area within the nucleus and without any membranous boundary to separate it from the rest of the nuclear material. These are said to be the factory of ribosomes while ribosomes are said to be the factory of protein synthesis.

28. The ingestion of liquid material into a cell by the budding of small vesicles from the cell membrane is called pinocytosis while the process by which certain living cells called phagocytes ingest or engulf other cells or solid particles.

29. Golgi complex is considered as secretory organelle of the cell. Secretory proteins are synthesized on RER, then transferred to Golgi apparatus through SER for final processing and packaging and finally released as secretory vesicles.

30. Spindle fibers are made up of microtubules. There are two centrioles in non-dividing stage of a cell. Each centriole has nine microtubule triplets. During dividing stage of cell, spindle fibers arise from these centrioles.

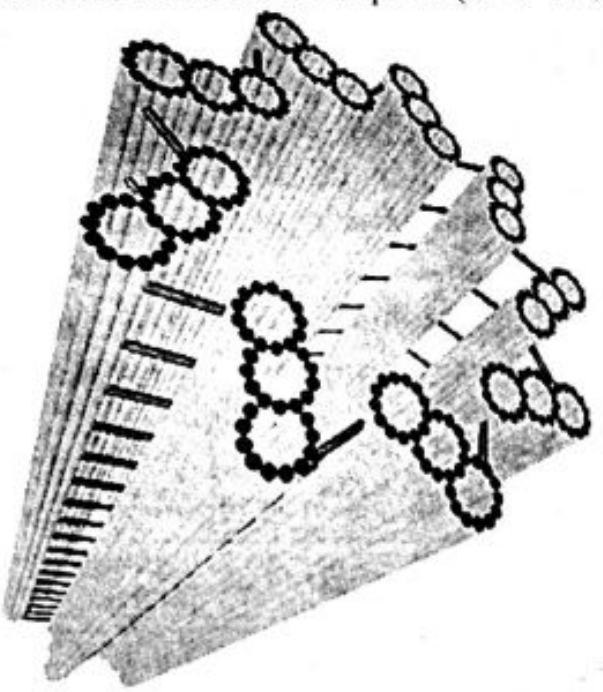
31.



32. F_1 particles are located on cristae, the infoldings of inner mitochondrial membrane. F_1 particle is actually ATP synthase which plays role in synthesis of ATP through chemiosmosis.

33. Bacteria cell wall is made up of peptidoglycan which has glycan with short chain of amino acids.

34. Each centriole is made of nine microtubule triplets (9×3=27).



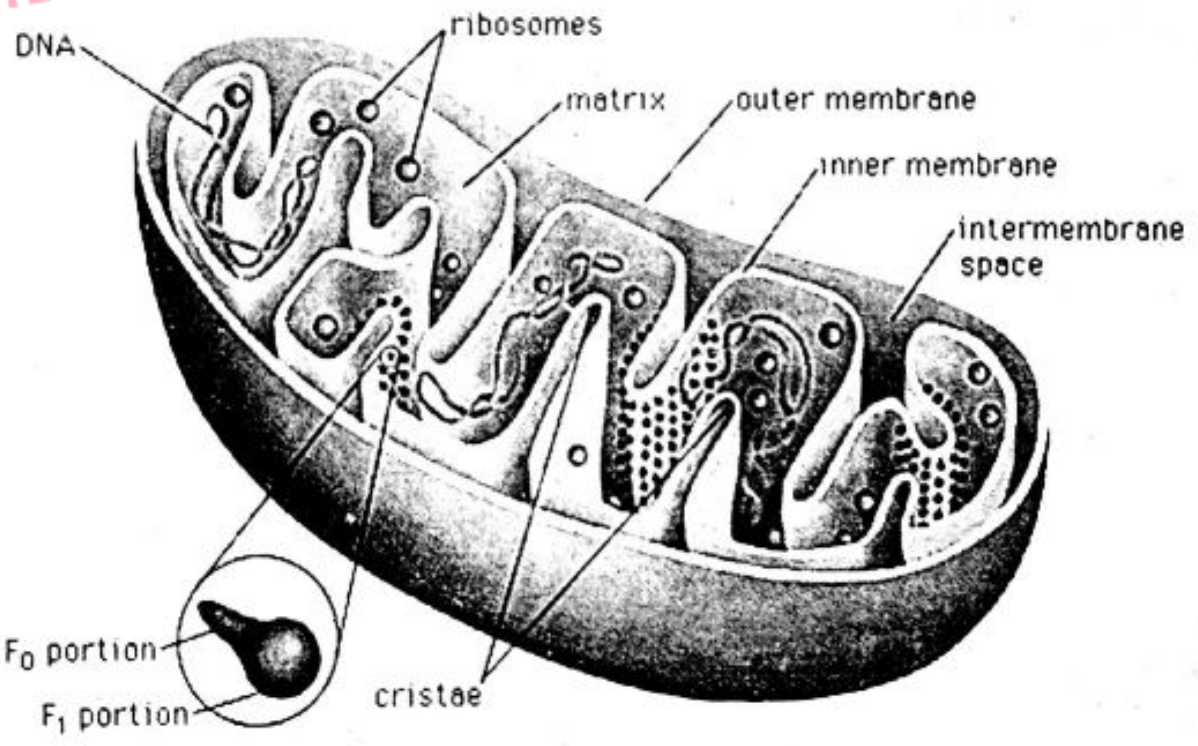
35. Fluid mosaic model of the plasma membrane described the arrangement of phospholipids in two layers, stabilized interiorly by the hydrophobic interactions while hydrophilic interactions at intracellular and extracellular faces with embedded proteins randomly.

36. Ribosomes are factory of protein synthesis. The attached ribosomes are associated with RER and nuclear membrane but the free ribosomes are suspended in the cytoplasm.

37. Mitochondria are responsible for fatty acid catabolism while lipid synthesis takes place in SER.

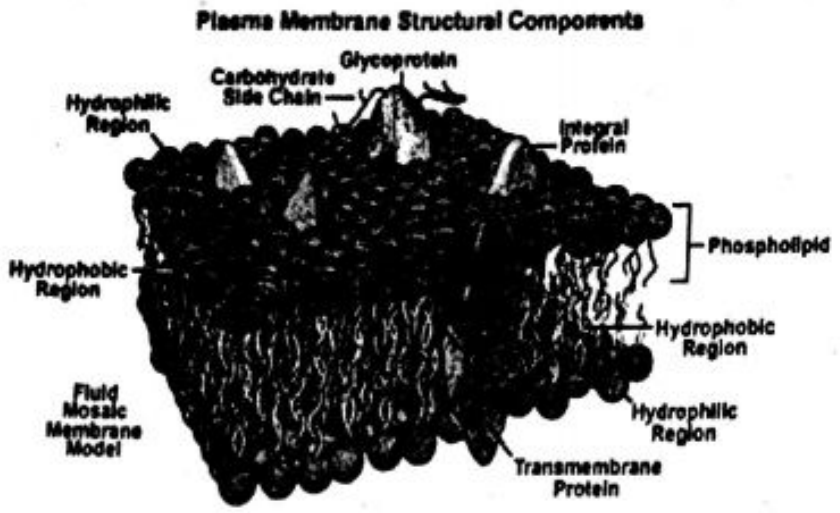
38. Mitochondria, chloroplast and nucleus are double membrane bounded organelles. Lysosomes, Golgi complex, endoplasmic reticulum and micro-bodies are single membranous organelles while ribosomes lack membrane.

39.



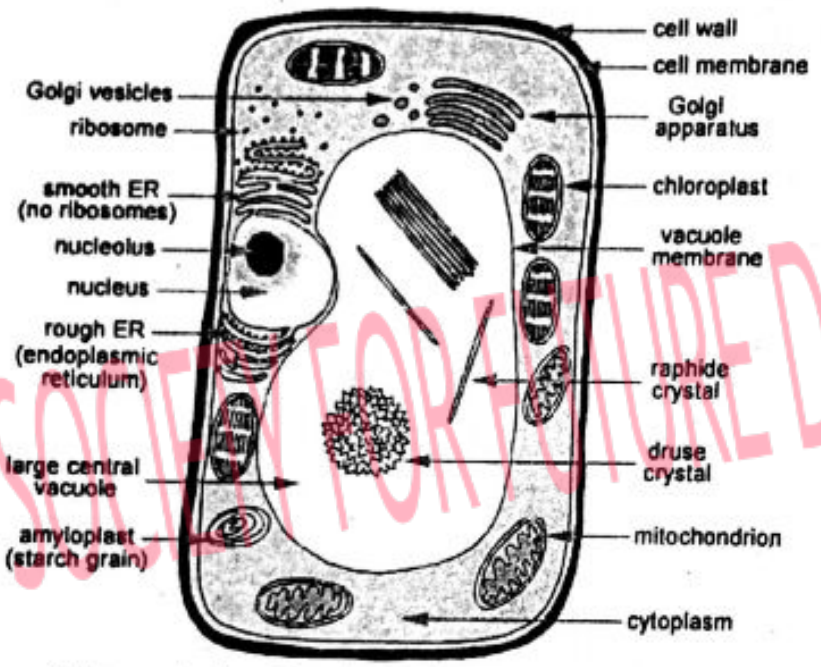
40. Facilitated diffusion also known as facilitated transport or passive-mediated transport, is the process of spontaneous passive transport of molecules or ions across a biological membrane via specific trans-membrane integral proteins.

41.



42. Chloroplast, cell wall and large central vacuole are the organelles which are absent in an animal cells but present in plant cells.

43.



44. The detoxification of drugs is the function of SER while protein synthesis is the function of RER. Mechanical support, however, is the function of both RER and SER.

45. Membrane bounded organelles are absent in prokaryotic cells but present in eukaryotic cells. Ribosomes are non-membranous and are present in both prokaryotic and eukaryotic cells.

46. Centrioles are present only in animal cell but RER, microtubules and ribosomes are present in both animal and plant cells.

47. The size of the ribosomes present in prokaryotic and eukaryotic cells is 70S and 80s, respectively. 70S ribosomes are, however, present in some eukaryotic organelles like mitochondria and chloroplasts.

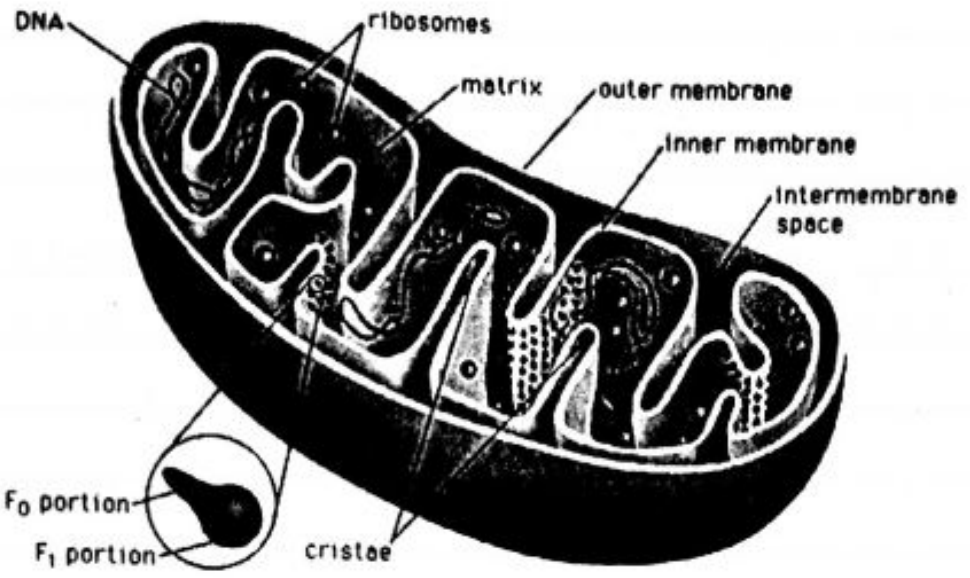
48. Mesosomes are membrane infoldings in bacterial cell and are more prominent in Gram negative bacteria. Mesosomes are the sites of cellular respiration. Electron transport chain occurs in mesosomes as mitochondria is absent in bacteria.

49. Mitotic and meiotic cell divisions are absent in bacterial cells instead bacterial cells divide through binary fission. Microtubules are responsible for spindle formation and these ensure mitosis and meiosis in eukaryotic cells.

50. Genomic DNA molecules in prokaryotes is single, circular, double stranded and not bounded by any membrane and it is freely dispersed in cytoplasm.

51. Mitochondria are power house of a cell. Aerobic cellular respiration takes place in mitochondria.

52.



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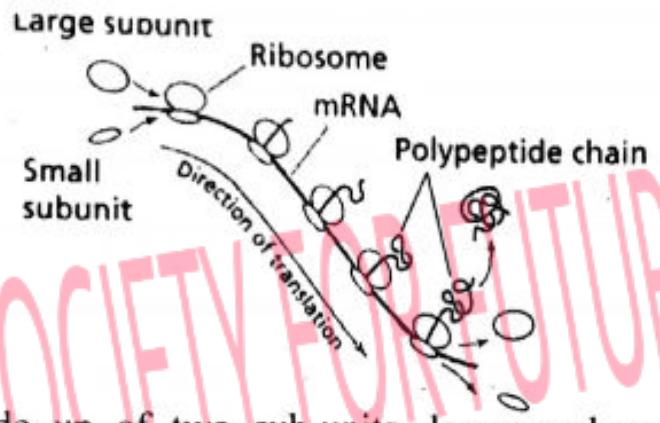


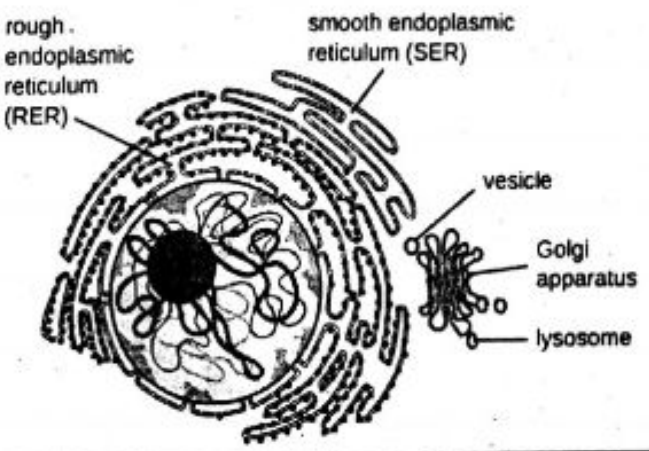
54. A ribosome is made up of two sub-units, larger and smaller subunits. In case of eukaryotic cell, larger subunit is 60S and smaller subunit is 40S while prokaryotic cell has 50S and 30S larger and smaller sub-units, respectively.

55. Smaller ribosomes (70S) are present in prokaryotic cell but larger ribosomes (80S) are present in eukaryotic cells.

56. Phagocytosis is the process by which a cell uses its plasma membrane to engulf a large solid particle, giving rise to an internal compartment called the phagosome. It is one type of endocytosis while pinocytosis, otherwise known as fluid endocytosis is a mode of endocytosis in which small particles suspended in extracellular fluid are brought into the cell through an invagination of the cell membrane, resulting in a suspension of the particles within a small vesicle inside the cell.

57. Autophagy is the natural, regulated mechanism of the cell that removes unnecessary or dysfunctional components. It allows the orderly degradation and recycling of cellular components with the help of lysosomes.

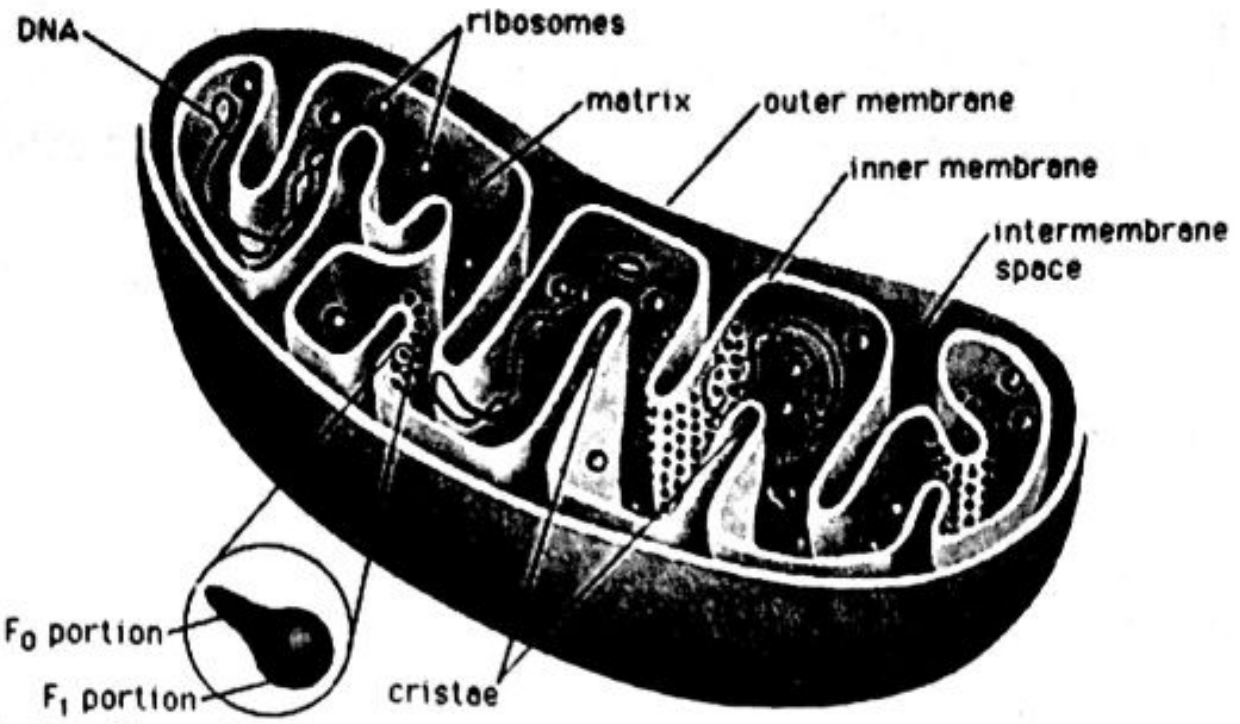
58.



59. Ribosomal RNA (rRNA) is synthesized and stored in nucleolus. Central fibril area of nucleolus has large molecular weight RNA and rDNA.
60. Resolution is the shortest distance between two points that a user can still see as separate images under the microscope.
61. SER is responsible for lipid metabolism, detoxification, nerve impulse conduction and transport of material in the cell.
62. Ribosome is the factory of protein synthesis. But the factory of ribosomes synthesis is nucleolus.
63. Chemically ribosomes are composed of an almost equal amount of RNA and proteins; hence they are ribonucleo-protein particles.
64. Vacuole is single membrane bounded organelle. This single membrane bounding vacuole is known as tonoplast.
65. Lysosomes are membrane bound, dense granular structures containing hydrolytic enzymes responsible mainly for intracellular and extracellular digestion.
66. Each centriole is made of nine microtubule triplets (9×3=27).

67. Maturing, concave and inner face of the Golgi complex is the site from where Golgi vesicles after processing are budded off.
68. Mitochondria and chloroplasts both are considered as semiautonomous organelles, as they have their own circular DNA and 70S ribosomes. Mitochondria are present in both plant and animal cells but chloroplast is present in autotrophic eukaryotes.
69. Magnification of a microscope is the combine effect of lenses. For a compound microscope the total magnification will be M = mo x me, where 'mo' is the magnification due to objective and 'me" is that due to eyepiece.
70. Osmosis, diffusion and facilitated diffusion are passive processes of passage of molecules across the cell membrane but exocytosis and endocytosis are active processes of molecules across the cell.
71. SER is responsible for lipid metabolism, detoxification, nerve impulse conduction and transport of material in the cell.
72. Ribosome is the factory of protein synthesis. But the factory of ribosomes synthesis is nucleolus.
73. Golgi complex is considered as secretory organelle of the cell. Secretory proteins are synthesized on RER, then transferred to Golgi apparatus through SER for final processing and packaging and finally released as secretory vesicles.

74.



75. Mitochondria and chloroplasts both are considered as semiautonomous organelles, as they have their own circular DNA and 70S ribosomes. Mitochondria are present in both plant and animal cells but chloroplast is present in autotrophic eukaryotes.

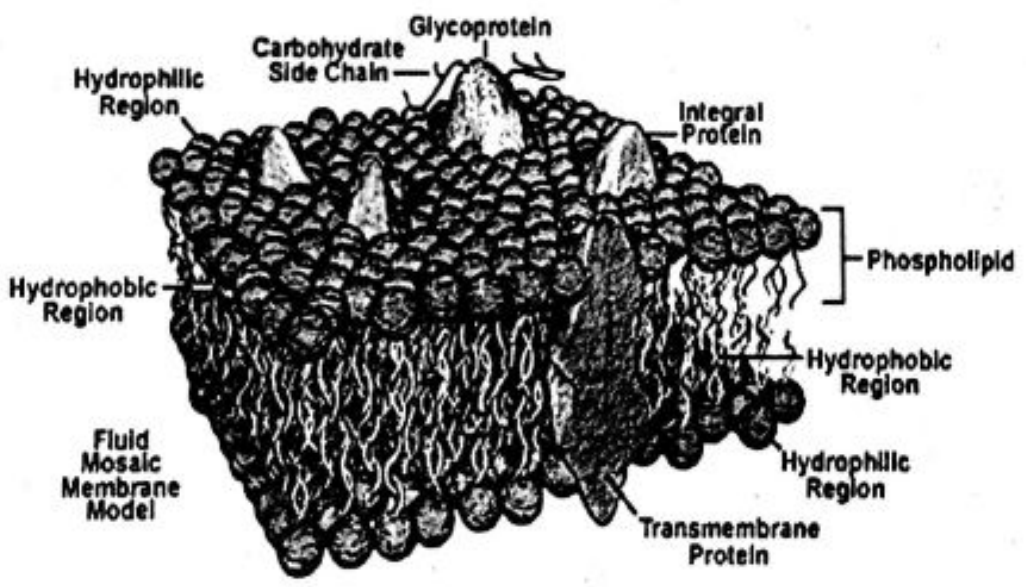
76. The term 'prokaryotes' is derived from the Greek word 'pro-meaning before' and 'karyon meaning nucleus'. Prokaryotic cells are cells that do not have a true nucleus and membrane-bound organelles.

77. Smaller ribosomes (70S) are present in prokaryotic cell but larger ribosomes (80S) are present in eukaryotic cells.

78. Animal cells the outer most membrane is cell membrane, where as in plants it is cell wall.

79. Eukaryotes contain 80S in general, 70S in found in prokaryotes.

80.



81. Contractile vacuole contains tonoplast, a multisensory membrane.

82. Secretory proteins are synthesized on RER, then transferred to Golgi apparatus through SER for final processing and packaging and finally released as secretory vesicles.

83. Plant cell wall is secreted by the vesicles formed from Golgi complex.

2&3 TOPIC BIOLOGICAL MOLECULES & ENZYMES

PRACTICE EXERCISE

TOPIC-WISE MCQs

INTRODUCTION TO BIOLOGICAL MOLECULES

Q.1 The sum of all chemical reactions taking place within a cell is called:
A) Thermoregulation
B) Metabolism
C) Osmoregulation
D) Isomerism

Q.2 Which is an example of anabolic process?
A) Respiration
B) Photosynthesis
C) Digestion
D) Both A and B

Q.3 A mammalian cell contains 1.1 percentage:
A) Protein
B) DNA
C) Water
D) RNA

Q.4 Most abundant organic compounds of a cell are:
A) Water
B) Carbohydrates
C) Protein
D) Lipids

Q.5 Amount of DNA present in mammalian cell:
A) 1%
B) 0.5%
C) 0.25%
D) 0.75%

IMPORTANCE OF WATER

Q.6 Water is a very good solvent for substance due to its_____ nature and act as _____ due to its higher heat capacity.
A) Dipole nature, thermo-stabilizer
B) Organic, inorganic
C) Polar, bipolar
D) Ionic, covalent

Q.7 Due to higher heat capacity and H-bonds, water acts as:
A) Thermo-stabilizer
B) Inert medium
C) Solvent
D) Reactive medium

Q.8 The water molecules remain attached together and do not separate because of _____bonding.
A) Non-covalent
B) Hydrogen
C) Ionic
D) Hydrophobic

Q.9 Which property of water plays an important role in regulation of heat produced by oxidation?
A) Heat capacity
B) Dipole nature
C) Heat of vaporization
D) Ionization of water

CARBOHYDRATES

Q.10 Most abundant carbohydrate in nature is:
A) Cellulose
B) Starch
C) Polysaccharides
D) Glycogen

Q.11 All of the following yield glucose on complete hydrolysis except:
A) Starch
B) Glycogen
C) Cellulose
D) Chitin

Q.12 Glucose combines with _____ to form milk sugar.
A) Glucose
B) Fructose
C) Galactose
D) Mannose

Q.13 Formation of a tri-saccharide involves release of _____ water molecule.
A) 1
B) 2
C) 3
D) 4

Q.14 How many carbon atoms are present inside the ring of fructose?
A) 6
B) 4
C) 5
D) 3

Q.15 Which of the following polysaccharide is present in human muscles abundantly?
A) Myoglobin
B) Collagen
C) Actin and myosin
D) Glycogen

Q.16 Pick out the odd one:
A) Cellulose
B) Galactose
C) Agar
D) Pectin

Q.17 Which of the following carbons are present outside the ring of fructose?
A) 1st carbon & 2nd carbon
B) 1st carbon and 5th carbon
C) Only 1st carbon
D) 1st carbon and 6th carbon

Q.18 Which of the following sugar is sweetest?
A) Glucose
B) Sucrose
C) Fructose
D) Maltose

Q.19 In a disaccharide, if carbon atoms are 12 then how many OH groups will be present?
A) 11
B) 8
C) 10
D) 12

Q.20 Which of the following is non-reducing disaccharide sugar?
A) Mannose
B) Maltose
C) Sucrose
D) Lactose

Q.21 Which of the following sugar is mainly present in human blood?
A) Glucose
B) Fructose
C) Sucrose
D) Mannose

PROTEINS

Q.22 Haemoglobin carries _____ oxygen atoms.
A) 4
B) 8
C) 2
D) 1

Q.23 How many types of amino acids are present in the cell?
A) 170
B) 20
C) 25
D) 3000

Q.24 Which of the following amino acid is next to glycine with respect to the molecular structure?
A) Alanine
B) Serine
C) Ethanolamine
D) Aspartic acid

Q.25 A globular protein consisting of more than one polypeptide chains belongs to:
A) Primary structure
B) Secondary structure
C) Tertiary structure
D) Quaternary structure

Q.26 A protein having secondary structure possesses:
A) Hydrogen bonding
B) Disulfide bond
C) Peptide bond
D) Both A, C

Q.27 All of the following are examples of fibrous proteins except:
A) Silk fiber
B) Keratin
C) Myoglobin
D) Fibrin

Q.28 Which of the following is a complex of globular protein with non-proteinaceous material?
A) Collagen
B) Albumin
C) Fibrinogen
D) Haemoglobin

Q.29 Muscle haemoglobin possesses:
A) Primary structure
B) Secondary structure
C) Tertiary structure
D) Quaternary structure

Q.30 _____ are defensive proteins.
A) Antigens
B) Antibodies
C) Vaccines
D) Fibrinogen

Q.31 Proteins of hair, horns, feathers and other skin parts is:
A) Storage protein
B) Enzymatic protein
C) Structural protein
D) Hormonal protein

Q.32 Identify the protein, which cannot be crystallized?
A) Antibodies
B) Fibrin
C) Haemoglobin
D) Enzymes

Q.33 How many peptide bonds are present in an insulin molecule?
A) 49
B) 51
C) 50
D) 48

Q.34 Usually a polypeptide chain bends and folds upon itself to form a globular shape. This is protein's:
A) Primary conformation
B) Secondary conformation
C) Tertiary conformation
D) Quaternary conformation

LIPIDS

Q.35 It is an amino acid and also a part of phospholipid:
A) Serine
B) Choline
C) Ethanolamine
D) Aspartic acid

Q.36 Myelin sheath of neuron is composed of:
A) Sphingolipids
B) Choline
C) Ethanolamine
D) Waxes

Q.37 How many double bond/s is/are present in R-group of oleic acid?
A) 4
B) 6
C) 2
D) 1

Q.38 Which of following fatty acid is least likely to be found in waxes?
A) Steric acid
B) Acetic acid
C) Oleic acid
D) Palmitic acid

Q.39 Which of following cannot form a biopolymer?
A) Amino acid
B) Fatty acid
C) Nucleotides
D) Monosaccharides

NUCLEIC ACIDS

Q.40 All of the following biomolecules are nutritious except:
A) Carbohydrates
B) Proteins
C) Lipids
D) Nucleic acids

Q.41 It contains nitrogenous base:
A) Glycogen
B) ATP
C) Cellulose
D) Haemoglobin

Q.42 Which of following cannot yield phosphorus on hydrolysis?
A) Nucleotide
B) Nucleoside
C) DNA
D) RNA

Q.43 Which of following do not contain phosphodiester bond?
A) DNA
B) ATP
C) RNA
D) NAD

Q.44 Nucleic acid is:
A) Monomer and micro molecule
B) Polymer and macro molecule
C) Monomer and macro molecule
D) Polymer and micro molecule

CONJUGATED MOLECULES

Q.45 Nucleo-histones are present in:
A) Nucleoli
B) Chromosomes
C) Ribosomes
D) Mitochondria

Q.46 Conjugated histone proteins are:
A) Structural and regulatory
B) Structure only
C) Regulatory
D) Transport proteins

Q.47 All of the following are conjugated molecules except:
A) Glycolipids
B) Glycoproteins
C) Nucleoproteins
D) Phospholipids

Q.48 Most of the cellular secretions are:
A) Glycolipids
B) Glycoproteins
C) Lipoproteins
D) Nucleoproteins

ENZYEMS

Q.49 Coenzymes are closely related to:
A) Hormones
B) Inhibitors
C) Antibodies
D) Vitamins

Q.50 The effect of reversible competitive inhibitor can be neutralized by increasing the concentration of:
A) Substrate
B) Enzyme
C) Activator
D) Inhibitor

Q.51 Function of succinate dehydrogenase is aided by:
A) NAD^+
B) FAD^+
C) Metal ion
D) Vitamin

Q.52 Prosthetic groups are:
A) Metallic ions
B) Organic molecules
C) Inorganic molecules
D) Radicals

Q.53 Optimum pH value for pancreatic lipase is:
A) 7.60
B) 8.00
C) 9.00
D) 9.70

Q.54 ES complex is converted into product by:
A) Cofactor
B) Catalytic site
C) Coenzyme
D) Binding site

Q.55 Optimum pH of enterokinase is:
A) Slightly acidic
B) Slightly basic
C) Highly acidic
D) highly basic

Q.56 Allosteric enzymes have _____ major sites.
A) 1
B) 2
C) 3
D) 4

Q.57 Which of the following properties of amino acids is affected by a change in pH?
A) Oxidation of amino acids
B) Reduction of amino acids
C) Atomization of amino acids
D) Ionization of amino acids

Q.58 Change in temperature from 30°C to 40°C in human body will cause:
A) Increase in rate of reaction
B) Decrease in rate of reaction
C) First increase then decreases in rate of reaction
D) First increase then become constant

PAST PAPER MCQs

2008

Q.1 Name the human tissues that contain about 85% water:
A) Nerve cells
B) Bone cells
C) Brain cells
D) None of these

Q.2 Which of the following gives blue color with iodine?
A) Starch
B) Cellulose
C) Glycogen
D) All of these

Q.3 Which bond is the potential source of chemical energy for cellular activities?
A) C-N
B) C-O
C) C-H
D) H-O

Q.4 The optimum temperature for enzymes of human body is:
A) 32°F
B) 46°C
C) 313 K
D) 37°C

2009

Q.5 Which of the following components is less resistant to decay?
A) Lignin
B) Starch
C) Chitin
D) Cellulose

Q.6 Haemoglobin exhibits:
A) Secondary Structure
B) Primary Structure
C) Quaternary Structure
D) Tertiary Structure

Q.7 Antibodies are actually:
A) Globular proteins
B) Glycoproteins
C) Fibrous proteins
D) Glycolipids

Q.8 Enzyme after catalysis detaches itself from the product:
A) Completely
B) Incompletely
C) Changed
D) Unchanged

2010

Q.9 An activated enzyme consisting of polypeptide and a cofactor is known as:
A) Amylase
B) Apoenzyme
C) Holoenzyme
D) Coenzyme

Q.10 _____ forms weak linkages with enzymes and their effect can be neutralized completely or partly by an increase in the concentration of the substrate.
A) Only competitive Inhibitors
B) Reversible inhibitors
C) Irreversible inhibitors
D) Both reversible and irreversible inhibitors

2011

Q.11 The covalent bond formed between two monosaccharides is called:
A) Glycosidic bond
B) Hydrogen bond
C) Peptide bond
D) Disulphide

Q.12 The bond formed between glucose and fructose to form sucrose is:
A) 1,4-glycosidic linkage
B) 1,2-glycosidic linkage
C) 1,6-glycosidic linkage
D) 1,3-glycosidic linkage

Q.13 In an amino acid, in which the R-group is H, its name will be:
A) Alanine
B) Glycine
C) Leucine
D) Valine

Q.14 Fatty acids are the organic compounds containing hydrogen, oxygen and one of the following are:
A) –COOH
B) $-NH_2$
C) Acyl
D) Sucrose

Q.15 The combination of a pentose sugar with a base result in a compound known as:
A) Nucleotide
B) Nucleoside
C) Nucleic Acid
D) Polynucleotide

Q.16 One of the pyrimidine bases is absent in DNA:
A) Uracil
B) Thymine
C) Cytosine
D) Adenine

Q.17 The non-protein part of enzyme which is covalently and permanently bonded is called:
A) Prosthetic Group
B) Co-Factor
C) Co-Enzyme
D) Activator

Q.18 Enzymes increase the rate of reaction by:
A) Increasing Temperature
B) Decreasing pH
C) Decreasing Activation Energy
D) Increasing Activation Energy

Q.19 An enzyme and substrate reacts through a special feature or site present in enzyme:
A) Building Site
B) Active Site
C) Catalyst Site
D) Inhibition Site

2012

Q.20 Carbohydrates are organic molecules and contain three elements:
A) Carbon, water and oxygen
B) Carbon, Sulphur and hydrogen
C) Carbon, calcium and hydrogen
D) Carbon, hydrogen and oxygen

Q.21 Which one are intermediates in respiration and photosynthesis both?
A) Ribose and heptulose
B) Glyceraldehydes and dihydroxyacetone
C) Glucose and galactose
D) Fructose and ribulose

Q.22 Which of the following component is found in the cell wall of fungi?
A) Cellulose
B) Chitin
C) Proteins
D) Glycerol

Q.23 Which of the following is a peptide bond?
A) –C–N
B) –C–O
C) H–O
D) –S–S

Q.24 Which of the following is an unsaturated fatty acid?
A) Acetic Acid
B) Butyric acid
C) Oleic acid
D) Palmitic acid

Q.25 Which of the following combination of base pair is absent in DNA?
A) A–T
B) C–G
C) A–U
D) T–A

Q.26 If the detachable co-factor is an inorganic ion, then it is designated as:
A) Coenzyme
B) Prosthetic group
C) Holoenzyme
D) Activator

Q.27 The type of inhibition in which inhibitor has no structural similarity to substrate and combines with enzyme at other than the active site is called:
A) Irreversible inhibition
B) Competitive inhibition
C) Non-competitive and reversible inhibition
D) Reversible inhibition

Q.28 The inhibitors that bind tightly and permanently to enzymes and destroy their globular structure and catalytic activity are:
A) Reversible inhibitors
B) Irreversible inhibitors
C) Competitive inhibitors
D) Non-competitive inhibitors

Q.29 Enzyme succinate dehydrogenase converts succinate into:
A) Malate
B) Malonic acid
C) Citrate
D) Fumarate

2013

Q.30 _____ is most abundant carbohydrate in nature.
A) Waxes
B) Glycerol
C) Starch
D) Cellulose

Q.31 Which of the following is a keto-sugar?
A) Glyceraldehyde
B) Dihydroxyacetone
C) Ribose
D) Glucose

Q.32 Amino acid in which the R-group is hydrogen is:
A) Glycine
B) Alanine
C) Leucine
D) Valine

Q.33 Acylglycerols like fats and oils are esters formed by condensation reaction between:
A) Fatty acids and water
B) Fatty acids and alcohols
C) Fatty acids and glucose
D) Fatty acids and phosphates

Q.34 Which of the following is purine?
A) Guanine
B) Cytosine
C) Thymine
D) Uracil

Q.35 If the co-factor is covalently or tightly and permanently bonded to enzyme, then it will be called:
A) Coenzyme
B) Prosthetic group
C) Activator
D) Apoenzyme

Q.36 All coenzymes are derived from:
A) Proteins
B) Nucleic acids
C) Carbohydrate
D) Vitamins

Q.37 The view that active site of an enzyme is flexible and when a substrate combines with it, cause changes in enzyme structure is known as:
A) Lock & key model
B) Induce fit model
C) Sliding filament model
D) Specificity model

Q.38 Optimum pH value for the working of pancreatic lipase is:
A) 4.50
B) 7.60
C) 2.00
D) 9.00

2014

Q.39 The simplest monosaccharide containing keto group is:
A) Glyceraldehyde
B) Dihydroxyacetone
C) Glucose
D) Ribose

Q.40 All co-enzymes are derived from:
A) Proteins
B) Carbohydrates
C) Metal ions
D) Vitamins

Q.41 A co-factor tightly bound to the enzyme on the permanent basis is called:
A) Activator
B) Co-enzyme
C) Prosthetic group
D) Apo-enzyme

Q.42 Which one of the following is the optimum pH of pancreatic lipase enzyme?
A) 7.60
B) 8.00
C) 9.00
D) 9.70

Q.43 The competitive inhibitors have structural similarity with:
A) Active site
B) Binding site
C) Substrate
D) Co-enzyme

2015

Q.44 Monosaccharides are major components of:
A) DNA, ATP, ribulose bisphosphate and cysteine
B) DNA, NAD and Insulin
C) DNA, NADP, ATP and ribulose bisphosphate
D) DNA, RNA and myosin

Q.45 Number of base pairs in one turn of DNA is:
A) 10
B) 2
C) 34
D) 54

Q.46 Which molecular structure of enzyme is essential for activity of enzyme?
A) Primary structure
B) Quaternary structure
C) Secondary structure
D) Tertiary structure

Q.47 Some enzymes require helper which is non-protein part for its efficient functioning that is called:
A) Accelerator
B) Cofactor
C) Prosthetic group
D) Apoenzyme

Q.48 Pepsin, protein digesting enzymes, sets best pH:
A) 9.70
B) 4.50
C) 2.00
D) 7.6

Q.49 Which one of the following is an example of competitive inhibitor?
A) Glucose
B) Fumarate
C) Succinic acid
D) Malonate

2016

Q.50 The compounds which on hydrolysis yield polyhydroxy aldehyde or ketone subunits are:
A) Lipids
B) Proteins
C) Polynucleotides
D) Carbohydrates

Q.51 Secondary structure of protein is found in:
A) Trypsin
B) Keratin
C) Insulin
D) Glucagon

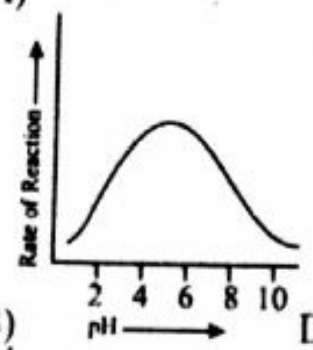
Q.52 Phosphodiester bond is:
A) P—O—C—P—O—C
B) C—O—P
C) C—O—P—O—C
D) C—C—O—P

Q.53 An enzyme required Mg^{+2} to catalyze the substrate. The Mg^{++} is best identified as:
A) Prosthetic group
B) Activator
C) Co-enzyme
D) Inhibitor

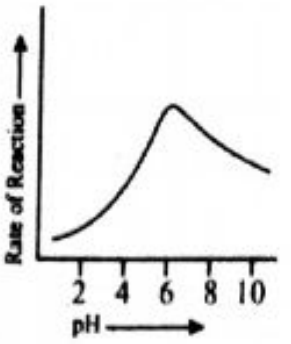
Q.54 According to _____ model, the active site of enzyme is modified as the substrate interacts with enzyme.
A) Induced fit
B) Lock and key
C) Emil Fischer
D) Fluid mosaic

Q.55 Which one of the following graphs shows how the rate of reaction of pepsin is affected by pH?

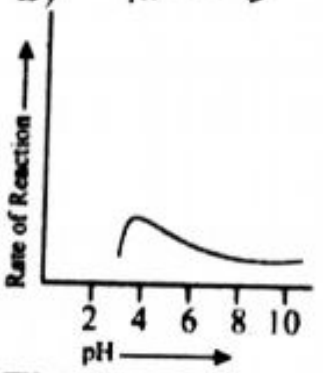
A)



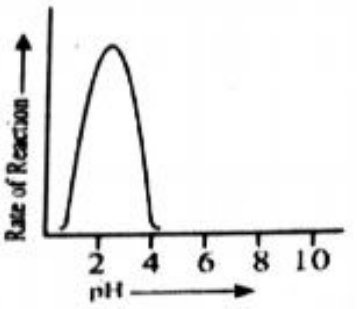
C)



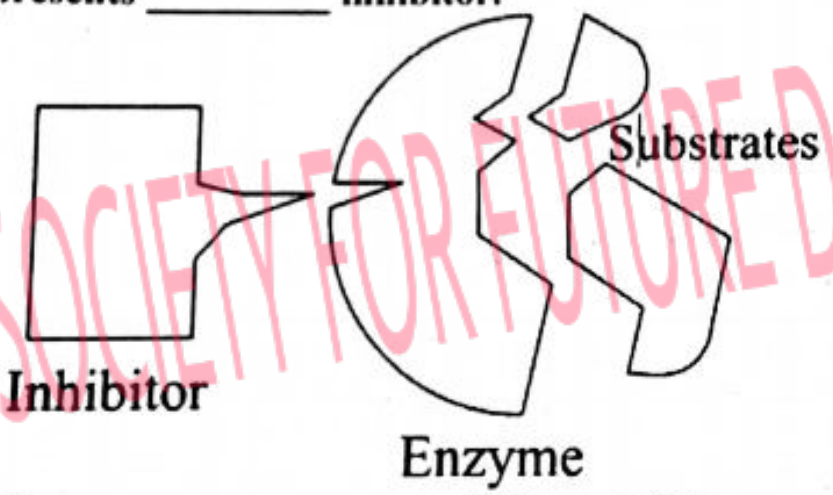
B)



D)



Q.56 This figure represents _____ inhibitor.



A) Non-competitive
B) Competitive
C) Irreversible
D) Isosteric

2017

Q.57 _____are the major site for storage of glycogen in animal's body.

A) Muscle and liver
B) Around thighs and belly
C) Around belly and hips
D) Liver and kidneys

Q.58 The number of amino acids that have been found to occur in cells and tissues are:

A) 170
B) 20
C) 25
D) 45

Q.59 Most proteins are made up of _____ type of amino acid.

A) 20
B) 170
C) 25
D) 200

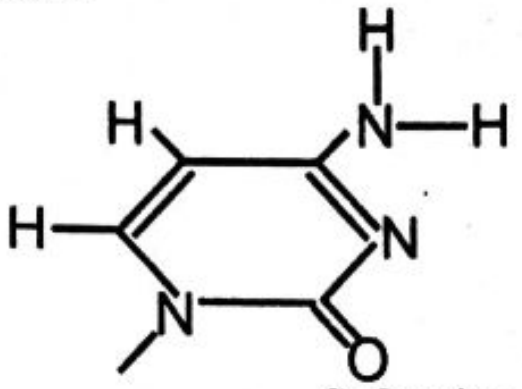
Q.60 If in lipids there is a higher proportion of unsaturated fatty acid, then it will be:

A) Oils
B) Waxes
C) Phenols
D) Fats

Q.61 When X-rays are passed through crystalline DNA, it shows helix making one twist every:

A) 2nm
B) 3.4nm
C) 34nm
D) 4nm

Q.62 Following is the structure of:



A) Uracil
B) Thymine
C) Guanine
D) Cytosine

Q.63 All enzymes are_____.
A) Fibrous proteins
B) Low molecular weight proteins
C) Lipoproteins
D) Globular proteins

Q.64 The reactants on which enzyme work are:
A) Products
B) Metabolites
C) Substrates
D) Catabolites

Q.65 Which of the following comprises of inorganic ions?
A) Coenzymes
B) Activators
C) Prosthetic group
D) Apoenzyme

2017 Re-Take

Q.66 Which of the following type of carbohydrate has high molecular weight and is sparingly soluble in water?
A) Monosaccharide
B) Disaccharides
C) Oligosaccharides
D) Polysaccharides

Q.67 Backbone of amino acid comprises of:
A) C-C-N
B) –COOH group
C) $-NH_2$ Group
D) –H group

Q.68 Bonds present in alpha helix are:
A) Hydrogen bonds
B) Disulphide linkage
C) Ionic bonds
D) Peptide bonds

Q.69 Sequence of amino acids is important in:
A) Primary structure
B) Secondary structure
C) Tertiary structure
D) Quaternary structure

Q.70 All of the following are subunits of DNA except:
A) Deoxyribose sugar
B) Phosphate group
C) Nitrogenous base
D) Choline

Q.71 What is true about enzymes?
A) Fibrous proteins
B) Use in reaction
C) No effect on end product
D) Non-specific

Q.72 Modified form of Lock and model was proposed by:
A) Koshland
B) Fischer
C) Watson
D) Rosalind Franklin

Q.73 Which of the following type of inhibitor can be neutralize by adding more substrate into reaction?
A) Irreversible inhibitor
B) Reversible inhibitor
C) Irreversible non-competitive
D) Irreversible competitive

2018

Q.74 Glycosidic bond is formed by the:
A) Removal of water
B) Addition of oxygen
C) Removal of oxygen
D) Addition of water

Q.75 Which of the following holds the alpha helix of protein in its place?
A) Hydrogen bond
B) Amino group
C) R-group
D) Disulphide bond

Q.76 The number and sequence of amino acids along a polypeptide chain is called _____ structure of a protein.
A) Secondary
B) Quaternary
C) Primary
D) Tertiary

Q.77 Which of the following is unsaturated "fatty acid"?
A) Butyric acid
B) Stearic acid
C) Oleic acid
D) Palmitic acid

Q.78 A complete turn of the double helix of DNA comprises of:
A) 3.4 nm
B) 3.4 Angstrom
C) 34 nm
D) 34 μm

Q.79 Single ringed pyrimidines are:
A) Uracil, cytosine and thymine
B) Cytosine, guanine and uracil
C) Adenine and guanine
D) Cytosine, adenine and thymine

Q.80 A non-protein part essential for proper and essential functioning of enzyme is called:
A) Extra factor
B) Additional factor
C) Efficient cofactor
D) Cofactor

Q.81 The temperature that promotes the maximum activity of enzyme is referred as:
A) Fixed temperature
B) Optimum temperature
C) Controlled temperature
D) Active temperature

Q.82 If molecule can bind to another site of the enzyme rather than the true active site, it is referred as _____.
A) Non-competitive inhibitors
B) Allosteric inhibition
C) Competitive inhibitors
D) Irreversible inhibition

2019

Q.83 If water has high latent heat of vaporization, how this property of water could be helpful to plants and animals?
A) With the release of large amount of water vapors, a small amount of heat loss can take place
B) No cooling effect with the release of even large amount of water vapors
C) It will keep their temperature very high
D) With the release of small amount of water vapors, a great amount of heat loss can take place

Q.84 Starch is present in tuber, fruits and grains but absent in animal cells instead animals have a substance stored in liver and muscles known as:
A) Glucose
B) Glycogen
C) Galactose
D) Glucagon

Q.85 The covalent bond or bridge between two monosaccharides to form a disaccharide called a:
A) Carboxyl bond
B) Hydroxyl bond
C) Hydrogen bond
D) Glycosidic bond

Q.86 Which is an example of a disaccharide?
A) Lactose
B) Glycogen
C) Starch
D) Fructose

Q.87 Most proteins are made up of:
A)16 types of amino acids
B)10 types of amino acids
C) 170 types of amino acids
D) 20 types of amino acids

Q.88 The structure of a fibrous protein comprises of polypeptide chains in the form of:
A) Cluster
B) Flat uncoiled chains
C) Spherical or curled up ball
D) Long strands or fibrils

Q.89 In glycine, 'R' is _____.
A) Fatty acid
B) Ethane
C) Hydrogen
D) Methane

Q.90 Sara is a chemistry student who is carrying out an experiment between an alcohol and acetic acid in the laboratory. The product formed at the end of the experiment will be:
A) Glucose and oxygen
B) Glycogen and water molecule
C) An ester and water molecule
D) Glycerol and Sulfuric acid

Q.91 Lipids contain double amount of energy as compared to the same amount of carbohydrates due to the presence of:
A) Lower proportion of C–H bonds
B) Higher proportion of C–H bonds
C) Higher proportion of C–O bonds
D) Higher proportion of oxygen

Q.92 Which one is an example of a Nucleotide?
A) Adenosine
B) ATP
C) Guanine
D) NAD^+

Q.93 The nitrogen containing bases in nucleotide are of two types; purines and pyrimidines; the purine bases are:
A) Guanine and cytosine
B) Adenine, guanine and cytosine
C) Adenine and guanine
D) Adenine and thymine

Q.94 The type of energy reduced by the enzymes for biological reactions to occur is called the:
A) Light Energy
B) Activation Energy
C) Active Energy
D) Heat Energy

Q.95 What is common in both competitive and non-competitive inhibition?
A) Irreversible inhibition
B) Feedback inhibition
C) Reversible inhibition
D) Non-Reversible inhibition

Q.96 A student of chemical engineering mistakenly engulfed the toxic compound "A" which was a potent inhibitor of certain enzyme. He was immediately brought to hospital where Dr. injected intravenously substrate "B" to minimize the toxic effect of compound A. His life was saved from serious damages. The treatment method shows that compound A was a _____ inhibitors.
A) Temperature sensitive
B) Competitive reversible
C) Irreversible
D) Non-competitive reversible

2020

Q.97 Which property of water helps to maintain the integrity of lipid membranes:
A) Specific heat capacity
B) Hydrogen bonding
C) Cohesion and adhesion
D) Hydrophobic exclusion

Q.98 Water act as universal solvent because of:
A) Heat of vaporization
B) Hydrogen bonding
C) High polarity
D) Cohesion and adhesion

Q.99 Lipids store double amount of energy as compared to carbohydrates because of:
A) High proportion of oxygen
B) High CO ratio
C) Low proportion of carbon
D) High proportion of CH

Q.100 Which of the following is an unsaturated fatty acid?
A) Oleic acid
B) Palmitic acid
C) Butyric acid
D) Acetic acid

Q.101 Monosaccharides have a general formula represented by:
A) $Cn(H_2O)_n$
B) $C(H_2O)_n$
C) $C_2(H_2O)_n$
D) $C_1(H_2O)_n$

Q.102 NAD^+ is an example of:
A) Mononucleotide
B) Dinucleotides
C) Tri nucleotides
D) Tetranucleotide

Q.103 Lock and key model for enzyme action proposed by Emil Fischer suggests that:
A) Enzymes are unbiased for substrate
B) Enzymes can modify their active sites
C) Enzymes are restricted to one reaction type
D) Enzyme can catalyze variety of reactions

Q.104 Most enzymes have an optimum temperature of around:
A) 30°C
B) 40°C
C) 50°C
D) 20°C

Q.105 Enzymes work by lowering the of the reactions they catalyze.
A) Kinetic energy
B) Activation energy
C) Heat energy
D) Potential energy

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	D	21	A	31	C	41	B	51	B
2	B	12	C	22	B	32	B	42	B	52	B
3	D	13	B	23	A	33	A	43	B	53	C
4	C	14	B	24	A	34	C	44	B	54	B
5	C	15	D	25	D	35	A	45	B	55	A
6	A	16	B	26	D	36	A	46	A	56	B
7	A	17	D	27	C	37	D	47	D	57	D
8	B	18	C	28	D	38	B	48	B	58	C
9	C	19	B	29	C	39	B	49	D		
10	A	20	C	30	B	40	D	50	A		

PAST PAPERS MCQs

1	C	16	A	31	B	46	D	61	B	76	C	91	B
2	A	17	A	32	A	47	B	62	D	77	C	92	B
3	C	18	C	33	B	48	C	63	D	78	A	93	C
4	D	19	B	34	A	49	D	64	C	79	A	94	B
5	B	20	D	35	B	50	D	65	B	80	D	95	C
6	C	21	B	36	D	51	B	66	D	81	B	96	B
7	A	22	B	37	B	52	C	67	A	82	A	97	D
8	D	23	A	38	D	53	B	68	A	83	D	98	C
9	C	24	C	39	B	54	A	69	A	84	B	99	D
10	B	25	C	40	D	55	D	70	D	85	D	100	A
11	A	26	D	41	C	56	A	71	C	86	A	101	A
12	B	27	C	42	C	57	A	72	A	87	D	102	B
13	B	28	B	43	C	58	A	73	B	88	D	103	C
14	A	29	D	44	C	59	A	74	A	89	C	104	B
15	B	30	D	45	A	60	A	75	A	90	C	105	B

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Temperature regulation, water and salt regulation respectively called thermoregulation and osmoregulation while isomerism is the phenomenon in which more than one compounds have the same chemical formula but different structures.

2.

Process	Definition	Example	Energy relation
Anabolism	Formation of larger molecules from smaller one	Photosynthesis	Energy absorbed
Catabolism	Breakdown of larger molecules into smaller	Respiration & digestion	Energy released

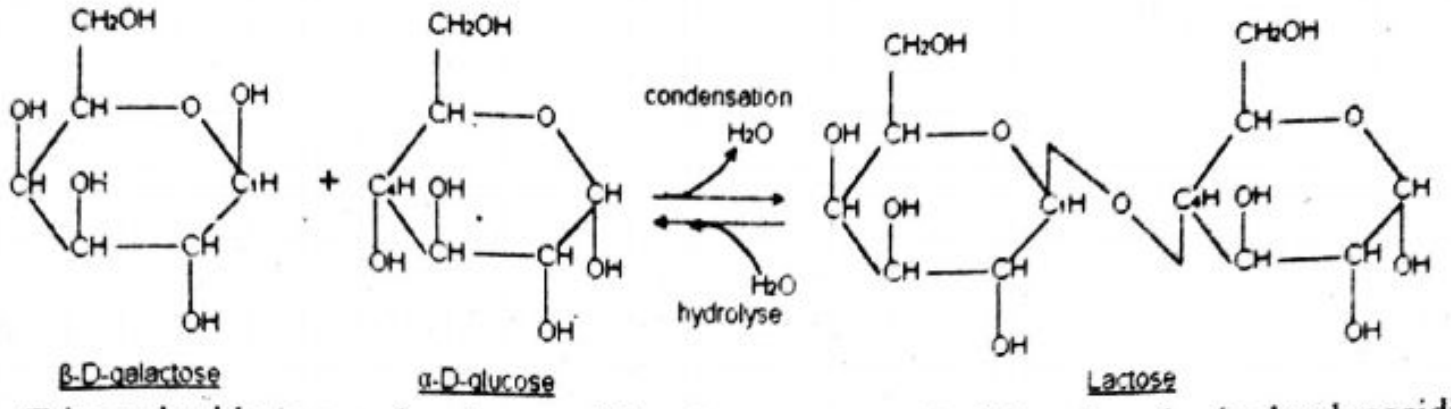
3,4, 5.

Sr.No.	Chemical Components	% total cell weight	
		Bacterial Cell	Mammalian Cell
1.	Water	70	70
2.	Proteins	15	18
3.	Carbohydrates	3	4
4.	Lipids	2	3
5.	DNA	1	0.25
6.	RNA	6	1.1
7.	Organic molecules (enzymes, hormones, metabolites)	2	2
8.	Inorganic ions (Na^+,K^+,Mg^{+2},Cl^-,SO_4^{-2}etc.)	1	1

6. Water is an excellent solvent for polar substances due to its dipole nature. Ions and molecules move randomly and are in a more favorable state to react with other molecules and ions when in solution and water have great ability to absorb heat due to higher heat capacity and act as thermo-stabilizer.
7. Water has great ability to absorb heat with minimum change in its own temperature due to higher heat capacity and act as thermo-stabilizer.
8. The sticking together of like substances is called cohesion. Depending on how attracted molecules of the same substance are to one another, the substance will be more or less cohesive. Hydrogen bonds cause water to be exceptionally attracted to each other. Therefore, water is very cohesive.
9. Evaporation causes cooling because the process requires heat energy. The energy is taken away by the molecules when they convert from liquid into gas, and this causes cooling on the original surface.
10. A type of carbohydrate, cellulose contains chains of glucose rings providing strength and rigidity. Cellulose forms the cell walls of plants and is the primary constituent of wood, making this organic compound, the most abundant one on the surface of the Earth.

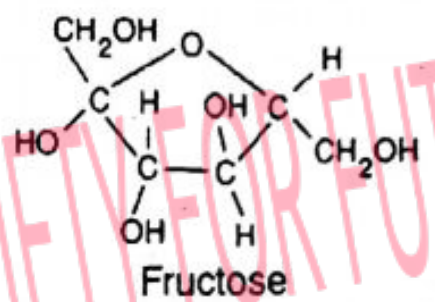
11. Chitin is a N_2-containing polysaccharide and it will yield N-acetyl-D-glucosamine on hydrolysis while starch and glycogen will yield α-D glucose monomers and Cellulose will yield β-D glucose monomers on hydrolysis.

12.



13. Tri-saccharide is a molecule containing three monosaccharides, there is single glycosidic bond between two adjacent monosaccharides and third monosaccharide will bind to already bound disaccharide by forming another glycosidic bond. Thus there will be two glycosidic bonds and one water molecule will be released from each glycosidic bond.

14. Four carbon atoms are present inside the ring of fructose while two carbon atoms are present outside of the ring.



Fructose

15. Glycogen is most abundant polysaccharide present in human muscles and liver while myoglobin, collagen, actin and myosin are proteins.

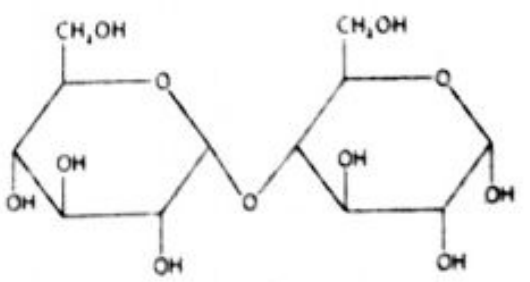
16. Cellulose, agar and pectin are the examples of polysaccharides but galactose is an example of monosaccharide.

17. Fructose can form five cornered ring structure called fructofuranose, having four carbons and one oxygen atom within the ring while first and last carbon remains outside of the ring, i.e. 1st carbon and 6th carbon.

18. Fructose has ketone functional group which gives sweet taste when dissolved in water.

19.

Maltose



Glucose Glucose

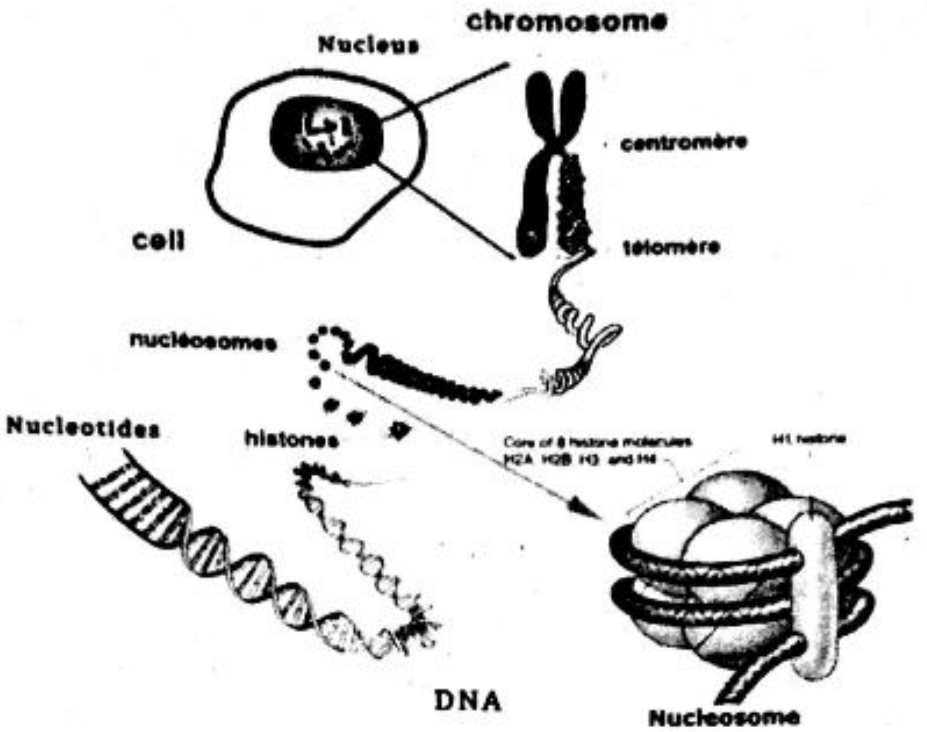
20. The reducing group in sucrose is used in glycosidic bond formation due to which it is non-reducing in nature. On the other hand, mannose, maltose and lactose are all reducing sugars.

21. In non-diabetic individuals, the concentration of glucose in the blood is about 0.08%.

22. Hemoglobin consists of 4 polypeptide chains and there is one haem group in each chain which can hold one oxygen molecule (two atoms), thus one hemoglobin molecule carries eight oxygen atoms.

23. 170 amino acids are present in nature; 25 types amino acid can synthesize proteins but most of the proteins can be synthesized by the combinations of 20 types of amino acids.
24. The simplest amino acid is glycine in which R is 'H' atom. Alanine is next to glycine which contains $-CH_3$ as R-group.
25. In many complex proteins, polypeptide tertiary chains are aggregated and held together by hydrophobic interactions, hydrogen and ionic binds. This specific arrangement is the quaternary structure.
26. All proteins have primary structure: amino acids are joined with each other through peptide bonds. In secondary structure, polypeptide chain coils to form either α helix or β-pleated sheet or both through hydrogen bonds.
27. Silk fiber, keratin and fibrin are examples of fibrous proteins while myoglobin has tertiary structure and it is a typical water soluble globular protein found in muscles.
28. Hemoglobin consists of 4 polypeptide chains forming a quaternary structure, and 4 haem groups containing 4 iron atoms as a non-protein part of the molecule.
29. Myoglobin, also called as muscle haemoglobin, is made up of single polypeptide chain which coils upon itself forming tertiary structure.
30. Antibodies are also called immunoglobulins, they are the part of immune system and protect body against invading pathogens.
31. Usually fibrous proteins containing secondary structure are structural proteins.
32. Fibrin is an example of fibrous protein and cannot non-crystalline. Antibodies, hemoglobin and enzymes are globular proteins and can be crystalline.
33. There are two polypeptide chains in insulin. One containing 21 amino acids and the other containing 30 amino acids. The bond between each chain is one less than the total number of the amino acids. In this way number of peptide bonds will be 49 out of 51 amino acids.
34. When a single polypeptide chain folds upon itself and form globular structure, it is tertiary structure of the proteins. It is maintained by three types of bonds, namely ionic, hydrogen and disulfide.
35. Serine and aspartic acids are examples of amino acids while choline and ethanolamine are N_2-containing bases. Serine can be the constituent of phospholipids and acts as nitrogenous base.
36. The myelin sheath of neurons is composed of sphingolipids. Ethanolamine and choline are nitrogenous bases found in phospholipids. Waxes are abundantly found in protective covering of fruits and leaves.
37. Oleic acid is an example of mono-unsaturated fatty acid having single double bond between C_9 and C_{10}.
38. Chemically, waxes are mixtures of long chain alkanes (with odd number of carbons atoms ranging from C 25 to C35) and alcohols, ketones and esters of long chain fatty acids.
39. Amino acids join to form proteins. Nucleotides join to form nucleic acid while monosaccharides join to form polysaccharides.
40. Through metabolism carbohydrates, lipids and proteins all can be the source of energy, while nucleic acids are not the source of energy.
41. ATP is a nucleotide which contains pentose sugar, nitrogenous base and three phosphate groups. Glycogen and cellulose are polysaccharides and hemoglobin is a quaternary protein.
42. Nucleoside is only made up of pentose sugar and nitrogenous base.
43. ATP is a single nucleotide. Phosphodiester bond is present between nucleotide.
44. Nucleic acid is a polymer of nucleotides which are joining through phosphodiester bond.

45.



46. Histones are the chief protein components of chromatin, acting as spools around which DNA winds, and playing a role in gene regulation. Without histones, the unwound DNA in chromosomes would be very long.

47. Two different molecules belonging to different categories, usually combine together to form conjugated molecules.

48. The Golgi apparatus is responsible for cellular secretion. When protein vesicles move to Golgi apparatus for delivery to targeted destinations. As the secretory proteins move through the Golgi apparatus, a number of chemical modifications like Glycosylation may occur.

49. Because many of the coenzymes are derived from the vitamins, e.g. NAD is a coenzyme and is derived from vitamins.

50. Addition of more substrate molecules will replace inhibitors, and will bind with the active site of the enzyme and results in increase in rate of reaction.

51. During the conversion of the succinic acid into fumaric acid, FAD^+ is reduced by gaining two hydrogens from succinic acid which are liberated by succinate dehydrogenase.

52. Inorganic cofactors are activators while organic cofactors may be coenzymes or prosthetic group.

53. Pancreatic enzymes mostly work in an alkaline pH which helps in the digestion of food in small intestine. The optimum pH for the working of pancreatic lipase is 9.00

54. Active site contains two sites binding site and catalytic site. Binding site is responsible for the formation of ES complex. After the formation of this complex catalytic site is activated and it converts ES complex into products.

55. Optimum pH of enterokinase is 5.50 which is slightly acidic

56. Along the active site for the attachment of substrate, allosteric enzymes also have another site where a molecule that is not a substrate may bind and regulate the enzyme action.

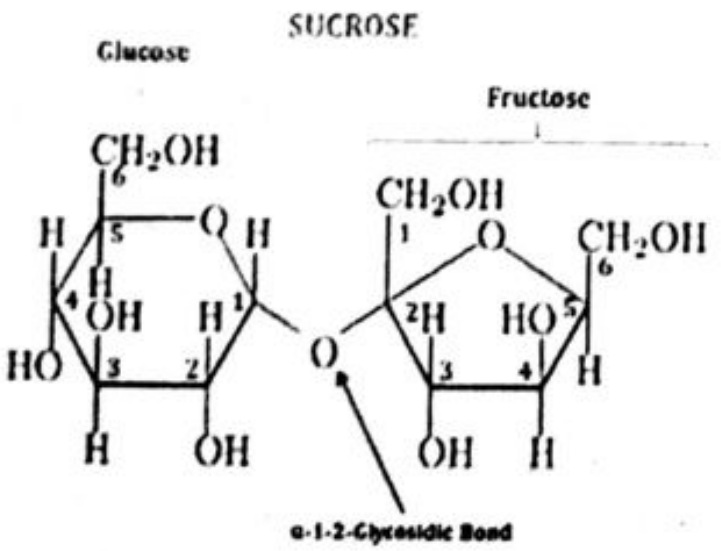
57. Change in pH causes the imbalance of H^+/OH^- ions which causes the ionization of amino acids at the active sites and substrate as well.

58. The optimum temperature for the enzymes in human body is 37°C. When the temperature is increased from 30°C, the rate of reaction is also increased. At 37°C the rate of reaction is maximum. If the temperature further increases, the rate of reaction decreases due to denaturation of enzymes at high temperature.

PAST PAPER MCQs

1. Water varies from 65 to 89 percent in different organisms. Human tissues contain about 20% water in bone cells and 85 percent in brain cells.
2. Cellulose gives no color with iodine. Glycogen gives red color with iodine while starch gives blue color with iodine.
3. Carbon-oxygen association in glycosidic linkages provides stability to the complex carbohydrate molecules. Carbon combines with nitrogen in amino acid linkages to form peptide bonds and forms proteins. Affinity of hydrogen for high electronegative oxygen is responsible for hydrogen bonding.
4. All enzymes can work at their maximum rate at a specific temperature called as optimum temperature. For enzymes of human body 37°C is the optimum temperature.
5. Starch is an example of functional carbohydrate and it is less resistant to decay because it can be easily digested in the human body. Lignin, chitin and cellulose are examples of structural polysaccharides and show more resistance to decay.
6. Haemoglobin consists of four polypeptide chains and exhibit quaternary structure.
7. An antibody, also known as an immunoglobulin, is a large, Y-shaped globular protein produced mainly by plasma cells and is used by the immune system to neutralize pathogens such as pathogenic bacteria and viruses.
8. Enzymes are used in biochemical reaction as a biocatalyst. After catalysis enzyme structure remains unchanged and it can be used again and again.
9. If non protein part is loosely attached to the protein part of enzyme, it is known as coenzyme. An enzyme with its coenzyme, or prosthetic group, removed is designated as apoenzyme. An activated enzyme consisting of polypeptide chain and a cofactor is known as holoenzyme. Amylase is starch digesting enzyme.
10. Addition of more substrate molecules will replace reversible inhibitors, and will bind with the enzyme and increase the rate of reaction.
11.

12.



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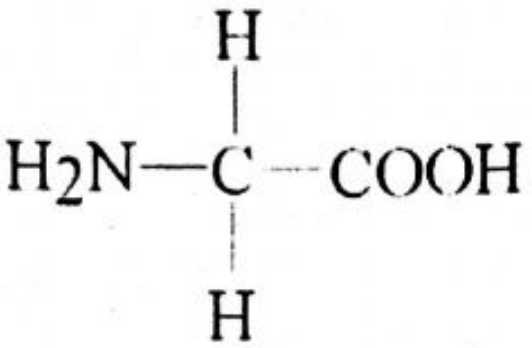
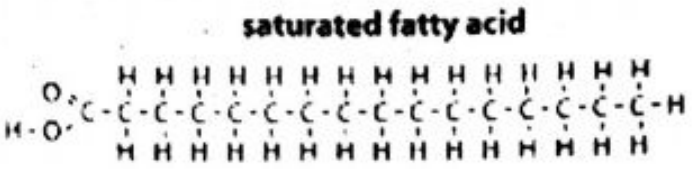
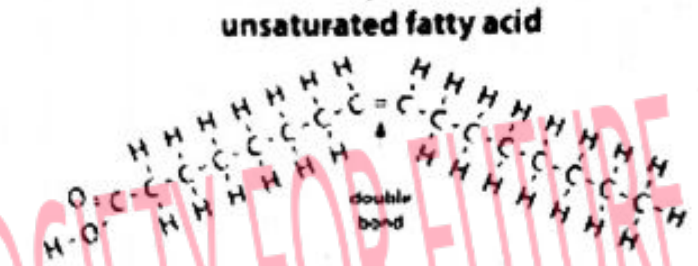


glycine

14.





15. The compound formed by combination of a base and a pentose sugar is called nucleoside. A nucleoside and a phosphoric acid combine to form a nucleotide. Nucleotides join to form polynucleotide. Nucleic acid is made up of polynucleotide.

16. Adenine, guanine and cytosine are the N_2-containing bases present in both DNA and RNA. Uracil is present in RNA and absent in DNA while thymine is present in DNA and absent in RNA.

17. Some enzymes consist solely of proteins. Others also have a non-protein part known as a co-factor. The detachable co-factor is known as an activator if it is an inorganic ion. If the non-protein part is covalently bonded, it is known as a prosthetic group. If it is loosely attached to the protein part, it is known as coenzyme.

18. Minimum amount of energy required to start a biochemical reaction is called activation energy. Enzymes have the ability to decrease the activation energy and enhance rate of biochemical reaction.

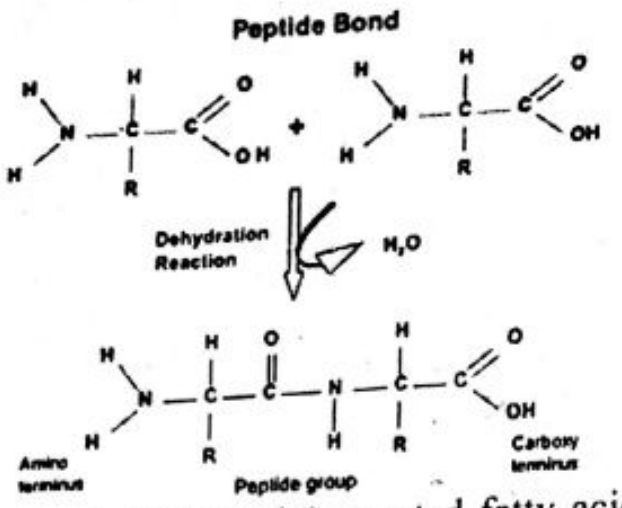
19. An enzyme and its specific substrate react with each other through a definite charge-bearing site of an enzyme called active site. The charge and shape of the active site is formed by some amino acids present in the polypeptide chain of the active site of the enzyme.

20. The word carbohydrate literally means hydrated carbons. They are composed of carbon, hydrogen and oxygen and the ratio of hydrogen and oxygen is the same as in water.

21. In nature monosaccharides with 3 to 7 carbon atoms are found. Trioses (3C) are, intermediates in respiration and photosynthesis.

22. Chitin is a structural polysaccharide found in cell wall of fungi and made up of N- acetyl glucosamine sub-units while cell wall of plants are made up of cellulose.

23.



24. Fatty acid may contain no double bond (saturated fatty acids) or up to 6 double bonds (unsaturated fatty acids). Oleic acid is an example of unsaturated fatty acid and has one double bond between C_9 and C_{10}.

25. In RNA, nitrogenous bases form the usual complementary pairing viz. cytosine (C) with guanine (G) and uracil (U) with adenine (A).

26. The detachable co-factor is known as an activator if it is an inorganic ion. If the non-protein part is covalently bonded, it is known as a prosthetic group. If it is loosely attached to the protein part, it is known as coenzyme. Enzyme with its cofactor is called holoenzyme.

27. Non-competitive reversible inhibitor blocks allosteric site of enzyme while competitive inhibitor has structural similarity with substrate and they bind active site of enzyme.

28. Irreversible inhibitors can check the reaction rate by occupying the active sites or destroying the globular structure enzyme. They occupy the active sites by forming covalent bonds or they may physically block the active sites. Reversible inhibitors can form weak linkages with the enzymes and their effect can be neutralized by increasing more substrate molecules.

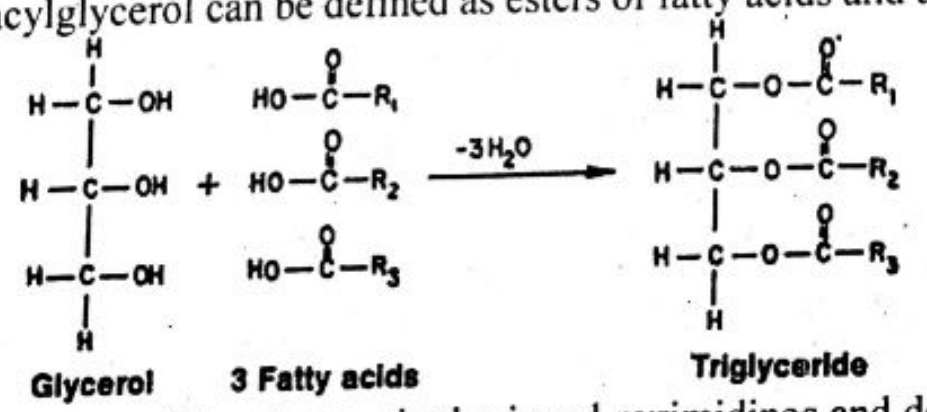
29. In Krebs cycle, an enzyme called succinate dehydrogenase acts on its substrate, succinate and convert in it into product, fumarate

30. A type of carbohydrate, cellulose contains chains of glucose rings providing strength and rigidity. Cellulose forms the cell walls of plants and is the primary constituent of wood, making this organic compound, the most abundant one on the surface of the Earth.

31. Glyceraldehyde, ribose and glucose are examples of aldo sugars while dihydroxyacetone is an example of keto sugar.

32. Amino acids mainly differ due to the type or nature of R group. R may be a hydrogen atom as in glycine, or CH_3 as in alanine, or any other group.

33. Chemically, acylglycerol can be defined as esters of fatty acids and alcohol.

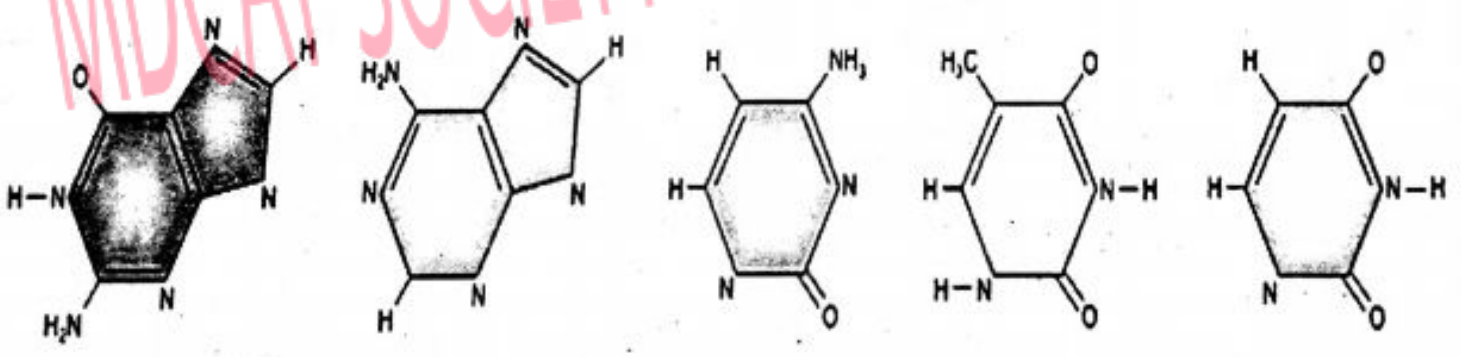


34. Nitrogenous bases are of two types, single ringed pyrimidines and double ringed purines. Pyrimidines are cytosine, thymine, and uracil while purines are adenine and guanine

35. The detachable co-factor is known as an activator if it is an inorganic ion. If the non-protein part is covalently bonded, it is known as a prosthetic group. If it is loosely attached to the protein part, it is known as coenzyme. Enzyme with its cofactor is removed is called apoenzyme.
36. Co enzymes are closely related to vitamins, which represent the essential raw materials from which coenzymes are made. Only small quantities of vitamins are needed because, like enzymes, co-enzyme can be used again and again.
37. According to lock and key model active site of enzyme is a rigid structure. Sliding filament model explain muscle movement while specificity model means that every enzyme reacts with specific substrate.
38. Optimum pH values for the catalytic activity of pepsin, sucrose, catalase and pancreatic lipase are 2.00, 4.50, 7.60 and 9.00, respectively.
39. Glyceraldehyde, ribose and glucose are aldo sugar while dihydroxyacetone are simplest three carbon keto sugar.
40. Co-enzymes are closely related to vitamins, which represent the essential raw materials from which coenzymes are made. Only small quantities of vitamins are needed because, like enzymes, co-enzyme can be used again and again.
41. The detachable co-factor is known as an activator if it is an inorganic ion. If the non-protein part is covalently bonded, it is known as a prosthetic group. If it is loosely attached to the protein part, it is known as coenzyme. Enzyme with its cofactor is removed is called apoenzyme.
42. Optimum pH values for the catalytic activity catalase, chymotrypsin, pancreatic lipase and arginase are 7.60, 7.00-8.00, 9.00 and 9.70, respectively.
43. Non-competitive reversible inhibitors block allosteric site of enzyme while competitive reversible inhibitors have structural similarity with substrate and they bind active site of enzyme.
44. Ribose is a five carbon sugar and a monosaccharide. It is major components of nucleosides/nucleotides, dinucleotides, nucleic acid and RuBP (carbon dioxide acceptor in dark reaction of photosynthesis).
45. The two strands of DNA are wound around each other so that there are 10 base pairs in each turn of the helix.
46. Globular structure of enzyme has very important role in its activity and this globular structure is attaining at least tertiary level structure.
47. Some enzymes require non-protein part for their proper functioning. If the non-protein part is covalently bonded, it is known as a prosthetic group. If it is loosely attached to the protein part, it is known as coenzyme. Enzyme with its cofactor is removed is called apoenzyme.
48. Optimum pH values for the catalytic activity of pepsin, sucrose, catalase and arginase is 2.00, 4.50, 7.60 and 9.70, respectively.
49. Malonate have structural similarity with succinic acid and it binds competitively with active site of succinic acid dehydrogenase enzyme and blocks its activity.
50. Carbohydrates are polyhydroxy aldehydes or ketones or complex substances which on hydrolysis yield polyhydroxy aldehyde or ketone sub-units. Proteins are polymers of amino acids. Lipids are heterogeneous group of compounds related to fatty acid while polynucleotide chain is made up of nucleotide.
51. Keratin is a fibrous protein having secondary structure and mostly found in nails and hairs. Trypsin is a protease while insulin and glucagon are the hormones and all are globular proteins

52. The bond between two nucleotides is called Phosphodiester bond and it is formed between phosphate group of one nucleotide attach at carbon 5 of pentose sugar with hydroxyl group 3 carbon of pentose sugar of another nucleotide.
53. Some enzymes use metal ions as co-factors like Mg^{+2}, Fe^{+2}, Cu^{+2}, Zn^{+2} etc. The detachable co-factor is known as an activator if it is an inorganic ion.
54. According to induce fit model, when a substrate combines with an enzyme, it induces changes in the enzyme structure. The change in structure enables the enzyme to perform its catalytic activity more efficiently.
55. Every enzyme work best at its optimum pH. Pepsin optimum pH is 2. Above 2 pH pepsin will be denatured.
56. Non-competitive inhibitor binds allosteric site of enzyme rather than active site.
57. Glycogen is called as animal starch and it is abundantly found in muscle and liver cells of animal tissue.
58. About 170 types of amino acids have been found to occur in cells and tissues. Of these, about 25 are constituents of proteins. Most of the proteins are, however, made of 20 types of amino acids.
59. About 170 types of amino acids have been found to occur in cells and tissues. Of these, about 25 are constituents of proteins. Most of the proteins are however, made of 20 types of amino acids.
60. Fats containing unsaturated fatty acids are usually liquid at room temperature and are said to be oils. Fats containing saturated fatty acids are solids.
61. The two strands of DNA are wound around each other so that there are 10 base pairs in each turn of about 34nm.

62.

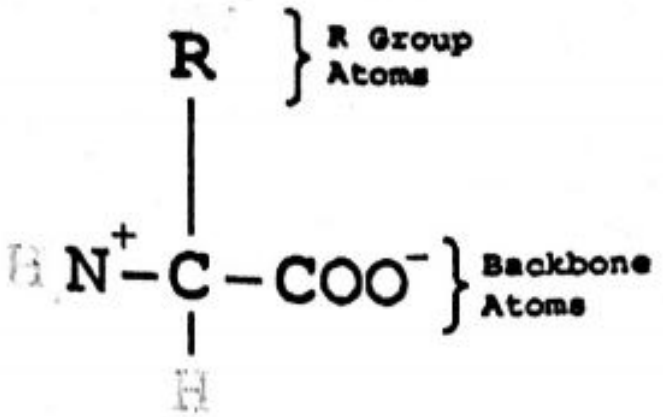


Guanine Adenine Cytosine Thymine Uracil

Purines Pyrimidines

63. Enzymes are composed of hundreds of amino acids joined together and coiled upon themselves to form a globular structure.
64. A substrate is a molecule acted upon by an enzyme. When substrates bind to enzymes, they undergo an enzyme induced chemical change, and are converted to products.
65. Some enzymes use metal ions as co-factors like Mg^{2+}, Fe^{2+}, Cu^{2+}, and Zn^{2+} etc. The detachable co-factor is known as an activator if it is an inorganic ion while coenzyme, apoenzyme and prosthetic group are organic in nature.
66. Polysaccharides are made up of many monosaccharides subunits and have higher molecular weight as compare to monosaccharide and oligosaccharide. Polysaccharides are sparingly soluble in water while monosaccharide has highly solubility.

67.



68. The α-helix is a very uniform geometric structure with 3.6 amino acids in each turn of the helix. The helical structure is kept by the formation of hydrogen bonds among the amino acids molecules in successive turns of the spiral.

69. The primary structure of a protein is described by number, sequence and types of amino acids in a polypeptide chain.

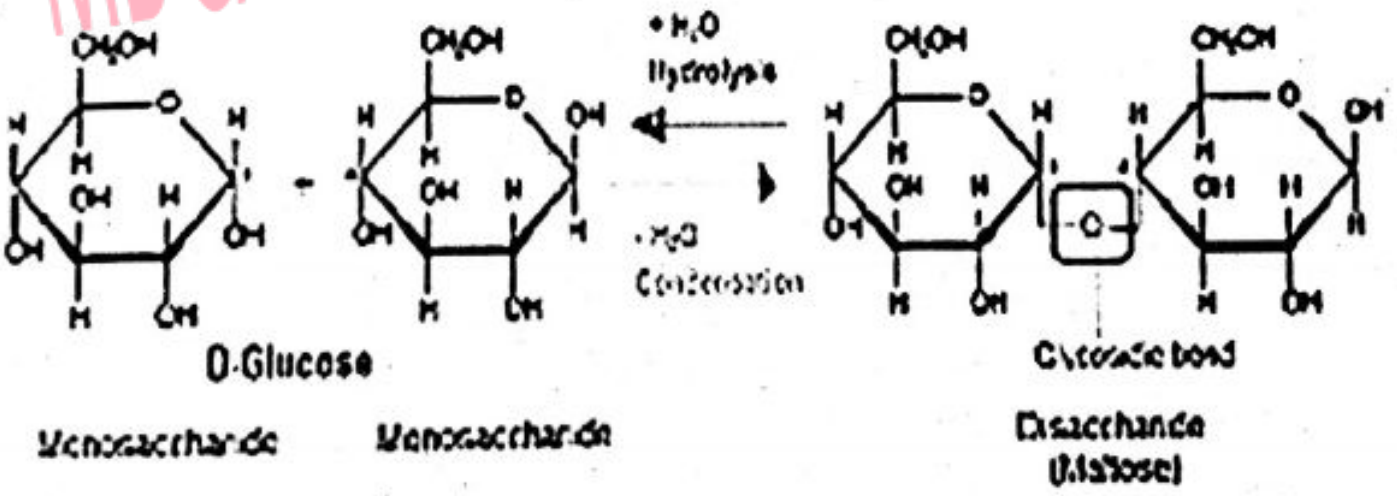
70. DNA and RNA are the polymers, formed by the dehydration condensation reaction between nucleotides. Chemically, nucleotides are composed by N_2-containing base, a pentose sugar and phosphate group/s. Choline is also an example of N_2-containing base and imported components of phospholipids.

71. Enzymes are globular proteins which act as biocatalyst and speed up biochemical reactions and their presence does not affect the nature of or properties of end product/s.

72. Modified form of lock and key model is called induced fit model which was proposed by D. Koshland. According to this model, when a substrate combines with an enzyme, it induces changes in the enzyme structure.

73. Reversible inhibitors can form weak linkages with the enzyme. Their effect can be neutralized completely or partly by an increase in the concentration of the substrate.

74.



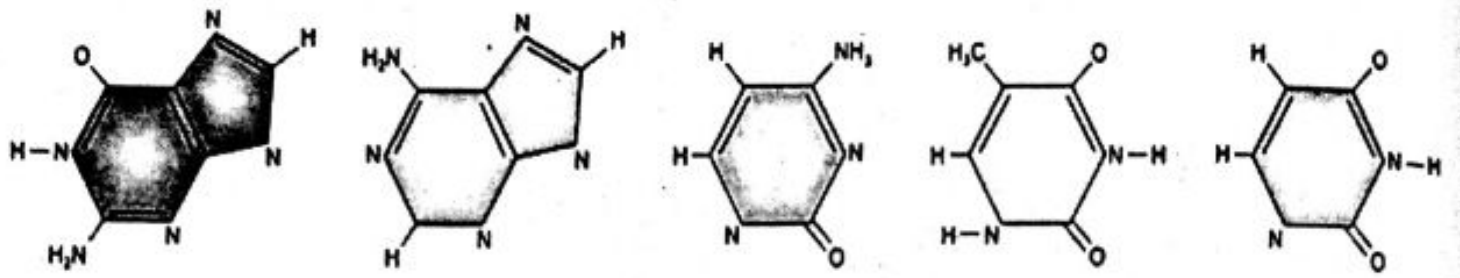
75. The α-helix is a very uniform geometric structure with 3.6 amino acids in each turn of the helix. The helical structure is kept by the formation of hydrogen bonds among the amino acids molecules in successive turns of the spiral.

76. The primary structure of a protein is described by number, sequence and type of amino acids in a polypeptide chains.

77. Butyric acid, palmitic acid and stearic acids examples of saturated fatty acids. Oleic acid is an example of mono-unsaturated fatty acid and has double bond between C_9 and C_{10}.

78. The two strands of DNA are wound around each other so that there are 10 base pairs in each turn of about 34nm.

79.



80. Some enzymes consist solely of proteins. Others also have a non-protein part known as a co-factor, which is essential for the proper functioning of the enzymes. The cofactor usually acts as 'bridge' between the enzyme and its substrate.

81. All enzymes can work at their maximum rate at a specific temperature called as optimum temperature. For enzymes of human body, 37°C is the optimum temperature.

82. Non-competitive reversible inhibitor blocks allosteric site of enzyme while competitive inhibitor has structural similarity with substrate and they bind active site of enzyme.

83. Water absorbs much heat as it changes from liquid to gas and causes cooling effect. Evaporation of only two ml out of one liter of water lowers the temperature of the remaining 998 ml by 1°C.

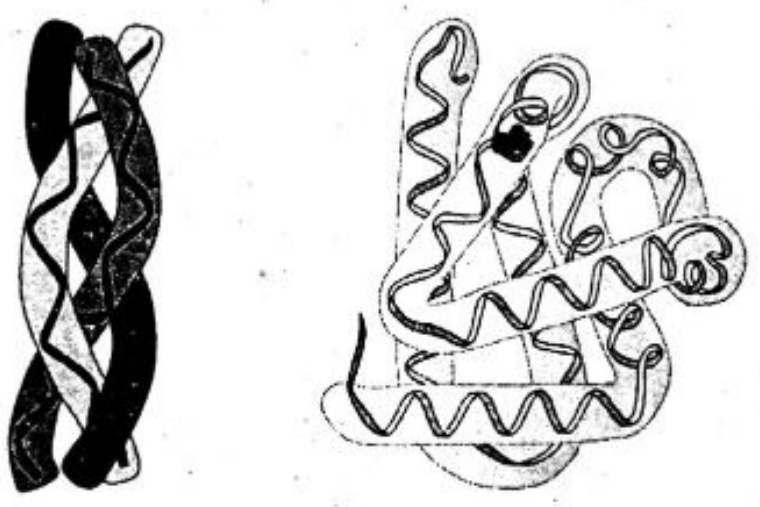
84. Glycogen is animal starch found in liver and muscle cell while starch is stored in plants cells.

85. When two monosaccharides join through dehydration condensation process they form disaccharide with glycosidic linkage and release water molecule.

86. Glycogen and starch are examples of polysaccharides while fructose is an example of monosaccharide.

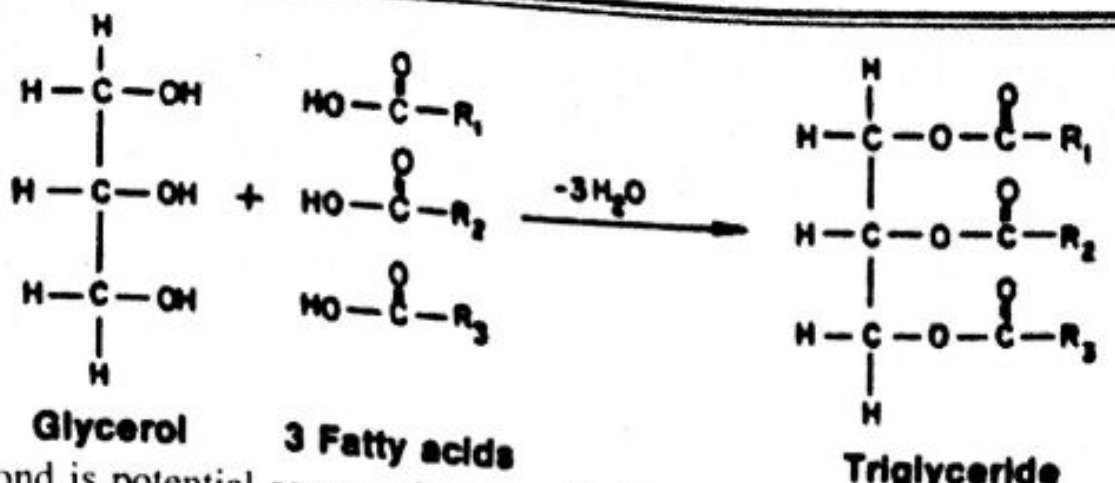
87. About 170 types of amino acids have been found to occur in cells and tissues. Of these, about 25 are constituents of proteins. Most of the proteins are however, made of 20 types of amino acids.

88.



89. Amino acids are mainly differing due to the type or nature of R-group. R may be a hydrogen atom as in glycine, or CH_3 as in alanine, or any other group.

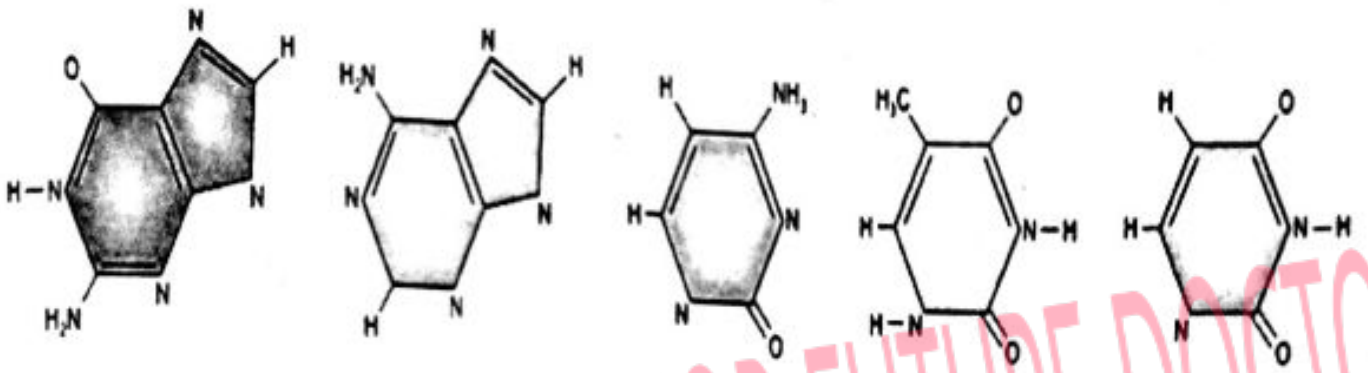
90. Chemically, acylglycerol can be defined as esters of fatty acids and alcohol.



91. C-H bond is potential source of energy. Lipids have higher proportion of C-H bonds as compare to carbohydrates and proteins.

92. Adenosine is a nucleoside while guanine is a nitrogenous base. NAD is a dinucleotide.

93.



94. The minimum amount of energy requires to start a chemical reaction is called activation energy. Enzymes speed up reaction by lowering its activation energy.

95. Both competitive and non-competitive inhibitors are example of reversible inhibitor and their effect can be neutralizing by adding small amount of substrate.

96. Reversible inhibitors form weak linkages with the enzyme. Their effect can be neutralized completely or partly by an increase in the concentration of the substrate. Since the student was recovered after injected substance 'B', it means that substance 'B' is the original substrate of that enzyme which has been competitively blocked by substance 'A'.

97. When a hydrophobic molecule is dropped in an aqueous medium, hydrogen bonds between water molecules will be broken to make room for the hydrophobic molecule; however, water molecules do not react with hydrophobic molecule. This is considered an endothermic reaction, because when bonds are broken heat is put into the system.

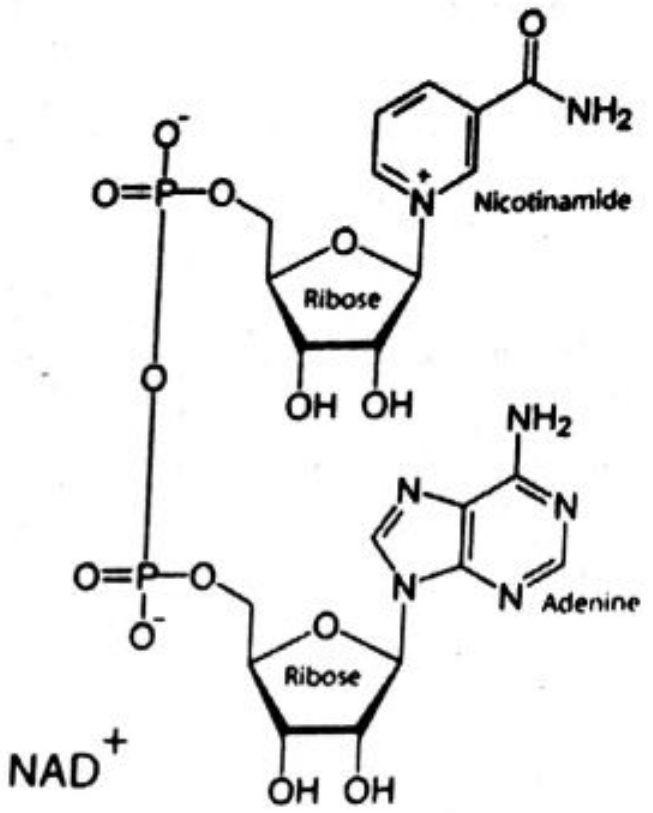
98. A solvent is simply a substance that can dissolve other molecules and compounds, which are known as solutes. Because of its polarity and ability to form hydrogen bonds, water makes an excellent solvent, meaning that it can dissolve different kinds of molecules.

99. Lipids are used as energy storage via fatty acids. Fatty acids are composed of carboxylic acids attached to long chains of hydrocarbons. So percentage of C---H bonds in lipids is much higher.

100. Oleic acid is slightly larger (18 carbons) and is an example of an unsaturated fatty acid.

101. General formula of monosaccharides is $C_n(H_2O)_n$ as number of carbon and oxygen is usually same in monosaccharides.

102.



103. According to lock and key model every enzyme is specific due to its active site for its substrate. So every enzyme can convert only its specific substrate into product.

104. Because the optimum temperate of human body is around to 37°C so, most of the enzymes work around this temperature with their maximum efficiency.

105. An enzyme binds to its specific substrate by its catalytic site and transforms its substrate into product. So this pathway lowers the activation energy.

4 TOPIC BIOENERGETICS

PRACTICE EXERCISE

TOPIC-WISE MCQs

ROLE OF LIGHT AND PHOTOSYNTHETIC PIGMENTS

Q.1 Spectrophotometer is used to measure:
A) Absorption of CO_2
B) Reflection of pigments
C) Absorption of O_2
D) Absorption of different wavelengths

Q.2 Which shows the effectiveness of wavelengths of light driving photosynthesis?
A) Absorption spectrum
B) Broad spectrum
C) Action spectrum
D) Narrow spectrum

Q.3 Carotenoids absorb strongly:
A) Red to orange
B) Yellow red
C) Yellow green
D) Blue violet

Q.4 The most abundant protein in chloroplast is:
A) Rubisco
B) Ribulose bisphosphatase
C) RUBP
D) Ribulose bisphosphate hydrogenase

Q.5 Magnesium is central part of:
A) Porphyrin ring
B) Pyrrole ring
C) Phytol tail
D) Hydrophobic part

Q.6 The products of photosynthesis in green plants are:
A) $C_6H_{12}O_6+6O_2$
B) $C_6H_{12}O_6+6O_2 + H_2O+$ energy
C) $(CH_2O)_n+H_2O+2S$
D) $C_6H_{12}O_6+6O_2 +6 H_2O$

Q.7 Location of phytol tail of chlorophyll b is:
A) Stroma
B) Thylakoid surface
C) Thylakoid membrane
D) Thylakoid lumen

Q.8 Some photosynthetic organisms contain chloroplasts that lack photosystem II, yet are able to survive. The best way to detect the "lack of photosystem II" in these organisms would be:
A) To determine if they have thylakoids in the chloroplasts
B) To test for liberation of O_2 in the light
C) To test for CO_2 fixation in the dark
D) To do experiments to generate an action spectrum

Q.9 Which one the following is not function of carotenoids?
A) Convert light energy into chemical energy
B) Transfer energy
C) Protect Chlorophyll
D) Protect human eye

Q.10 Chlorophyll consists of:
A) A head of phytol and tail of four pyrrole rings
B) A head of linked carbons and tail of four pyrrole rings
C) A head of four pyrrole rings and tail of linked nitrogen
D) A head of four pyrrole rings and a phytol tail

Q.11 Following is correct sequence of energy transfer between photosynthetic pigments:
A) Chl.a→Chl.b→Carotenoids
B) Chl.b→Carotenoids →Chl.a
C) Carotenoids →Chl.b→Chl.a
D) In any direction

Q.12 Conversion of light energy into chemical energy is function of:
A) Mitochondria
B) Stroma of chloroplast
C) Cytoplasm
D) Grana

Q.13 All of the followings are differences between Chl. 'a' and 'b' except:
A) Chl.a has different types while Chl.b has single type
B) Chl.a have functional group -CH_3 but Chl.b has-CHO
C) Chl.a is necessary pigment but Chl.b is accessory pigments
D) Chl.a is present in antenna complex while Chl.b is in reaction center

ROLE OF WATER AND CO_2

Q.14 The source of oxygen released during photosynthesis is:
A) Water
B) Glucose
C) CO_2
D) Oxidation of chlorophyll

Q.15 Van Neil hypothesis about the production of oxygen during photosynthesis was based on the study and investigations on
A) Bacteria
B) Protonema
C) Algae
D) Cyanobacteria

LIGHT DEPENDENT REACTIONS (PRODUCTIONOF ATP VIA ETC/CHEMIOSMOSIS)

Q.16 Incorrect statement for photosynthesis is:
A) It occurs during daytime
B) It requires chlorophyll
C) It uses water with CO_2
D) It uses oxygen

Q.17 Which is not true for dark reaction?
A) Does not require light directly
B) Also called Z-scheme
C) It uses ATP
D) G3P is produced

Q.18 Where does the light reactions take place?
A) Stroma
B) Chloroplast
C) Thylakoid membrane
D) Leucoplast

Q.19 The final acceptor of electrons during the noncyclic electron pathway is:
A) Photosystem I
B) ATP
C) Photosystem II
D) $NADP^+$

Q.20 PS-I is named as it:
A) Absorbs wavelength of 680 nm
B) Absorbs wavelength of 700 nm
C) Discovered earlier than PS-II
D) Slightly located upward than PS-II

Q.21 Each photon of light excites how many electrons:
A) 1
B) 2
C) 4
D) 6

Q.22 Water splits during photosynthesis in/on:
A) Interior space of thylakoid
B) Into the stroma
C) Outside the thylakoid membrane
D) At ATP synthase complex

Q.23 During cyclic photophosphorylation, electrons pass from all except:
A) Photosystem I
B) Photosystem II
C) Ferredoxin
D) Cytochrome complex

Q.24 $NADPH_2$ is produced in photosynthesis during:
A) Dark reaction
B) Non-cyclic photophosphorylation
C) Pseudo cyclic photophosphorylation
D) Cyclic photophosphorylation

Q.25 $NADP^+$ reductase transfers electron from:
A) $NADP^+$ to ferredoxin
B) ADP to ATP
C) Ferredoxin to $NADP^+$
D) Cytochrome complex to $NADP^+$

Q.26 Which of the following is correct sequence for the movement of electrons during non-cycling photophosphorylation?
A) P680→P700→water→$NADP^+$
B) Water→P680→P700→$NADP^+$
C) Water →P700→P680→$NADP^+$
D) P680→P700 →$NADP^+$→water

Q.27 Z-scheme is another name used for:
A) Cyclic photophosphorylation
B) Non-cyclic photophosphorylation
C) Calvin cycle
D) Oxidative phosphorylation

Q.28 Photosystem II has reaction center of:
A) P_{680}
B) P_{730}
C) P_{700}
D) P_{660}

LIGHT INDEPENDENT REACTION

Q.29 The process in which carbon from CO_2 is incorporated into organic molecules:
A) Glycolysis
B) Krebs cycle
C) Calvin cycle
D) Light dependent reactions

Q.30 Which statement is not true about the noncyclic electron pathway?
A) It absorbs photons into PS-I
B) It produces ATP
C) It is a long pathway
D) Carbon dioxide fixation

Q.31 Which is most necessarily associated with the Calvin cycle?
A) ATP production
B) Carbon dioxide fixation
C) Oxygen production
D) Carbon dioxide production

Q.32 The product of the dark reaction is:
A) ATP
B) G3P
C) RuBP
D) PEP

Q.33 If 12 NADPH are used in Calvin cycle, then how many glucose molecules will be formed:
A) One
B) Two
C) Six
D) Twelve

Q.34 Calvin cycle is also known as C_3 pathway due to:
A) Initial incorporation of 3 CO_2molecules
B) Production of 3 carbon 3PGA
C) Production of 3 carbon G3P
D) Cycle has 3 steps

Q.35 For fixing 3 molecules of CO_2 in Calvin cycle, what is needed?
A) 9ATP + 6$NADPH_2$
B) 6ATP + 9$NADPH_2$
C) 18ATP + 12$NADPH_2$
D) 3ATP + 3$NADPH_2$

CELLULAR RESPIRATION (AEROBIN AND ANAEROBIC REACTION)

Q.36 In yeast, pyruvic acid is converted to:
A) Ethyl alcohol
B) Acetic acid
C) Lactic acid
D) Fumaric acid

Q.37 About 2% energy of chemical bonds of glucose is converted into ATP by:
A) Glycolysis
B) Fermentation
C) Chemiosmosis
D) Calvin cycle

Q.38 This process may have CO_2 as its products:
A) Glycolysis
B) Fermentation
C) Chemiosmosis
D) Calvin cycle

Q.39 $C_3H_6O_3$ formation relates to:
A) Glycolysis
B) The Krebs cycle
C) The electron transport system
D) Fermentation

Q.40 Cellular respiration is essentially a/an _____ process.
A) Oxidation
B) Reduction
C) Redox
D) Hydrogenation

PAST PAPER MCQs

2008

Q.1 Chlorophylls absorb mainly _____ wavelength.
A) Yellow
B) Green
C) Violet-blue
D) Indigo

Q.2 In which stage of aerobic respiration is 2-carbon molecules oxidized completely to carbon dioxide.
A) Glycolysis
B) ETC
C) Krebs cycle
D) Calvin cycle

Q.3 Which form of anaerobic respiration occurs in muscle cell of humans and other animals during extreme physical activities?
A) Alcoholic fermentation
B) Lactic acid fermentation
C) Glycolysis
D) Pyruvic acid oxidation

2009

Q.4 Which of the following molecules is reduced by accepting hydrogen in Calvin cycle?
A) Glyceraldehyde-3-phosphate
B) Ribulose bisphosphate
C) 3-Phosphoglycerate
D) 1,3-Bisphosphoglycerate

Q.5 Immediate source of energy for cellular metabolism is:
A) Lipids
B) ATP
C) Carbohydrates
D) Proteins

Q.6 The molecule formed after first phosphorylation during glycolysis is:
A) Fructose-6-phosphate
B) Fructose-1, 6-bisphosphate
C) Glucose-1-phosphate
D) Glucose-6-phosphate

Q.7 Krebs cycle in mitochondria takes place in:
A) Cytosol
B) Matrix
C) Outer Membrane
D) Inner Membrane

2010

Q.8 Instrument which is used to measure relative abilities of different pigments to absorb different wavelengths of light is called:
A) Spectrometer
B) Photometer
C) Barometer
D) Spectrophotometer

Q.9 Type of respiration which involves step by step breakdown of carbon chain molecules in the cell is called:
A) External respiration
B) Cellular respiration
C) Pulmonary respiration
D) Cutaneous respiration

Q.10 Krebs cycle takes place in:
A) Ribosomes
B) Golgi Apparatus
C) Mitochondria
D) Endoplasmic reticulum

Q.11 End products of yeast fermentation, bacterial fermentation and anaerobic respiration are:
A) Citric acid, lactic acid, carbon dioxide and water
B) Ethyl alcohol, citric acid and carbon dioxide
C) Ethyl alcohol, lactic acid, carbon dioxide and water
D) Methanol, lactic acid and citric acid

2011

Q.12 Z-scheme is used for:
A) Non-Cyclic Photophosphorylation
B) Cyclic Photophosphorylation
C) Both Cyclic and Non-Cyclic Photophosphorylation
D) Oxidative Phosphorylation

Q.13 Some electron from the second primary acceptor may pass back to chlorophyll molecules by electron carrier system, yielding ATP. This process is called:
A) Phosphorylation
B) Photophosphorylation
C) Non-Cyclic Phosphorylation
D) Cyclic Phosphorylation

Q.14 Oxidative phosphorylation, synthesis of ATP in the presence of oxygen occurs in:
A) All types of cells
B) All anaerobic cells
C) All primitive cells
D) All aerobic cells

Q.15 Glycolysis is the breakdown of glucose into two molecules of:
A) Glycerate
B) Lactic Acid
C) Pyruvate
D) Succinic Acid

Q.16 Before entering Krebs cycle, the pyruvate is first decarboxylated and oxidized into:
A) Alpha ketoglutaric acid
B) Citric acid
C) Glyceric acid
D) Acetic acid

2012

Q.17 Which one are intermediates in respiration and photosynthesis both?
A) Ribose and heptulose
B) Glyceraldehydes& dihydroxyacetone
C) Glucose and galactose
D) Fructose and ribulose

Q.18 The product/s of cyclic photophosphorylation is/are:
A) ATP
B) NADP
C) NADP and ATP
D) NADP, ATP and O_2

Q.19 The end product of glycolysis is:
A) ADP
B) Reduced FAD
C) Citric acid
D) Pyruvate

Q.20 Total NADH formed by one glucose molecule during Krebs Cycle are:
A) 6
B) 3
C) 8
D) 18

Q.21 One molecule of $FADH_2$ is produced in Krebs cycle during conversion of:
A) Fumarate to Malate
B) Succinate to Fumarate
C) Malate to Oxaloacetate
D) α-Ketoglutarate to Succinate

Q.22 The terminal electron acceptor in electron transport chain is:
A) Hydrogen
B) Iron
C) Cytochrome
D) Oxygen

2013

Q.23 A biochemical process which occurs within a cell to breakdown complex compounds to produce energy is called:
A) Respiration
B) Photosynthesis
C) Oxidation reduction
D) Photophosphorylation

Q.24 Which part of chlorophyll molecule absorbs light?
A) Phytol
B) Porphyrin ring
C) Pyrrole
D) Thylakoid membrane

Q.25 Every molecule of NADH fed into ETC produces:
A) 2 ATP
B) 3 ATP
C) 4 ATP
D) 6 ATP

Q.26 Final acceptor of electrons in respiratory chain is:
A) Cytochrome a
B) Oxygen
C) Cytochrome a_3
D) Cytochrome c

Q.27 The end product of anaerobic respiration in humans and other mammals is:
A) Pyruvic acid
B) Ethanol
C) Lactic acid
D) Glucose

2014

Q.28 The most common respiratory substrate as a source of energy is:

A) Glucose
B) Sucrose
C) Fructose
D) Insulin

Q.29 Oxidative phase of glycolysis starts with dehydrogenation of:

A) Glycolysis
B) Ribulose bisphosphate
C) Glyceraldehyde 3-phosphate
D) NADH

Q.30 Which one of the following is the stage of cellular respiration for which oxygen is not essential?

A) Glycolysis
B) Pyruvate oxidation
C) Krebs cycle
D) Electron Transport Chain

Q.31 Pyruvate, the end product of glycolysis moves from cytosol to mitochondrial matrix where it is oxidized into _____ producing CO_2 as a by-product.

A) Active acetic acid
B) Citrate
C) NAD^+
D) FAD

Q.32 Pyruvate ⟶ Acetyl Co-A:

A) $FAD^+ \rightarrow FADH$
B) $NAD^+ \rightarrow NADH$
C) $NADH \rightarrow NAD + H^+$
D) $FADH^+ \rightarrow FAD + H^+$

Q.33 In one turn, the Krebs cycle produces one molecule of ATP, one molecule of $FADH_2$ and _____ molecules of NADH.

A) 1
B) 2
C) 3
D) 4

Q.34 Which one of the following is the site of oxidative phosphorylation in mitochondria?

A) Cristae
B) Matrix
C) Outer membrane
D) Ribosomes

2015

Q.35 In light independent stage of photosynthesis, the CO_2 combines with _____ to form an unstable 6-carbon intermediate.

A) Ribulose bisphosphate
B) Hexose sugar
C) Glycerate-3-phosphate
D) Glyceraldehyde-9-phosphate

Q.36 In glycolysis, glycerate-1,3-bisphosphate is converted into glycerate-3-phosphate by losing _____ phosphate molecules.

A) 3
B) 2
C) 1
D) 4

Q.37 Malate is oxidized by _____ to oxaloacetate in Krebs cycle.

A) ATP
B) $NADP^+$
C) NAD^+
D) FAD

Q.38 In electron transport chain, the electrons from NADH and $FADH_2$ are passed to:

A) Cytochrome a
B) Cytochrome a_3
C) Co-enzyme c
D) Co-enzyme Q

Q.39 Carriers of the respiratory chain are located on:

A) Matrix of mitochondria
B) Outer membrane of mitochondria
C) Inner membrane of mitochondria
D) Cytoplasmic matrix

2016

Q.40 Functional group of chlorophyll 'a' is:
A) —CH_3
B) —CHO
C) —COOH
D) —OH

Q.41 Photosystem I has chlorophyll 'a' molecules which absorb maximum light of:
A) 680 nm
B) 780 nm
C) 700 nm
D) 580 nm

Q.42 Cyclic flow of electrons produces:
A) ATP and CO_2
B) ATP
C) Only CO_2
D) Only Oxygen

Q.43 Each _____ consists of a light gathering antenna complex and reaction center.
A) Chlorophyll
B) Photosystem
C) Photon
D) Electron

Q.44 Immediate product formed after CO_2 fixation in Calvin Cycle is:
A) Unstable 6-carbon compound
B) Unstable 5-carbon compound
C) Unstable 4-carbon compound
D) Unstable 3-carbon compound

2017

Q.45 Chlorophyll molecule contains:
A) Mg^{++}
B) Ca^{++}
C) K^{+}
D) Na^{+}

Q.46 The tail of chlorophyll molecule is embedded in:
A) Membrane of mitochondria
B) Thylakoid membrane
C) Membrane of SER
D) Membrane of RER

Q.47 Chlorophyll 'a' and chlorophyll 'b' differ in one of the functional groups, Chlorophyll 'a' has:
A)-CHO
B)-OH
C)-CH_3
D)-NH_2

Q.48 Glycerate-3-phosphate in the presence of ATP and reduced NADP from light dependent stage is reduced to:
A) 3-carbon compound
B) Ribulose bisphosphate
C) 5-carbon compound
D) 6-carbon compound

Q.49 Calvin cycle occurs in:
A) Grana of chloroplast
B) Stroma of chloroplast
C) Chlorophyll (Reaction center)
D) Roots of plants

2017 Re-take

Q.50 Pick the characteristic of tail of chlorophyll:
A) Hydrophilic
B) Hydrophobic
C) Present in stroma
D) $C_{20}H_{20}$

Q.51 Which of the following color is maximum absorbed by chlorophyll?
A) Red
B) Green
C) Yellow
D) Indigo

Q.52 Graph showing effectiveness of absorbed light is called:
A) Absorption spectrum
B) Action spectrum
C) Light spectrum
D) Dark spectrum

Q.53 Splitting of water in sunlight is called:
A) Lysis
B) Condensation
C) Photolysis
D) Hydrolysis

Q.58 CO2 acceptor in Calvin cycle is
A) Rubisco
B) RuBP
C) PGA
D) G3P

Q.59 Chlorophyll is concentrated at
A) Chlorosome in Acetyl Co-A
B) Chlorosome in G3P
C) Chlorosome in pyruvate
D) Chlorosome in Thylakoid

Q.60 Acceptor of acetyl Co-A in Krebs cycle is
A) Oxaloacetate
B) Citrate
C) Succinate
D) Fumarate

2018
Q.57 When we extract carotenoids from the source we see that it is
A) Violet in colour
B) Blue green in colour
C) Yellow green in colour
D) Yellow and orange red in colour

Q.58 _____ is the site of light independent reaction
A) Thylakoid space
B) Thylakoid membrane
C) Cristae
D) Stroma

Q.59 At the last step of glycolysis which of the following compound is formed?
A) Fructose phosphate
B) Ethyl alcohol
C) Pyruvic acid/Pyruvate
D) Lactic acid

Q.60 The enzymes required in glycolysis are present in
A) Golgi apparatus
B) Cell cytoplasm
C) Inner mitochondrial membrane
D) Matrix of mitochondria

Q.61 In aerobic respiration
A) Pyruvate is completely oxidized to form oxygen and water
B) Pyruvate is carbon-fixed to produce sugar
C) Pyruvate is converted to ethanol and carbon dioxide
D) Pyruvate is completely oxidized to form carbon dioxide and water

Q.62 The enzymes required for Krebs cycle are found in _____
A) Cytosol
B) Matrix
C) Cytoplasm
D) Intermembrane

2019
Q.63 The photosynthetic pigments of plants are arranged as clusters in thylakoid membranes. The reaction centers of these clusters consist of _____ molecules.
A) ATP
B) Chlorophyll
C) Chlorosome
D) Carotenoids

Q.64 Which of the following photosystem is involved in cyclic photophosphorylation?
A) PS I and PS II
B) PS II
C) PS III
D) PS I

Q.65 In chemiosmosis, the proton (H+) pumps moves from _____
A) Stroma to lumen
B) Stroma to cytoplasm
C) Lumen to Stroma
D) Cytoplasm to Stroma

Q.66 Glycolysis takes place in the _____ of cell
A) Large complex
B) Nucleus
C) Cytoplasm
D) Mitochondrion

Q.67 How many molecules of ATP would be utilized for phosphorylation of one glucose molecule during glycolysis?
A) One
B) Four
C) Two
D) Three

2020
Q.68 First stable compound during Calvin Cycle is
A) 3 Phosphoglycerate
B) Glyceraldehyde 3 Phosphate
C) 3 Bisphosphoglycerate
D) Ribulose bisphosphate

Q.69 What is the function of ribulose?
A) Intermediates in photosynthesis
B) Respiratory fuel
C) Intermediates in cellular respiration
D) Component of DNA and RNA

Q.70 Which of the following processes does not need pyruvic acid as a substrate?
A) Alcoholic fermentation
B) Calvin cycle
C) Aerobic respiration
D) Lactic acid fermentation

Q.71 Which of the following is a copper containing protein in electron transport chain?
A) Plastoquinone
B) Cytochrome C
C) Plastocynin
D) Ferredoxin

Q.72 In electron transport chain, ATP synthesis takes place when electrons move from:
A) Primary electron acceptor to plastoquinone
B) Plastoquinone to cytochromes
C) Cytochrome to plastocyanin
D) Plastocynin to photosystem

Q.73 The end product of glycolysis in anaerobic respiration is:
A) Ethanol and carbon dioxide
B) Lactate
C) Pyruvate
D) Acetyl Co A

Q.74 Photophosphorylation takes place in the _____of the chloroplast.
A) Stroma
B) Granum
C) Inner membrane
D) Outer membrane

ANSWER KEY

TOPIC-WISE MCQs

1	D	11	C	21	A	31	B	41	A	51	B	61	B
2	C	12	D	22	A	32	B	42	D	52	D	62	D
3	D	13	D	23	B	33	A	43	C	53	B	63	A
4	A	14	A	24	B	34	B	44	C	54	A	64	D
5	A	15	A	25	C	35	A	45	B	55	A	65	B
6	D	16	D	26	B	36	A	46	B	56	A	66	D
7	C	17	B	27	B	37	B	47	A	57	D	67	A
8	D	18	C	28	A	38	B	48	B	58	D	68	C
9	A	19	D	29	C	39	D	49	C	59	B	69	B
10	D	20	C	30	D	40	A	50	C	60	B		

PASTPAPERS MCQs

1	C	11	C	21	B	31	A	41	C	51	A	61	D	71	C
2	C	12	A	22	D	32	B	42	A	52	B	62	B	72	C
3	B	13	D	23	A	33	C	43	B	53	C	63	B	73	C
4	D	14	D	24	B	34	A	44	A	54	B	64	D	74	B
5	B	15	C	25	B	35	A	45	A	55	C	65	A		
6	D	16	D	26	B	36	C	46	B	56	A	66	C		
7	B	17	B	27	C	37	C	47	C	57	D	67	C		
8	D	18	A	28	A	38	D	48	A	58	D	68	A		
9	B	19	D	29	C	39	C	49	B	59	C	69	A		
10	C	20	A	30	A	40	A	50	B	60	B	70	B		

EXPLANATORY NOTES

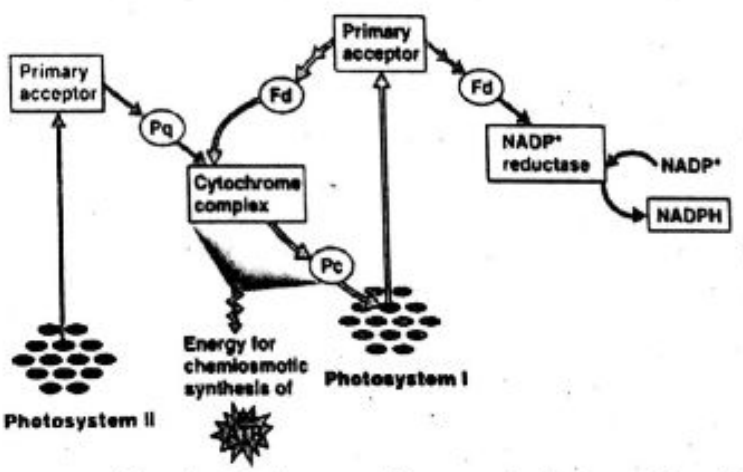
TOPIC-WISE MCQs

1. Spectrophotometer is an electrical instrument, which is used to measure the relative abilities of different pigments to absorb different wavelengths of light.
2. A graph plotting absorption of light of different wavelengths by a pigment is called absorption spectrum while the graph showing relative effectiveness of different wavelengths of light in driving photosynthesis is called action spectrum.
3. Carotenoids are yellow and red to orange pigments that absorb strongly the blue-violet range, different wavelengths than the chlorophyll absorbs, so they broaden the spectrum of light the provide energy for photosynthesis.
4. Carbon dioxide fixation in dark reaction is carried out by the enzyme ribulose bisphosphate carboxylase, also known as Rubisco. It is the most abundant protein in chloroplasts, and probably the most abundant protein on earth.
5.

6.

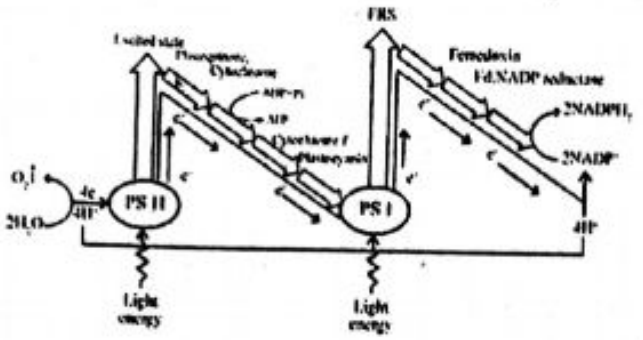
7. Chlorophyll molecule has a long hydrocarbon tail which is attached to one of the pyrrole rings of chlorophyll molecules and is embedded in the hydrophobic core thylakoid membrane
8. Photosystem II is involved in photolysis of water as result oxygen is evolved) If photosystem II is absent in an organism oxygen will be not liberated)
9. Transfer of energy, broadening the spectrum and protection of chlorophyll molecules and eyes are the functions of carotenoids. The conversion of light energy into chemical energy is the function of chlorophyll molecules.
10. A chlorophyll molecule has two main parts; one flat, light absorbing hydrophilic head and the other long, anchoring, hydrophobic hydrocarbon tail. The head is complex porphyrin ring which is made up of four joined smaller pyrrole rings
11. Carotenoids and chlorophyll 'b' are called accessory pigments because they absorb light and transfer the energy to chlorophyll a, which then initiates the light reactions. It is generally believed that the order of transfer of energy is.

12. Light dependent phase of photosynthesis takes place in grana of chloroplast in which light energy is converted chemical energy.
13. The antenna complex has many molecules of chlorophyll 'a', chlorophyll 'b' and carotenoids, most of them channeling the energy to reaction center. Reaction center has one or more molecules of chlorophyll 'a' along with primary electron acceptors, and associated electron carries of ETC).
14. The source of oxygen released during photosynthesis is water. This was confirmed by scientists Van Niel during 1940s when first use of an isotopic tracer (O^{18}) in biological research was made.
15. Using evidence from bacteria that utilize hydrogen sulfide (H_2S) for photosynthesis, van Niel hypothesized that all photosynthetic organisms need a hydrogen source and that plants split water as their hydrogen source, releasing oxygen. Scientists confirmed this hypothesis by using a heavy isotope of oxygen (^{18}O).
16. Photosynthesis is the biochemical process that occurs during day time and requires chlorophyll for sugar synthesis and uses CO_2 as reactant. O_2, however, is produced as by-product during light dependent phase of photosynthesis and consumed during cellular respiration.
17. Light reaction is also called Z-scheme so option B is irreverent to dark reaction.
18. The light reactions of photosynthesis take place at thylakoid membrane while dark reactions take place in stroma of chloroplast.
19. $NADP^+$ acts as the final electron acceptor during non-cyclic electron flow, while electrons are moved back from ferredoxin to cytochrome complex to generate assimilating power via cyclic electron flow.
20. Photosynthetic pigments are organized into clusters, called photosystems. There are two photosystems found in plants, PS-I and PS-II. These are named so in order of their discovery.
21. Each photon of light is able to excite a single electron during light reactions of photosynthesis.
22. During Photolysis water molecule is broken down and oxygen is realized in atmosphere. Two electron are used to fill the holes created by electron in chlorophyll.
23.

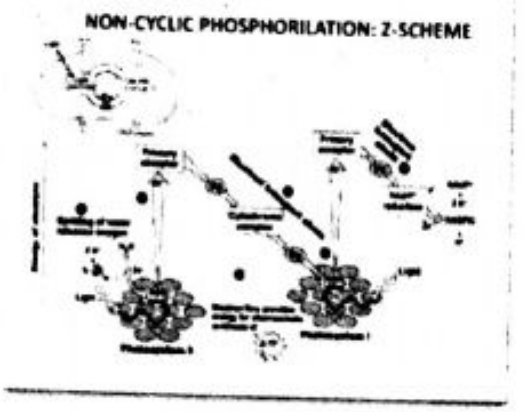


24. As a result of energy conversion in light reaction, reducing and assimilating power in the form of NADPH (NADPH + H+) and ATP are formed, both temporarily storing energy to be carried along with H+ to the light independent reactions.
25. The primary electron acceptor of PS-I passes the photo-excited electrons to ETC, which transfers them to ferredoxin. NADP reductase then transfers the electrons from ferredoxin to $NADP^+$ and converts it into NADPH. This is the redox reaction that stores the high energy electrons in NADPH.

26.



27. And 28



29. The cyclic series of reactions, catalyzed by the respective enzymes, by which the carbon is fixed and reduced, resulting in the synthesis of sugar during the dark reactions of photosynthesis, is called Calvin cycle in which organic RuBP is used as CO_2 acceptor.

30. Carbon dioxide fixation does not take place in light dependent phase of photosynthesis; rather its fixation occurs in light independent phase.

31. The production of ATP and O_2 as by product is associated with light reactions while CO_2fixation is associated with dark reactions.

32. During dark reactions fixed carbon is reduced to energy rich G3P with the energy and reducing power of ATP and NADPH, respectively (both the products of light-dependent reactions).

33. Since 6 molecules of NADPH are used for the synthesis of 1 G_3P in Calvin cycle, so for the synthesis of one glucose molecule 12 molecules of NADPH are required)

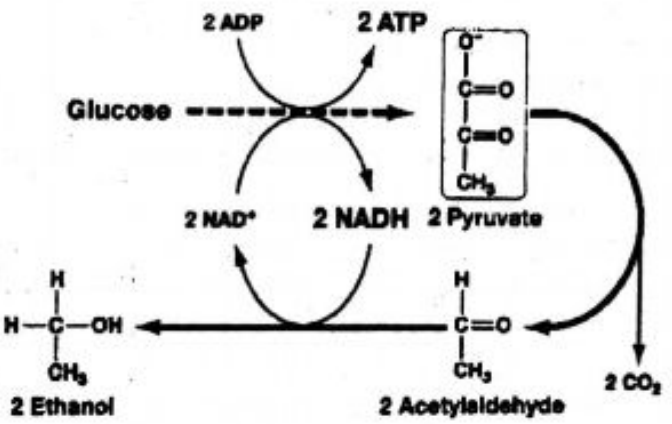
34. Because the product of initial carbon fixation is a three - carbon compound, the Calvin cycle is also known as C_3 pathway.

35. The chemical equation of dark reaction is:

$$3CO_2 + 6NADPH + 9ATP \longrightarrow (CH_2O)_3 + 6NAPD + 9ADP + 9Pi + 3H_2O$$

(Carbohydrate)

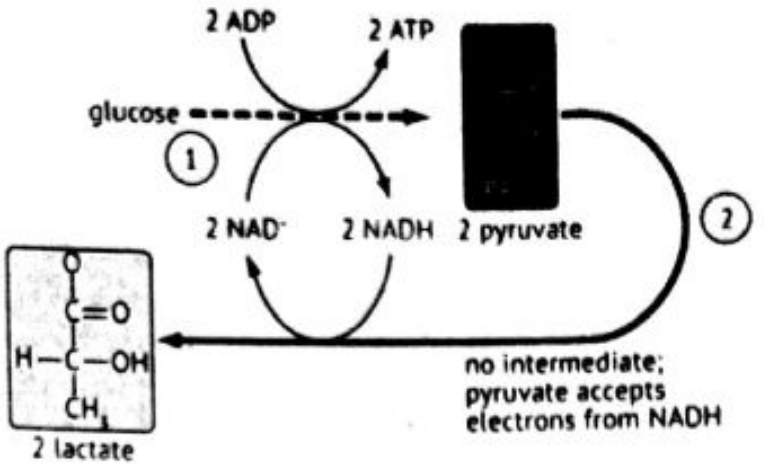
36.



37. Only about 2% of the energy present within the chemical bonds of glucose in converted into ATP during anaerobic respiration/fermentation.

38. CO_2 is not produced during glycolysis and chemiosmosis while it is being consumed in Calvin cycle. During alcoholic fermentation, pyruvate molecules are decarboxylated to form acetaldehyde which is then reduced to ethanol.

39.



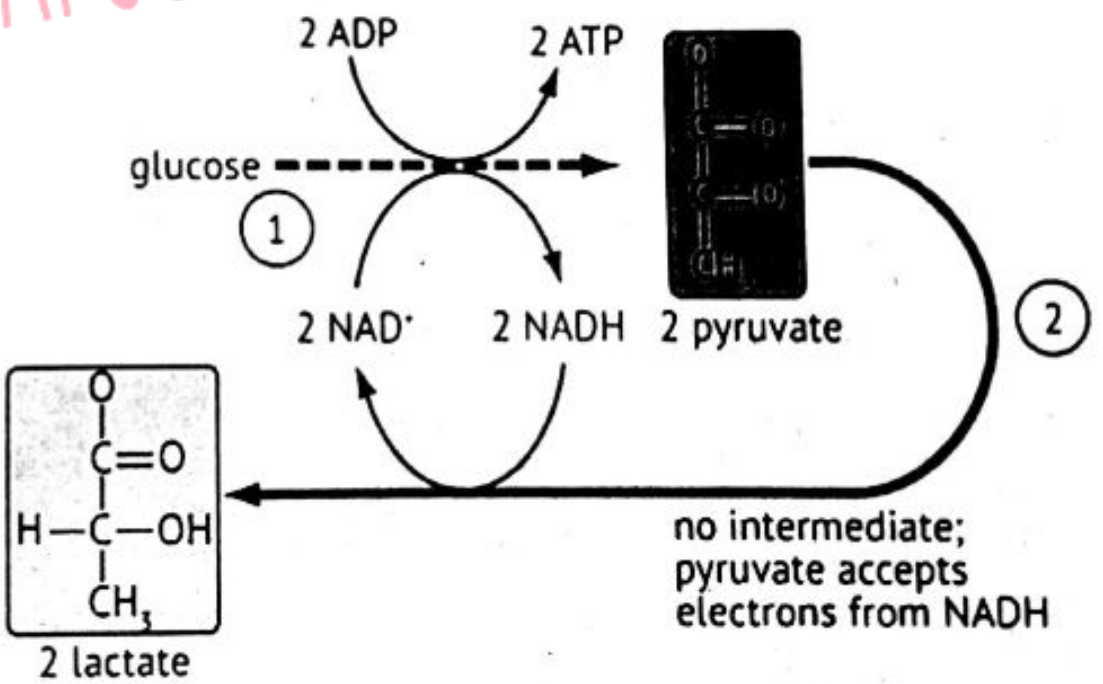
40. Cellular respiration is essentially an oxidation process while photosynthesis is essentially a reduction process.

41. RBCs are unable to carry put oxidative phosphorylation because they lack mitochondria Oxyntic cells, neurons and cardiac muscle cells are able to produce ATP molecules through oxidative phosphorylation because they have mitochondria.

42. Combustion is not amultistep reaction, enzyme controlled and intracellular. All these are the characteristics are related to cellular respiration.

43. Energy is released during cellular respiration by catabolism of organic molecules in all organisms.

44.



45. During fermentation of lactic acid, NADH is oxidized to regenerate NAD^+.

46. During the preparatory phase of glycolysis, one molecule of fructose 1, 6-bisphosphate is converted into 2 molecules of phosphorylated trioses e.g. G_3P and DAP. No ATP and NADH are consumed or produced in this reaction.

47. When 2-phosphglycerate is converted into PEP, a water molecule is released

48. Removal of phosphate group from a molecule is called de-phosphorylation. Conversion of fructose 1,3-bisphosphoglycerate into 3-phosphoglycerate is a de-phosphorylation reaction.

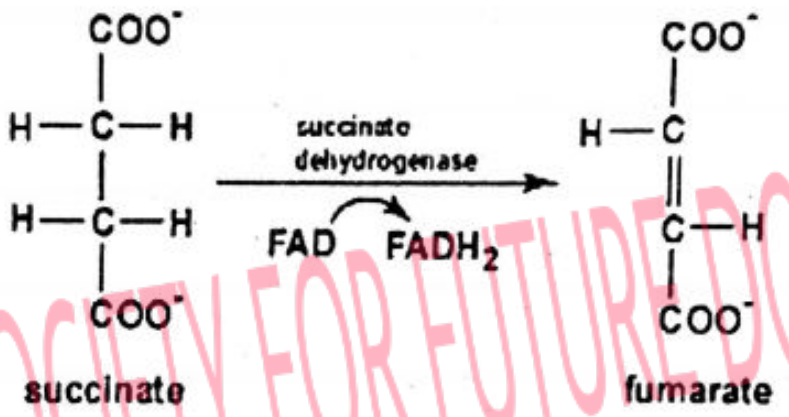
49. During glycolysis, glucose ultimately breaks down into pyruvate and energy; a total of 2 ATP is derived in the process (Glucose + $2NAD^+$ + 2ADP + 2 Pi --> 2 Pyruvate + 2NADH + 2 H^+ + 2 ATP + $2H_2O$). The hydroxyl groups allow for phosphorylation. The specific form of glucose used in glycolysis is glucose 6-phosphate.

50. The oxidation of succinate into fumarate produces $FADH_2$.This reaction is catalyzed by an enzyme called succinic acid dehydrogenase.

51. The cyclic reactions of Krebs cycle produce both NADH and $FADH_2$, while in glycolysis, only NADH is produced During electron transport chain, these NADH and $FADH_2$ molecules are oxidized to produce ATP molecules.

52. When products of glycolysis pass through Krebs cycle, it will produce 6 molecules of NADH, 2 molecules of $FADH_2$ and 2 molecules of ATP.

53.



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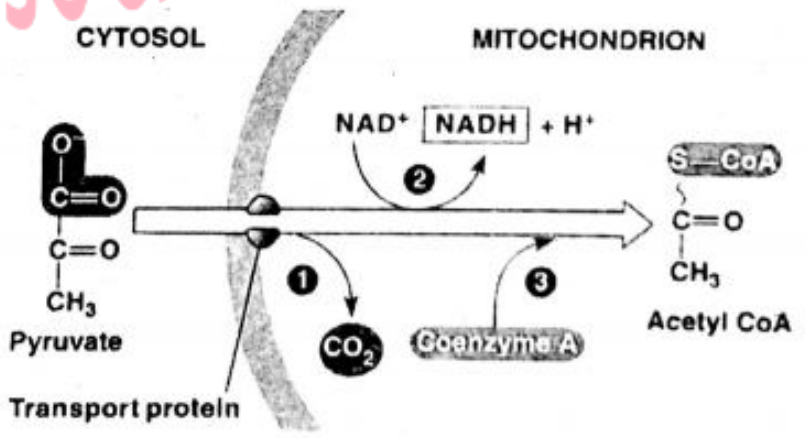
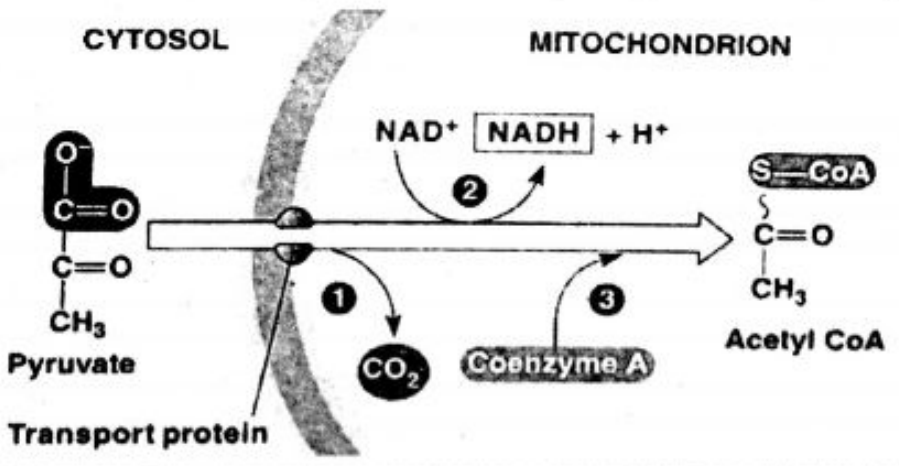


55. Theoretically, one NADH molecule generates 3ATP molecules while one $FADH_2$ generates 2 ATP molecules during their oxidation through electron transport chain.

56.



57. Starting from end product of glycolysis, 3 times decarboxylation occurs. It means 3 molecules of CO_2 produced)

58. When pyruvate molecule is converted into acetyl CoA, one carbon of pyruvate is removed in the form of carbon dioxide (decarboxylation) along with hydrogen (dehydrogenation) that is added to NADH.

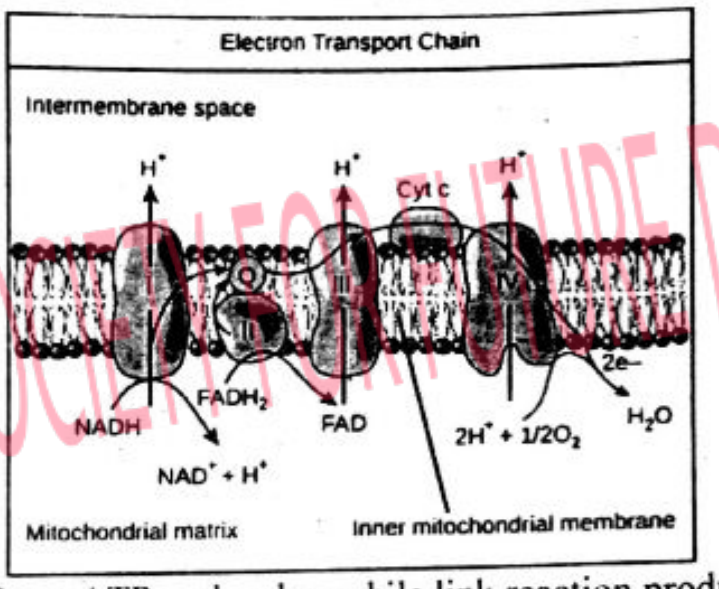
59. At the mitochondrial inner membrane, electrons from NADH and $FADH_2$ pass through the electron transport chain to oxygen, which is then reduced to water.

60. Passage of electrons between donor and acceptor in ETC releases energy, which is used to generate a proton gradient across the mitochondrial membrane by actively "pumping" protons into the inter-membrane space, producing a thermodynamic state that has the potential to do work.

61. Biological oxidation involves the removal of hydrogen, a redox reaction catalyzed by the dehydrogenases, linked to a specific coenzyme.

62. ATP molecules have three phosphate groups i.e. α, β and γ phosphates. The bond between the phosphate groups are the source of energy and their breaking will release 7.3 Kcal of energy.

63.



64. Glycolysis produces 2 net ATP molecules, while link reaction produces only two NADH molecules. Krebs cycle produces 2 ATP molecules, 6 NADH and 2 $FADH_2$ molecules. These reduced electron carriers are then oxidized via ETC to generate maximum ATP molecules through chemiosmosis.

65. Phosphofructokinase is the main regulatory enzyme in preparatory phase of glycolysis and it is inhibited by the increased concentration of NADH.

66. The ATP molecules are produced during glycolysis via substrate level phosphorylation in cytosol while oxidative phosphorylation is associated with mitochondria. Photophosphorylation is the process of utilizing light energy from photosynthesis to convert ADP to ATP and is associated with chloroplasts.

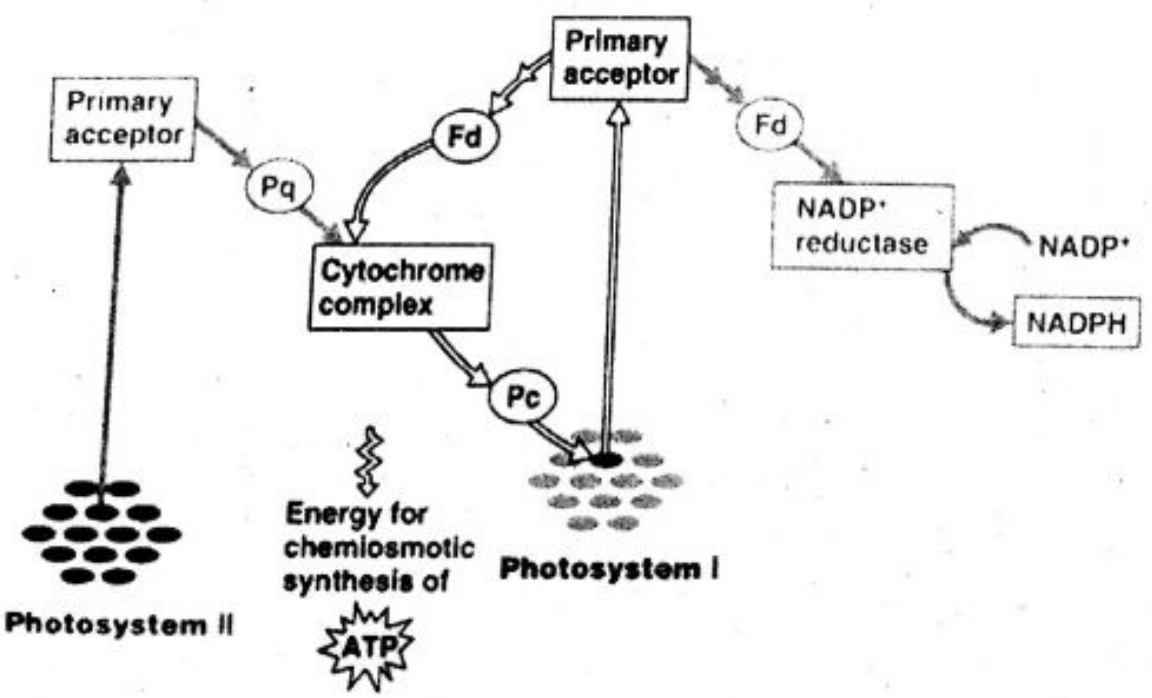
67. Cellular respiration is a process in which energy is released in the form of ATP due to catabolism of organic substance.

68. Total 40 ATP molecules are produced due to aerobic breakdown of glucose in both prokaryotes and eukaryotes. In prokaryotes 2 ATP are utilized in preparatory phase of glycolysis, so net ATP production is 38.

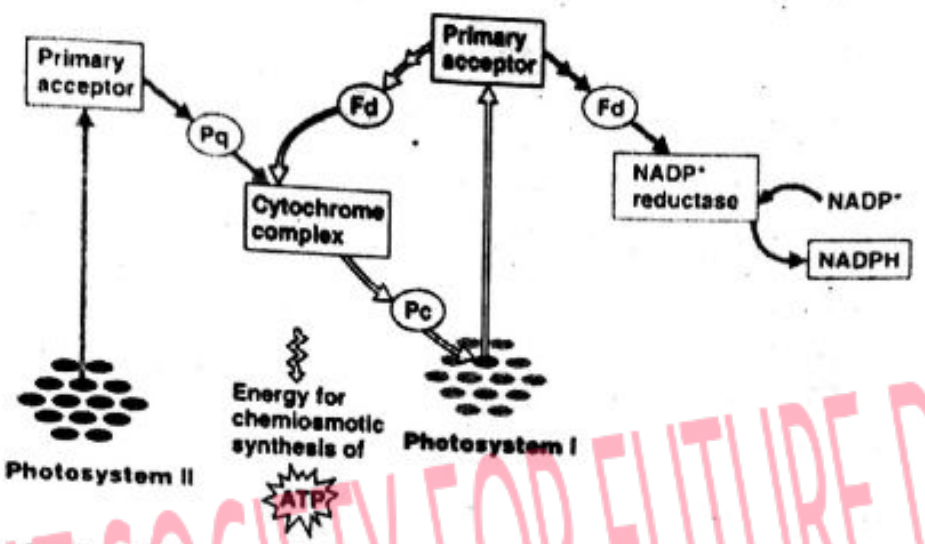
69. Chemiosmosis is the movement of ions across a semi-permeable membrane, down their electrochemical gradient. An example of this would be the generation of ATP by the movement of H^+ across a membrane during cellular respiration or photosynthesis

PAST PAPER MCQs

1. Carotenoids are yellow and red to orange pigments that absorb strongly the blue violet range, different wavelengths than the chlorophyll absorbs.
2. After pyruvic acid oxidation, acetyl CoA enters a cyclic series of chemical reactions during which oxidation process is completed This cyclic series of reactions is called Krebs cycle.
3. Lactic acid fermentation occurs in muscle cells of humans and other animals during extreme physical activities, such as sprinting, when oxygen cannot be transported to the cells as rapidly as it is needed
4. In Calvin cycle, each molecule of PGA receives an additional phosphate from ATP of light reaction, forming 1,3 - bisphosphoglycerate as the product which is then reduced to glyceraldehyde 3-phosphateby receiving a pair of electrons donated from NADPH of light reactions.
5. During cellular respiration, ATP molecules are produced This ATP is source for all cellular activity.
6. The first step in glycolysis is the transfer of a phosphate group from ATP to glucose. As a result, a molecule of glucose-6 -phosphate is formed
7. Glycolysis is take place in cytosol while Krebs cycle takes place in mitochondrial matrix. ETC occurs at cristae.
8. Spectrophotometer is an electrical instrument which is used to measure the relative abilities of different pigments to absorb different wavelengths of light. By using spectrophotometer, we can plot absorption spectrum.
9. Cellular respiration is a process in which organic molecule is breakdown step by step in a cell to extract energy. External respiration, pulmonary respiration and cutaneous respiration are different types of gas exchange mechanisms in different organisms.
10. Glycolysis is take place in cytosol while Krebs cycle takes place in mitochondrial matrix. ETC occur at cristae.
11. Cell processes pyruvic acid in two major ways during anaerobic respiration, alcoholic fermentation and lactic acid fermentation. During alcoholic fermentation carbon dioxide and alcohol is produced while during lactic acid fermentation lactic acid is produced
12. The path of electrons through the two photosystems during non-cyclic photophosphorylation is known as Z-scheme from its shape.
13.

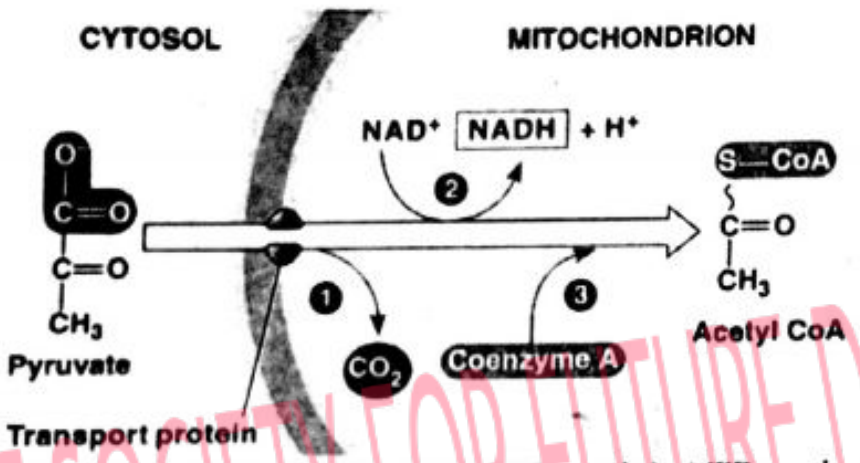


14. The synthesis of ATP molecules during oxidative phosphorylation is the feature of all those organisms that perform aerobic respiration.
15. Glycolysis is the breakdown of glucose up to the formation of pyruvic acid) Glycolysis can take place both in the absence of oxygen (anaerobic condition) or in the presence of oxygen (aerobic condition).
16. The pyruvate (3- carbon molecule) is first changed into 2-carbon acetic acid molecule. One carbon is released as CO_2 (decarboxylation). Acetic acid on entering the mitochondrion unites with coenzyme-A to form acetyl CoA (active acetate). In addition, more hydrogen atoms are transferred to NAD^+.
17. Two trioses Glyceraldehydes and dihydroxyacetone are, intermediates in respiration and photosynthesis.
18.



19. Glycolysis is the breakdown of six carbon containing glucose up to the formation of three carbon containing pyruvic acid) Glycolysis can take place both in the absence of oxygen (anaerobic condition) or in the presence of oxygen (aerobic condition).
20. When single acetyl CoA molecule enter into Krebs cycle, it yields 3 molecules of NADH, hence, two molecules of acetyl CoA will have produced 6 NADH.
21. After succinate formation, the next step in the Krebs cycle is the oxidation of succinate to fumarate. Again, two hydrogen atoms are removed, but this time the oxidizing agent is a coenzyme called FAD, which is reduced to $FADH_2$.
22. In ETC, Cytochrome 'a_3'is oxidized by oxygen and the electrons arrive at the bottom end of the respiratory chain. Oxygen is the most electronegative substance and act as the final acceptor of the electrons.
23. Respiration is a catabolic process in which organic molecule is broken down to produced energy in the form of ATP.
24. A chlorophyll molecule has two main parts: One flat, square, light absorbing hydrophilic head and the other long, anchoring, hydrophobic hydrocarbon tail. The head is complex porphyrin ring which is made up of 4 joined smaller pyrrole rings composed of carbon and nitrogen atoms.
25. Every NADH produced three molecules of ATP during electron transport chain while $FADH_2$ produced two molecules of ATP.
26. In ETC, Cytochrome 'a_3' is oxidized by oxygen and the electrons arrive at the bottom end of the respiratory chain. Oxygen is the most electronegative substance and act as the final acceptor of the electrons.
27. Anaerobic respiration occurs in muscle cells of humans and other animals during extreme physical activities, such as sprinting, when oxygen cannot be transported to the cells as rapidly as it is needed)

28. The most common fuel used by the cell to provide energy by cellular respiration is glucose. The way glucose is metabolized depends on the availability of oxygen. Prior to entering a mitochondrion, the glucose molecule is split to form two molecules of pyruvic acid)
29. Oxidative phase of glycolysis starts when Two electrons or two hydrogen atoms are removed from the molecule of 3-phosphoglyceraldehyde and transferred to a molecule of NAD^+. This is of course, an oxidation-reduction reaction, with the PGAL being oxidized and the NAD^+ being reduced)
30. During glycolysis glucose molecule is split to form two molecules of pyruvic acid Glycolysis is a common step in both aerobic and anaerobic respiration.
31. Pyruvic acid oxidation takes place in mitochondria Firstly carbon dioxide is removed from pyruvic acid during this process as a result two carbon compound acetic acid is formed which join with coenzyme A to form acetyl coenzyme A)
32.



33. In one turn of Krebs cycle, 3 NADH, 1 $FADH_2$ and 1 ATP molecule is produced from acetyl coenzyme A when it is oxidized
34. ATP formation in the presence of oxygen is called oxidative phosphorylation. ETC is responsible for this which is present take at cristae.
35. The Calvin cycle begins when a molecule of CO_2 reacts with a highly reactive phosphorylated five carbon sugar RuB. This reaction is catalyzed by the enzyme ribulose bisphosphate carboxylase, also known as Rubisco.
36. The oxidation of PGAL is an energy yielding process. Thus a "high energy" phosphate bond is created in this molecule. At the very next step in glycolysis this phosphate group is transferred to a molecule of ADP converting it into ATP. The end product of this reaction is 3PG.
37. NAD^+ mediated oxidation of malate produces oxaloacetate, the original 4-carbon molecule.
38. NADH and $FADH_2$are oxidized by coenzyme 'Q' in electron transport chain. This oxidation yields enough free energy to permit the synthesis of a molecule of ATP from ADP and inorganic phosphate.
39. Carriers of electron transport chain are located on cristae and these carriers are involving in ATP formation by the process of chemiosmosis.
40. Functional group of chlorophyll 'a' is $-CH_3$ while functional group of chlorophyll 'b' is -CHO.
41. Chlorophyll 'a' itself exists in several forms differing slightly in their red absorbing peaks e.g. at 670,680, 690, 700 nm. Chlorophyll 'a' of photosystem I absorbs 700nm and Chlorophyll 'a' of photosystem II absorb light of 680 nm.
42. During non-cyclic phosphorylation ATP and NADPH are produced while during cyclic flow of electron only ATP is produced.

43. Each photosystem consists of a light-gathering 'antenna complex' and a 'reaction center'. The antenna complex has many molecules of chlorophyll 'a', chlorophyll 'b' and carotenoids, most of them channeling the energy to reaction center. Reaction center has one or more molecules of chlorophyll 'a' along with a primary electron acceptor, and associated electron carriers of 'electron transport system'.

44. The Calvin cycle begins when a molecule of CO_2 reacts with a highly reactive phosphorylated five carbon sugar named RuBP. The product of this reaction is a highly unstable, six carbons intermediate that immediately breaks into two molecules of three carbon compound called 3-PGA)

45. An atom of magnesium is present in the center of porphyrin ring and is coordinated with the nitrogen of each pyrrole ring. That is why magnesium deficiency causes yellowing in plants. Haem portion of haemoglobin is also a porphyrin ring but containing an iron atom instead of magnesium atom in the center.

46. A chlorophyll molecule has two main parts: One flat, square, light absorbing hydrophilic head and the other long, anchoring, hydrophobic hydrocarbon tail. The chlorophyll molecule is embedded in the hydrophobic core of thylakoid membrane by this tail.

47. Functional group of chlorophyll 'a' is $-CH_3$ while functional group of chlorophyll 'b' is -CHO.

48. In Calvin cycle reduction phase, 1, 3 bisphosphoglycerate is reduced to glyceraldehyde 3-phosphate(G_3P) by receiving a pair of electrons donated from NADPH of light reactions. G3P is the same three-carbon sugar which is formed in glycolysis.

49. Light reactions take place in/on thylakoid membrane while dark reaction occurs at stroma of chloroplasts.

50. Chlorophyll molecule has long, anchoring, hydrophobic hydrocarbon tail which is called phytol. The chlorophyll molecule is embedded in the hydrophobic core of thylakoid membrane by this tail.

51. Chlorophylls absorb mainly violet-blue and orange-red wave lengths. Green, yellow and indigo wave lengths are least absorbed by chlorophylls and are transmitted or reflected, although the yellow are often masked by darker green color.

52. A graph plotting absorption of light of different wavelengths by a pigment is called absorption spectrum while graph showing relative effectiveness of different wavelengths of light in driving photosynthesis is called action spectrum.

53. During non-cyclic phosphorylation water molecules splits into two hydrogen ions and an oxygen atom, which immediately combine with another oxygen atom to formO_2. This water splitting step of photosynthesis that releases oxygen is called photolysis. The oxygen produced during photolysis is the main source of replenishment of atmospheric oxygen.

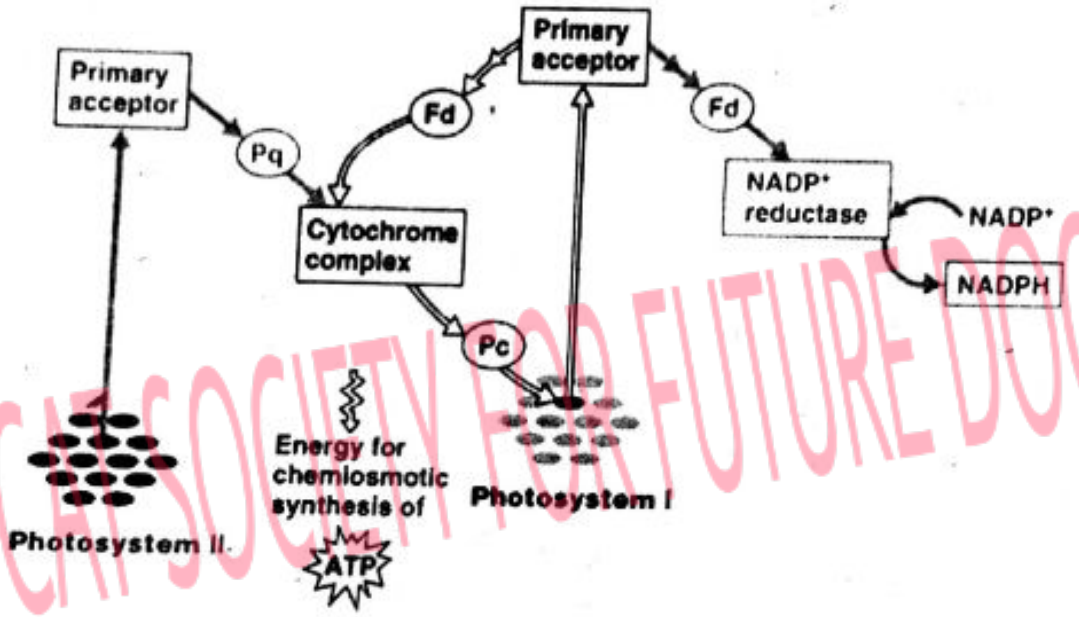
54. The Calvin cycle begins when a molecule of CO_2 reacts with a highly reactive phosphorylated five carbon sugar named ribulose bisphosphate (RuBP). This reaction is catalyzed by the enzyme ribulose bisphosphate carboxylase, also known as Rubisco.

55. Glycolysis is the breakdown of glucose up to the formation of pyruvic acid Glycolysis can take place both in the absence of oxygen (anaerobic condition) or in the presence of oxygen (aerobic condition).

56. The first step in the Krebs cycle is the union of acetyl CoA with oxaloacetate to form citrate. In this process, a molecule of CoA is regenerated and one molecule of water is use Oxaloacetate is a 4-carbon acid and citrate thus has 6 carbon atoms.

57. Carotenoids are yellow and red to orange pigments that absorb strongly the blue violet range, different wave lengths than the chlorophyll absorbs.

58. Light reactions take place in thylakoid membrane while dark reaction occurs at stroma
59. Glycolysis is the breakdown of glucose upto the formation of pyruvic acid. Glycolysiscan take place both in the absence of oxygen (anaerobic condition) or in the presence of oxygen (aerobic condition).
60. The enzymes required for glycolysis are present in cytoplasm of the cell while enzymes required for pyruvic acid oxidation and Krebs cycle are present in mitochondrial matrix.
61. The complete breakdown of glucose molecule occurs only in the presence of oxygen, i.e. in aerobic respiration. During aerobic respiration glucose is oxidized to CO_2 and water and energy is released.
62. The enzymes required for glycolysis are present in cytoplasm of the cell while enzymes required for pyruvic acid oxidation and Krebs cycle are present in mitochondrial matrix.
63. Reaction center of photosystem has one or more molecules of chlorophyll 'a' along with a primary electron acceptor, and associated electron carriers of 'electron transport system'.
64.



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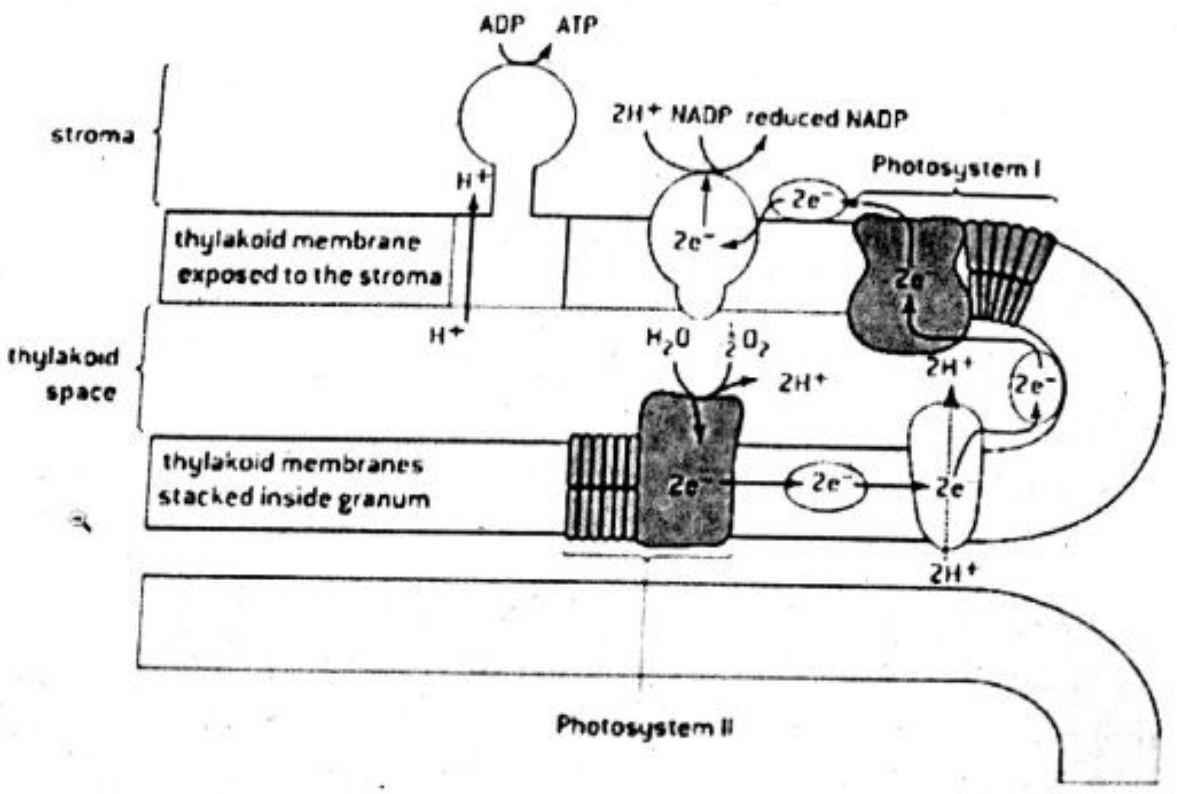


66. Glycolysis is take place in cytoplasm while Krebs cycle takes place in mitochondrial matrix. Golgi complex is associated with various functions like modification and packaging o biological molecules.
67. During glycolysis two molecule of ATP are used during preparatory phase while four molecule of ATP are produced.
68. Three molecules of $CO_2$are required to make trios during one Calvin cycle. 5 carbon sugar which is RuBP reacts with $CO_2$and make six carbon compounds that immediately brakes and is converted into three carbon compounds which is 3-Phosphoglycerate.
69. Ribulose diphosphate (RuBP) is an intermediate compound during dark reaction of photosynthesis.
70. Pyruvic acid is an intermediate compound during respiration which is concerted into alcohol and lactic acid in alcoholic and lactic acid fermentation respectively. Pyruvic acid is intermediate compound during aerobic respiration also.
71. Plastocyanin is a copper containing protein which is present in electron transport chain during photophosphorylation.
72. During this process
73. During glycolysis partial oxidation of glucose is taken place due to which one molecule glucose is converted into two molecule pyruvate that can be converted into ethanol and carbon dioxide or lactic acid.
74. Photosynthetic pigments are present in membrane of thylakoids so photophosphorylation takes place at granum.

5 TOPIC ACELLULAR LIFE

PRACTICE EXERCISE

TOPIC-WISE MCQs

DISCOVERY OF VIRUSES

Q.1 Viruses may not replicate in:
A) Blood Plasma
B) A plant cell
C) Skin cell
D) Hepatocytes

Q.2 Nucleic acid is the only component of:
A) Virus
B) Viroid
C) Virion
D) Prion

Q.3 It is false for viruses:
A) Viruses contain both DNA and RNA
B) No independent metabolic activities
C) Viruses are non-cellular
D) Tiny and infectious agent

Q.4 In prions, information is carried further through:
A) DNA
B) Proteins
C) RNA
D) Glycoproteins

Q.5 The filterable agents were first purified in 1935, when Stanley was successful in crystallizing the virus:
A) Polio
B) Hepatitis
C) Tobacco mosaic Virus
D) Influenza

Q.6 Viruses cannot be grown on artificial culture media because they are:
A) Facultative parasites
B) Obligate parasites
C) Endoparasites
D) Ectoparasites

STRUCTURE OF VIRUSES

Q.7 It is present in all the viruses:
A) DNA
B) Capsid
C) RNA
D) Envelop

Q.8 The component responsible for determination of shape of virus is:
A) Kind of nucleic acids
B) Kind of hosts
C) Protein subunits
D) Viral envelop

Q.9 Which of the following is not essential part of virus?
A) Nucleic acid
B) Envelope
C) Capsid
D) None of these

Q.10 A virion is a:
A) Virus
B) Viral lysozyme
C) Capsid
D) Viral gene

Q.11 _____ capsomeres are present in capsid of herpes virus.
A) 152
B) 252
C) 162
D) 262

Q.12 Members of which of the following group are all parasites?
A) Viruses
B) Bacteria
C) Fungi
D) Protozoa

CLASSIFICATION OF VIRUSES

Q.13 Polio viruses are:
A) Tadpole shaped
B) Spherical viruses
C) Rod shaped viruses
D) Spring like

Q.14 The genome of most of the animal viruses contain:
A) DNA
B) RNA
C) Protein
D) Both DNA and RNA

Q.15 TMV are:
A) Tadpole shaped
B) Helical shaped
C) Rod shaped viruses
D) Spherical viruses

BACTERIOPHAGE (STRUCTURE & LIFE CYCLE)

Q.16 Volume of bacteriophage is about _____ of host:
A) 1/10
B) 1/100
C) 1/100 times
D) 1/1000

Q.17 The enzyme involved in viral replication are synthesized:
A) By the host cell
B) On the viral ribosomes
C) On the interior surface of viral membrane
D) On the interior surface of viral coat

Q.18 In lytic cycle of life cycle of bacteriophage, the phage is regarded as:
A) Master
B) Guest
C) Inducer
D) Slave

Q.19 The part of bacteriophage that enters the host cell is:
A) Protein sheath
B) Protein coat
C) Genome
D) Tail

Q.20 The bacteriophage attaches itself by its tail to the cell wall of bacterium at:
A) Anywhere on the cell
B) Receptor site
C) Adhering surface
D) Binding site

Q.21 When a virus is in the lysogenic cycle, which of these will occur?
A) Viral DNA becomes incorporated into the host DNA
B) Host cell produces many new viruses before it breaks apart
C) The viral DNA replicates and it separated by the cell's spindle apparatus
D) Antiviral defenses of the cell expel the viral DNA

VIRAL DISEASES

Q.22 Most commonly, lesions can be seen around mouth, lips and at other skin sites in:
A) Influenza
B) Mumps
C) Polio
D) Herpes

Q.23 Viral inflammation of parotid gland is commonly associated with:
A) Mumps
B) Herpes simplex
C) Small pox
D) Influenza

Q.24 All of the following are viral diseases except:
A) Influenza
B) Mumps
C) Polio
D) Tetanus

Q.25 Hepatitis A virus is:
A) RNA
B) DNA
C) ss RNA
D) ss DNA

Q.26 HAV is transmitted through:
A) Blood
B) Fecal-oral route
C) Serum
D) Syringes

Q.27 Virus that attack on spinal cord is:
A) Rabies
B) Toga virus
C) HIV
D) Poliovirus

Q.28 Poliomyelitis affects:
A) Sensory neuron
B) Motor neuron
C) Brain
D) Muscles

Q.29 Which one is not RNA virus?
A) Small pox virus
B) Influenza virus
C) Mumps and Measles virus
D) Polio virus

Q.30 Small Pox is caused by Pox virus which is:
A) DNA Naked Virus
B) RNA Naked Virus
C) RNA Enveloped Virus
D) DNA Enveloped Virus

Q.31 Mad cow disease is caused by:
A) Virus
B) Viroid
C) Virion
D) Prion

Q.32 Hepatitis C is also known as:
A) Infections Hepatitis
B) Infusion Hepatitis
C) Serum Hepatitis
D) Delta Hepatitis

Q.33 Pigs are reservoir for:
A) Hepatitis A
B) Hepatitis C
C) Hepatitis B
D) Hepatitis E

HIV & AIDS

Q.34 Retroviruses contain:
A) Single stranded RNA
B) Single stranded DNA
C) Double stranded RNA
D) Double stranded DNA

Q.35 Major Cells that are infected by HIV are:
A) B-lymphocytes
B) Natural cells
C) T-Helper cells
D) T-Lymphocytes

Q.36 It acts as a template strand for reverse transcriptase:
A) Viral DNA
B) Viral RNA
C) Host DNA
D) T-lymphocytes

Q.37 The phenomenon of transcription in HIV life cycle occurs in:
A) Nucleus
B) Cytoplasm
C) Inside viral capsid
D) None of these

Q.38 Attachment of HIV DNA with host DNA is done via action of:
A) Integrase
B) Protease
C) Reverse transcriptase
D) Nuclease

Q.39 HIV can be transmitted by all of the following sources except:
A) Intimate sexual contact
B) Breast feeding
C) Contact with blood
D) Saliva

Q.40 Uncoating of HIV virion occurs:
A) Outside the cell
B) In nucleus
C) In cytoplasm
D) At any place

PAST PAPER MCQs

2009

Q.1 The major cell infected by the HIV is:

A) Leucocyte
B) Monocyte
C) Helper T-lymphocyte
D) B-lymphocyte

2010

Q.2 Chemically, viruses are made up of:

A) Nucleic acid only
B) Protein only
C) Nucleic acid and protein
D) Core and coat

2012

Q.3 In HIV viruses, reverse transcriptase converts single-stranded RNA into double stranded viral DNA. This process is called:

A) Translation
B) Duplication
C) Replication
D) Reverse Transcriptase

2013

Q.4 Reverse transcriptase is used to make DNA copies of:

A) Host RNA
B) Viral RNA
C) Host DNA
D) Viral DNA

2014

Q.5 Which of the following cells are mainly infected by HIV?

A) T-killer lymphocytes
B) T-helper lymphocytes
C) B-plasma cells
D) B-memory cells

2015

Q.6 HIV is classified as:

A) Bacteriophage
B) Oncovirus
C) Retrovirus
D) Icosahedral virus

2016

Q.7 AIDS is caused by:

A) Bacteria
B) Virus
C) Fungi
D) Alga

2017

Q.8 Cilia and flagella are absent in:

A) Viruses
B) Bacteria
C) Higher plants
D) Lower animals

2018

Q.9 In viruses, a combined structure formed by core (Nucleic Acid) and capsid is:

A) Nucleocapsid
B) Envelope
C) Capsomeres
D) Prions

2019

Q.10 Taxonomy includes the arrangement of organisms into different taxa. Which of the following represents the correct hierarchy of various taxa of classification?

A) Species, genus, family, order, class, phylum
B) Order, family, class, phylum, kingdom
C) Species, genus, order, family, class, phylum
D) Species, genus, family, class, order, phylum

Q.11 Capsid, the protective coat of a virus is made up of subunits known as capsomeres.
A) Lipid
B) Protein
C) RNA
D) DNA

Q.12 Among followings, _____ enzyme is naturally found in human immunodeficiency virus.
A) DNA polymerase
B) RNA polymerase
C) Reverse transcriptase
D) Ligase

2020

Q.13 Which of the following is not related to enveloped virus?
A) They survive for a short time
B) Their envelop is sensitive to sunlight
C) They are tolerant to antibodies
D) Envelope is derived from host

Q.14 The complete mature and infection virus particle is known as:
A) Venome
B) Genome
C) Virion
D) Capsid

Q.15 Numerous opportunistic diseases might attack a person suffering from which of the following diseases:
A) Measles
B) Influenza
C) Hepatitis A
D) AIDS

Q.16 Which of the following is not true about human immunodeficiency virus HIV?
A) It is a retrovirus
B) It is surrounded by an envelope
C) It does not cause AIDS
D) It causes deficiency of the human immune system

ANSWER KEY

TOPIC-WISE MCQs

1	A	11	C	21	A	31	D
2	B	12	A	22	D	32	B
3	A	13	B	23	A	33	D
4	B	14	B	24	D	34	A
5	C	15	C	25	A	35	C
6	B	16	D	26	B	36	B
7	B	17	A	27	D	37	A
8	C	18	A	28	B	38	A
9	B	19	C	29	A	39	D
10	A	20	B	30	D	40	C

PAST PAPERS MCQs

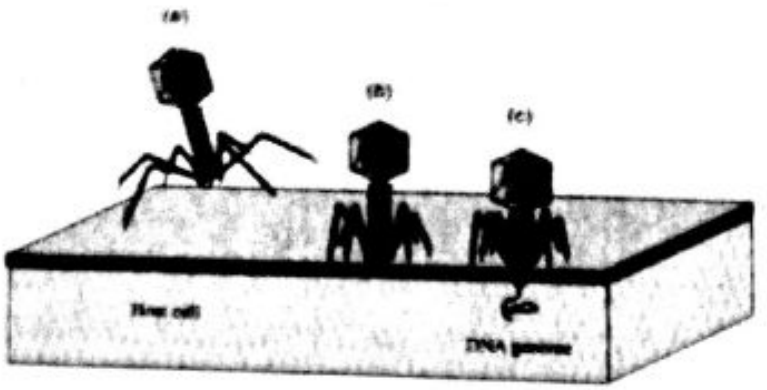
1	C	11	B
2	C	12	C
3	D	13	C
4	B	14	C
5	B	15	D
6	C	16	C
7	B		
8	A		
9	A		
10	A		

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. One of the most important features of viruses is that they can reproduce only in animal or plant cells or in micro-organisms, where they reproduce by replication. Hence, viruses are said to be the obligate intra-cellular parasites. Blood without blood cells is blood plasma and it cannot provide machinery for viral replication.
2. Viroids are made up of only small, circular ssRNA molecules. Prions are of controversial nature and chemically, these are composed of mis-folded or infectious proteins. Virions are complete, mature and infectious particles.
3. Viruses are composed of central core of nucleic acid, either DNA or RNA but not the both, which is also known as the genome and is surrounded by a protein coat, the capsid.
4. Prions are mis-folded or infectious proteins with the ability to transmit their mis-folded shape onto normal variants of the same protein.
5. Stanley was the first scientist who crystallized tobacco mosaic virus in 1935.
6. Viruses cannot grow on artificial media because lack metabolic machinery for the synthesis of their own nucleic acid and protein.
7. Viruses contain DNA or RNA. Viruses may be enveloped or non-enveloped.
8. The viral capsid is made up of protein subunits known as capsomeres. The number of capsomeres is characteristics of a particular virus and gives definite shape to the virion.
9. Viruses are made up of protein capsid and nucleic acid. There are some viruses that have an additional covering of host plasma membrane known as envelope. Envelope is non-essential
10. Complete, mature and infectious particles are known as virions.
11. Capsid of viruses is made up of protein subunits known as capsomeres. Number of capsomeres is characteristic of a particular virus i.e., herpes virus has 162 capsomeres and adenovirus has 252 capsomeres in their capsid.
12. Bacteria can be parasitic, saprotrophic, chemosynthetic, photosynthetic and symbiont.
    Fungi can be parasitic and saprotrophic.
    Protozoa can be parasite or free living.
13. Spherical (Polio)
    Rod-like (TMV)
    Tadpole (Lambda phages)
14. Animal virus contains DNA or RNA as genetic material but mostly animal viruses are RNA viruses.
15. Common shapes of viruses:
    Spherical (Polio)
    Rod-like (TMV)
    Tadpole (Lambda phages)
16. The volume of bacteriophage is 1000 times smaller than that of bacterium.
17. Viruses do not have their own biosynthetic machinery but depend upon host for replication.
18. In lytic cycle of life cycle of bacteriophage, the phage overtakes the host machinery.

19.



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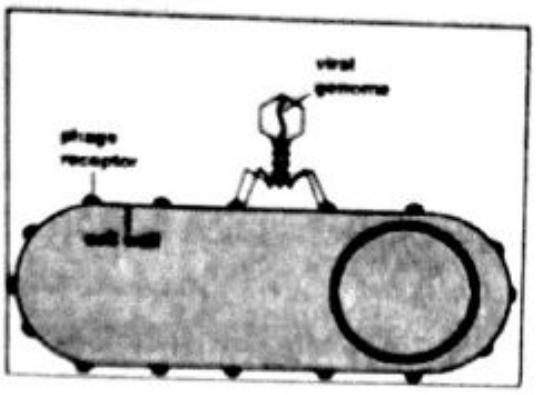

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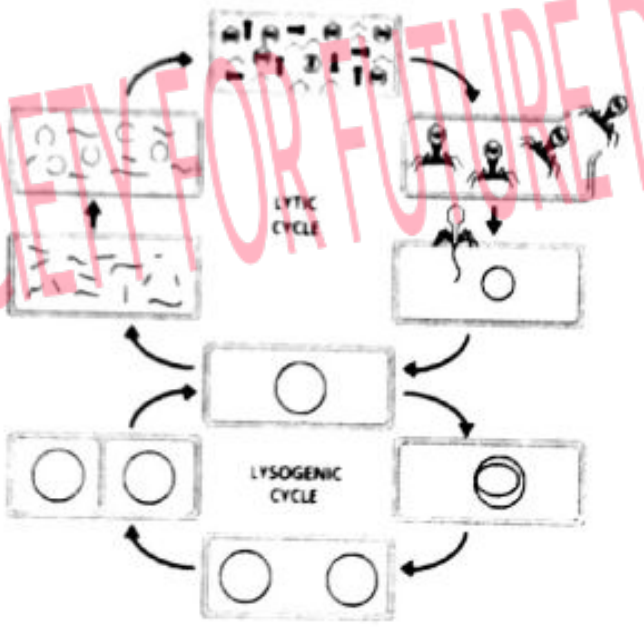
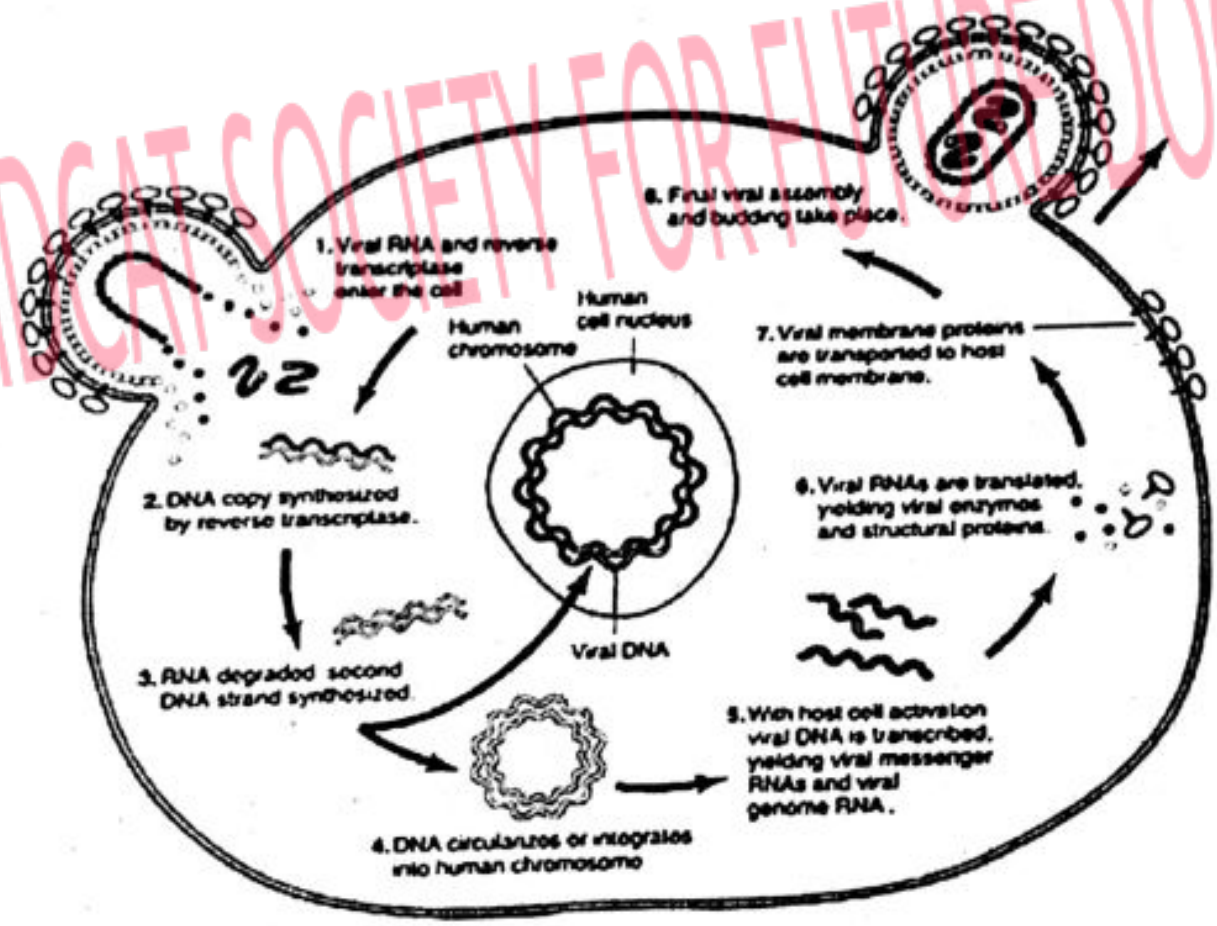


22. In oral herpes, blisters are usually formed at these sites.
23. Mumps belongs to group paramyxoviruses. It is highly contagious and this disease cause painful swelling of parotid glands.
24. Tetanus is a bacterial disease caused by *Clostridium tetani.*
25. Viruses can be classifying on the bases of genome, HAV contains single standard RNA, HBV contains DNA and HCV contains RNA.
26. The virus spreads by the fecal–oral route, and infections often occur in conditions of poor sanitation and overcrowding.
27. Polio virus replicates in oropharynx, intestine and spread through blood to nervous system. Polio virus replicates in motor neuron located in spinal cord. Death of these cell result in paralysis.
28. Polio virus replicates in oropharynx, intestine and spread through blood to nervous system. Polio virus replicates in motor neuron located in spinal cord. Death of these cell result in paralysis.
29. Pox virus is DNA enveloped; Mumps, measles and poliovirus have RNA as genetic material.

30. Pox virus is DNA enveloped virus which caused epidemic in the past causing small pox, but now this disease has been eradicated from the world.
31. Prions are infectious particles made up of only proteins containing informations for replication and cause mad cow infection and mysterious brain infection in man.
32. Hepatitis C virus is RNA enveloped virus that causes infusion hepatitis.
33. Most recent work of Halbur and coworker (2001) reveals that pig could be the source of infection of hepatitis E.
34. All retroviruses are RNA viruses containing copies of single stranded RNA as genome.
35. HIV attacks a specific type of immune cell in the body, known as helper cells. When HIV destroys these cells, then it becomes difficult for the body to fight against the infections.
36. HIV is equipped with reverse transcriptase along with the other essential enzymes. Reverse transcriptase responsible for reverse transcription, during which viral genomic ssRNA is converted into viral dsDNA in the cytoplasm of helper T-cells.
37. In HIV infected helper T-cells, the process of transcription occurs in nucleus while the process of reverse transcription occurs in cytoplasm.
38. HIV integration is the insertion of HIV genetic material into the genome of the infected cell. This process is completed with the help of integrase.
39. Modes of transmission of HIV are blood transfusion, sexual contacts and breast feeding. Saliva is not the source of transmission of HIV.
40.



PAST PAPERS MCQs

1. HIV attacks a specific type of immune cell in the body, known as helper cells. When HIV destroys these cells, then it becomes difficult for the body to fight against the infections.
2. Viruses are composed of central core of nucleic acid, either DNA or RNA but not the both, which is also known as the genome and is surrounded by a protein coat, the capsid.
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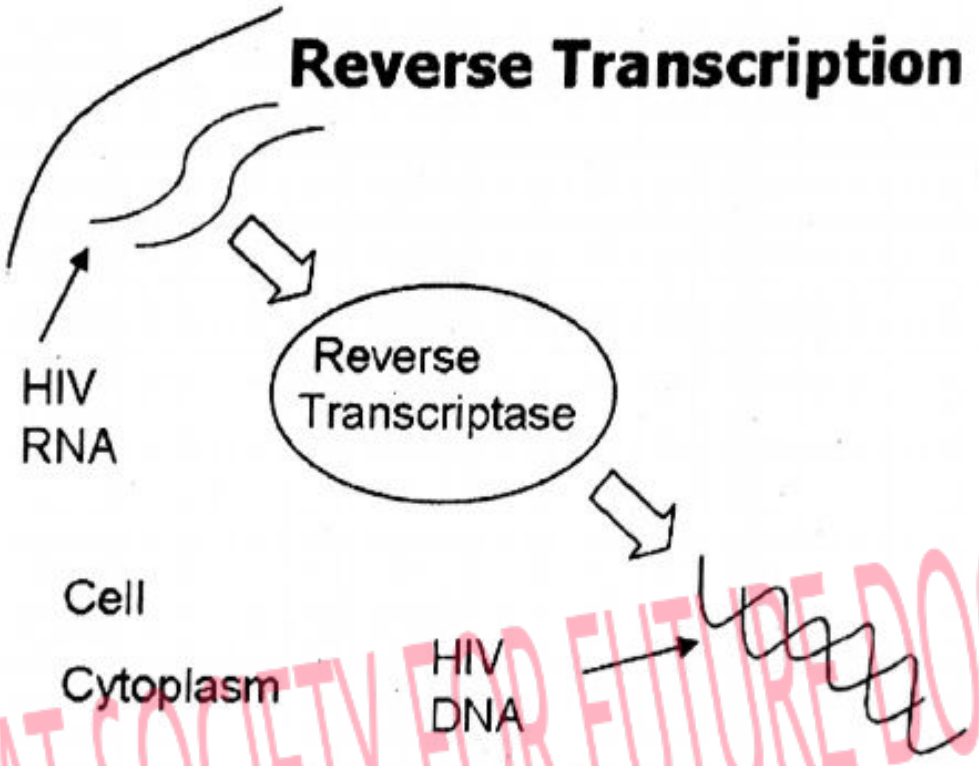
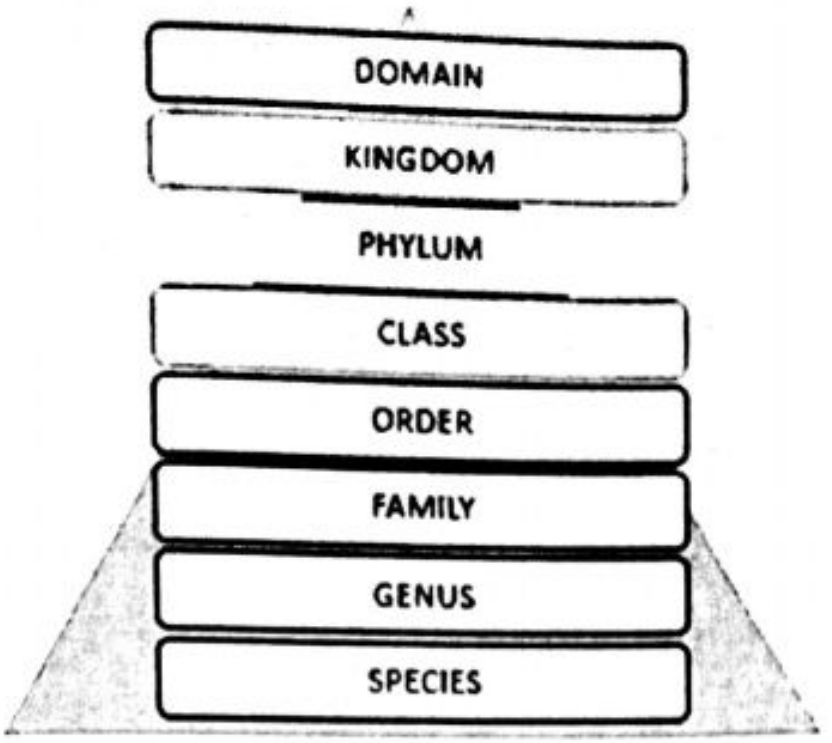


4. HIV is equipped with various enzymes and among them; reverse transcriptase is of great importance. It takes HIV genomic ssRNA as template and reverse transcribe it to form viral dsDNA in the cytoplasm of the infected cells.
5. HIV attacks a specific type of immune cell in the body, known as helper cells. When HIV destroys these cells, then it becomes difficult for the body to fight against the infections.
6. Retroviruses are a type of viruses that uses RNA as its genetic material. After infecting their host cells, the retrovirus uses an enzyme called reverse transcriptase to convert its genomic RNA into DNA. The retrovirus then integrates its viral DNA into the DNA of the host cell, which allows the retrovirus to replicate. One typical example of retrovirus is HIV.
7. AIDS is a chronic, potentially life threatening condition caused by the HIV. By damaging the immune system, HIV interferes with body's ability to fight infection and disease.
8. Viruses are infectious particles made up of protein coat known as capsid and genome either DNA or RNA. Both cilia and flagella are absent in viruses.
9. All viruses contain two main components; a nucleic acid genome of either DNA or RNA and a protein coat, called the capsid, which covers the genome. Together this is called the nucleocapsid. In addition, many animal viruses contain a lipid bilayer envelope. The entire intact virus is called the virion.

10.



SCIENTIFIC CLASSIFICATION

11. Chemically, a virion is made up of a core of genetic material; either DNA or RNA, surrounded by a protective coat called a capsid which is made up of protein.

12. HIV particles are equipped with reverse transcriptase, integrase and proteases while DNA polymerase, RNA polymerase and ligase are absent in HIV.

13. Antibiotics have no effects on viruses

14.

Virions	Prions	Viroids
Complete, mature and infectious particles.	Chemically, these are composed of mis-folded or infectious proteins.	Made up of only small, circular ssRNA molecules.

15. AIDS results into loss of immunity which may leads to opportunistic infection

16. Causative agent of AIDS is HIV.

6 TOPIC PROKARYOTES

PRACTICE EXERCISE

TOPIC-WISE MCQs

BACTERIAL SIZE AND SHAPE

Q.1 In five kingdom classification unicellular, colonial and non-nucleated cells are placed in:
A) Plantae
B) Animalia
C) Monera
D) Protista

Q.2 Largest number of bacteria may be found in the arrangement called as:
A) Streptococci
B) Tetrad
C) Sarcina
D) Diplococci

Q.3 *Vibrio cholera* belongs to which category?
A) Coccus
B) Bacillus
C) Diplococcus
D) Spirochete

BACTERIAL CELL STRUCTURE

Q.4 Respiratory enzymes in bacteria are present in:
A) Mesosome
B) Nucleoid
C) Cell wall
D) Cytoplasm

Q.5 *Haemophilus influenzae* is a:
A) Virus
B) Bacterium
C) Fungus
D) Protozoa

Q.6 Dormant thick walled desiccation resistant body:
A) Endospore
B) Exospore
C) Mesosome
D) Cyst

Q.7 The moneran devoid of cell wall is:
A) Actinomycetes
B) *Mycoplasma*
C) Eubacteria
D) Archaebacteria

Q.8 Primary Gram's stain is:
A) Crystal violet
B) Safranin
C) CV-I
D) Iodine

Q.9 Archaebacteria lack in their structure/composition:
A) Cell wall
B) Plasma membrane
C) Glycoprotein
D) Peptidoglycan

Q.10 Bacterial plasma membrane is not involved in:
A) Maintenance of cell shape
B) DNA replication
C) Cell Division
D) Respiratory metabolism

Q.11 All are the characteristics of Gram positive bacteria except:
A) High content of peptidoglycan
B) Techoic acid is present
C) High permeability
D) Stain pink with primary dye

Q.12 Cell envelope of a bacterium does not include:
A) Capsule
B) Slime
C) Cell wall
D) Plasma membrane

Q.13 Bacterial membranes differ from eukaryotic membrane as they lack:
A) Peptidoglycan
B) Phospholipid
C) Lipids
D) Cholesterol

Q.14 Feulgen Stain is specifically used to identify:
A) Glycogen
B) Lactic Acid
C) DNA
D) RNA

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D) RNA

Q.15 What is not true about bacterial spore?
A) Produced during differentiation of vegetative cells
B) Are heat resistant
C) Are desiccation resistant
D) May be exospores or endospores

Q.16 True pili are present in _____ bacteria.
A) Gram negative
B) Gram positive
C) *Staphylococci*
D) *Mycoplasma*

Q.17 Some bacteria are resistant to phagocytosis due to the presence of:
A) Cell wall
B) Flagella
C) Capsule
D) Slime

NUTRITION IN BACTERIA

Q.18 All are chemosynthetic autotrophic bacteria except:
A) *Nitrosomonas*
B) *Nitrobacter*
C) *Rhizobium*
D) *Nitrococcus*

RESPIRATION IN BACTERIA

Q.19 Which of the following is aerobic bacterium?
A) *Spirochete*
B) *Cyanobacteria*
C) *E. coli*
D) *Pseudosomanas*

REPRODUCTION IN BACTERIA

Q.20 Bacteria produce spore in:
A) Lag phase
B) Log phase
C) Decline phase
D) Stationary phase

Q.21 Conjugation introduces_____ in bacterial population.
A) Identical features
B) New traits
C) Pathogenic features
D) Old traits

Q.22 Pick the odd one out:
A) Tetanus
B) Foot and mouth disease
C) Dengue fever
D) Yellow fever

IMPORTANCE AND CONTROL OF BACTERIA

Q.23 Bacteria that live in intestine and produce vitamin 'K' belongs to:
A) Coccus
B) Bacillus
C) Spirilla
D) Spirochetes

Q.24 Resistance against antibiotics is mainly increasing because of:
A) Misuse of antibiotics
B) Global warming
C) Greenhouse effect
D) Allergies

Q.25 Chemotherapeutic agent is/are:
A) Antibiotic
B) Vaccine
C) Both A & B
D) Disinfectant

Q.26 Bacteria present in canned foods are:
A) *Clostridium botulinum*
B) *Salmonella*
C) *Campylobacter*
D) *Streptococcus*

Q.27 Antibiotics and hormones can be sterilized by using:
A) Membrane filtration
B) Dry heat
C) Radiations
D) Moist heat

Q.28 What is true about antibiotics?
A) Always protein in nature
B) Always produced from living cells
C) Never cause side effects
D) Can also be synthesized in laboratory

CYANOBACTERIA

Q.29 Name the cyanobacteria which are helpful in fixing atmospheric nitrogen.
A) Heterocysts
B) Nostoc
C) Akinetes
D) Hormogonia

PAST PAPER MCQs

2008

Q.1 Name the cyanobacteria which are helpful in fixing atmospheric nitrogen.
A) Heterocysts
B) Nostoc
C) Akinetes.
D) Hormogonia.

Q.2 Which of the following are spiral-shaped bacteria?
A) Cocci
B) Bacilli
C) *Pseudomonas*.
D) Vibrio.

2009

Q.3 Which of the following is aerobic bacterium?
A) *Spirochete*
B) *Cyanobacteria*
C) *E. coli*
D) *Pseudosomanas*

Q.4 The giant amoebas inhabit mud at the bottom of fresh water ponds and obtain energy from:
A) Microscopic bacteria
B) Aerobic bacteria
C) Anaerobic bacteria
D) Methanogenic bacteria

Q.5 Antibiotics act against:
A) Bacterial Diseases
B) Allergies
C) Bacterial and Viral Diseases
D) Viral Diseases

2010

Q.6 The entire cell wall of bacteria is often regarded as a single huge molecule or molecular complex called _____
A) Capsule
B) Secondary wall
C) Slime capsule
D) Sacculus

Q.7 When the division of cells is in three planes, the arrangement is known as:
A) Diplococcus
B) Sarcina
C) Streptococcus
D) Staphylococcus

Q.8 Bacterial 'death rate' is equal to 'birth rate; in:
A) Lag phase
B) Log phase
C) Death phase
D) Stationary phase

2011

Q.9 Which of the following contains peptidoglycan cell wall?
A) *Penicillium*
B) *Bacterium*
C) *Adiantum*
D) *Polytrichum*

Q.10 Antibiotics that kill microbes immediately are called_____.
A) Microbistatic
B) Microbicidal
C) Biostatic
D) Chemotherapeutic

2012

Q.11 Mesosomes are infoldings of the cell membrane and are involved in:
A) DNA replication
B) RNA synthesis
C) Protein synthesis
D) Metabolism

2013

Q.12 Antibiotics are produced by fungi and certain bacteria of group:
A) Actinomycetes
B) Oomycetes
C) Ascomycetes
D) Basidiomycetes

Q.13 During favorable conditions, certain bacteria produces:
A) Ribosomes
B) Plasmids
C) Mitochondria
D) Spores

Q.14 Which statement about bacteria is true:
A) Gram positive bacteria have more lipids in their cell wall
B) Gram negative bacteria have more lipids in their cell wall
C) Lipids are absent in cell wall of both gram positive and negative bacteria
D) Both have equal amount of lipids

2014
Q.15 Treatment by using attenuated culture of bacteria is called _____.
A) Chemotherapy
B) Sterilization
C) Antisepsis
D) Vaccination

Q.16 Which one of the following antibiotic causes permanent discoloration of teeth in young children if it is misused?
A) Penicillin
B) Streptomycin
C) Sulfonamide
D) Tetracycline

Q.17 Peptidoglycan or murein is a special or distinctive feature of cell wall in:
A) Algae
B) Fungi
C) Bacteria
D) Plants

2015
Q.18 Cyanobacteria are:
A) Photoautotrophic bacteria
B) Chemosynthetic bacteria
C) Saprotrophic bacteria
D) Parasitic bacteria

2016
Q.19 Many bacteria are motile due to presence of:
A) Flagella
B) Pilli
C) Cilia
D) Microtubules

Q.20 Syphilis is caused by:
A) Spirochete
B) Nostoc
C) Water blooms
D) Cyanobacteria

Q.21 _____ is an invagination of cell membrane which helps in cell division.
A) Fimbriae
B) Nucleoid
C) Mesosome
D) Endospore

2017
Q.22 Nucleoid is a structure not found in:
A) Campylobacter
B) Cyanobacteria
C) Spirochete
D) Goblet cells

Q.23 Cell wall structure of a cell of unknown origin was studied and was found to contain polysaccharide chain linked with short chains of amino acid. What do you think it can be?
A) Bacteria
B) Fungi Cell
C) Algae
D) Cortex cells

Q.24 Students were asked to give a guess about a unicellular organism with darkly stained nucleus. Which of the following can be straight away excluded from the list:
A) Paramecium
B) Amoeba
C) Plasmodium
D) Lactobacillus

Q.25 In which of the following shapes, gut living symbiont *Escherichia coli* is found:
A) Round
B) Oval
C) Spiral
D) Rod

2017 Re-take
Q.26 Arrangement of coccus bacteria in chain is called:
A) Streptococci
B) Staphylococci
C) Tetrad
D) Sarcina

Q.27 DNA of bacteria is present in:
A) Nucleoid
B) Nucleus
C) Mitochondria
D) Mesosome

Q.28 Find the characteristic true for Gram+ve bacteria:
A) Periplasmic space present in all
B) Less lipids than Gram-ve
C) Two major layers
D) Outer membrane present

2018

Q.29 Rod-shaped bacteria are known as _____.
A) Bacilli
B) Cocci
C) Vibrio
D) Sarcina

Q.30 If lipopolysaccharides did not appear in the wall of bacteria on staining then it will be known as _____.
A) Gram positive
B) Gram positive & gram negative
C) Gram negative
D) Capsule

2020

Q.31 Select the method which causes the oxidation of chemical constituent of a bacterial cell:
A) Steam
B) Dry heat
C) Filtration
D) Radiation

Q.32 Which of the following is true about the structure of a typical bacterium?
A) It has cell wall
B) It has cytoplasm
C) It has genetic material
D) All of the above

ANSWER KEY

TOPIC- WISE MCQs

1	C	11	D	21	B
2	A	12	D	22	A
3	D	13	D	23	B
4	A	14	C	24	A
5	B	15	A	25	A
6	D	16	A	26	A
7	B	17	D	27	A
8	A	18	C	28	D
9	D	19	D	29	A
10	A	20	C		

PAST PAPERS MCQs

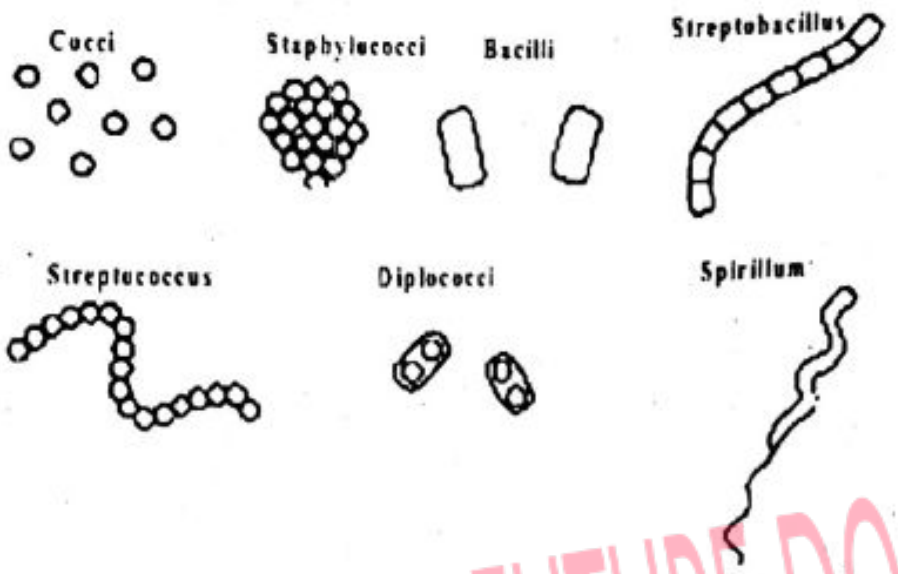
1	A	11	A	21	C	31	B
2	D	12	A	22	D	32	D
3	D	13	D	23	A		
4	D	14	B	24	D		
5	A	15	D	25	D		
6	D	16	D	26	A		
7	B	17	C	27	A		
8	D	18	A	28	B		
9	B	19	A	29	C		
10	B	20	A	30	A		

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. In five kingdom classification system, unicellular, colonial and non-nucleated organisms are placed in kingdom Monera while kingdom Protista, Plantae and Animalia have eukaryotic organisms.

2.



3. Coccus and diplococcus are round in shape while *Vibrio cholera* is spirochete.
4. Membranous invaginations present in bacteria are known as mesosomes carrying enzymes for respiration and cell division.
5. *Haemophilus influenzae* is a bacteria and it was the first prokaryotic organism to have the genome completely sequenced.
6. Dormant, thick walled desiccation resistant structures are cyst while spores are metabolically dormant bodies and are produce at a late stage of cell growth.
7. Mycoplasma is the only genus of prokaryotes which are devoid of peptidoglycan cell wall.
8. The primary stain used in Gram staining is crystal violet while safranine is the secondary stain.
9. Archaebacterial cell walls are composed of different polysaccharides and proteins, with no peptidoglycan.
10. Bacterial plasma membrane is involved in DNA replication, cellular division and respiratory metabolism while maintenance of cell shape is the function of cell wall.
11. Bacterial plasma membrane is involved in DNA replication, cellular division and respiratory metabolism while maintenance of cell shape is the function of cell wall.
12. Capsule, slime and cell wall are included in the cell envelope of bacteria while cell membrane is not included.
13. Phospholipid and proteins both are component of membrane of both cells i.e. prokaryotic cell and eukaryotic cell. Peptidoglycan is present in the cell wall of bacterial cell. Cholesterol is present in the cell membrane of eukaryotic cells only.
14. Feulgen stain is a positively charged stain so it can stain the negatively charged DNA.
15. As spore formation occurs during unfavorable condition i.e. selective antibiotic pressure and heat while differentiation of vegetative cells found in favorable conditions.
16. True pili are involved in conjugation, they are present on Gram negative bacteria.
17. Slime is involved in pathogenicity that's why resistant to phagocytosis.

18. Nitrosomonas, nitrobacter and nitrococcus are chemosynthetic autotrophic bacteria while rhizobium is heterotrophic.
19. Pseudomonas aeruginosa had been considered as an obligately aerobic bacterium previously, but it is now recognized to be highly adapted to anaerobic conditions.
20. Spore formation is an adaptation in order to survive and it is inevitable when all the bacteria are going to vanish in decline phase.
21. Conjugation refers to the transfer of genetic material which always leads to new trait.
22. Foot and mouth disease, Dengue fever Yellow fever are viral diseases while Tetanus is bacterial disease.
23. Bacteria that live in intestine and produce vitamin K are useful strain of *E. coli* which are Gram negative bacilli.
24. Now a days, antibiotics are used on regular basis and bacteria are getting resistance against antibiotics due to enhanced exposure.
25. Chemotherapeutic agents are the antibiotics that work with natural defense and stop the growth of bacteria and other microbes.
26. The bacteria present in canned food is *C. botulinum* and causes severe form of food poisoning. Botulism develops by the use of improperly canned or otherwise preserved food, especially meat.
27. Antibiotics and hormones are heat sensitive molecules and can be degraded if sterilized with the dry heat or moist heat. That is why such substances are sterilized by using specialized filters.
28. Antibiotics are of two types i.e. natural and synthetic. So these can be synthesized in laboratory, moreover these can be or cannot be protein in nature and produce side effects.
29. Heterocysts or heterocytes are specialized nitrogen-fixing cells formed during nitrogen starvation by some filamentous cyanobacteria, such as Nostoc.

EXPLANATORY NOTES

PAST PAPER MCQs

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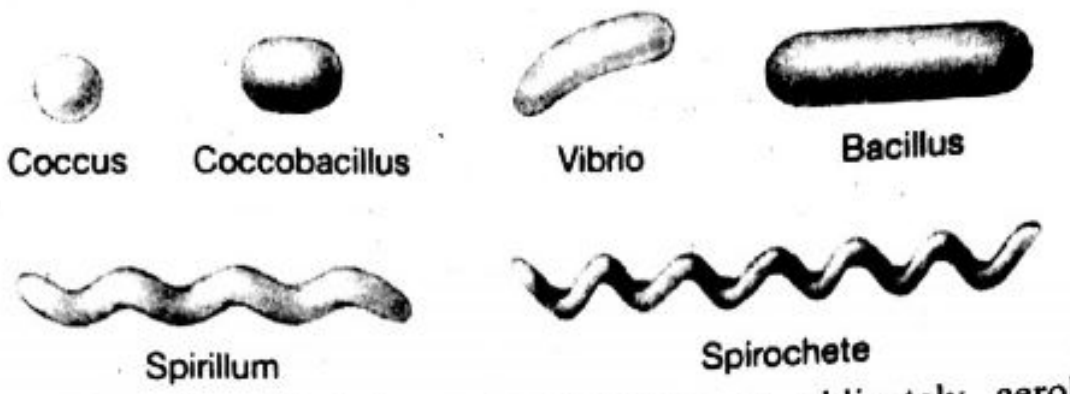
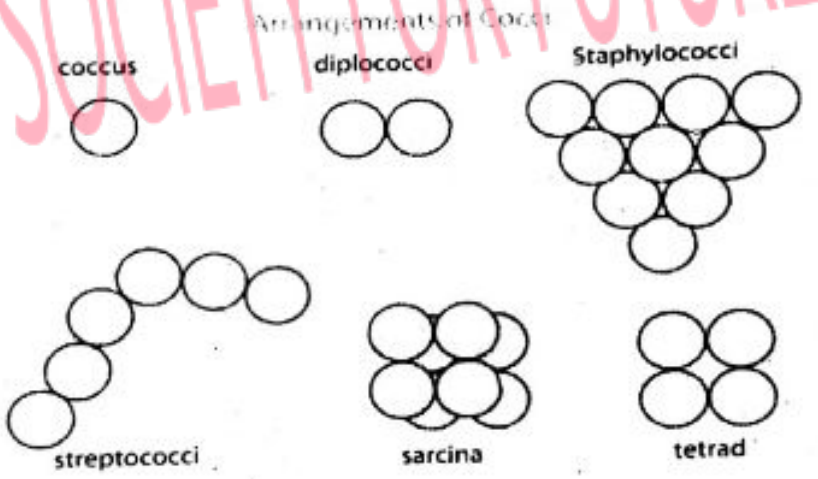


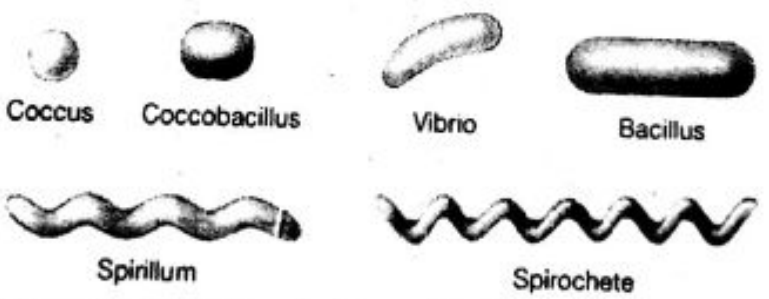
3. Pseudomonas aeruginosa had been considered as an obligately aerobic bacterium previously, but it is now recognized to be highly adapted to anaerobic conditions.
4. The giant amoebas obtain energy from methanogenic bacteria, which reside inside them. Giant amoebas inhabit mud at the bottom of freshwater ponds.
5. Antibiotics are used to treat bacterial infections.
6. The essential murein (peptidoglycan) sacculus is located in the periplasm of Gram-negative bacteria and is a giant, bag-shaped macromolecule which encases the cytoplasmic membrane to protect the cell from rupture by its internal turgor.

7.

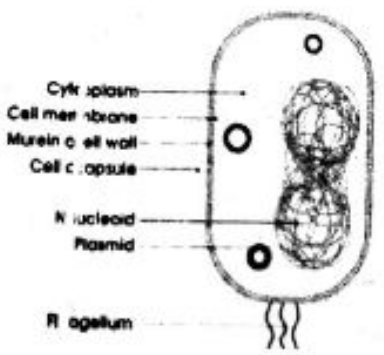


8. During the stationary phase, the rate of bacterial cell growth is equal to the rate of bacterial cell death.
9. The cell walls of gram bacteria are composed predominantly of peptidoglycan.
10. Microbicidal is an agent that destroys microbes (such as bacteria) while Microbistatic controls their reproduction or numbers.
11. Mesosomes are membranous invaginations of plasma membranes. They help in the making of cell walls, DNA replication nuclei. They also assist in secretion and respiration.
12. Being a large group of microbial resources of wide practical use and high commercial value, actinomycetes contribute to around 70% of the source of antibiotics.
13. During favorable conditions, certain bacteria produces Spores. Ribosomes are already present in them while plasmid and mitochondria can't be produced in bacterial cells.
14. Gram negative bacteria have more lipids in their cell wall.

15. A vaccine is a biological preparation that provides active acquired immunity to a particular infectious disease and this treatment is by using attenuated culture of bacteria.
16. Tetracycline has been on the market for over 60 years and is used in the treatment of many gram negative and gram positive infections; it causes permanent staining of the teeth if used in children less than the age of 8.
17. The cell wall is the principal stress-bearing and shape-maintaining element in bacteria formed of Peptidoglycan, also called murein.
18. Cyanobacteria also known as Cyanophyta, are a phylum of prokaryotes consisting of free-living photosynthetic bacteria.
19. For many pathogenic bacteria, flagellum-dependent motility and chemotaxis are present.
20. "syphilis", is an infection caused by the bacteria Treponema pallidum (Spirochete). Syphilis is spread by direct contact with an infected individual, such as: Sexual contact.
21. Mesosomes help with cell division, aiding cell wall synthesis and DNA replication.
22. Goblet cells are eukaryotic cells and have nucleus in them while nucleoid is found in bacterial cells so D is a good option among all.
23. Peptidoglycan or murein is a polymer consisting of sugars and amino acids that forms a mesh-like layer outside the plasma membrane of most bacteria, forming the cell wall.
24. Lactobacillus is a genus of Gram-positive, aerotolerant anaerobes or microaerophilic, rod-shaped, non-spore-forming bacteria. So don't have nucleus for being a prokaryotic cell.
25. Escherichia *coli* is a member of the family Enterobacteriaceae, which includes gram-negative, facultatively anaerobic rod-shaped bacteria.
26. Pairs of cocci are called diplococci; rows or chains of such cells are called streptococci; grapelike clusters of cells, staphylococci; packets of eight or more cells, sarcina; and groups of four cells in a square arrangement, tetrads.
27. Bacteria do not have a membrane-bound nucleus, and their genetic material is typically a single circular bacterial chromosome of DNA located in the cytoplasm in an irregularly shaped body called the nucleoid.
28. Gram +ve bacteria have less lipids and more peptidoglycan as compared to Gram –ve bacteria.
29.



30. If lipopolysaccharides did not appear in the wall of bacteria on staining then it will be known as Gram positive as we know lipopolysaccharide layer is a feature of Gram –ve bacteria.
31. Heating is the most commonly used method of sterilization and Dry Heat Kills by oxidation effects.
32.



7 TOPIC PROTISTS & FUNGI

PRACTICE EXERCISE

TOPIC-WISE MCQs

PROTOZOA

Q.1 Which of the following protists are considered as the ancestor of sponges:
A) Amoebae
B) Zooflagellates
C) Actinopods
D) Choanoflagellates

Q.2 Which protozoa move by flagella?
A) Amoeba
B) Paramecium
C) Trypanosome
D) Plasmodium

Q.3 _____ causes amoebic dysentery in human.
A) *Amoeba proteus*
B) *Naegleria fowleri*
C) *Trichonympha*
D) *Entamoeba histolytica*

Q.4 Sexual process of ciliates is controlled by:
A) Micronuclei
B) Macronuclei
C) Sex pili
D) Both A and B

Q.5 Shell of foraminifera is made up of:
A) Calcium carbonate
B) Calcium hydroxide
C) Silica
D) Chitin

ALGAE

Q.6 *Ceratium* is the example of:
A) Euglena
B) Diatoms
C) Brown algae
D) Dinoflagellates

Q.7 Which of the following are the most numerous unicellular algae in oceans?
A) Spirogyra
B) Volvox
C) Diatoms
D) Kelps

Q.8 Pick the giant algae:
A) Euglena
B) Chlamydomonas
C) Cholera
D) Kelps

Q.9 Which of the following form common monophyletic linage with plants?
A) Green algae
B) Brown algae
C) Red algae
D) All of these

Q.10 It acts as a site for starch formation and storage in green algae:
A) Vacuole
B) Chloroplast
C) Cytoplasm
D) Pyrenoid

Q.11 Type of algae that is harvested as fertilizer in the world:
A) Red algae
B) Green algae
C) Brown algae
D) Diatom

Q.12 Which of the following pigment/s is/are present in Euglenoids?
A) Chlorophyll a
B) Chlorophyll b
C) Carotenoids
D) All of these

Q.13 Flagella is absent in:
A) Diatoms
B) Brown algae
C) Green algae
D) Red algae

Q.14 It is unicellular motile alga:
A) Chlorella
B) *Desmid*
C) *Chlamydomonas*
D) *Spirogyra*

Q.15 *Pinnularia* belongs to:
A) Crysophyta
B) Pyrrophyta
C) Rodophyta
D) Phaeophyta

FUNGI LIKE PROTISTS

Q.16 Cell wall of Oomycotes is chemically made of:
A) Chitin
B) Protein
C) Lignin
D) Cellulose

Q.17 Hyphae of Oomycotes are:
A) Septate
B) A septate
C) Semi-septate
D) All of these

Q.18 The closest relatives of fungi are probably:
A) Animals
B) Brown algae
C) Slime molds
D) Vascular plants

Q.19 Plasmodium of slime mold is:
A) Uninucleated
B) Enucleate
C) True nucleated
D) Multinucleated

Q.20 Where does the spore formation occur in cellular slime mold?
A) Plasmodium
B) Sporophore
C) Sporangium
D) Pseudoplasmodium

Q.21 Spores of slime molds develop into:
A) Amoeboid cells
B) Biflagellated cells
C) Swarm cells
D) All of the above

Q.22 Which is the example of slime mold?
A) *Physarum*
B) *Anabaena*
C) *Rhizopus*
D) *Phytophthora*

Q.23 Which of the following is responsible for Irish potato famine?
A) *Physarum polycephalum*
B) *Phytophthora infestans*
C) *Naegleria polycephalum*
D) *Phytophthora polycephalum*

Q.24 Oomycotes sexually reproduced through:
A) Oospore
B) Oogamous
C) Zoospore
D) Zygospore

Q.25 White rust and downy mildews belongs to:
A) Slime mold
B) Plant
C) Oomycota
D) Algae

INTRODUCTION AND BODY OF FUNGUS

Q.26 Fungi are always:
A) Diploid
B) Multicellular
C) Heterotrophs
D) Septate

Q.27 Study of fungi is called:
A) Biology
B) Microbiology
C) Phycology
D) Mycology

Q.28 Chitin in fungal cell wall is more resistant to:
A) Decay
B) pH
C) Temperature
D) Moisture

Q.29 Fungi can tolerate a wide range of pH from:
A) 3-10
B) 2-9
C) 4-10
D) 1-13

Q.30 Septate dikaryotic hyphae are present in:
A) Ascomycota
B) Basidiomycota
C) Imperfect fungi
D) Both A and B

Q.31 Major component of fungal cell wall is:
A) Carbohydrates
B) Protein
C) Nucleic acids
D) Lipids

NUTRITION AND REPRODUCTION IN FUNGI

Q.32 Nuclear mitosis occurs in:
A) Fungi
B) Algae
C) Plants
D) Animals

Q.33 Rhizopus is also known as:
A) Pink mold
B) Blue green mold
C) Sac fungi
D) Conjugating fungi

Q.34 Asexual reproduction in ascomycetes is by:
A) Spores
B) Conidia
C) Fragmentation
D) Ascospores

Q.35 What is incorrect about spores in fungi?
A) Haploid
B) Non-motile
C) Water for dispersal
D) Flagellated

Q.36 Which one of the following is diploid?
A) Zygospore
B) Ascospore
C) Basidiospore
D) Spore

Q.37 Arthrobotrysis associated with:
A) Parasitic fungi
B) Predatory fungi
C) Saprotrophic fungi
D) Mutualistic fungi

Q.38 Ecological role of fungi is:
A) Photosynthesis
B) Decomposition
C) Homeostasis
D) Energy production

Q.39 Fungi stores surplus food in the form of:
A) Starch
B) Glycogen
C) Cellulose
D) Glucose

CLASSIFICATION OF FUNGI

Q.40 Ustilagotriticis the example of:
A) Club fungi
B) Sac fungi
C) Imperfect fungi
D) Zygomycota

Q.41 Rhizopus is also called:
A) Conjugating fungi
B) Black bread mold
C) Imperfect fungi
D) Both A and B

Q.42 Underground fruiting bodies of some Ascomycota (Tuber sp.) is called:
A) Morels
B) *Truffles*
C) *Amanita*
D) *Alternaria*

Q.43 Helminthosporiumis the example of:
A) Conjugation fungi
B) Sac fungi
C) Club fungi
D) Imperfect fungi

Q.44 Sac like structure contains 8 haploid spores called:
A) Mushroom
B) Basidia
C) Ascus
D) Yeast

Q.45 Scientific name of Loose smut of wheat is:
A) *Puccinia*
B) *Ustilagotritici*
C) Molds
D) Mushrooms

IMPORTANCE OF FUNGI

Q.46 _____ have association with 95% of all kinds of vascular plants.
A) *Spirogyra*
B) *Penicillium*
C) Mycorrhizae
D) *Chlorella*

Q.47 Which of the following is poisonous mushrooms?
A) Toadstools
B) *Penicilliumnotatum*
C) *Aspergillus fumigatus*
D) *Candida albicans*

Q.48 Griseofulvin is used for:
A) Lowering blood cholesterol
B) Lowering blood glucose
C) Organ transplant
D) Inhibit fungal growth

Q.49 Which of the following causes Candidosis?
A) *Red mold*
B) *Penicilliumnotatum*
C) *Aspergillus fumigatus*
D) *Candida albicans*

Q.50 Histoplasmosis is the infection of:
A) Brain
B) Kidney
C) Lungs
D) Heart

Q.51 Penicillin is first antibiotic obtained from:
A) *Saccharomyces cerevisiae*
B) *Penicilliumnigricans*
C) *Penicilliumchrysogenum*
D) *Tolypocadiuminflatum*

Q.52 Association between algae and fungi is called:
A) Ectomycorrhizae
B) Endomycorrhizae
C) Lichen
D) None of these

Q.53 Which of the following is used to produce soya sauce and soya paste from soya bean?
A) *Aspergillus tamari*
B) *Saccharomyces*
C) Amanita virosa
D) *Morchellaesculenta*

Q.54 Brush like arrangement of its conidia is the characteristic of:
A) *Penicillium*
B) *Rhizopus*
C) *Puccinia*
D) *Saccharomyces*

Q.55 Most visible part of lichen is:
A) Algae
B) Fungi
C) Virus
D) Bacteria

ANSWER KEY

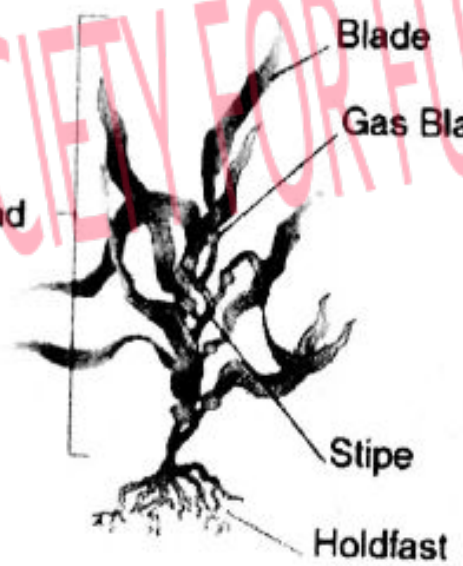
TOPIC-WISE MCQs

1	D	11	C	21	D	31	A	41	D	51	C
2	C	12	D	22	A	32	A	42	B	52	C
3	D	13	D	23	B	33	D	43	D	53	A
4	A	14	A	24	B	34	B	44	C	54	A
5	A	15	A	25	C	35	C	45	B	55	B
6	D	16	D	26	C	36	A	46	C		
7	C	17	B	27	D	37	B	47	A		
8	D	18	C	28	A	38	B	48	D		
9	A	19	D	29	B	39	B	49	D		
10	D	20	C	30	D	40	A	50	C		

EXPLANATORY NOTES

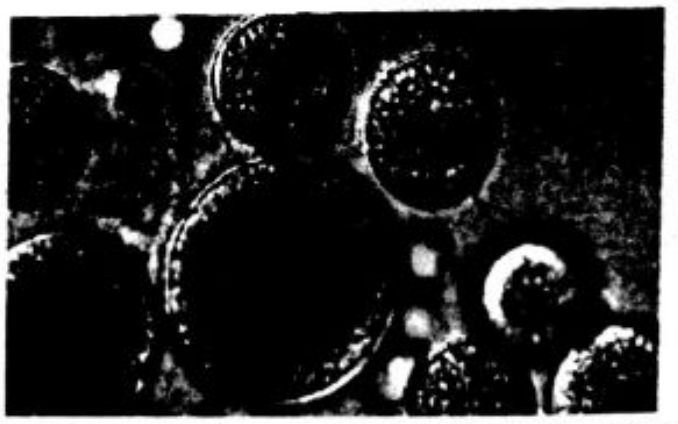
TOPIC-WISE MCQs

1. Ancestors of today's sponges may have been the first truly multicellular animals. That distinction may belong to protists called Choanoflagellates, which are single or multicellular bouquets or spheres of what look just like the choanocytes inside
2. Trypanosomes move actively and progress by movement of the undulating membrane and the free flagellum, which acts as a kind of propeller, thus drawing themselves through the blood plasma or tissue fluid.
3. Amoebic dysentery is an infection caused by any of the amoebae of the *Entamoeba* group. Symptoms are most common during infection by *Entamoeba histolytica.*
4. Ciliates may reproduce sexually (conjugation) or asexually (fission). During conjugation. Two ciliates come in contact with each other forming a cytoplasmic bridge between them. This is followed by a process known as meiosis of the micronuclei of either cell to produce haploid micronuclei.
5. Forams are unusual among single-celled organisms because they build shells made of calcium carbonate (calcareous) or from tiny grains of sand stuck together.
6. *Ceratium*, genus of single-celled aquatic dinoflagellate algae common in fresh water and salt water from the Arctic to the tropics.
7. Diatoms are photosynthetic unicellular algae populating the oceans
8.



9. The green algae and land plants form a monophyletic lineage (the chlorophytes) that contains both Protista and higher taxa. Green algae contain the same carotenoids and chlorophyll a and b as land plants, whereas other algae have different accessory pigments and types of chlorophyll molecules in addition to chlorophyll a. Both green algae and land plants also store carbohydrates as starch. Pyrenoids are sub-cellular micro-compartments found in chloroplasts of many algae.
10. It is the site of starch formation and storage.
11. Brown algae include a number of edible seaweeds. Seaweed use as agricultural fertilizers the extracts from brown algae have increased the yield of crops, seed germination, resistance to frost and fungal and insect attacks and uptake of inorganic constituents.
12. The chloroplasts of euglenoids contain chlorophyll a and chlorophyll b. Euglenoids also have some carotenoid pigments.
13. Red algae do not have flagella and centrioles during their entire life cycle.

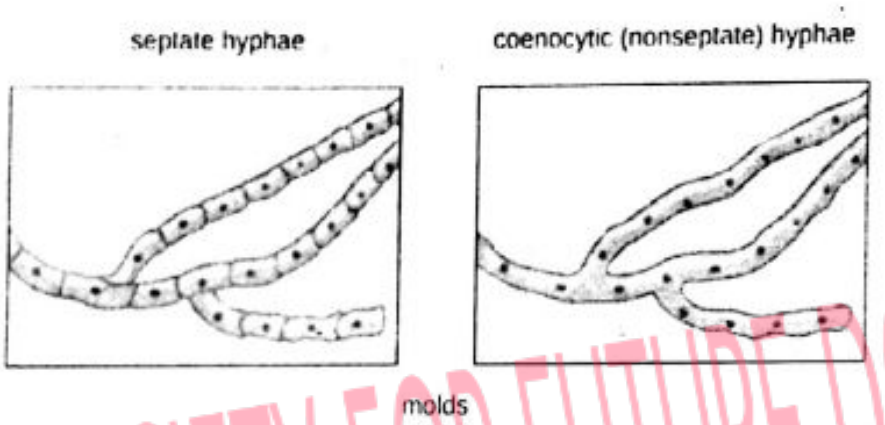
14.



15. Pinnularia is a genus fresh water alga more specifically a type of diatom.

16. The cell wall of oomycetes, however, is not composed of chitin, as in the fungi, but is made up of a mix of cellulosic compounds and glycan.

17.



18. Slime molds are generally resemble with fungi in that they are non-photosynthetic and have cell wall. Some of them have bodies formed of thread like structures called hyphae.

19. A plasmodium is an amoeboid, multinucleate, and naked mass of cytoplasm of slim mold.

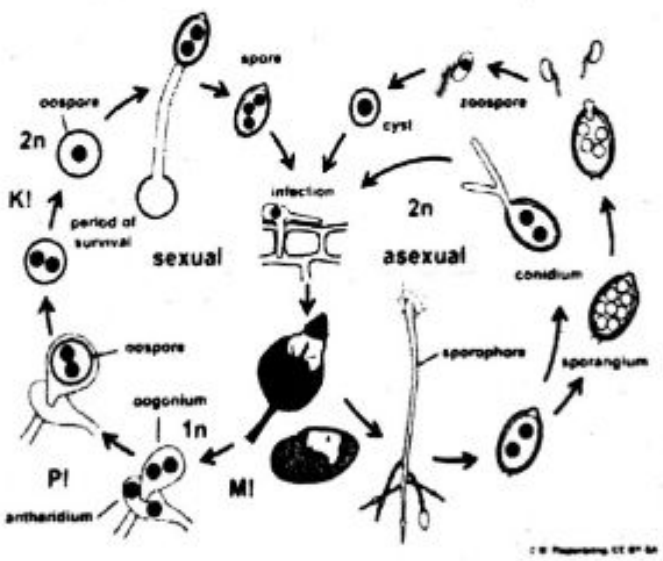
20. Slime molds form sporangia - clusters of spores, often on the tips of stalks such as in the Sporangium.

21. The germinated spore can transform into either an amoeba-like myxamoeba cell or a flagellated swarm cell.

22. Physarum is an acellular slime mold.

23. The Irish Potato Famine, also known as the Great Hunger, began in 1845 when a fungus-like organism called Phytophthora infestans spread rapidly throughout Ireland) The infestation ruined up to one-half of the potato crop that year, and about three-quarters of the crop over the next seven years.

24.



25. Oomycote or s mold include white rust and downy mildews. Both these cause disease in plants and other organisms
26. Among all the kingdoms, animals and fungi are truly heterotrophs.
27. Geek word 'myco' that means fungus.
28. Due to its tolerant nature, fungi is hard to decompose.
29. Most of the fungi as low pH 2 and not more than 9.
30. Separation of cells each having two nuclei are ascomycota and basidomycota)
31. The fungal cell wall is a complex and flexible structure composed basically of chitin, α- and β- linked glucans, glycoproteins.
32. The special character in fungi is carrying out mitosis with in the nucleus.
33. The hyphae of two mating strains of fungi (usually referred to as + or -) lie side by side, and each grows a projection toward the other. These projections, called gametangia, meet and fuse together.
34. Ascomycetes have conidia contain spores by which they reproduce by spores.
35. The mode of transmission of fungal spores is by air.
36. Most of the spores in fungi are haploid only zygospore are diploid.
37. Fungi that predates eat the invading organism and arthrobotyris is one of them.
38. Fungi acts as decomposer along with bacteria)
39. Fungi and animal stores there food in the form of glycogen contrary to plants and algae.
40. Ustiligo belongs to basidomycota.
41. Black bread mold that reproduce by conjugation is rhizopus.
42. Truffles from ascomycetes whose underground part is used for eating.
43. Imperfect fungi includes helminthosporiumis as an example organism.
44. In ascomycetes the sac like structure a combination of 8 spores.
45. Wheat is affected by ustiligotricti that causes loose smut.
46. Fungi are attached with plant roots as mycorrhizae.
47. Death cap which is another name used for toadstool is poisonous.
48. Fungi as a treatment against fungal infection is grisoflavin.
49. Candida albicans cause vaginal thrush.
50. Fungal spores land on the surface of lungs and causes the infection.
51. *Penicilliumchrysogenum* is the first strain used for the extraction of penicillin.
52. Lichen is an association between fungi and algae.
53. Strains of Aspergillus tamari is used in fermentation.
54. Ascomycetes have brush like structure known as conidia.
55. In lichens fungi takes most of the part.

8 TOPIC DIVERSITY AMONG PLANTS

PRACTICE EXERCISE

TOPIC-WISE MCQs

INTRODUCTION AND DIAGNOSTIC FEATURES OF PLANTS

Q.1 What system of classification is followed by the green plants?
A) Artificial
B) Phylogenetic
C) Natural
D) Phenetic

Q.2 All of the following are characters of a plant except:
A) Eukaryotic
B) Autotrophic
C) Develop from embryo
D) Motile

CLASSIFICATION OF PLANTS

Q.3 Bryophytes are thought to have evolved from:
A) Chlorophyta
B) Rhodophyta
C) Chrysophyta
D) Phaeophyta

Q.4 Bryophytes are called 'Amphibians of the plant world' as they need water for:
A) Reproduction
B) Motility
C) Nutrition
D) Predation

Q.5 The simplest of all bryophytes are:
A) Mosses
B) Hornworts
C) Liverworts
D) Whisk Ferns

Q.6 Meristematic tissues are found in:
A) Mosses
B) Hornworts
C) Liverworts
D) Ferns

Q.7 The genetic variation passes to the new sporophyte in the form of:
A) Gametes
B) Oospore
C) Spore mother cell
D) Zygote

Q.8 In alternation of generation, sporophyte begins with _____ and ends at _____.
A) Spore, oospore
B) Oospore, spore
C) Oospore, gametes
D) Oospore, spore mother cell

Q.9 Rootless sporophyte is found in:
A) Lycopsida
B) Sphenopsida
C) Pteropsida
D) Psilopsida

Q.10 The earliest group of vascular plants is:
A) Bryopsida
B) Psilopsida
C) Lycopsida
D) Hepaticopsida

Q.11 For asexual reproduction, gemma cup are present in:
A) Porella
B) Anthoceros
C) Marchantia
D) Polytrichum

Q.12 Archegonia and antheridia, develop on the tips of different branches on the same plant in:
A) Funaria
B) Marchantia
C) Polytrichum
D) Porella

Q.13 Alga like structure found in bryophytes is called:
A) Paraphyses
B) Algin
C) Protonema
D) Prothallus

Q.14 Which of the following is not related to others?
A) Horneophyton
B) Psilotum
C) Cooksonia
D) Psilophyton

Q.15 In which of e following sub division, the gametophyte cells contain a fungus?
A) Psilopsida
B) Sphenopsida
C) Pteropsida
D) Lycopsida

Q.16 Which of the following sequence is correct in terms of evolution of leaf?
A) Webbing→ Planation→ Overtopping
B) Planation→ Overtopping→ Webbing
C) Overtopping→ Webbing→ Planation
D) Overtopping→ Planation→ Webbing

Q.17 The space between overtopped dichotomous branches was occupied by a sheet of _____ cells.
A) Cholorenchyma
B) Collenchyma
C) Parenchyma
D) Aerenchyma

Q.18 The process of evolution of leaf was completed in _____ million years.
A) 10-15
B) More than 15-20
C) 15-20
D) 5-10

Q.19 Heterospory is attributed to:
A) Lycopodium
B) Equisetum
C) Selaginella
D) Adiantum

Q.20 Lycopsida, a sub-division of Tracheophyta, is commonly known as:
A) Whisk ferns
B) Horsetails
C) Club Mosses
D) Hornworts

Q.21 Which of the following is called horsetail?
A) Lycopsida
B) Sphenopsida
C) Pteropsida
D) Psilopsida

Q.22 Marchantia is an example of:
A) Anthoceropsida
B) Psilopsida
C) Bryopsida
D) Hepaticopsida

Q.23 The first seed plant appeared in the period of:
A) Late Devonian
B) Cambrian
C) Permian
D) Jurassic

Q.24 Maiden-hair fern belongs to the class:
A) Angiospermae
B) Gymnospermae
C) Bryophyta
D) Filicinae

Q.25 The genus of sago-palm is:
A) *Pinus*
B) *Cedrus*
C) *Cycas*
D) *Picea*

Q.26 A modified shoot is:
A) Flower
B) leaf
C) Archegonium
D) Fruit

Q.27 Fertilization in *Pinus* takes place after how many months of pollination?
A) 12
B) 18
C) 15
D) 20

Q.28 The process of double fertilization is attributed to:
A) Ferns
B) Bryophytes
C) Gymnosperms
D) Angiosperms

Q.29 _____ is called integumented, indehiscent megasporangium.
A) Ovule
B) Sporophyte
C) Embryo sac
D) 20

Q.30 Gymnosperms constitute how much of the total world's forest?
A) 1/3rd
B) 1/4th
C) 2/3rd
D) 2/4th

Q.31 _____ are highly evolved plants on earth.
A) Ferns
B) Gymnosperms
C) Angiosperms
D) Lycopods

Q.32 Which of the following angiosperm lacks chlorophyll?
A) Fragrant water lily
B) Wild geranium
C) Indian pipe
D) Picea hemlock

Q.33 Which of the following is a correct pair?
A) Sepals, Stamens
B) Sepals, Petals
C) Stamens, Carpals
D) Both B and C

Q.34 In angiosperms, endosperm form when one of the two male gametes fuses with:
A) Egg
B) Oospore
C) Secondary nucleus
D) Gamete itself becomes endosperm

Q.35 Endosperm is a _____ cell.
A) Haploid
B) Diploid
C) Triploid
D) Aneuploid

Q.36 The ovule consists of an integument, and a nutritive tissue:
A) Endosperm
B) Nucellus
C) Embryo
D) Synergid

Q.37 Fertilization in angiosperms occurs through a pore called:
A) Testa
B) Micropyle
C) Tegmen
D) Micropore

Q.38 Egg cell in the ovary is present on the side where _____ are present.
A) Antipodals
B) Polar nuclei
C) Synergid
D) Tube cells

Q.39 Angiosperm is divided into _____.
A) 2 sub divisions
B) 2 sub classes
C) 2 classes
D) 2 divisions

Q.40 All are characters of monocot except:
A) Venation is parallel
B) Vascular bundles are scattered
C) Sepals and petals are 3 or multiple of 3
D) Stem is either herbaceous or woody

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	C	21	B	31	C
2	D	12	A	22	D	32	C
3	A	13	C	23	A	33	D
4	A	14	B	24	D	34	C
5	C	15	A	25	C	35	C
6	B	16	D	26	A	36	B
7	B	17	C	27	C	37	B
8	D	18	B	28	D	38	C
9	D	19	C	29	A	39	B
10	B	20	C	30	A	40	D

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Organisms are classified into different groups on the basis of similarities and differences. These groups are supposed to foreshadow the natural relationships among living organisms and their mode of origin. Such a system of classification is called Phylogenetic system of classification.
2. Kingdom plantae mainly includes eukaryotic, autotrophic and non-motile organisms which develop from embryos.
3. Bryophytes are considered the first land colonizers being evolved from chlorophyte (green algae).
4. Bryophytes cannot live away from water as they need water for their reproduction because the sperms move through water from antheridia to archegonia.
5. The simplest of all bryophytes are liverworts because of their morphology having very simple sporophyte attached to a thalloid gametophyte.
6. In hornworts, meristematic tissues are present at the junction of foot and spore producing region and keeps on adding the cells towards spore producing region during the formation. maturation and dispersal of spores from the opposite end. Due to the activity of these tissues sporophytes keeps on increasing in length.
7. When an unfertilized egg gets fertilized by the sperm it changes in to oosphere and gives rise to sporophyte which ultimately forms spores from spore mother cells and give rise to the gametophyte once again.
8. When an unfertilized egg gets fertilized by the sperm it changes in to oosphere and gives rise to sporophyte which ultimately forms spores from spore mother cells and give rise to the gametophyte once again.
9. In psilopsida, rootless sporophyte is present and the stem is divided into an underground rhizome bearing rhizoids and into dichotomous aerial branches. Rhizoids function as roots and aerial branches carry out photosynthesis.
10. In psilopsida, rootless sporophyte is present and the stem is divided into an underground rhizome bearing rhizoids and into dichotomous aerial branches. Rhizoids function as roots and aerial branches carry out photosynthesis. Such characters make them earliest vascular plants.
11.

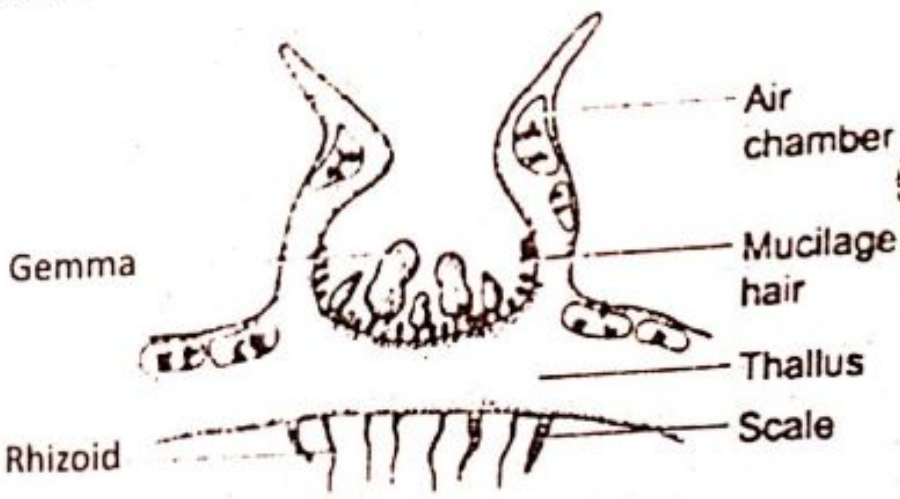


Fig: V.S. of thallus through gemma cup

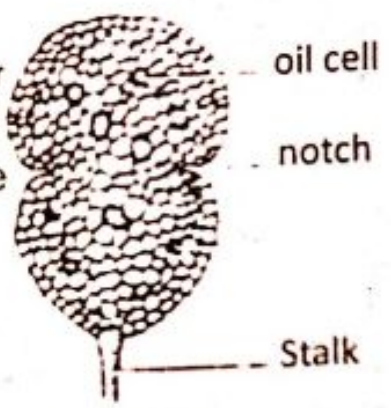
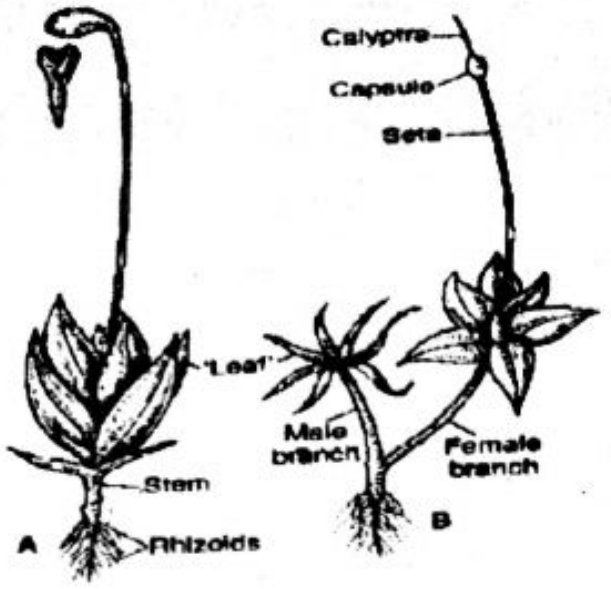


Fig: Gemma

12.



13. Spore of a moss develops into an alga like protonema containing buds from where haploid gametophyte develops into a sporophyte.
14. All the three genera: Horneophyton, Cooksonia and Psilophyton are extinct while Psilotum is a living genera.
15. The roots of psilopsida contain a fungus and form a mycorrhizal association for better growth and aeration.
16. The true sequence in evolution of leaf that was completed in more than 15-20 million years is Overtopping → Planation → Webbing.
17. The space between overtopped dichotomous branches was occupied by a sheet of parenchyma cells which ultimately formed blade or lamina of leaf.
18. The evolution of leaf was completed in more than 15-20 million years.
19. The sporophyte of *Selaginella* may have sporangia of two kinds; microsporangia and megasporangia and hence two types of spores, micro spores and megaspores having different size and structure respectively.
20. Lycopsids are also called club mosses/spike mosses because of their club/ spike-shaped strobili and small leaves resembling mosses. On the basis of types of spores produced in the sporophyte they are thus referred to as being 'homosporous' or 'heterosporous' respectively.
21. The whole plant body of the sphenopsida divides into joints and attains a shape like horse tail.
22. Marchantia is an example of hepaticopsida or liverworts.
23. First complete seed appeared approximately 365 million years ago during late Devonian times.
24. Adiantum is known as maiden-hair fern, because it is a delicate-looking, drooping fern with distinctive fan-shaped leaf segments, possesses many clustered fronds (large, divided leaves) on wiry black stems.
25. Cycas *revoluta* is the scientific name of sago palm.
26. A flower is a modified shoot which consists of pedicel, thalamus and floral leaves (sepals, petals, stamens, carpals).
27. Fertilization in *Pinus* takes place after 15 months of pollination.
28. Angiosperms have double fertilization that make zygote (2n) and endosperm tissue (3n).
29. Ovule which is present in the ovary is called integumented and indehiscent megasporangium.
30. Gymnosperms constitute $1/3^{rd}$ of the total world's forest.
31. Because of production of fruits enclosing seeds after double fertilization, angiosperms are considered the most evolved plants on earth.
32. Indian pipe which is naturally a parasite lacks chlorophyll.

33. Floral parts are divided into two categories
- Essential parts (Stamens, carpals)
- Non-essential parts (Sepals, petals)

34. In angiosperms, male gametophyte has two haploid cells one tube and other is called generative cell. Female gametophyte contains haploid egg cell and two haploid polar nuclei or secondary nucleus. Tube cell forms a pollen tube from which the generative cell reaches to the polar nuclei or secondary nucleus by forming a triploid endosperm while the other divided part of generative cells fuses with the egg cell and embryo is formed which in future is nourished by endosperm.

35. In angiosperms, male gametophyte has two haploid cells one tube and other is called generative cell. Female gametophyte contains haploid egg cell and two haploid polar nuclei or secondary nucleus. Tube cell forms a pollen tube from which the generative cell reaches to the polar nuclei or secondary nucleus by forming a triploid endosperm while the other divided part of generative cells fuses with the egg cell and embryo is formed which in future is nourished by endosperm.

36. The ovule has an outer covering (integument) and nucellus present inside it.

37. A pore facing synergid and egg cell is present towards the basal portion of ovary to which pollen tube enters through is called micropyle.

38. A pore facing synergid and egg cell is present towards the basal portion of ovary to which pollen tube enters through is called micropyle.

39. Angiospermae is itself a class of sub division pteropsida and it is divided further into two sub classes; monocot and dicot.

40. In monocots, only herbaceous stem is present. Because of having no secondary growth no woody stem is present.

9 DIVERSITY AMONG ANIMALS

TOPIC » PRACTICE EXERCISE

TOPIC-WISE MCQs

INTRODUCTION GRADE RADIATE AND GRADE BILATERIA

Q.1 Animals of grade radiata are:
A) Diploblastic
B) Triploblastic
C) Acoelomate
D) Pseudocoelomate

Q.2 All are the features of kingdom animalia except:
A) Heterotroph
B) Eukaryotes
C) Organic synthesis
D) Multicellular

DIPLOBLASTIC AND TRIPLOBLATIC ORGANIZATION

Q.3 Reproductive system arise from:
A) Germ layer
B) Mesoderm
C) Ectoderm
D) Endoderm

Q.4 Pseudocoelom develops from:
A) Blastostyl
B) Blastocyst
C) Blastocoel
D) Mesoderm

Q.5 Reproductive system, excretory system, circulatory system and respiratory system developed from:
A) Ectoderm
B) Mesoderm
C) Endoderm
D) Ectoderm and endoderm

Q.6 Bilaterally symmetrical animals are:
A) Lesser developed
B) Placed in one phylum only
C) Lacking mesoderm
D) Triploblastic

CLASSIFICATION ACCORDING TO COELOM (BODY CAVITY)

Q.7 The animal which has false coelom is:
A) Spongilla
B) Hookworm
C) *Obelia*
D) Planaria

Q.8 In coelomate the layer that surround endoderm is:
A) Coelomic Epithelium
B) Visceral Mesoderm
C) Ectoderm
D) Parietal Mesoderm

Q.9 All are correct about acoelomates except:
A) Sac type digestive system
B) Parenchyma fill the body space
C) Well developed respiratory system
D) Well developed Excretory system

Q.10 An acoelomate is:
A) Liver fluke
B) Pinworm
C) Star fish
D) Earthworm

Q.11 A body cavity is absent in:
A) Acoelomates
B) Acoelomates and Pseudocoelomates
C) Pseudocoelomates
D) Coelomates

Q.12 A fluid filled cavity which is mesodermal in origin but absent in nematodes is:
A) Coelom
B) Pseudocoelom
C) Gastrocoel
D) Spongocoel

Q.13 Everything is true about coelom except:
A) Found between body wall and gut
B) Lined by mesoderm
C) Fluid filled
D) Bound internally by cuticle of intestine

Q.14 Acoelomates do not lack:
A) Coelom
B) Special transport system
C) Mesoderm
D) Coelomic fluid

Q.15 In coelomates, gut is lined externally by:
A) Visceral mesoderm
B) Splanchnic mesoderm
C) Parietal mesoderm
D) Endoderm

Q.16 Which system is more developed in acoelomates?
A) Excretory system
B) Digestive system
C) Respiratory system
D) Osmoregulatory system

PROTOSTOMES AND DEUTEROSTOMES

Q.17 Spiral and determinate type cleavage is present in:
A) Pinworm
B) Cake urchin
C) Star fish
D) Amphioxus

Q.18 Indeterminate cleavage is not a characteristic of:
A) Echinodermata
B) Chordata
C) Mollusca
D) Hemichordata

INVERTEBRATE PHYLUMS

Q.19 The most important function of suckers is:
A) Absorption of blood
B) Ingestion of food
C) Attachment
D) Excretion of waste

Q.20 Which of the following is not an aschelminthes parasite?
A) *Rhabditis*
B) *Ascaris lumbricoides*
C) Pinworm
D) *Schistosoma*

Q.21 *Fasciola hepatica* complete life cycle in how many host/hosts?
A) 1
B) 2
C) 3
D) 4

Q.22 *Taenia's* embryo has _____ chitinous hooks.
A) 3
B) 4
C) 5
D) 6

Q.23 Parasite that cause inflammation in mucous membrane of colon and appendix is:
A) *Ascaris*
B) *Rhabditis*
C) Pin worm
D) Hook worm

Q.24 A free living flatworm that not acts as a parasite:
A) *Schistosoma*
B) Planaria
C) *Taenia*
D) *Fasciola*

Q.25 All are the hosts of tape worm except:
A) Pig
B) Snail
C) Cattle
D) Human

Q.26 Common name of *Ancyclostoma duodenale* is:
A) Pin worm
B) Hook worm
C) Tape worm
D) Earthworm

Q.27 *Enterobius vermicularis* is usually not associated with:
A) Inflammation of appendix
B) Itching of anus
C) Inflammation of colon
D) Blood clotting

Q.28 Common housefly may be a cause of:
A) Polio
B) Tuberculosis
C) Hepatitis
D) Malaria

Q.29 These are triploblastic, coelomates but coelom is not present as the main body cavity:
A) Flatworm
B) Arthropods
C) Nematodes
D) Annelida

Q.30 It is reduced coelom and communicates with blood vascular system in:
A) Pinworm
B) *Spongilla*
C) Cockroach
D) Tape worm

Q.31 The body cavity called enteron present in:
A) *Dugesia*
B) Tape worm
C) *Hydra*
D) Round worm

Q.32 The animals of phylum are known as schizocoelous:
A) Arthropoda
B) Porifera
C) Echinodermata
D) Chordata

Q.33 The circular rings called annuli are present on each segment of:
A) Earthworm
B) Tapeworm
C) Leech
D) *Nereis*

Q.34 For proper removal of tapeworm parasite from the patient body physicians also use:
A) Vaccination
B) Anima
C) Anemia
D) Anema

Q.35 "Tube within tube type" structure found in:
A) Porifera
B) Nematoda
C) Annelida
D) Chordata

Q.36 It cause severe anemia and retard physical and mental growth:
A) *Ascaris lumbricoides*
B) *Rhabditis*
C) *Ancyclostoma duodenale*
D) *Enterobius vermicularis*

Q.37 The sense organ are in the form of sensory papillae present on the lips at the anterior end in:
A) Flatworm
B) Round worm
C) *Nereis*
D) *Stylaria*

Q.38 Most of species found in soil, organic matter or water and faeces of man or animals:
A) *Ascaris*
B) Hook worm
C) *Rhabiditis*
D) Pin worm

Q.39 Tapeworm is embedded in _____ muscles of secondary host.
A) Cardiac
B) Skeletal
C) Smooth
D) Involuntary

Q.40 Pick the one that can be divided in two equal parts by an imaginary line is:
A) Sea anemone
B) Coral
C) Planaria
D) *Scolymastra*

Q.41 *Rhabditis* is usually absent in:
A) Soil
B) Human brain
C) Human/animal faeces
D) Water

Q.42 These worms are everywhere outdoors and play important role in breakdown of organic matter:
A) Roundworm
B) Pinworm
C) Hookworm
D) Segmented worm

Q.43 All of the following are vectors of diseases for humans except:
A) Honey bee
B) Common housefly
C) Female *Anopheles*
D) Tsetse fly

Q.44 Wrong statement about nematodes is:
A) They may cause diseases to humans
B) They may cause diseases to plants
C) Also called as roundworms
D) Have a coelom

Q.45 False statement about hook worm is:
A) It lives in large intestine
B) Found in Asia, North Africa and Europe
C) Sucks the body fluids
D) Hold villi

Q.46 Natural silk is not:
A) A protein
B) Obtained from an insect
C) Produced by modified salivary glands
D) Glycolipid in nature

Q.47 Scavenger insects may eat:
A) Dead matter present on organism
B) Dead plant matter only
C) Dead animals and plants
D) Living animals only

Q.48 Fate of the blastomeres is foretold in:
A) Echinoderms
B) Arthropods
C) Hemichordates
D) Chordates

VERTEBRATA

Q.49 Amphibians are evolved from:
A) Cartilaginous fishes
B) Dipnoi
C) Reptiles
D) Cyclostomata

Q.50 Pigment cells called chromatophores present in:
A) Reptiles
B) Chondrichthyes
C) Amphibian
D) Mammals

Q.51 Amnion is not present around the embryo of:
A) Reptiles
B) Birds
C) Amphibian
D) Mammals

Q.52 Reptiles flourished throughout _____ era.
A) Cenozoic
B) Proterozoic
C) Devonian
D) Mesozoic

Q.53 Birds do not have teeth so the function of teeth is performed by:
A) Beak
B) Stomach
C) Pharynx
D) Gizzard

Q.54 In _____ both ovaries and oviducts are functional.
A) Robin
B) Eagle
C) Kestrel
D) Kingfisher

Q.55 *Archaeopteryx is* connecting link between:
A) Reptiles & mammals
B) Birds & mammals
C) Reptiles & birds
D) amphibian and fishes

Q.56 Which of them is not poikilotherm?
A) Spiny ant eater
B) Crocodile
C) Lizard
D) Snake

Q.57 The mammal-like reptile that was found as fossil in Texas:
A) *Archaeopteryx*
B) *Varanope*
C) *Duck bill platypus*
D) *Opossum*

Q.58 The lower jaw is composed of only one large bone:
A) Reptiles
B) Chondrichthyes
C) Amphibian
D) Mammals

Q.59 Scales are totally absent in:
A) Birds
B) Lizard
C) Toad
D) Eagle

PAST PAPER MCQs

2008

Q.1 Which of the following do not have a body cavity?
A) Pseudocoelomata.
B) Acoelomata.
C) Coelomata.
D) None of these

Q.2 Sharks and rays are included in class:
A) Cyclostomata
B) Chondrichthyes
C) Osteichthyes.
D) Tetrapoda

Q.3 Which of the following does not have specialized respiratory organs?
A) Hydra.
B) Birds.
C) Cockroach.
D) Both A and B

Q.4 Name the vertebrates which are without jaws.
A) Osteichthyes.
B) Cyclostomata.
C) Chondrichthyes.
D) None of these.

2009

Q.5 Coelem is a cavity lined by:
A) Mesoderm
B) Endoderm
C) Epiderm
D) Ectoderm

Q.6 It is an endoparasite of humans, cattle and pig that completes its life cycle in two hosts:
A) Tapeworm
B) Aurelia
C) Liver fluke
D) Planaria

Q.7 Tse-tse fly causes the sleeping sickness and skin diseases by transmitting:
A) *Plasmodium*
B) *Trypanosoma*
C) *Anopheles*
D) Insects

2010

Q.8 Book lungs are present in arthropods for exchange of gases in class:
A) Crustacea
B) Insecta
C) Myriapoda
D) Arachnida

Q.9 Larvae of which group are similar to chordates?
A) Echinodermata
B) Annelida
C) Arthropoda
D) Nematoda

Q.10 A parasite living inside body of the host is called:
A) Ectoparasite
B) Obligate parasite
C) Facultative parasite
D) Endoparasite

Q.11 Which of the following is exclusive character of mammals?
A) Homeothermic
B) Hair
C) Poikliothermic
D) Four chambered heart

2011

Q.12 The nervous system develops from which of the following layer during embryonic development of animals?
A) Mesoderm
B) Ectoderm
C) Endoderm
D) Mesoderm and Endoderm

Q.13 Fasciola is endoparasite of:
A) Colon
B) Liver
C) Small Intestine
D) Bile Duct

Q.14 Body cavity of round worms is called:
A) Pseudocoelom
B) Coelom
C) Acoelom
D) Enteron

Q.15 *Trypanosoma* is transmitted in human beings by:
A) *Plasmodium*
B) *Anopheles*
C) House Fly
D) Tsetse Fly

2012 Q.16 Ascaris is:
A) Diploblastic
B) Triploblastic
C) Haploid
D) Acoelomate

Q.17 During development, in an animal, mesoderm layer gives rise to:
A) Nervous System
B) Alimentary canal lining
C) Muscular and skeletal system
D) Mouth

Q.18 Fasciola is the name given to:
A) Tapeworm
B) Planaria
C) Liver fluke
D) Earthworm

Q.19 Polymorphism is characteristic feature of:
A) Porifera
B) Cnidaria
C) Annelida
D) Nematodes

2013 Q.20 Schistosoma is a parasite that lives in the _____ of the host.
A) Intestine
B) Kidney
C) Liver
D) Blood

Q.21 Sleeping sickness in humans is caused by:
A) *Trypanosoma*
B) *Plasmodium*
C) *Anopheles*
D) *Andes*

Q.22 The cavity between body wall and alimentary canal is:
A) Coelom
B) Mesoderm
C) Endoderm
D) Mesoglea

Q.23 The layer which forms the lining of digestive tract and glands of digestive system is:
A) Ectoderm
B) Mesoderm
C) Endoderm
D) Mesoglea

2014 Q.24 Which one of the following is the primary host of liver fluke?
A) Man
B) Sheep
C) Snail
D) Dog

Q.25 Which one of the following is an example of a free living carnivorous flatworm?
A) Liver fluke
B) *Dugesia*
C) Tapeworm
D) *Schistosoma*

Q.26 Ascaris is which one of the following?
A) Ectoparasite
B) Intestinal parasite
C) Respiratory tract parasite
D) Urinogenital tract parasite

Q.27 Polymorphism is a feature exhibited by members of:
A) Coelenterates
B) Arthropoda
C) Porifera
D) Platyhelminthes

2015 Q.28 _____ is a triploblastic organism.
A) Jelly Fish
B) Sea Anemone
C) Tapeworm
D) Corals

Q.29 In arthropods, the body cavity is in the form of:

A) Coelem
B) Haemocoel
C) Psedocoelem
D) Enteron

Q.30 _____ is also called liver fluke.

A) Dugesia
B) Taenia
C) Fasciola
D) Coral

Q.31 Name common gut roundworm parasite of human and pigs.

A) *Ascaris lumberocoides*
B) *Lumbericus terresaris*
C) *Pheretima posthuma*
D) *Hirudo Medicinalis*

Q.32 _____ is a good example of polymorphism.

A) Hydra
B) Starfish
C) Obelia
D) Equplectella

2016

Q.33 In radial symmetry all body parts are arranged around the central axis. Radial symmetry represents _____ mode of life.

A) Sessile
B) Streamlined
C) Active
D) Parasitic

Q.34 Pseudo-coelomates have a body cavity but it is not true coelom. Which one of the following is included in the group?

A) Planaria
B) Tapeworm
C) Earthworm
D) Ascaris

Q.35 *Taenia* is an endoparasite of human, pig and cattle which belongs to phylum.

A) Cnidaria
B) Aschelminthes
C) Annelida
D) Platyhelminthes

Q.36 Body of _____ consists of segments called proglottis which contains mainly sex organs.

A) Planaria
B) Ascaris
C) Fasciola
D) Tapeworm

Q.37 _____ is a common parasite of the intestine of human and pig which belongs to phylum nematode.

A) *Taenia solanum*
B) *Schistosoma*
C) *Ascaris lumbriocoides*
D) *Fasciola hepatica*

2017

Q.38 Snails are the intermediate hosts in:

A) *Fasciola hepatica*
B) *Taenia solium*
C) *Schistoma*
D) *Ancyclosoma duodenale*

Q.39 _____ is an intestinal parasite of man belonging to phylum nematoda:

A) *Taenia solium*
B) *Wucheronia bancrolti*
C) *Ascaria lumbricoides*
D) *Schistoma*

2018

Q.40 Following group is the example of acoelomates:

A) Platyhelminthes
B) Molluscs
C) Aschelminthes
D) Annelids

ANSWER KEY

TOPIC-WISE MCQs

1	A	11	A	21	B	31	C	41	B	51	C
2	C	12	A	22	D	32	A	42	A	52	D
3	B	13	D	23	C	33	C	43	A	53	D
4	C	14	C	24	B	34	D	44	D	54	B
5	B	15	A	25	B	35	B	45	A	55	C
6	D	16	A	26	B	36	C	46	D	56	A
7	B	17	A	27	D	37	B	47	C	57	B
8	B	18	C	28	C	38	C	48	B	58	D
9	C	19	C	29	B	39	B	49	B	59	C
10	A	20	D	30	C	40	C	50	C		

PAST PAPERS MCQs

1	B	11	B	21	A	31	A
2	B	12	B	22	A	32	C
3	A	13	D	23	C	33	A
4	B	14	A	24	B	34	D
5	A	15	D	25	B	35	D
6	A	16	B	26	B	36	D
7	B	17	C	27	A	37	C
8	D	18	C	28	C	38	A
9	A	19	B	29	B	39	C
10	D	20	D	30	C	40	A

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Grade radiate includes only one phylum Cnidaria (Coelenterata). These animals are always diploblastic and have gastrovascular cavity with sac type digestive system.
2. Organic synthesis is referred to as photosynthesis in which inorganic molecules (water and carbon dioxide) are converted into organic molecule (Glucose). This process takes place in Autotrophs.
3. Ectoderm form skin and nervous system, Endoderm form digestive system and rest of the systems in triploblastic animals are formed from mesoderm including reproductive system.
4. The body cavity that is formed from Blastocoel (cavity that is formed at blastula stage of developing embryo) is called pseudocoelom.
5. Ectoderm forms skin and nervous system. Endoderm forms lining of digestive system and rest of the systems in triploblastic animals originate from mesoderm.
6. All bilateral symmetrical animals are triploblastics.
7. False coelom is characteristic of Aschelminthes (nematodes). Hook worm belongs to this phylum.
8. Coelom (body cavity) is formed due to splitting of mesoderm at embryonic stages. Its outer layer is called parietal layer which underlines the body wall, while inner layer of mesoderm is called visceral layer that surrounds the endoderm.
9. Acoelomate includes animals of Phylum Platyhelminthes in which re7spiratory and circulatory system is absent. Gaseous exchange takes place directly through body surface.
10. Liver fluke is flatworm (Platyhelminthes). All the Platyhelminthes are acoelomates.
11. Acoelomates are those animals in which there is no body cavity or space between body wall and digestive system. This group includes only one phylum Platyhelminthes.
12. Coelom is true body cavity which is always formed from mesoderm. Nematodes are Pseudocoelomates.
13. Coelom is internally lined by visceral layer of mesoderm. In pseudocoelomates body cavity is internally bound by cuticle of intestine.
14. Acoelomates are triploblastic animals in which all the three germinal layers ectoderm, mesoderm and endoderm are present.
15. During embryonic development mesoderm splits into outer parietal layer that internally lines the body wall and inner visceral layer (mesoderm) that externally surrounds gut.
16. Acoelomate has sac type digestive system, no respiratory and osmoregulatory systems. They have tubular excretory system called protonephridia having flame cells.
17. Spiral and determinate type cleavage is present in proterostomes. Pinworm belongs to phylum Aschelminthes that are proterostomes.
18. Molluscs are proterosromes and have determinate cleavage in which fate of blastomeres is foretold. Indeterminate cleavage is characteristic of deuterostomes.
19. In some parasitic species suckers play minor role in feeding, but their prime function is attachment.
20. Schistosoma belongs to phylum platyhelminthes.
21. *Fasciola hepatica* is commonly known as liver fluke, and completes life cycle in two hosts. One is snail and other is sheep or man.
22. *Taenia solium's* (Tape worm) embryo is round in shape and has six chitinous hooks for attachment with secondary host (Cattle or Pig).

23. Pin worms are parasites in the human caecum, colon and appendix. Their movement causes intense itching of anus, inflammation of mucous membrane of colon and appendix.
24. All flatworms (Platyhelminthes) are parasites except Planaria species.
25. Tapeworm can be endoparasite of pig, cattle and man. It cannot be a parasite of snail. Snail may be host of liver fluke.
26. Hook worm is common name of *Ancyclostoma duodenale*.
27. *Enterobius vermicular* is movement causes intense itching of anus, inflammation of mucous membrane of colon and appendix resulting in insomnia and loss of appetite. It has no role in blood clotting.
28. Hepatitis A and E is transmitted through contact with feces of affected person. House fly feeds on waste material therefore it may transmit hepatitis virus.
29. In arthropods the coelom is modified to form cavities around different parts of the body called hemocoels or sinuses.
30. Coelom is modified to form hemocoel or sinuses in arthropods that have open circulatory system. Cockroach has open circulatory system.
31. Hydra is diploblastic Cnidarian, its body cavity is called gastrovascular cavity or enteron.
32. Schizocoelous coelom is formed in proterostomes in which coelom is formed from splitting of mesoderm from blastopore.
33. There is fix number of segments in leech body and each segment has circular rings called annuli.
34. Tapeworm has high regeneration ability even if head remains in intestine it can regenerate into complete animal. For its complete removal physicians give anema to patients.
35. Nematoda have tube like body and well developed tubular digestive system.
36. *Ancyclostoma duodenale* sucks blood and body fluids from villi of intestine. It produces anticoagulant and leaves wounds bleeding after feeding that cause severe anemia and retards physical and mental growth.
37. Round worm has sense organs at anterior end of their lips.
38. Most species of *Rhabditis* are found in soil, organic matter or water and feces of man and animals.
39. Cow or pig is the secondary host of tapeworm where it is embedded in voluntary (skeletal) muscles.
40. The bilaterally symmetrical animals can be divided into two equal parts by an imaginary lines. Only planaria has bilateral symmetry.
41. *Rhabditis* can't be found in human brain because most species of *Rhabditis* are found in soil, organic matter or water and feces of man and animals.
42. Round worms are everywhere outdoor, where they play an important role in breaking down of organic matter.
43. Honey bee are pollinating insects, they transmit pollen grain (male gamete) from anther of one plant to stigma of other plant of the same species.
44. Nematodes (Aschelminthes) are pseudocoelomates have false body cavity, while coelom is true body cavity.
45. Hook worm is always found in small intestine. It can never be found in large intestine.
46. Natural silk is fibrous protein produced by larvae of silk worm.
47. Scavengers are those animals that feed on dead animals and plants e.g. *Drosophila* and Vulture.
48. Arthropods are proterostomes in which cleavage is determinate (fate of blastomeres is foretold) and spiral.

49. The Dipnoi are a group of sarcopterygiian fish, are commonly known as the lungfish. Their "lung" is a modified swim bladder. They are considered as ancestors of amphibians.
50. The three types of chromatophores that are important in the coloration of amphibians are: melanophores, xanthophores and iridophores.
51. The amnion, along with the chorion, the yolk sac and the allantois form a protective sac around the embryo. Amphibians and fish are not amniotes and thus lack the amnion.
52. The Mesozoic Era is an interval of geological time from about 252 to 66 million years ago. It is also called the Age of Reptiles.
53. Birds do not have teeth. Birds "chew" their food in their gizzard
54. In almost all species of birds, including poultry, only the left ovary and oviduct are functional except eagle.
55. Archaeopteryx is known to be a communicating connection between reptiles and birds because it looks like a bird and has bird wings. The teeth and tail, however, are closer to those of reptiles.
56. A poikilotherm is an animal whose internal temperature varies considerably. It is the opposite of a homeotherm, an animal which maintains thermal homeostasis. Spiny ant eater belongs to homeotherm.
57. The mammal-like reptile that was found as fossil in Texas is *Varanope*
58. The lower jaw of mammals consists of only one bone, the dentary, and the jaw hinge connects the dentary to the squamosal (flat) part of the temporal bone in the skull. Working together, these muscles permit up-and-down and side-to-side movements of the jaw, making chewing possible which is unique to mammals.
59. Frogs and toads don't have fur, feathers, or scales on their skin. Instead, they have a moist and permeable skin layer covered with mucous glands. Their special skin allows them to breathe through their skin in addition to using their lungs.

PAST PAPERS MCQs

1. Acoelomates have no true body cavity. The acoelomate phyla are Porifera, Cnidaria, and Platyhelminthes.
2. The class Chondrichthyes has two subclasses: the subclass Elasmobranchii (sharks, rays, skates, and sawfish) and the subclass Holocephali (chimaeras).
3. Hydra lack specialized respiratory system. Respiration occurs in Hydra by means of diffusion. Hydra has only 2 cell layers, so its body is thin enough to allow for diffusion.
4. Cyclostomata are known to be the only living vertebrates without true jaws, hence called Agnatha. Cyclostomata includes hagfishes and lampreys.
5. Coelomate animals have a body cavity called a coelom with a complete lining called peritoneum derived from mesoderm.
6. Tapeworms are flat, segmented worms that live in the intestines of some animals. Animals can become infected with these parasites when grazing in pastures or drinking contaminated water.
7. Trypanosomiasis or sleeping sickness is caused by the parasite Trypanosoma, which is carried by the tsetse fly.
8. Book lung, form of respiratory organ found in certain air-breathing arachnid arthropods (scorpions and some spiders). Each book lung consists of a series of thin plates that are highly vascular (i.e., richly supplied with blood) and are arranged in relation to each other like the pages of a book.
9. Deuterostomes include the phyla Echinodermata and Chordata, which are Deuterostomes share similar patterns of early development.
10. Endoparasites live inside the host. They include heartworm, tapeworm, and flatworms.
11. An animal is considered a mammal if it can produce milk. Other features unique to mammals include hair or fur (chemically different from hair like structures on non-mammals); the malleus, incus, and stapes in the ear; and a diaphragm separating the heart and lungs from the abdomen.
12. The ectoderm gives rise to the nervous system and the epidermis.
13. *Fasciola hepatica*, also known as the common liver fluke lives in bile duct.
14. The pseudocoelom is a fluid-filled body cavity lying inside the external body wall of the nematode or round worms
15. Trypanosomiasis or sleeping sickness is caused by the parasite Trypanosoma, which is carried by the tsetse fly.
16. *Ascaris* is a triploblastic, bilaterally symmetrical and has no body cavity so are called acoelomates.
17. The ectoderm gives rise to the nervous system and the epidermal skin cells, the mesoderm gives rise to the muscle cells and connective tissue in the body, and the endoderm gives rise to the digestive system and other internal organs. Organogenesis is the formation of organs from the germ layers.
18. *Fasciola* hepatica, also known as the common liver fluke lives in bile duct.
19. Polymorphism refers to the occurrence of structurally and functionally more than two different types of individuals within the same organism. It is a characteristic feature of Cnidarians, particularly the polyp and medusa forms, or of zooids within colonial organisms like those in Hydrozoa.
20. Schistosomiasis is an acute and chronic parasitic disease caused by blood flukes (trematode worms) of the genus Schistosoma.
21. Trypanosomiasis or sleeping sickness is caused by the parasite Trypanosoma, which is carried by the tsetse fly.

22. Coelom is the principal body cavity in most animals, located between the intestinal canal and the body wall.
23. The endoderm is found in both vertebrate and invertebrate embryos, and is responsible for the formation of the gut and associated organs.
24. Sheep is the primary host of liver fluke.
25. *Dugesia* are carnivores, and they eat other small invertebrates and dead or decaying animals.
26. Adult *Ascaris* worms inhabit the lumen of the small intestine, usually in the jejunum or ileum. They have a life span of 10 months to 2 years and then are passed in the stool.
27. Polymorphism refers to the occurrence of structurally and functionally more than two different types of individuals within the same organism. It is a characteristic feature of Cnidarians (Coelenterates), particularly the polyp and medusa forms, or of zooids within colonial organisms like those in Hydrozoa.
28. The body of a platyhelminth (or tapeworm) consists of not only the ectoderm and the endoderm but also the mesoderm.
29. In arthropods, the body cavity is in the form of Haemocoel.
30. *Fasciola* hepatica, also known as the common liver fluke lives in bile duct.
31. *Ascaris* worms inhabit the lumen of the small intestine, usually in the jejunum or ileum. They have a life span of 10 months to 2 years and then are passed in the stool.
32. Polymorphism refers to the occurrence of structurally and functionally more than two different types of individuals within the same organism. It is a characteristic feature of Cnidarians (Coelenterates), particularly the polyp and medusa forms, or of zooids within colonial organisms like *Obelia*.
33. In radial symmetry all body parts are arranged around the central axis. Radial symmetry represents sessile mode of life.
34. *Ascaris* belong to the phylum Nematoda of super phylum Aschelminthes. They have a cylindrical body without showing any metamerism, a pseudocoel (false coelom) and a complete digestive tract lined by endodermal epithelium.
35. *Taenia* is a genus of tapeworms (a type of Platyhelminth) that includes some important parasites of livestock.
36. The major part of the tapeworm is called strobila and it consists of segments, proglottids. They each contain both male and female reproductive organs
37. *Ascaris* worms inhabit the lumen of the small intestine of human and pig.
38. Snails are the intermediate hosts of *Fasciola hepatica.*
39. *Ascaris lumbricoides* worms inhabit the lumen of the small intestine of human and pig.
40. Examples of acoelomates are found in the kingdom Animalia and the phylum Platyhelminthes. Commonly known as flatworms, these invertebrate animals are unsegmented worms with bilateral symmetry.

10 TOPIC LIFE PROCESSES IN ANIMALS & PLANTS

PRACTICE EXERCISE

TOPIC-WISE MCQs

MODES OF NUTRITION

Q.1 _____ can exist in an exclusively inorganic environment:
A) Plants
B) Fungi
C) Animals
D) All of these

MINERAL NUTRITION IN PLANTS WITH DEFICIENCY SYMPTOMS

Q.2 Chlorosis is caused by deficiency of:
A) Phosphorus
B) Copper
C) Nitrogen
D) Water

CARNIVOROUS PLANTS

Q.3 All the insectivorous plants are:
A) Heterotrophic
B) Decomposers
C) Autotrophic
D) Parasites

Q.4 End of leaf is modified to form a hood in:
A) *Sarracenia purpurea*
B) *Dionaea muscipula*
C) *Drosera intermedia*
D) All of A, B, C

Q.5 Pick out the different:
A) Dodder
B) Venous fly trap
C) Sundew
D) Pitcher plant

HUMAN DIGESTIVE SYSTEM (ORAL CAVITY)

Q.6 Which one is different from others?
A) Amylase
B) Gastrin
C) Glucagon
D) Insulin

Q.7 In which of the following types of animals would you expect the digestive tract to be more complex:
A) Those with single opening
B) Those with two opening
C) Those with multiple openings
D) Those without any opening

Q.8 Cooking of the food and _____ in the mouth significantly improve the digestibility of food stuff by the enzymes.
A) Mastication
B) Churning
C) Peristalsis
D) Acidity

Q.9 The digestion of carbohydrates occurs briefly in _____ and largely in the _____ respectively.
A) Mouth, intestine
B) Esophagus, mouth
C) Stomach, intestine
D) Mouth, stomach

Q.10 On taking a spoonful of boiled rice and after partial digestion, which of the following biomolecule cannot be the part of bolus?
A) Protein
B) Amylose
C) Vitamins
D) Monosaccharide

Q.11 How many sites of digestion are present in the digestive system of man?
A) 3
B) 5
C) 4
D) 6

Q.12 Oral cavity is aided in selection of food by all of the following senses except:
A) Smell
B) Sound
C) Sight
D) Taste

Q.13 Align the following events performed by oral cavity:
1) Digestion
2) Mastication
3) Lubrication
4) Selection
A) 1,3,4,2
B) 4,3,2,1
C) 4,2,1,3
D) 4,2,3,1

Q.14 Main function of $NaHCO_3$ and other salts in buccal cavity is to:
A) Perform chemical digestion
B) Act as antiseptic agent
C) Stabilize the pH
D) Act as promoter of Ptyalin

Q.15 All of the following are influenced by the movement of tongue except:
A) Nasal opening
B) Epiglottis
C) Teeth cleansing
D) Peristalsis

Q.16 Peristalsis is the characteristic movement of _____ by which food is moved along.
A) Respiratory tract
B) Digestive tract
C) Reproductive tract
D) Urinary tract

Q.17 Which of the following region in alimentary canal produces no enzyme?
A) Oesophagus
B) Stomach
C) Duodenum
D) Jejunum

STOMACH

Q.18 More gastric juice is produced by gastric glands on the stimulation of a hormone:
A) Pepsinogen
B) Gastrin
C) Secretin
D) Insulin

Q.19 Cardiac sphincter is present at the junction of stomach and:
A) Esophagus
B) Caecum
C) Duodenum
D) Heart

Q.20 The digestive enzyme which is absent in adults:
A) Rennin
B) Amylase
C) Renin
D) Enterokinase

Q.21 In animals, discontinuous feeding is associated with:
A) Ingestion of food
B) Quantity of food
C) Absorption of food
D) Storage of food

Q.22 Which of the following layer regulates the peristaltic movement along the digestive tract?
A) Middle
B) Outermost
C) Innermost
D) Connective tissue layer

Q.23 Pepsin hydrolyzes protein to yield:
A) NH_3
B) Peptones and polypeptide
C) Amino acids
D) Dipeptides

Q.24 Which combination of the following food components in humans reaches the stomach undigested?
A) Starch, Proteins and Fats
B) Proteins, Cellulose and Fats
C) Vitamins, Carbohydrates and Polypeptides
D) Proteins, Starch and Cellulose

Q.25 In the wall of alimentary canal, sequence from outer to inner is:
A) Serosa, longitudinal muscle, mucosa, sub-mucosa
B) Mucosa, serosa, muscles, epithelium
C) Serosa, longitudinal muscles, circular muscles, sub-mucosa, mucosa
D) Serosa, longitudinal muscles, sub-mucosa, mucosa

SMALL INTESTINE AND ACESSORY GLANDS

Q.26 Secretion which lacks enzymes is:
A) Saliva
B) Bile
C) Pancreatic juice
D) Gastric juice

Q.27 Lactase breaks the lactose into:
A) Fatty acids + glycerols
B) Glucose monomers
C) Amino acid + peptones
D) Glucose + galactose

Q.28 The total length of small intestine is approximately:
A) 6m
B) 9m
C) 8m
D) 11m

Q.29 Release of $NaHCO_3$ and many enzymes required for intestinal digestion is related with:
A) Pancreas
B) Gallbladder
C) Mouth
D) Liver

Q.30 Final digestion of food stuff and absorption of digested products occur at:
A) Small intestine
B) Mouth
C) Large intestine
D) Stomach

Q.31 The acidic dietary contents of the stomach, on reaching small intestine are neutralized by _____, produced by _____.
A) Bicarbonate, liver
B) Bicarbonate, duodenum
C) Hydrogen, duodenum
D) Bicarbonate, pancreas

Q.32 The hepatic portal vein is located between the:
A) Hepatic vein – vena cava
B) Pancreas – small intestine
C) Mouth – stomach
D) Small intestine – liver

Q.33 Hepatic and pancreatic secretions are also stimulated by a hormone called:
A) Gastrin
B) HCl
C) Secretin
D) Enterokinase

Q.34 Which of the following carries lipoproteins from digestive tract?
A) Hepatic portal vein
B) Lymphatic vessels
C) Mesenteric vein
D) Hepatic vein

Q.35 Which of the following is produced from both intestinal lining and pancreas?
A) Maltase
B) Enterokinase
C) Lipase
D) Erypsin

Q.36 Which of the following is not a component of pancreatic juice?
A) $NaHCO_3$
B) Chymotrypsinogen
C) Amino peptidase
D) Amylopsin

Q.37 Fats changes to lipoproteins in:
A) Goblet cells
B) Lacteals
C) Blood vessel
D) Crypts

Q.38 These are the part of lymphatic system:
A) Lacteals
B) Villi
C) Duodenum
D) Liver

Q.39 Starch is digested in:
A) Oral cavity and stomach
B) Duodenum and ileum
C) Buccal cavity and duodenum
D) Esophagus and proximal part of small intestine only

Q.40 Which of the following is incorrect regarding to trypsin and pepsin?
A) Both released as pro-enzymes
B) Both act upon same substrate
C) Both are endo-peptidase
D) Both act on same site and pH

Q.41 Which one of the following is endocrine pair present in digestive canal?
A) Esophagus and Stomach
B) Stomach and Duodenum
C) Pancreas and Ileum
D) Stomach and Liver

Q.42 Which of the following do not pass from the small intestine to the large intestine?
A) Water and sloughed off mucosal cells
B) Organic and inorganic salts
C) Cellulose and inactive enzymes
D) Gastrin and secretin

Q.43 Small intestine is termed small because of its small:
A) Surface area
B) Diameter
C) Volume
D) Length

Q.44 All principal components of food can be digested by:
A) Gastric juice
B) Bile
C) Pancreatic juice
D) Oral secretions

Q.45 Which of the following statement regarding liver is incorrect?
A) It produces no digestive enzyme
B) Filters blood
C) Detoxify chemicals and drugs
D) Produces albumin and prothrombin

Q.46 Which of the following is not a component of intestinal juice?
A) Ptyalin
B) Erypsin
C) Lipase
D) Lactase

Q.47 Fats pass into blood via:
A) Right lymphatic duct
B) Thoracic lymphatic duct
C) Subclavian vein
D) Jugular vein

LARGE INTESTINE

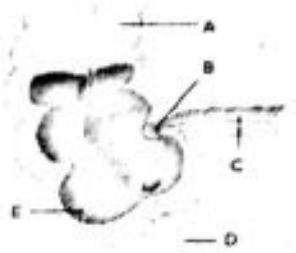
Q.48 In large intestine vitamin K is formed by the activity of:
A) Symbiotic bacteria
B) Parasitic bacteria
C) Obligate parasite
D) Facultative bacteria

Q.49 The longest part of large intestine is:
A) Caecum
B) Colon
C) Rectum
D) Anus

Q.50 The large intestine in human:
A) Digests all type of food
B) Absorbs H_2O + electrolytes
C) Is the longest part of GIT
D) Is connected to stomach

Q.51 Movement of materials across ileum to large intestine is guarded by:
A) Pyloric sphincter
B) Cardiac asphincter
C) Ileocolic sphincter
D) Anal sphincter

Q.52 Find out correct labeling:



A) A- Ascending colon, B- Ileocaecal valve, C- Ileum, D- Appendix, E- Caecum
B) A- Rectum, B- Ileocaecal valve, C- Appendix, D- Small intestine, E- Colon
C) A- Transverse colon, B- Ileocaecal valve, C- Jejunum, D- Ileum, E- Caecum
D) A- Colon, B- Ileocaecal valve, C- Appendix, D- Ileum, E- Rectum

DISORDERS OF DIGESTIVE SYSTEM

Q.53 It is associated with deposition of fats:
A) Anorexia nervosa
B) Heart burn
C) Obesity
D) Piles

Q.54 Inability to digest lactose in milk leads to:
A) Diarrhoea
B) Constipation
C) Ulcer
D) Vomiting

Q.55 Anorexia Nervosa can be treated with:
A) Anti-inflammatory drugs
B) Psychiatric therapy
C) Vaccines
D) Antibiotics

PAST PAPER MCQs

2009

Q.1 Hepatic and pancreatic secretions are also stimulated by a hormone called:
A) Gastrin
B) Secretin
C) Insulin
D) Glucagon

Q.2 Like pepsin, trypsin is also secreted as inactive trypsinogen, which is activated by:
A) Enterokinase
B) Lipase
C) Chyme
D) Erypsin

Q.3 Pepsin enzyme is produced in an inactive form and is activated in situation when it is required because:
A) Not produced in complete form
B) Quite capable of destroying cells internal structure
C) It does not work efficiently at that time
D) None of the above

Q.4 At the junction between esophagus and the stomach there is a special ring of muscles called:
A) Cardiac Sphincter
B) Ileocolic Sphincter
C) Esophageal Sphincter
D) Pyloric Sphincter

2010

Q.5 In human beings, what is the function of amylase in digestion?
A) Digestion of triglycerides
B) Digestion of lipids
C) Digestion of all types of food
D) Digestion of carbohydrates

Q.6 Where is the ileocolic sphincter located in your body?
A) At the junction of esophagus and stomach
B) At the junction of stomach and small intestine
C) At the junction of ileum and large intestine
D) At the junction of small intestine and large intestine

2011

Q.7 During swallowing of food which structure close nasal opening?
A) Hard Palate
B) Soft Palate
C) Epiglottis
D) Larynx

Q.8 Which of the following hormones stimulate the secretion of pancreatic juice from pancreas in liver?
A) Secretin
B) Pepsinogen
C) Gastrin
D) Both Gastrin and Secretin

Q.9 In large intestine, vitamin k is formed by the activity of:
A) Symbiotic Bacteria
B) Obligate Bacteria
C) Parasitic Bacteria
D) Facultative Bacteria

2012

Q.10 The muscles of the stomach wall thoroughly mix up the food with gastric juices and the resulting semi-solid/semi-liquid material is called:
A) Bolus
B) Bolus or chime
C) Mucus
D) Chyme

Q.11 Trypsinogen is converted into trypsin by the activity of:
A) Goblet cells
B) Absorptive cells
C) Enterokinase
D) Peptidase

Q.12 Goblet cells secrete:
A) HCl
B) Mucus
C) Enzymes
D) Amylase

Q.13 In large intestines, vitamin K is formed by the activity of:
A) Symbiotic bacteria
B) Obligate parasite
C) Parasitic bacteria
D) Facultative bacteria

2013

Q.14 Saliva is basically composed of water, mucus, amylase and:
A) Sodium bicarbonate
B) Sodium chloride
C) Sodium hydroxide
D) Hydrocarbons

Q.15 _____ is activated to_____ by Enterokinase/enteropeptidase enzyme secreted by the lining of duodenum.
A) Pepsinogen, Pepsin
B) Pepsinogen, Trypsin
C) Trypsinogen, Trypsin
D) Chymotrypsinogen, Chymotrypsin

Q.16 The function of Goblet cells is to secrete:
A) Gastrin
B) Hydrochloric acid
C) Pepsinogen
D) Mucus

Q.17 Which one of the following vitamins is produced by microflora of large intestine?
A) Vitamin K
B) Vitamin C
C) Vitamin A
D) Vitamin D

Q.18 Which of the following are absorbed in the large intestine?
A) Water and salts
B) Water and peptones
C) Salts and glycerol
D) Amino acids and sugars

2014

Q.19 Gastric glands are composed of _____ types of cells.
A) Two
B) Three
C) Four
D) Five

Q.20 HCl in gastric juice is secreted by which one of the following cells?
A) Chief cells
B) Oxyntic cells
C) Mucous cells
D) Kupffer cells

Q.21 In human, Escherichia coli is involved in the formation of:
A) Calcium
B) Vitamin D
C) Vitamin A
D) Vitamin K

2015

Q.22 Oxyntic cells in stomach produces:
A) Pepsin
B) Pepsinogen
C) Gastrin
D) HCl

Q.23 The hormone which inhibits the secretion of pancreatic juice is:
A) Secretin
B) Gastrin
C) Thyroxine
D) Parathormone

Q.24 Trypsinogen is activated to trypsin by:
A) HCl
B) Enterokinase
C) Mucus
D) Gastrin

Q.25 The emulsification of fats is the role of:
A) Saliva
B) Pancreatic juice
C) Gastrin
D) Bile

2016

Q.26 Protein components of food are digested by the enzymatic secretion of:
A) Goblet Cells
B) Parietal Cells
C) Zymogen Cells
D) Oxyntic Cells

Q.27 Digestive System consists of different layers, the innermost is known as:
A) Submucosa
B) Mucosa
C) Muscularis
D) Serosa

Q.28 Food enters from stomach into small intestine through:
A) Pyloric Sphincter
B) Cardiac Sphincter
C) Semilunar valve
D) Diaphragm

Q.29 _____ are the part of a gastric gland which produce hydrochloric acid.
A) Parietal Cells
B) Goblet Cells
C) Chief Cells
D) Zymogen Cells

Q.30 Digestion of _____ starts in oral cavity due to the action of enzyme present in saliva.
A) Starch
B) Cellulose
C) Fatty Acids
D) Polypeptides

2017 Q.31 Food is diverted in the oesophagous by:
A) Glottis
B) Tongue
C) Cheeks
D) Epiglottis

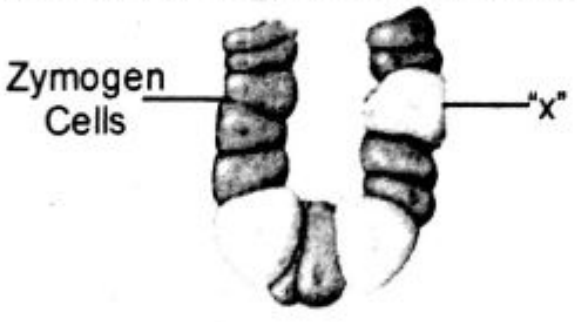
Q.32 Label 'a' in the following diagram:

A) Cardiac sphincter
B) Sino atrial valve
C) Stomach valve
D) Pyloric sphincter

Q.33 Enzyme pepsin acts on:

Option	Substrate	Product
A)	Proteins	Polypeptides
B)	Polypeptide	Dipeptides
C)	Fats	Fatty acids / glycerol
D)	Proteins	Amino acids

Q.34 Following is the structure of gastric glands in stomach wall where 'x' is:



A) Mucosa
B) Mucus cells
C) Visceral fat cells
D) Oxyntic cells

Q.35 Salivary amylase begins to digest starch to shorter polysaccharides and then to:
A) Sucrose
B) Glucose
C) Maltose
D) Lactose

Q.36 Number of salivary glands found in human oral cavity:
A) 3
B) 4
C) 6
D) 2

2017 – Retake

Q.37 Which of the following cells secrete HCl?
A) Oxyntic cells
B) Zymogen cells
C) G Cells
D) Mucous cells

Q.38 All kind of absorption take place in:
A) Duodenum
B) Jejunum
C) Ileum
D) Colon

Q.39 Appendix is finger like process arise from:
A) Colon
B) Rectum
C) Caecum
D) Small intestine

2018

Q.40 The first part of the large intestine is:
A) Caecum
B) Rectum
C) Colon
D) Appendix

Q.41 The term "Loss of appetite" refers to disease:
A) Anorexia nervosa
B) Obesity
C) Bulimia nervous
D) Botulism

Q.42 The term which is employed to the loss of appetite due to fear of becoming obese is:
A) Obesity
B) Anorexia nervosa
C) Dyspepsia
D) Bulimia nervosa

Q.43 Name the neurotic disorder characterized by bouts of over eating of fattening foods.
A) Bulimia nervosa.
B) Dyspepsia.
C) Anorexia nervosa.
D) Salmonella.

ANSWER KEY

1	A	11	A	21	D	31	D	41	B	51	C
2	C	12	B	22	A	32	D	42	D	52	A
3	C	13	D	23	B	33	C	43	B	53	C
4	A	14	C	24	B	34	B	44	C	54	A
5	A	15	D	25	C	35	C	45	A	55	B
6	A	16	B	26	B	36	C	46	A		
7	B	17	A	27	D	37	B	47	B		
8	A	18	B	28	A	38	A	48	A		
9	A	19	A	29	A	39	C	49	B		
10	D	20	A	30	A	40	D	50	B		

PAST PAPERS MCQs

1	B	11	C	21	D	31	D	41	A
2	A	12	B	22	D	32	D	42	B
3	B	13	A	23	A	33	A	43	A
4	A	14	A	24	B	34	D		
5	D	15	C	25	D	35	C		
6	C	16	D	26	C	36	A		
7	B	17	A	27	B	37	A		
8	A	18	A	28	A	38	C		
9	A	19	B	29	A	39	C		
10	D	20	B	30	A	40	A		

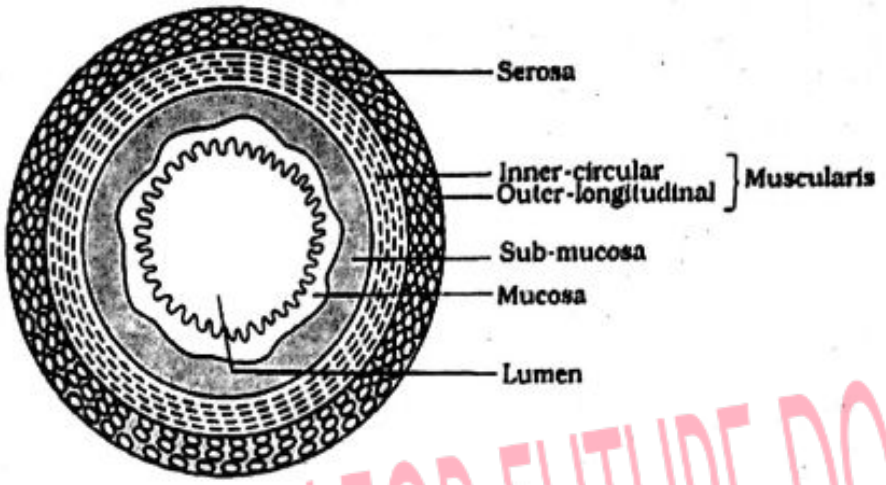
EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Plants are autotrophs and they are able to convert inorganic carbon to organic carbon while animals and fungi are heterotrophs and require organic compounds.
2. The lack of nitrogen is one of the more common nutrients associated with chlorosis
3. Insectivorous plants are both autotrophs and heterotrophs as they can photosynthesize but the soil in which they grow is nitrogen deficient.so they capture insects for obtaining nitrogen.
4. Sarracenia purpurea, commonly known as the purple pitcher plant and its leaves form hood as can be seen in given picture.

5. Dodder is an annual seed-bearing parasitic vine while all others are insectivorous plants.
6. Amylase is an enzyme while other three are hormones.
7. Those animals which have tubular type digestive system are more complex as compared to sac like digestive system. Tube have two openings.
8. Mastication increases the surface area of food particles which provides site of action for enzymes and significally improves the digestibility.
9. Oral cavity has amylase enzyme and intestine has amylopsin, lactase and maltase for complete digestion of carbohydrates.
10. Bolus is a partially digested food material by amylase in oral cavity which produces maltose that is disaccharide.
11. Oral cavity, stomach and small intestine are the main sites of digestion.
12. Smell, taste and sight helps for selection of food. Sound is not related to food selection
13. 1-Selection of food, 2-Mastication, 3-Lubrication, 4-Enzymetric.
14. $NaHCO_3$ is bicarbonate which neutralizes the pH in acidic environment.
15. Peristalsis is related to circular and longitudinal muscles of alimentary canal.
16. Human digestive tract starts from oral cavity and ends at anal canal.
17. Esophagus is a muscular tubule which start peristalsis in alimentary canal and secrete no enzyme.
18. High protein in food stimulates the release of gastrin which acts on epithelial cells to increase the secretion of stomach.

19. Cardiac sphincter presents between esophagus and stomach, opening at the approach of food that can then be swept into the stomach by rhythmic peristaltic wave.
20. Rennin is an enzyme in new born for colostrum digestion. Renin is an enzyme released from stomach.
21. Discontinuous feeding requires storage and propulsion of small portion of food.
22. As the middle layer is made up of smooth muscles which contract and relax and generate peristalsis which is responsible for contraction and relaxation.
23. Pepsin is an active enzyme which convert proteins into polypeptides and peptones in stomach.
24. Oral cavity is the site of digestion of starch. So protein, cellulose and fats are not digested.
25.



26. All secretions have enzymes except bile. It is involved in mechanical digestion on fat which is called emulsification.
27. Lactose is composed of glucose and galactose; lactase is enzyme that breaks lactose.
28. Small intestine has three parts: duodenum 20-25cm, jejunum 2.4m, ileum 3.5m, so total is approximately 6m.
29. Pancreas provides set of enzymes and $NaHCO_3$ for digestion of carbohydrates, proteins and fats. Liver has no enzymatic secretion.
30. Small intestine has duodenum, jejunum and ileum for complete digestion and absorption due to their secretions and large surface area.
31. Pancreas has $NaHCO_3$ which neutralizes the acidic content of food and liver has bile salts for emulsification.
32. The vein that pours blood from liver to circulatory system is hepatic vein whereas hepatic portal vein pours blood from digestive system to liver.
33. When acidic chyme touches the lining of duodenum wall it stimulates the secretion of hormone secretin to stimulate hepatic and pancreatic secretion and inhibit gastric secretion.
34. In intestine, villi have lacteals which absorb fat and carry lipoprotein as chylomicrons.
35. Lipase is an enzyme for lipid digestion which is secreted from pancreas and intestinal lining of small intestine.
36. Small intestine secretes aminopeptidase enzyme.
37. Protein present in lymph combines with fats absorbed from digestive system through lacteals.
38. Lacteals are present in villi to absorb and transport fats to the blood in the form of lipoprotein.
39. Amylase and amylopsin are present in buccal cavity and duodenum respectively for starch digestion.

40. Pepsin is present in stomach and works in acidic pH while trypsin is present in intestine and works in alkaline pH.
41. Stomach and duodenum secrete hormones and act as endocrine glands.
42. Gastrin and secretin are the hormones which are secreted into the blood and not passes to large intestine as fecal material.
43. Small intestine has smaller diameter as compared to large intestine.
44. Pancreas has complete set of enzymes for digestion of all principal components of food.
45. Liver is a metabolic station and has a lot of enzymes for metabolism.
46. Ptyalin is present in oral cavity for starch digestion.
47. Thoracic lymphatic duct is the main duct which transfer lipoproteins into blood.
48. In large intestine *E. coli* produce vitamin K and live as symbionts.
49. Large intestine has colon in the form of ascending, transverse, descending colon.
50. Large intestine provides site for absorption of water and electrolytes.
51. Ileocolic sphincter allows materials to pass from ileum to large intestine.
52.

A=Ascending colon, B=ileocecal sphincter, C=ileum, D=appendix, E=caecum.
See above answer

53. Obesity is a medical condition that occurs when a person carries excess weight or body fat that might affect their health.
54. Lactose intolerance is a digestive disorder caused by the inability to digest lactose, the main carbohydrate in dairy products. It can cause various symptoms, including bloating, diarrhea and abdominal cramps.
55. Anorexia nervosa is psychological disorder and can be treated by psychiatric therapy.

PAST PAPER MCQs

1. Secretin is a hormone released into the bloodstream by the duodenum (especially in response to acidity) to stimulate secretion by the liver and pancreas.
2. Enterokinase is an enzyme produced by cells of the duodenum and is involved in digestion in humans and other animals.it converts trypsinogen into its active form trypsin, resulting in the subsequent activation of pancreatic digestive enzymes.
3. Pepsin enzyme is secreted by gastric glands of the stomach as inactive pepsinogen to protect the cells of these secretory glands from strong protein digesting action of the enzyme. The inactive form of the enzyme is activated by acidic pH of stomach lumen and the stomach wall is protected by mucus lining.
4. Cardiac sphincter a sphincter between the esophagus and the stomach, opening at the approach of food that can then be swept into the stomach by rhythmic peristaltic waves.
5. The main function of amylases is to hydrolyze the glycosidic bonds in starch molecules, converting complex carbohydrates to simple sugars.
6. The ileocecal valve is typically located on the last fold before entry into the cecum, and can be located at the junction of ileum and large intestine.
7. The soft palate separates the oral and nasal cavities.
8. Secretin is a hormone released into the bloodstream by the duodenum (especially in response to acidity) to stimulate secretion by the liver and pancreas.
9. In large intestine vitamin k is formed by the activity of a symbiotic bacteria like *E.coli*.
10. Chyme is the pulpy acidic fluid which passes from the stomach to the small intestine, consisting of gastric juices and partly digested food.
11. Enterokinase is an enzyme produced by cells of the duodenum and is involved in digestion in humans and other animals.it converts trypsinogen into its active form trypsin, resulting in the subsequent activation of pancreatic digestive enzymes.
12. Goblet cells are single-cell glands that produce and secrete mucin.
13. In large intestine vitamin k is formed by the activity of a symbiotic bacteria like *E.coli*.
14. Produced in salivary glands. human saliva comprises 99.5% water, but also contains many important substances. Sodium bicarbonate, mucus, antibacterial compounds and various enzymes.
15. Enterokinase is an enzyme produced by cells of the duodenum and is involved in digestion in humans and other animals.it converts trypsinogen into its active form trypsin, resulting in the subsequent activation of pancreatic digestive enzymes.
16. Goblet cells are single-cell glands that produce and secrete mucin.
17. In large intestine vitamin k is formed by the activity of a symbiotic bacteria like *E.coli*.
18. Water and salts are absorbed in the large intestine.
19. These glands are composed of three major cell types: zymogenic, parietal, and mucous cells.
20. Parietal cells within the stomach lining secrete hydrochloric acid that lowers the pH of the stomach.
21. In large intestine vitamin k is formed by the activity of a symbiotic bacteria like *E.coli*.
22. Parietal cells (Oxyntic cells) within the stomach lining secrete hydrochloric acid that lowers the pH of the stomach.

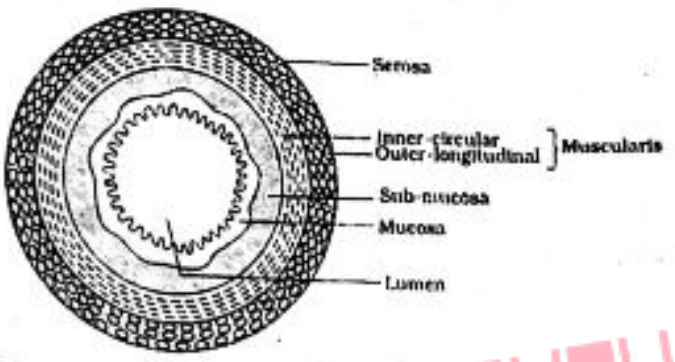
23. Secretin is a hormone released into the bloodstream by the duodenum (especially in response to acidity) to controls secretion by the liver and pancreas.

24. Enterokinase is an enzyme produced by cells of the duodenum and is involved in digestion in humans and other animals.it converts trypsinogen into its active form trypsin. resulting in the subsequent activation of pancreatic digestive enzymes.

25. When bile enters the small intestine, it will mix with the fat globules and will cause them to break down into smaller units called emulsion droplets. This process is called emulsification. Emulsification greatly increases the surface area of the fat on which the lipase can actually act on.

26. Zymogenic (chief) cells, which are thought to produce the enzymes pepsin and rennin. (Pepsin digests proteins, and rennin curdles milk.)

27.



28. The pyloric sphincter is a small piece of smooth visceral muscle that acts as a valve and regulates the flow of partially digested food from the stomach to the duodenum.

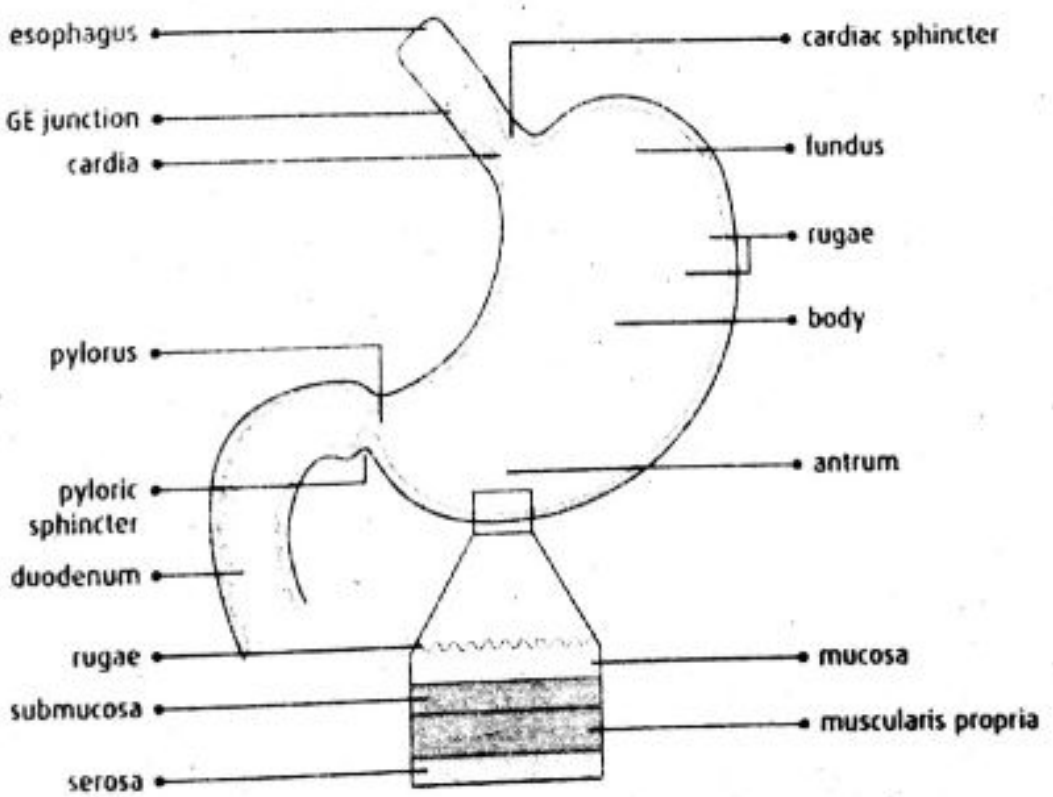
29. Parietal cells (Oxyntic cells) within the stomach lining secrete hydrochloric acid that lowers the pH of the stomach.

30. The main function of amylases is to hydrolyze the glycosidic bonds in starch molecules with in oral cavity, converting complex carbohydrates to simple sugars.

31. The epiglottis is a leaf-shaped flap in the throat that prevents food from entering the windpipe and the lungs.

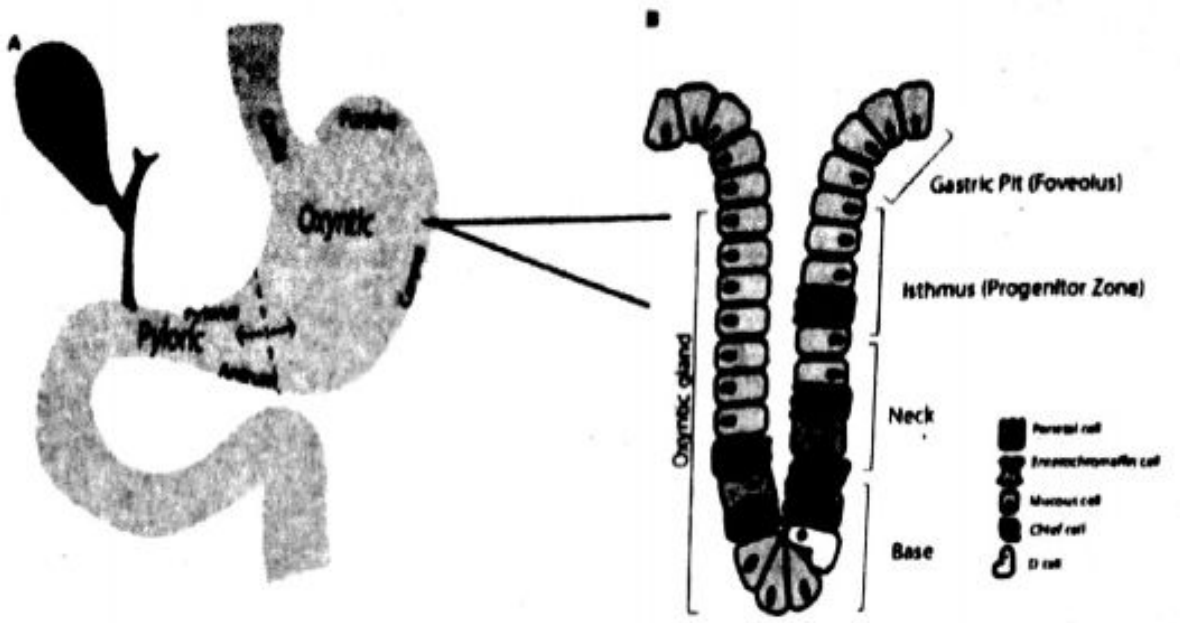
32.

The Stomach



33. Pepsin is a stomach enzyme that serves to digest proteins found in ingested food.

34.



35. Salivary amylase begins to digest starch to shorter polysaccharides and then to maltose
36. Humans have three paired major salivary glands (parotid, submandibular, and sublingual)
37. Parietal cells (Oxyntic cells) within the stomach lining secrete hydrochloric acid that lowers the pH of the stomach.
38. All kind of absorption take place in Ileum
39. The appendix (or vermiform appendix; also cecal appendixor is a finger-like, blind-ended tube connected to the cecum.
40. The first part of the large intestine is Caecum.
41. Anorexia is an eating disorder characterized by an abnormally low body weight, intense fear of gaining weight and loss of appetite.
42. Anorexia is an eating disorder characterized by an abnormally low body weight, intense fear of gaining weight and loss of appetite.
43. Bulimia nervosa is a serious eating disorder, you eat large amounts of food and then purge to get rid of extra calories

TOPIC-WISE MCQs

GASEOUS EXCHANGE IN PLANTS

Q.1 In Photorespiration, Glycine Is Converted into Serine in:
A) Peroxisome
B) Mitochondria
C) Lysosome
D) Chloroplast

Q.2 Photorespiration is a reverse of:
A) Glycolysis
B) Krebs cycle
C) ETC
D) Calvin cycle

Q.3 Which cells functions as multisensory hydraulic valves:
A) Mesophyll cells
B) Sieve tube cells
C) Guard cells
D) Xylem cells

HUMAN RESPIRATORY SYSTEM

Q.4 All of the following are lined with mucous membrane of ciliated epithelium except:
A) Nasal cavity
B) Bronchi
C) Trachea
D) Bronchioles

Q.5 Which of the following function is not associated with nasal cavity?
A) Filtration
B) Moistening
C) pH adjustment
D) Temperature adjustment

Q.6 A complex cartilaginous structure surrounding the upper end of the trachea:
A) Larynx
B) Pharynx
C) Esophagus
D) Epiglottis

Q.7 A muscularly controlled cartilage, hinge-like action and serves as a lid which automatically covers the opening of the larynx is called:
A) Epiglottis
B) Uvula
C) Esophageal sphincter
D) Respiratory valve

Q.8 Opening from nose to throat is closed by:
A) Epiglottis
B) Soft palate
C) Esophageal sphincter
D) Tongue

Q.9 A cavity bounded by ribs and diaphragm is called:
A) Abdominal cavity
B) Pelvic cavity
C) Thoracic cavity
D) Pleural cavity

Q.10 Bronchioles are cartilage less tubules having largest diameter of:
A) 1mm
B) 1μm
C) 0.1mm
D) 1nm

Q.11 Bronchioles are made up of mainly:
A) Connective tissues
B) Circular smooth muscles
C) Goblet cells
D) Endothelial cells

Q.12 Functional units of lungs are:
A) Alveoli
B) Air sacs
C) Bronchioles
D) Epithelial cells

Q.13 Each air sac consists of several microscopic alveoli which are:
A) Double layered structures
B) Triple layered structures
C) Single layered structures
D) Multi layered structures

Q.14 A sheet of skeletal muscles forming the floor of chest cavity is called:
A) Pleura
B) Diaphragm
C) Peritoneum
D) Serosa

Q.15 All of the following correctly explain the role of labeled structure in given figure except:

A) D: Voice box
B) F: Common opening for food and air
C) E: obstruct entry of food into nasal cavity
D) C: Separates respiratory and digestive tract

Q.16 The function of nasal cavity is:
A) Protection
B) Temperature regulation
C) Moisten
D) All A, B and C

Q.17 The epithelium of alveoli is:
A) Ciliated epithelium
B) Cuboidal epithelium
C) Squamous epithelium
D) Columnar epithelium

Q.18 How many functional pairs of vocal cords are present in humans?
A) 1
B) 2
C) 3
D) 4

Q.19 Trachea lies_____ to the esophagus.
A) Dorsal
B) Ventral
C) Medial
D) Lateral

Q.20 _____ are folds of tissue within the larynx, creates sounds when vibrate.
A) Vocal cords
B) Glottis
C) Epiglottis
D) Trachea

Q.21 The respiratory bronchioles terminate in elongated airways called:
A) Alveolar sacs
B) Alveolar duct
C) Bronchi
D) Alveoli

Q.22 Cartilage rings present in trachea which prevent it from collapsing and keep the air passage way open, are:
A) "O" shaped
B) "D" shaped
C) "C" shaped
D) "G" shaped

Q.23 Vocal cords are stretched across:
A) Larynx
B) Pharynx
C) Glottis
D) Bronchi

MECHANISM OF RESPIRATION

Q.24 The chemical nature of surfactant is:
A) Glycolipids
B) Glycoproteins
C) Nucleoproteins
D) Lipoproteins

Q.25 In humans, the respiratory center is:
A) Cerebrum
B) Pons
C) Medulla oblongata
D) Midbrain

Q.26 Surfactant is present in:
A) Bronchi
B) Bronchioles
C) Alveoli
D) Trachea

Q.27 During exercise, the breathing rate may rise to:
A) 15 times per minute
B) 30 times per minute
C) 20 times per minute
D) 25 times per minute

Q.28 Which energy is consumed in breathing?
A) Chemical
B) Potential
C) Physical
D) Mechanical

Q.29 Find out the incorrect statement:
A) Inspired air contains more O_2 than exhaled air
B) Amount of N_2 is equal in both inhaled and exhaled air
C) Expired air has 100 times greater CO_2 as inspired air
D) Exhaled air is comparatively dried than inhaled air

Q.30 Breathing is a mechanical process consisting of:
A) 2 phases
B) 3 phases
C) 4 phases
D) 5 phases

Q.31 During inspiration fresh air moves in, which has high percentage of:
A) CO
B) N_2
C) O_2
D) CO_2

Q.32 Partial pressure of oxygen is maximum in:
A) Inspired air
B) Expired air
C) Alveolar air
D) Oxygenated blood

Q.33 Which of the following play passive role during breathing?
A) Lungs
B) Diaphragm
C) Intercostal muscles
D) Pleura

Q.34 Which of the following factors does not alter the rate of breathing by influencing the chemoreceptors in medulla oblongata, aorta and carotid artery?
A) CO_2 partial pressures in the blood
B) O_2 partial pressures in the blood
C) H^+ concentration in the blood
D) Blood glucose level

Q.35 If you hold your breath for a long time, CO_2 levels are likely to _____, and the pH of body fluids is likely to _____.
A) Increase, decrease
B) Decrease, Increase
C) Increase, increase
D) Decrease, decrease

Q.36 During expiration, the diaphragm becomes:
A) Less dome-shaped
B) Flattened
C) Oblique
D) More dome-shaped

Q.37 Which of the following condition is responsible for increase in ventilation rate?
A) Minor decrease in O_2 content of inhaled air
B) Decrease in O_2 content of exhaled air
C) Increase of CO_2 content in inhaled air
D) Increase of CO_2 content in exhaled air

Q.38 During inspiration, the diaphragm:
A) Contracts and relax
B) Relax and rises
C) Contracts and goes downward
D) Relax and goes downward

TRANSPORT OF RESPIRATORY GASES AND RESPIERATORY PIGMENTS

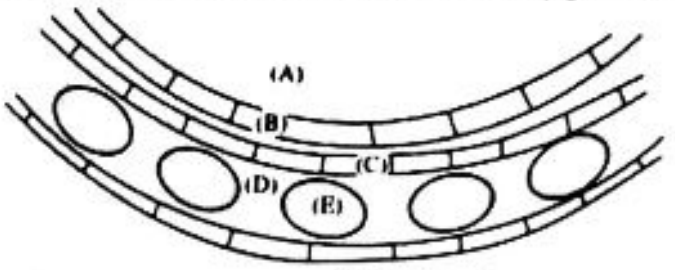
Q.39 Diffusion of respiratory gases is inversely proportional to:
A) Surface area
B) Difference in concentration
C) Thickness of the membrane
D) Presence of moisture

Q.40 At normal alveolar ventilation, the respiratory center is stimulated by:
A) O_2 concentration in venous blood
B) CO_2 concentration in arterial blood
C) CO_2 concentration in venous blood
D) O_2 concentration in arterial blood

Q.41 Which one of these shows the path of blood after it leave the lungs?
A) Pulmonary Vein – Left Atrium – Left Ventricle – Aorta
B) Pulmonary Artery – Left Atrium – Left Ventricle – Aorta
C) Pulmonary Vein – Right Atrium – Right Ventricle – Aorta
D) Pulmonary Artery – Right Atrium – Right Ventricle – Aorta

Q.42 Which of the following correctly describes the binding affinities of gases with haemoglobin?
A) $CO>CO_2>O_2$
B) $O_2>CO_2>CO>$
C) $CO_2>O_2>CO$
D) $O_2>CO_2>CO$

Q.43 Just after inhalation, the highest partial pressure of oxygen will be in:



A) B and C
B) D and E
C) Only A
D) Only E

Q.44 All of the following occurs due to presence of carbon dioxide in blood except:
A) Increases rate of breathing
B) Makes blood more acidic
C) Increases respiratory volume
D) All A, B, C

Q.45 Most of the CO_2 in the blood is carried as/by:
A) Hemoglobin
B) Dissolved form
C) Bicarbonate ions
D) Bound to plasma proteins

Q.46 The amount of CO_2 in pulmonary artery is:
A) 54ml/100ml of blood
B) 60ml/100ml of blood
C) 50ml/100ml of blood
D) 4ml/100ml of blood

Q.47 Which of the following incorrectly explains the binding of inorganic component in structures found in erythrocytes?
A) CO with organic portion of haem
B) O_2 with Fe^{++} of haem
C) CO_2 with NH_2 group of haemoglobin
D) H^+ with COOH group of haemoglobin

Q.48 Partial pressure of O_2 in alveolar sacs, during inhalation, is:
A) 158 mmHg
B) 115 mmHg
C) Less than 100 mmHg
D) 60 mmHg

Q.49 Which of the following shows maximum solubility in blood plasma?
A) Oxygen
B) Nitrogen
C) Carbon dioxide
D) Carbon monoxide

Q.50 Amount of oxygen absorbed by haemoglobin at 115mmHg per 100 ml of blood is:
A) 20 ml
B) 13.4 ml
C) 16 ml
D) 19.6ml

Q.51 Which of the following is false regarding to haemoglobin?
A) It is a globular protein
B) Abundantly found in RBC's
C) It contains organic haem group and inorganic Fe^{++}
D) Each haem in haemoglobin can bind to four O_2 molecules

Q.52 All of the following can bind to haemoglobin except:
A) HCO_3^-
B) H^+
C) O_2
D) CO_2

Q.53 O_2 pressure in cells or tissues is:
A) 158mmHg
B) 115mmHg
C) Less than 100mmHg
D) Less than 60mmHg

Q.54 The oxygen content of fresh air is about:
A) 200 ml/lit
B) 300 ml/lit
C) 400 ml/lit
D) 500 ml/lit

Q.55 All of the following facilitates the release of O_2 from haemoglobin except:
A) High CO_2concentration
B) High temperature
C) High pH
D) High Acidity

Q.56 In reduced form, hemoglobin carries:
A) CO_2
B) Hydrogen ion
C) O_2
D) CO

Q.57 Which of the following has maximum oxygen carrying capacity?
A) Haemoglobin in erythrocytes
B) Myoglobin in sarcoplasm
C) Globulin in blood plasma
D) Bicarbonate ions in RBCs

Q.58 The binding capacity of haemoglobin is greater than myoglobin by:
A) 80%
B) 90%
C) 75%
D) 100%

Q.59 The characteristics red color of hemoglobin is due to:
A) Haem
B) α–globin chains
C) β–globin chains
D) Central iron atom

Q.60 What is true about haemoglobin?
A) It is dipeptide and present in RBC
B) It is present in dissolved state in blood plasma
C) It is dipeptide in mammals and localized in RBC
D) It is having haem group

LUNG CAPACITIES

Q.61 Tidal volume of lungs is:
A) 5 liter
B) 1.5 liter
C) 0.5 liter
D) 3500 ml

Q.62 The residual volume is:
A) 5 liter
B) 500 ml
C) 1.5 liter
D) 3500 ml

RESPIRATORY DISORDERS

Q.63 All are respiratory disorders except:
A) Pulmonary tuberculosis
B) Rickets
C) Emphysema
D) Lungs Cancer

Q.64 In heavy smokers, the alveoli become enlarged and damaged which reduces the surface area for the exchange of respiratory gases. This condition is called:
A) Lung cancer
B) Asthma
C) Emphysema
D) Bronchitis

PAST PAPER MCQs

2008

Q.1 When carbon dioxide pressure increases, the capacity of haemoglobin to hold oxygen:
A) Increases many folds
B) Decreases
C) Remains constant
D) Is doubled

2009

Q.2 Most of the carbon dioxide is carried in the blood in the form of:
A) Bicarbonate ions
B) Carboxyhaemoglobin
C) CO_2
D) Blood plasma protein

Q.3 The respiratory pigment, which has much higher affinity to combine with oxygen, is:
A) Myoglobin
B) Globin
C) Haemoglobin
D) Hemocyanin

2010

Q.4 Which one of the following acts as functional unit of lungs in man?
A) Air sac
B) Larynx
C) Trachea
D) Bronchioles

Q.5 Expiration in human beings is carried out by:
A) Contraction of lungs
B) Contraction of intercostal membrane
C) Relaxation of intercostal and diaphragm muscles
D) Contraction of diaphragm muscle

Q.6 Which one of following factor is directly proportional to oxygen carrying capacity of haemoglobin?
A) Carbon dioxide
B) Temperature
C) pH
D) Light

2015

Q.7 About 70-85% CO_2 in blood is carried:
A) As carboxylase myoglobin
B) With proteins in plasma
C) Freely as CO_2
D) As bicarbonate

2016

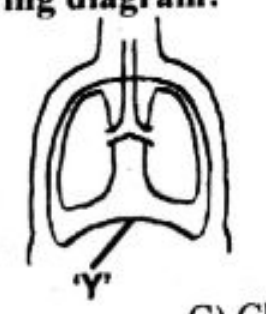
Q.8 Breathing consists of:
A) Four phases
B) Three phases
C) One phase
D) Two phases

Q.9 Carboxyhaemoglobin (10-20%) is formed when CO_2 combines with:
A) Amino group of haemoglobin
B) Iron part of haemoglobin
C) Haem portion of haemoglobin
D) Plasma proteins

2017

Q.10 Respiratory tubules are termed as bronchioles when they attain the diameter of _____ or lesser.
A) 1.2cm
B) 1cm
C) 1mm
D) 1.2mm

Q.11 Label the part 'Y' in the following diagram:



A) Pleura
B) Diaphragm
C) Chest cavity
D) Inter-coastal muscle

Q.12 Low partial pressure of oxygen in tissues favors _____ of oxyhaemoglobin.

A) Dissociation
B) Formation
C) Stability
D) Transformation

Q.13 Which of the following is a respiratory disorder related to malnutrition?

A) Cancer
B) Asthma
C) Emphysema
D) Tuberculosis

2017 Re-Take

Q.14 Site of gaseous exchange in humans is:

A) Trachea
B) Alveoli
C) Bronchus
D) Nose

Q.15 Gaseous exchange in animals takes place with the help of process called as:

A) Active transport
B) Phagocytosis
C) Cyclosis
D) Diffusion

Q.16 Breakdown of thin wall of alveoli occurs in:

A) Emphysema
B) Cancer
C) T.B
D) Asthma

2018

Q.17 During breathing air from pharynx enters to:

A) Alveoli
B) Bronchioles
C) Bronchi
D) Trachea

Q.18 Which of the following statement is correct about the respiratory pigments?

A) Albumin, globulin and globular proteins are present in respiratory pigments
B) Myoglobin and haemoglobin has higher affinity for nitrogen
C) Myoglobin has more affinity for oxygen as compared to haemoglobin
D) Cyanide and haemoglobin has low affinity for oxygen

Q.19 Gradual breakdown of the alveolar wall leads to which type of disease in a smoker?

A) Asthma
B) Bronchitis
C) Coronary heart disease
D) Emphysema

Q.20 The low levels of surfactant produced by alveolar epithelium causes:

A) Emphysema
B) Bronchitis
C) Respiratory distress syndrome
D) Asthma

2019

Q.21 During inspiration the space inside the chest cavity is increases due to:

A) Increased pressure
B) The relaxation of the muscle of the diaphragm
C) Relaxation of the external intercostal muscle
D) The contraction of the muscles of the diaphragm

Q.22 A disease caused by gradual breakdown of the thin walls of alveoli is _____.

A) Tuberculosis
B) Asthma
C) Emphysema
D) Bronchitis

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	B	21	B	31	B	41	A	51	D	61	C
2	D	12	B	22	C	32	A	42	A	52	A	62	C
3	C	13	C	23	A	33	A	43	C	53	D	63	B
4	D	14	B	24	D	34	D	44	C	54	A	64	C
5	C	15	B	25	C	35	A	45	C	55	C		
6	A	16	D	26	C	36	D	46	A	56	B		
7	A	17	C	27	B	37	A	47	A	57	A		
8	B	18	B	28	A	38	C	48	B	58	C		
9	C	19	B	29	D	39	C	49	C	59	A		
10	A	20	A	30	A	40	C	50	D	60	D		

PAST PAPERS MCQs

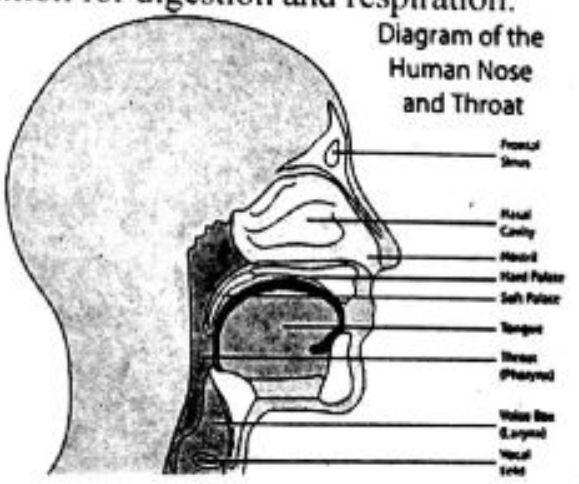
1	B	11	B	21	D
2	A	12	A	22	C
3	A	13	D		
4	A	14	B		
5	C	15	D		
6	C	16	A		
7	D	17	D		
8	D	18	C		
9	A	19	D		
10	C	20	C		

EXPLANATORY NOTES

TOPIC-WISE MCQs

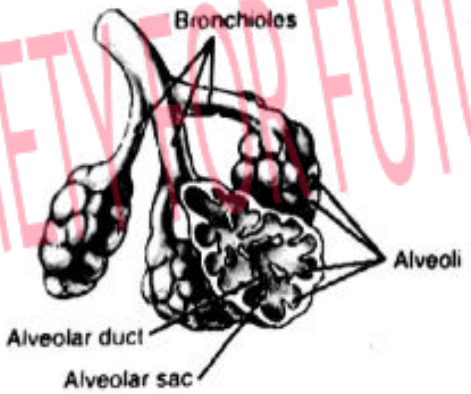
1. The glycine is the simplest amino acid which soon after its formation diffuses into the mitochondria where two glycine molecules are converted into serine
2. Photorespiration uses ATP and NADPH produced in the light reactions just like Calvin-Benson cycle. But infact, photorespiration is reverse of Calvin cycle.
3. Just like vacuoles, guard cells also have multisensory hydraulic valves.
4. Ciliated epithelium containing goblet cells is absent in bronchioles.
5. Air while passing through the nasal cavity becomes warm, moist and filtered of smaller foreign particles by mucous membrane.
6. Larynx is also known as voice box and has vocal cards for sound production. It is made up of complex cartilaginous structure surrounding the upper end of the trachea.
7.

8. During swallowing backward movement of tongue pushes the soft palate up and closes the nasal opening at the back.
9. Chamber of the body of vertebrates that is protected by the rib cage.
10. When the diameter of bronchi becomes 1mm or less and it is devoid of cartilage is named as bronchioles.
11. Bronchioles have circular smooth muscles. Cartilage and ciliated epithelium are absent in bronchioles.
12. Air sac is the functional unit of the lungs. Air sac consists of several microscopic single layered structures called alveoli.
13. Air sac is the functional unit of the lungs. Air sac consists of several microscopic single layered structures called alveoli which are single layered structures.
14. The diaphragm is a thin skeletal muscle that sits at the base of the chest and separates the abdomen from the chest. It contracts and flattens when you inhale. This creates a vacuum effect that pulls air into the lungs.
15. Pharynx (throat) is common for digestion and respiration.

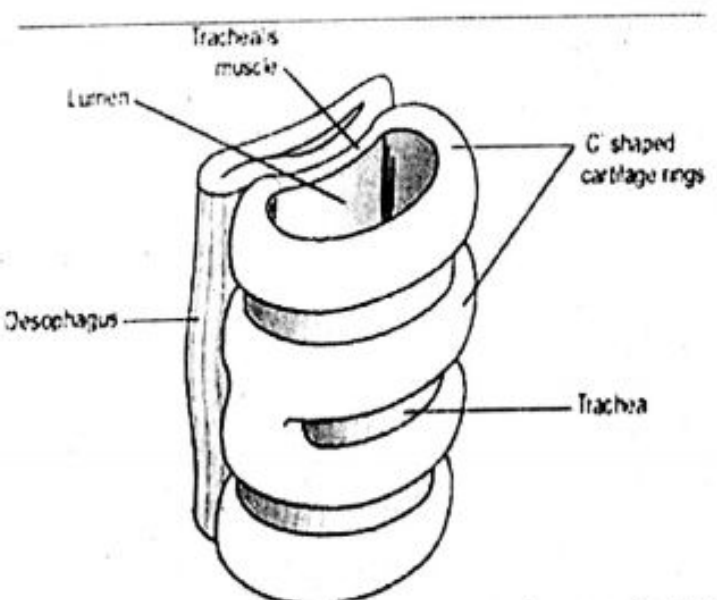


16. Air while passing through the nasal cavity becomes warm, moist and filtered of smaller foreign particles by mucous membrane.
17. Epithelium of alveoli squamous or flattened epithelial cells, very thin and irregular in outline, occur as the covering epithelium of the alveoli of the lung.
18. In the glottis, the mucous membrane is stretched across into two thin edged fibrous bands called vocal cords, which help in sound production.
19. Ventral is the underside of an organism or an organ.

20. In the glottis, the mucous membrane is stretched across into two thin edged fibrous bands called vocal cords, which help in sound production.
21.

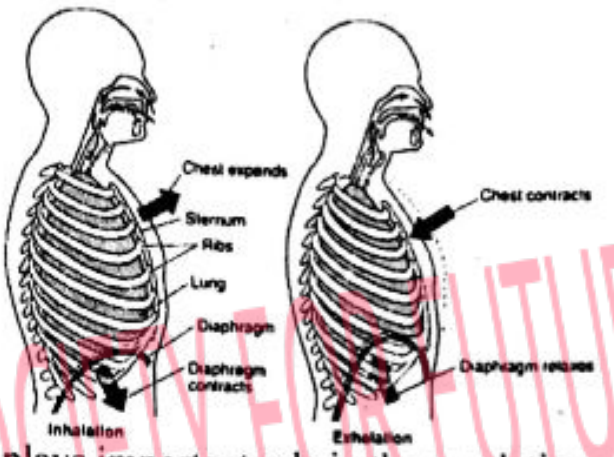


22.

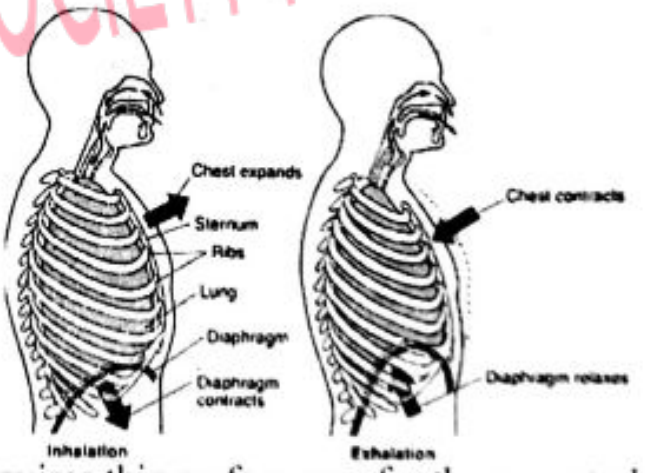


23. In the glottis (upper end of larynx) the mucous membrane is stretched across into two thin edged fibrous bands called vocal cords, which help in sound production.
24. Surfactants are compounds that lower the surface tension (or interfacial tension) between two liquids, between a gas and a liquid, or between a liquid and a solid. Surfactants may act as detergents, wetting agents, emulsifiers, foaming agents, and dispersants.

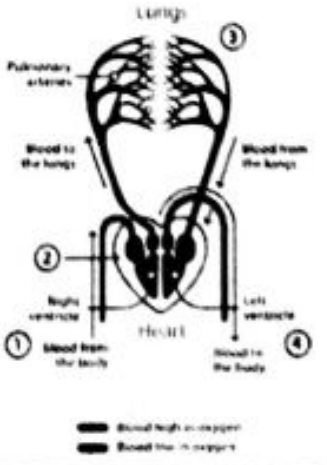
25. Involuntary breathing is controlled by medulla oblongata.
26. Surfactant (the mixture of lipoproteins) produced by the secretory cells of the alveolar epithelium.
27. At rest, we inhale and exhale 15-20 times per minute. During exercise, the breathing rate may rise to 30 times per minute.
28. Over all process of breathing is active and consumes energy during inspiration in the form of ATP.
29. Exhaled air has saturated water contents as compared to inhaled air which has variable water contents.
30. Breathing is mechanical process consisting of two phases i.e., inspiration and expiration.
31. Highest concentration in inhaled air and exhaled air is that of N_2, that is 79%.
32. Oxygen is 21% in inhaled air and it is 16% in exhaled air.
33. Lungs neither pull air in nor can they push it out. During inspiration passive expansion of elastic lungs occurs and expiration is due to passive contraction of lungs.
34. CO_2, O_2, pH and temperature are the factors responsible to affect the capacity of haemoglobin to combine with oxygen.
35. If we hold our breath for long time then due to increased metabolic activity CO_2 level will be increased and pH will also be decreased.
36.



37. Concentration of CO_2 plays important role in the regulation of respiration.
38.



39. Gaseous exchange requires thin surface area for the gases to be diffused.
40. Carbon dioxide is much more important than oxygen as a regulator of normal alveolar ventilation.
41.



42. The affinity of CO with haemoglobin is more than that of CO_2, similarly the affinity of CO_2 with haemoglobin is more than O_2.
43. Partial pressure of oxygen is more in alveoli than blood vessels surrounding alveoli.
44. Level of carbon dioxide in the blood is stimulus for breathing. More carbon dioxide in the blood will lead to the carbonic acid formation and so lesser will be the H^+ ions concentration.
45. About 70% of CO_2 is carried as bicarbonate ions.
46. Venus blood contains 4% more CO_2 per 100ml (54ml/100ml) of blood as compared to arterial blood (50ml/100ml).
47. Binding site of CO and O_2 with haemoglobin is common that is Fe^{++} of haem.
48. Partial pressure of O_2 is less in alveoli than that in atmosphere. It is about 115mmHg.
49. Carbon dioxide is more soluble in blood than is oxygen; about 5 to 7 percent of all carbon dioxide is dissolved in the plasma.
50. When oxygen tension is 115mmHg mercury, haemoglobin is 98% saturated and therefore contains 19.6ml of oxygen per 100ml of blood.
51. Haemoglobin has four polypeptide chains; each chain has one haem group which can bind with single oxygen molecule.
52. 70% of carbon dioxide is transported in the form of $NaHCO_3$. CO_2 combines with amine group of haemoglobin.
53. During cellular respiration, oxygen is used and carbon dioxide is produced, due to the consumption of oxygen there is least partial pressure of oxygen at tissue level.
54. Approximately there is 20% oxygen in the air (20ml/100ml or 200ml/1000ml).
55. More CO_2, less O_2, high temperature and less pH facilitate oxygen dissociation from oxyhaemoglobin.
56. Addition of H^+ ions or electrons is known as reduction. Reduced form of haemoglobin contains H^+.
57. 90% of cytoplasm of erythrocytes is occupied by haemoglobin. Each molecule of haemoglobin carries four oxygen molecules.
58. Each molecule of haemoglobin four oxygen molecules but each molecule of myoglobin contains one oxygen molecule. Because haemoglobin has four polypeptide chains while myoglobin has one polypeptide chain.
59. The actual colour of RBCs is red and it is due to the presence of iron in the haem group of haemoglobin.
60. Haemoglobin is four polypeptide chains containing protein.
61. Tidal volume is the amount of air that moves in or out of the lungs with each respiratory cycle. It measures around 500 mL in an average healthy adult.
62. Residual volume is the volume of air remaining in the lungs after maximum forceful expiration. Its value is between 1400 and 1600 ml.
63. Rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency.
64. Emphysema is a lung condition that causes shortness of breath. In people with emphysema, the air sacs in the lungs (alveoli) are damaged. Over time, the inner walls of the air sacs are weakened and ruptured creating larger air spaces instead of many small ones.

PAST PAPER MCQs

1. The affinity of CO with haemoglobin is more than that of CO_2; similarly the affinity of CO_2 with haemoglobin is more than O_2.
2. About 70% of CO_2 is transported as bicarbonate ions.
3. Myoglobin has more affinity to bind with oxygen as compare to haemoglobin which has more capacity for oxygen.
4. Air sac is the functional unit of the lungs. Air sac consists of several microscopic single layered structures called alveoli.
5. During expiration, intercostal muscles are relaxed and diaphragm becomes more dome shape.
6. Less the pH means more H^+ ion concentration. More the H^+ ions concentration less is the oxygen carrying capacity of haemoglobin.
7. About 70% of CO_2 is transported as bicarbonate ions.
8. Breathing is mechanical process consisting of two phases i.e., inspiration and expiration.
9. About 70% CO_2 is transported in the form of bicarbonate ions and about 20% is transported as carboxyhaemoglobin. Carboxyhaemoglobin is formed when carbon dioxide combines with amine group of haemoglobin.
10. When the diameter of bronchi becomes 1mm or less and it is devoid of cartilage is named as bronchioles.
11. Floor of chest cavity is known as diaphragm.
12. More CO_2, less O_2, high temperature and less pH facilitate oxygen dissociation from oxyhaemoglobin.
13. Malnutrition and poor living conditions facilitate *Mycobacterium* to grow.
14. Air sac is the functional unit of the lungs. Air sac consists of several microscopic single layered structures called alveoli. Gaseous exchange occurs at alveoli.
15. Gaseous exchange is always a passive process in which gases move from higher concentration to lower concentration.
16. Emphysema is a lung condition that causes shortness of breath. In people with emphysema, the air sacs in the lungs (alveoli) are damaged. Over time, the inner walls of the air sacs are weakened and ruptured creating larger air spaces instead of many small ones.
17. Pharynx is common of digestion and respiration. Air from pharynx moves to trachea and food is pushed to esophagus.
18. Myoglobin stores oxygen in muscles. It is also known as muscle haemoglobin. It has more affinity for oxygen as compared to haemoglobin, so for this reason it is not a good oxygen carrier.
19. Emphysema is a lung condition that causes shortness of breath. In people with emphysema, the air sacs in the lungs (alveoli) are damaged. Over time, the inner walls of the air sacs are weakened and ruptured creating larger air spaces instead of many small ones.
20. Respiratory distress syndrome is common, and it occurs because enough surfactant is not produced by secretory cells of the alveolar epithelium.
21. During inspiration muscles of ribs and diaphragm contract due to which ribs are elevated and diaphragm becomes less dome shape. The space in chest cavity is increased.
22. Emphysema is a lung condition that causes shortness of breath. In people with emphysema, the air sacs in the lungs (alveoli) are damaged. Over time, the inner walls of the air sacs are weakened and ruptured creating larger air spaces instead of many small ones.

TOPIC-WISE MCQs

BLOOD CIRCULATORY SYSTEM (BLOOD)

Q.1 All are plasma protein except:
A) Albumin
B) Fibrinogen
C) Globulin
D) Myoglobin

Q.2 Identify the anti-coagulant:
A) Thrombin
B) Platelets
C) Fibrin
D) Heparin

Q.3 If blood cells are removed from the blood, then the liquid left is called_____.
A) Lymph
B) Urine
C) Plasma
D) Interstitial fluid

Q.4 The erythrocytes are meant for:
A) Imparting red colour
B) Exchange of gases
C) Carrying oxygen
D) All A, B, and C

Q.5 In the fetus, RBC's are produced in:
A) Liver
B) Bone marrow
C) Kidney
D) Lymph nodes

Q.6 Which plasma protein mainly maintains colloidal osmotic pressure of the blood?
A) Albumin
B) Fibrinogen
C) Globulins
D) Prothrombin

Q.7 Average life span of red blood cells is about:
A) 2 months
B) 6 months
C) 3 months
D) 4 months

Q.8 Which salt is most abundant in blood plasma?
A) KCl
B) $MgCl_2$
C) NaCl
D) $CaCl_2$

Q.9 Which WBCs spend initial hours in blood and remaining whole life in tissues?
A) Eosinophils
B) Lymphocytes
C) Basophils
D) Monocytes

Q.10 Antibodies are produced by:
A) Plasma clone cells
B) T-lymphocytes
C) B- Lymphocytes
D) Macrophages

Q.11 Circulatory system consists of:
A) Cardiovascular system only
B) Heart, blood and blood vessels
C) Lymphatic system only
D) Cardiovascular and lymphatic systems

Q.12 The major organic constituent of plasma is:
A) Water
B) Salts
C) Proteins
D) Wastes

Q.13 If we remove the clotting proteins from plasma the remaining fluid is called_____.
A) Water
B) Antibodies
C) Serum
D) Lymphocytes

Q.14 The protein which acts as catalyst in blood clotting process?
A) Histone
B) Immunoglobulin
C) Albumin
D) Prothrombin

Q.15 The main reservoir of pro-inflammatory substance is:
A) Platelets
B) Basophils
C) Monocytes
D) Lymphocytes

Q.16 Which protein is not related to liver?
A) Albumin
B) Fibrinogen
C) Prothrombin
D) Immunoglobulins

Q.17 The 2nd most abundant cells among WBCs in blood are:
A) Monocytes
B) Lymphocytes
C) Eosinophils
D) Neutrophils

Q.18 Which of the following plasma protein act as anti-viral agent?
A) Albumin
B) Prothrombin
C) Heparin
D) Interferon

Q.19 In humans, blood circulatory system during embryonic development arises from:
A) Blastopore
B) Mesoderm
C) Endoderm
D) Notochord

Q.20 Which of the following cell is anucleated when it becomes mature in humans?
A) Monocytes
B) Basophils
C) Neutrophils
D) RBCs

Q.21 All of the following are the functions of blood except:
A) Leukemia
B) Wound healing
C) Immunity
D) Buffer action

Q.22 Liver breaks haemoglobin into a toxic waste called:
A) Bilirubin
B) Cholesterol
C) Ammonia
D) Urea

Q.23 Blood leaving lungs after pulmonary circulation is rich in:
A) Oxygen
B) Carbon dioxide
C) Haemoglobin
D) Number of RBCs

Q.24 Which is phagocyte of blood?
A) Eosinophil
B) Basophil
C) Platelet
D) Neutrophil

Q.25 All of the following are related to blood clotting except:
A) Thrombin
B) Platelets
C) Fibrin
D) Immunoglobulin

Q.26 The group of proteins that comprises 7% of the plasma are:
A) Albumin, keratin, fibrinogen
B) Globulin, keratin, fibrinogen
C) Albumin, globulin, fibrinogen
D) Hemoglobin, keratin, fibrinogen

HUMAN HEART AND STRUCURE

Q.27 Chordae tendinae are extension of:
A) Heart
B) Auricles
C) Ventricles
D) Sinus venosus

Q.28 Which one has the thickest walls than the others?
A) Right atria
B) Right ventricle
C) Left atria
D) Left ventricle

Q.29 The nature of valves in the heart is:
A) Membranous
B) Tendinous
C) Muscular
D) Ligamentous

Q.30 Oxygenated blood is supplied to all body parts from:
A) Right atrium
B) Right ventricle
C) Left atrium
D) Left ventricle

Q.31 Mitral valve prevents the flow of blood from:
A) Right atrium to right ventricles
B) Right atrium to left atrium
C) Left atrium to left ventricles
D) Left ventricles to left atrium

Q.32 First artery that arises from the base of aorta:
A) Pulmonary artery
B) Renal artery
C) Coronary artery
D) Iliac arteries

Q.33 Terminal branches of arterial pathway in human is/are:
A) Aorta
B) Brachiocephalic artery
C) Coronary artery
D) Iliac arteries

Q.34 Only vein that is distributary in nature:
A) Aorta
B) Pulmonary trunk
C) Vena cava
D) Hepatic portal vein

Q.35 At start of ventricular contraction:
A) Bi and tricuspid valves are opened
B) Semilunar valves are closed
C) Bi and tricuspid valve are opened and semilunar valve are closed
D) Bi and tricuspid valves closed and semilunar valves are opened

Q.36 Ventricle depolarization is represented by:
A) P wave
B) T wave
C) QRS complex
D) PQRS complex

Q.37 There is a delay of _____ between atrial systole and ventricle systole.
A) 0.8 sec
B) 0.15 sec
C) 1.5 sec
D) 0.4 sec

Q.38 The most appropriate statement for atrial systole is:
A) A.V valves closed
B) A.V valves open
C) A.V valves open and semilunar valves closed
D) A.V valves closed and semilunar valves open

Q.39 At the end of ventricle contraction:
A) A.V valves open
B) Semilunar valves open
C) A.V valves open and semilunar valves are closed
D) Both A.V and semilunar valves are closed

Q.40 Lubb sound is produced when:
A) A.V valves open
B) A.V valves close
C) Semilunar valve close
D) Semilunar valve open

Q.41 Heart cycle is naturally initiated by:
A) S.A node
B) Battery
C) A.V node
D) Henson node

Q.42 Atrial depolarization is represented by:
A) P wave
B) T wave
C) QRS Complex
D) PQRS

Q.43 All events of cardiac cycle are completed in:
A) 0.8 sec
B) 0.15 sec
C) 0.3 sec
D) 0.4 sec

Q.44 Which of the following statement best describes the function of sinoatrial node?
A) It sends out electrical impulses to ventricular muscles causing both ventricles to contract
B) It is present at upper end of left atrium
C) It consists of small number of diffusely oriented cardiac fibres
D) It sends out electrical impulses to atrial muscles causing both atria to contract

Q.45 The portion of heart which is always ready to be the pacemaker if SA node stop working:
A) Bundle branch
B) Ventricle Muscles
C) AV node
D) Atrial Muscles

Q.46 Which valve allows blood to pass from heart to pulmonary artery?
A) Right Semi lunar valve
B) Left Semi lunar valve
C) Left AV valve
D) Right AV valve

Q.47 Myocardium of heart shows _____ characters.
A) Smooth and involuntary
B) Striated and involuntary
C) Smooth and voluntary
D) Striated and voluntary

Q.48 Ventricular systole requires about:
A) 1 sec
B) 0.1 sec
C) 0.8 sec
D) 0.3 sec

Q.49 The waves of ECG shows mainly:
A) Blood pressure
B) Mechanical Events
C) Electrical Events
D) Chemical Events

Q.50 The second heart sound is produced by:
A) Closure of AV valves
B) Closure of Semilunar valves
C) Opening of AV valves
D) Opening of Semilunar valves

Q.51 In humans, only _____ systemic arch is present.
A) Left
B) Right
C) Superior
D) Inferior

Q.52 The heart muscle is nourished by:
A) Chambers of the heart
B) Coronary artery
C) Right atrium
D) Left atrium

Q.53 Which one is continuation of iliac artery?
A) Renal Artery
B) Hepatic Artery
C) Femoral Artery
D) Intercostal Arteries

BLOOD VESSELS

Q.54 Which vein has oxygenated blood?
A) Renal vein
B) Subclavian vein
C) Pulmonary vein
D) Jugular vein

Q.55 In man, blood from alimentary canal to liver is transported by:
A) Hepatic portal vein
B) Pulmonary vein
C) Hepatic vein
D) Renal vein

Q.56 Arteriosclerosis is:
A) A metabolic disorder
B) An infectious disorder
C) A degenerative disorder
D) A genetic disorder

BLOOD PRESSURE AND RATE OF BLOOD FLOW

Q.57 The least blood pressure can be observed in:
A) Arteries
B) Veins
C) Capillaries
D) Vena cava

Q.58 _____ have maximum cross-sectional area compare to others.
A) Arteries
B) Veins
C) Capillaries
D) Vena cava

LYMPHATIC SYSTEM

Q.59 All are functions of lymphatic system except:
A) Transport fat
B) Blood filtration
C) Provide immunity
D) Filtration of urea

Q.60 Lymph is not present in:
A) Lacteal
B) Left thoracic lymphatic duct
C) Lymph node
D) Left subclavian vein

Q.61 Which one is more closely related to lymph?
A) CSF
B) Blood
C) Interstitial fluid
D) Urine

Q.62 Lymph nodes are drained by:
A) Single afferent vessel
B) Many afferent vessels
C) Single efferent vessel
D) Many efferent vessels

Q.63 Largest lymphoid mass is:
A) Thymus
B) Adenoid
C) Spleen
D) Tonsils

Q.64 Lymph flows in the lymph vessels due to:
A) Blood pressure
B) Presence of valve
C) Contraction and relaxation of heart
D) Gravity

Q.65 Flow of lymph is maintained by:
A) Skeletal muscles
B) Breathing movements
C) Visceral movements
D) All A, B, C

Q.66 Just as blood is filtered by spleen, the lymph is filtered by:
A) Spleen
B) Tonsils
C) Lymph nodes
D) Liver

Q.67 Lymph just before entering into subclavian vein always passes through:
A) Heart
B) Groin lymph nodes
C) Abdominal vessels
D) Thoracic lymphatic duct

Q.68 Return of lymph from lower leg is assisted by:
A) Lymph nodes
B) Calf muscles
C) Venous valves
D) Cytokines

Q.69 After taking too much fat, the lymph consists of how many fat globules?
A) 10%
B) 20%
C) 1%
D) 8%

UPTAKE AND TRANPORT OF MINERALS WATER

Q.70 Active transport is selective and is dependent upon:
A) Photosynthesis
B) Transportation
C) Respiration
D) Permeability

Q.71 The site/s where most of the uptake of water and minerals take place is/are:
A) Root hairs
B) Underground stem
C) Root cells
D) Leaves

Q.72 The roots bear a dense cluster of tiny hair like structures which are extensions of:
A) Mesodermal cells
B) Endodermal cells
C) Epidermal cells
D) Epithelial cells

Q.73 Apoplast pathway can take water and minerals up to:
A) Xylem
B) Endodermis
C) Cortex
D) Pericycle

Q.74 The membrane of vacuoles is known as:
A) Cisternae
B) Cristae
C) Tonoplast
D) Protoplast

Q.75 Transport of minerals from soil to epidermal cells of roots via carrier protein molecules along their concentration gradient is called:
A) Diffusion
B) Passive transport
C) Facilitated diffusion
D) Active transport

UPTAKE OF WATER BY ROOTS

Q.76 The pathway adopted by water in plants through adjacent cell walls is:
A) Apoplast pathway
B) Vacuolar pathway
C) Symplast pathway
D) Tonoplast pathway

Q.77 In plants, the neighboring cells are connected with one another by:
A) Plasmodesmata
B) Vacuoles
C) Cell walls
D) Casparian strips

Q.78 In the root cells_____ pathway becomes discontinuous in the endodermis due to the presence of casparian strip.
A) Tonoplast
B) Symplast
C) Apoplast
D) Vacuolar

ASCENT OF SAP

Q.79 Pulling upward of water and dissolved minerals towards the leaves through the xylem tissue is called:
A) Pressure flow
B) Ascent of sap
C) Root pressure
D) Imbibition

Q.80 It is the attraction among water molecules, which holds water together, forming a solid chain-like column within the xylem tubes:
A) Cohesion
B) Tension
C) Imbibition
D) Adhesion

Q.81 The tendency of dissimilar particles or surfaces to cling to one another is called:
A) Tension
B) Cohesion
C) Climbing
D) Adhesion

OSMOTIC PRESSURE

Q.82 The water potential of pure water is:
A) Zero
B) Infinity
C) One
D) Negative

Q.83 To attain maximum turgidity of a cell, it must be placed in:
A) Normal saline
B) Glucose solution
C) Distilled water
D) Away from sunlight

Q.84 In an _____ solution, solute and pressure potentials is equal to water potential?
A Hyperplasmonic
B) Hypertonic
C) Isotonic
D) Hypotonic

TRANSLOCATION OF ORGANIC SOLUTES

Q.85 The cells of phloem that conduct or transport sugars and other organic material throughout plant are called:
A) Tracheids
B) Companion cells
C) Sieve elements
D) Phloem parenchyma cells

Q.86 The main component of honey dew dry matter/phloem sap is:
A) Glucose
B) Starch
C) Maltose
D) Sucrose

Q.87 Sucrose moves actively from source to _____.
A) Sieve tube
B) Companion cell
C) Xylem
D) Mesophyll cells

Q.88 Transport of sugar from mesophyll cells to phloem tissue occur by all except:
A) Simple diffusion
B) Active transport
C) Carrier mediated transport
D) Osmosis

TRANSPIRATION AND FACTORS EFFECTING IT

Q.89 Cuticular transpiration is_____ of total transpiration.
A) 6-8%
B) 7-9%
C) 5-7%
D) 4-6%

Q.90 All plants do not possess:
A) Lenticels
B) Stomata
C) Cuticle
D) Chlorophyll

Q.91 Aerating openings formed in the bark through which exchange of gases takes place and water is lost in the form of vapours are:
A) Hydathodes
B) Lenticels
C) Stomata
D) Ostia

Q.92 Increase in the following causes, increase in rate of transpiration except:
A) Light intensity
B) Humidity
C) Temperature
D) Wind

Q.93 _____ provides the necessary energy or force for ascent of sap according to cohesion tension theory.
A) Cohesion
B) Transpiration
C) Adhesion
D) Imbibition

Q.94 Out of total water pulled upward, how much is used in various plant activities?
A) 1%
B) 25%
C) 10%
D) 99%

IMMUNE SYSTEM

Q.95 Common feature of cell humoral response and cell mediated response are:
A) Recognition of antigen
B) Production of antibodies
C) Tissue rejection
D) Plasma clone formation

Q.96 Tissue rejection is the function of which type of response?
A) Cell mediated
B) Cell signaling
C) Cell humoral
D) Cell to cell

Q.97 Vaccination against specific disease like tetanus is an example of:
A) Artificial active immunity
B) Artificial passive immunity
C) Natural active immunity
D) Natural passive immunity

Q.98 Antibodies are injected in:
A) Artificial active immunity
B) Artificial passive immunity
C) Natural active immunity
D) Natural passive immunity

Q.99 Antibodies consist of:
A) One Heavy chain only
B) Two heavy and two light chain only
C) Two heavy chains only
D) Two light chains only

Q.100 Antibodies are an example of _____ protein.
A) Fibrous
B) Catalytic
C) Globular
D) Regulatory

Q.101 Antigen binding sites are present on:
A) Constant region of heavy chain only
B) Constant region of light chain only
C) Variable region of both heavy and light chains
D) Constant region of both heavy and light chains

Q.102 Any foreign body that may activate immune system:
A) Antigen
B) Antibodies
C) Immunoglobulin
D) Plasmogen

Q.103 Immunity is the capacity of body for all except:
A) Recognize antigen
B) Increase antibodies production
C) Mobilize Lymphocytes
D) Mobilize hemoglobin

Q.104 Immunity is generally destroyed in:
A) All infections
B) All inflammations
C) HIV infection
D) All diseases

Q.105 Specific immunity is the result of:
A) 1st line of defense
B) 2nd line of defense
C) 3rd line of defense
D) 4th line of defense

Q.106 Phagocytosis usually involves:
A) 1st line of defense
B) 2nd line of defense
C) 3rd line of defense
D) 4th line of defense

Q.107 All are examples of 1st line of defense except:
A) Skin
B) Stomach HCl
C) Mucous
D) Antibodies

Q.108 Cyclosporine is used to inhibit which type of response?
A) Cell mediated
B) Cell signaling
C) Cell humoral
D) Cell to cell

Q.109 Type of immunity that is present by birth is called:
A) Innate immunity
B) Acquired immunity
C) Adaptive immunity
D) Secondary immunity

Q.110 Generally, vaccination provides:
A) Artificial active immunity
B) Artificial passive immunity
C) Natural active immunity
D) Natural passive immunity

Q.111 All are true about passive immunization except:
A) Antibodies are injected
B) Antitoxin are injected
C) Antisera are injected
D) Antibodies are produced

Q.112 Antibodies consist of:
A) One chain
B) Three chains
C) Two chains
D) Four chains

Q.113 Disulfide bridge is present between all except:
A) Heavy –Heavy chains
B) Heavy- light chain
C) Light and heavy chain
D) Light and light chain

Q.114 Vaccination is not available for which of the following disease:
A) Bacterial
B) Viral
C) Fungal
D) Microbial

Q.115 Stronger and specific immunity is found in:
A) All animals
B) Invertebrates only
C) Humans only
D) All vertebrates

Q.116 An antigen is:
A) Residue of antibody
B) Stimulus for antibody formation
C) Result of antibody
D) Opposite to an antibody

Q.117 A vaccine contains:
A) Antigens
B) Antibodies
C) Macrophages
D) All A, B, C

Q.118 Humoral immune response is generated by:
A) B lymphocytes
B) T lymphocytes
C) Basophils
D) Neutrophils

Q.119 B-lymphocytes originate in human from:
A) Blood cells
B) Bone marrow
C) Bursa of fabricious
D) Thymus

Q.120 Transplant rejection is:
A) Cell mediated response
B) Humoral response
C) Immune response
D) Auto immune response

Q.121 Injection of anti-venom serum after snake bite is an example of:
A) Active artificial immunization
B) Active natural immunization
C) Passive natural immunization
D) Passive artificial immunization

Q.122 Phagocytes generally come into action when:
A) 1st defense line is breached
B) Parasites enter the body
C) Infection is over
D) Lymphocytes fail

Q.123 Study of mechanisms of body defense is called:
A) Immunology
B) Serology
C) Teratology
D) Microbiology

Q.124 Which one which is not involved in immunity?
A) T-lymphocytes
B) Antibodies
C) B-lymphocytes
D) Myoglobin

Q.125 Immune system is an example of:
A) 1st line of defense
B) 2nd line of defense
C) 3rd line of defense
D) 4th line of defense

Q.126 Antibodies are involved in:
A) 1st line of defense
B) 2nd line of defense
C) 3rd line of defense
D) 4th line of defense

Q.127 All are components of immune system except:
A) T-lymphocytes
B) Antibodies
C) B-lymphocytes
D) Monocytes

PAST PAPER MCQs

2009

Q.1 Which of the following statement best describes the function of sinoatrial node?
A) It sends out electrical impulses to ventricles to contract
B) It is present at upper end of the left atrium
C) It consists of small number of diffusely oriented cardiac fibers
D) It sends out electrical impulses to atrial muscles causing both atria to contract

Q.2 Arteriosclerosis is:
A) A metabolic disorder
B) A degenerative disorder
C) An infectious disorder
D) A nutritional deficiency disorder

Q.3 Heparin prevents blood clots and is released by:
A) Eosinophils
B) Monocytes
C) Neutrophils
D) Basophils

2010

Q.4 Which one of the following statements best describes the function of sinoatrial node?
A) It sends out electrical impulses to atrial muscles causing both atria to contract
B) It consists of small number of diffusely oriented cardiac fibers
C) It sends out electrical impulses to ventricular muscles causing both ventricles to contract
D) It is present at upper end of left atrium

Q.5 Granulocytes or white blood cells are produced in:
A) Lymph nodes
B) Red bone marrow
C) Tonsils
D) Spleen

Q.6 The flow of lymph in lymphatic vessels is maintained by:
A) Heart, activity of smooth muscles and valves
B) Activity of skeletal muscles, heart and breathing movements
C) Breathing movements, activity of skeletal muscles and valves
D) Exercise, breathing movements and heart

2011

Q.7 The right atrium of the heart usually receives the:
A) Deoxygenated Blood
B) Oxygenated Blood
C) Filtered Blood
D) Non-Filtered Blood

Q.8 The type of agranulocytes which stays in blood for a few hours and then enters tissues and become macrophages are:
A) Lymphocytes
B) Monocytes
C) Eosinophils
D) Basophils

Q.9 Which protein plays a major role in maintaining osmotic balance?
A) Albumin
B) Globulin
C) Fibrinogen
D) Pro-thrombin

Q.10 The largest lymph duct called thoracic lymph duct drains into
A) Sub-clavian vein
B) Renal vein
C) Pulmonary vein
D) Hepatic portal vein

2012

Q.11 Which vein has oxygenated blood?
A) Renal vein
B) Sub-clavian vein
C) Pulmonary vein
D) Jugular vein

Q.12 Mature mammalian red blood cells do not have:
A) Nucleus
B) Red color
C) Fluids
D) Haemoglobin

Q.13 In a normal person plasma constitutes about _____ by volume of blood.
A) 50%
B) 60%
C) 45%
D) 55%

2013

Q.14 Right atrium is separated from right ventricle by:
A) Tricuspid valve
B) Bicuspid valve
C) Semilunar valve
D) Septum

Q.15 The average life span of red blood cell is about:
A) Four months
B) Two months
C) Five months
D) One month

Q.16 Antibodies are produced against invading cells by:
A) Lymphocytes
B) Monocytes
C) Basophils
D) Neutrophils

Q.17 The lymphatic vessels of the body empty the lymph into blood stream at the:
A) Abdominal vein
B) Sub-clavian vein
C) Jugular vein
D) Bile duct

2014

Q.18 The oxygenated blood from lungs to heart is transported by the:
A) Pulmonary artery
B) Coronary artery
C) Pulmonary vein
D) Hepatic artery

Q.19 Histamine is produced by which one of the following cells?
A) Basophils
B) Platelets
C) Monocytes
D) Eosinophils

Q.20 Which one of the following is the most numerous / commonest of white blood cells?
A) Eosinophils
B) Monocytes
C) Neutrophils
D) Lymphocytes

Q.21 Which one of the following proteins takes part in blood clotting?
A) Prothrombin
B) Fibrinogen
C) Immunoglobulin
D) Globulin

2015

Q.22 Right atrium is separated from right ventricle by:
A) Bicuspid Valve
B) Semilunar Valve
C) Tricuspid Valve
D) Interatrial Septum

Q.23 One complete heart beat consists of one systole and one diastole and lasts for about:
A) 0.8 sec
B) 0.2 sec
C) 0.4 sec
D) 0.5 sec

Q.24 The flaps of tricuspid valves are attached to muscular extensions of right ventricle known as:
A) Smooth Muscles
B) Papillary Muscles
C) Intercostal Muscles
D) Skeletal Muscles

Q.25 The heart beat cycle starts when electric impulses are generated from:
A) AV Node
B) SV Node
C) SA Node
D) PQ Node

Q.26 Granulocytes are:
A) Monocytes, Eosinophils, Basophils
B) Basophils, Macrophages, Neutrophils
C) Neutrophils, Eosinophils, Basophils
D) Monocytes, Macrophages, Basophils

2016

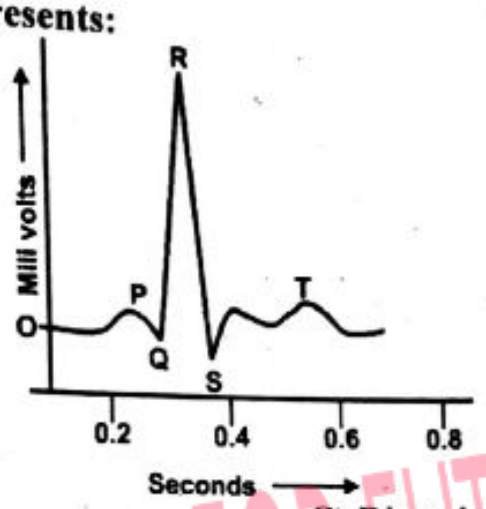
Q.27 In human the closed sac which surrounds the heart is:
A) Endocardium
B) Myocardium
C) Pericardium
D) Epicardium

Q.28 Chordae tendineae are the fibrous cords attached with:
A) Cardiac end of stomach valve
B) Tricuspid valve of heart
C) Pyloric sphincter of stomach
D) Eyelid

Q.29 Bicuspid valve controls the flow of blood from:
A) Right atrium to right ventricle
B) Right ventricle to pulmonary artery
C) Left ventricle to aorta
D) Left atrium to left ventricle

2017

Q.30 In ECG, QRS wave represents:



A) Ventricular systole
B) Atrial systole
C) Diastole
D) Recovery systole

Q.31 A type of blood cell that produces heparin is_____.
A) Basophils
B) Neutrophils
C) Eosinophils
D) Monocytes

Q.32 Thoracic lymph duct of the lymphatic system opens into_____.
A) Superior vena cava
B) Sub-clavian vein
C) Inferior vena cava
D) Renal vein

2017 Re-Take

Q.33 Bicuspid valve is present in which part of heart?
A) Right atrium and right ventricle
B) Right atrium and left ventricle
C) Left atrium and left ventricle
D) Left atrium and right ventricle

Q.34 Cardiac cycle lasts about:
A) 0.4 sec
B) 0.8 sec
C) 0.01 sec
D) 0.5 sec

Q.35 Which of the following is agranulocyte cell?
A) Neutrophil
B) Eosinophil
C) Basophil
D) Lymphocyte

Q.36 Percentage of protein in human blood is:
A) 1-2
B) 7-10
C) 7-9
D) 6-9

2018

Q.37 The thickest chamber of human heart is:
A) Left atrium
B) Left ventricle
C) Right atrium
D) Right ventricle

Q.38 Which one of the following act as a pacemaker in heart?
A) Atria ventricular node
B) Atria ventricular bundles of fibers
C) Sino-atrial nod
D) Bundle of His

Q.39 Which statement is correct about atrial systole?
A) Atria relax and ventricles contract
B) Atria contract and ventricle also contract
C) Atria and ventricles are relaxed
D) Ventricles remain relax while atria contract

Q.40 Which one of the following cells do not have nucleus?
A) Eosinophils
B) Platelets
C) Basophils
D) Neutrophils

2019

Q.41 Which of the following blood vessels contain semilunar valves?
A) Arteries
B) Veins
C) Arterioles
D) Capillaries

Q.42 The major function of basophils is to:
A) Destroy small particles by phagocytosis
B) Release heparin to prevent blood clotting
C) Inactivate inflammation producing substances
D) Transport oxygen

Q.43 Large lymph vessels ultimately form larger lymph duct, which drains its lymph into:
A) Carotid and Aorta
B) Sub-clavian artery
C) Sub-clavian Vein
D) Vena cava and Aorta

2020

Q.44 Regarding structure of human heart chordae tendinous are present in:
A) Atria
B) Pulmonary valve
C) Renal
D) Ventricle

Q.45 The only vein in the human body carrying oxygenated blood is:
A) Femoral
B) Pulmonary
C) Renal
D) Iliac

Q.46 The cells which play very important role in developing immunity are:
A) Monocytes
B) Neutrophils
C) Lymphocytes
D) Thrombocytes

Q.47 Which of the following blood vessels have the highest pressure of blood?
A) Aorta
B) Pulmonary arteries
C) Pulmonary veins
D) Vena cava

Q.48 Autoimmune diseases act at the principle of:
A) Self against antigens
B) Antigen against self
C) Self against self
D) Antigen self-destroyed

Q.49 In human heart the left atrium receives:
A) The superior vena cava
B) The inferior vena cava
C) The coronary sinus
D) The four pulmonary veins

Q.50 Antibodies are manufactured in:
A) T lymphocytes
B) Red blood cells
C) Platelets
D) B lymphocytes

TRANSPORT IN PLANTS

2008

Q.51 The attraction among water molecules which hold water together is called:
A) Tension
B) Adhesion
C) Cohesion
D) Imbibition

2019 Q.52 **Water and minerals move down their concentration gradient through plasmodesmata, to cells of cortex, endodermis, pericycle and then to sap in the xylem cells. This is also known as the:**
A) Symplastic pathway
B) Mineral absorption pathway
C) Vacuolar pathway
D) Apoplastic pathway

Q.53 **Four plants are present in different environmental conditions. Plant A is present in warm climate with continuous rainfall, plant B is present in a cool forest, plant C is present in warm climate with little breeze while plant D is present in warm climate high wind speed. Which one of the above plants will have highest rate of transpiration?**
A) Plant B
B) Plant D
C) Plant C
D) Plant A

Q.54 **In plants, which sugar is transported from source to sink through sieve tubes?**
A) Fructose
B) Sucrose
C) Glucose
D) Starch

Q.55 **Xerophytes have small thick leaves to:**
A) Help them float on water
B) Help them survive in salty environment
C) Limit water loss by reducing the surface area
D) Limit water loss by increasing the surface area

2020 Q.56 **In roots the apoplast pathway of water is disrupted when water reaches:**
A) Plasmodesmata
B) Endodermis
C) Cortex
D) Pith

IMMUNITY

2009 Q.57 **Tissue rejection is executed by:**
A) Both B and T lymphocytes
B) Monocytes
C) B-lymphocytes
D) T-lymphocytes

2011 Q.58 **Thymus gland is involved in maturation of:**
A) Platelets
B) B-Lymphocytes
C) Eosinophils
D) T-Lymphocytes

Q.59 **Mucous membranes are part of body defense system and they offer:**
A) Physical Barriers
B) Mechanical Barriers
C) Chemical Barriers
D) Biological Barriers

Q.60 **The immunity in which T-cells recognize the antigens or micro-organisms is known as:**
A) Tissue Grafting
B) Phagocytosis
C) Cell Mediated Immunity / Response
D) Hormonal Immunity / Response

Q.61 **In passive immunity which of the following component are injected into blood:**
A) Antigens
B) Immunogens
C) Serum
D) Immunoglobulins

Q.62 **Immediate protection is obtained from:**
A) Passive Immunity
B) Active Immunity
C) Vaccination
D) Natural Activity Immunity

2012 Q.63 **Antigen is a foreign protein or any other molecule which stimulates the formation of**
A) MC complex
B) Immunogen
C) Mucus
D) Antibodies

Q.64 Antibodies are produced by which of the following lymphocytes?
A) B lymphocytes
B) A lymphocytes
C) T lymphocytes
D) B and T lymphocytes

Q.65 T-lymphocytes become mature and competent under the influence of:
A) Liver
B) Bursa of fabricius
C) Thymus gland
D) Spleen

Q.66 Skin and mucous membranes are part of the body defense system and they form the
A) Physical barrier
B) Mechanical barriers
C) Chemical barriers
D) Biological barriers

Q.67 Snake bite is treated with which type of immunization?
A) Active
B) Passive
C) Humoral
D) Specific

2013

Q.68 Which part of the antibody recognizes the antigen during immune response?
A) Heavy part
B) Variable part
C) Light part
D) Consonant part

Q.69 Two identical light chains and two identical heavy chains in antibody molecule are linked by:
A) Disulphide bridges
B) Peptide bond
C) Glycerol bond
D) Ionic bond

Q.70 In the structural diagram of an antibody molecule which portion is occupied by variable chains?
A) Lower region
B) Upper region
C) Middle region
D) In between chains

Q.71 In passive immunity which of the following components are injected into body?
A) Antigens
B) Immunogens
C) Serum
D) Immunoglobulin

2014

Q.72 Which part of antibody recognizes the antigen during immune response?
A) Heavy part
B) Light part
C) Constant part
D) Variable part

Q.73 Which one of the following glands is involved in the production of lymphocytes?
A) Pineal
B) Pituitary
C) Thymus
D) Adrenal

Q.74 Antibodies are proteins and made up of how many polypeptide chains?
A) One
B) Two
C) Three
D) Four

Q.75 T-lymphocytes recognize antigen and attack microorganisms or transplanted organ and tissues. This effect is called:
A) Cell-mediated response
B) Humeral immune response
C) Active immunity
D) Passive immunity

Q.76 What type of immunity is achieved by injecting antibodies, antiserum, anti-venom serum?
A) Active immunity
B) Passive immunity
C) Artificially induced immunity
D) Naturally induced immunity

2015

Q.77 B-lymphocytes are named due to their relationship with:
A) Blood
B) Bursa of Fabricius
C) Bone Marrow
D) Bile Duct

Q.78 The lymph vessel of villi is called:
A) Epithelium
B) Afferent lymph vessel
C) Adrenals
D) Lacteal

Q.79 In _____ response, B-cells produce plasma cells that synthesize antibodies and release in blood plasma and tissue fluid.
A) Cell-Mediated
B) Hormonal
C) Humoral
D) Phototactic

Q.80 Response of body against the transplanted organ is:
A) Homeostatic Response
B) Behavioral Response
C) Primary Response
D) Cell-mediated Response

Q.81 Passive immunity is used against:
A) Malaria
B) Typhoid
C) Dengue
D) Tetanus

2016
Q.82 In antibody molecule, two heavy and two light chains are bonded by:
A) Disulphide Bond
B) Mono sulphide Bond
C) Hydrogen Bond
D) Ionic Bond

Q.83 Variable amino acid sequences in antibody molecule are found in _____.
A) Both light chains only
B) Both heavy chains only
C) One heavy and one light chain
D) Both heavy and light chains

Q.84 B-cells release antibodies in blood plasma, tissue fluid and lymph. This kind of immune response is called:
A) Cell Mediated Response
B) Humoral Response
C) Active Response
D) Compound Response

Q.85 The type of immunity in which antibodies are passed from one individual to another is called:
A) Passive Immunity
B) Artificial Active Immunity
C) Natural Active Immunity
D) Humoral Immunity

Q.86 To combat the active infections of tetanus, rabies and snakes the _____ method of immunization is used:
A) Active
B) Humoral
C) Active Artificial
D) Passive

2017
Q.87 How many polypeptide chains are present in a typical antibody structure?
A) 1
B) 2
C) 3
D) 4

Q.88 The antibody molecule consists of_____ polypeptide chains:
A) Eight
B) Four
C) Six
D) Two

Q.89 _____cells survive for a few days and secrete a huge no of antibodies in blood, tissue fluids or lymph.
A) Memory cells
B) B-lymphocytes
C) T-lymphocytes
D) Plasma cells

Q.90 The intermediate protection from infection of snake bite can be obtained by:
A) Active Immunity
B) Natural active immunity
C) Passive immunity
D) Vaccination

Q.91 Vaccination is:
A) Natural active immunity
B) Natural passive immunity
C) Artificial active immunity
D) Artificial passive immunity

2018
Q.92 In immunoglobulins/antibodies, two light chains and two heavy chains are linked to each other by?
A) Covalent bonds
B) Hydrogen bonds
C) Disulphide bonds
D) Ionic bonds

Q.93 Cell mediated immune response is given by:
A) Neutrophils
B) T lymphocytes
C) Macrophages
D) B lymphocytes

Q.94 Anti-venom given after a snake bite venom is an example of:
A) Artificial active immunity
B) Natural active immunity
C) Artificial passive immunity
D) Natural passive immunity

2019
Q.95 Now a days, every new born gets regular shots of vaccine for polio. It contains _____ for polio to make a child immune against this disease.
A) Antisera
B) Antibodies
C) Antibiotics
D) Antigens

Q.96 A person got an infection, he became ill but then he survived. What do you think which type of immunity he would have developed?
A) Naturally induced active immunity
B) Artificially induced active immunity
C) Active immunity
D) Passive immunity

ANSWER KEY

TOPIC-WISE MCQs

1	D	16	D	31	D	46	A	61	C	76	A	91	A	106	B	121	D
2	D	17	B	32	C	47	B	62	C	77	A	92	B	107	D	122	A
3	C	18	D	33	D	48	D	63	C	78	C	93	B	108	A	123	A
4	D	19	B	34	D	49	C	64	B	79	B	94	A	109	A	124	D
5	A	20	D	35	D	50	A	65	D	80	A	95	A	110	A	125	C
6	A	21	A	36	C	51	A	66	C	81	D	96	A	111	D	126	C
7	D	22	A	37	B	52	B	67	D	82	A	97	A	112	D	127	D
8	C	23	A	38	C	53	C	68	B	83	C	98	B	113	D		
9	D	24	D	39	D	54	C	69	A	84	C	99	B	114	C		
10	A	25	D	40	B	55	A	70	C	85	C	100	C	115	D		
11	D	26	C	41	A	56	D	71	A	86	D	101	C	116	B		
12	C	27	C	42	A	57	C	72	C	87	B	102	A	117	A		
13	C	28	D	43	A	58	C	73	B	88	D	103	D	118	A		
14	D	29	C	44	D	59	D	74	C	89	C	104	C	119	B		
15	B	30	D	45	C	60	D	75	C	90	A	105	C	120	A		

PAST PAPERS MCQs

1	D	11	C	21	B	31	A	41	B	51	C	61	D	71	D	81	D	91	C
2	B	12	A	22	C	32	B	42	B	52	A	62	A	72	D	82	A	92	C
3	D	13	D	23	A	33	C	43	C	53	B	63	D	73	C	83	D	93	B
4	A	14	A	24	B	34	B	44	D	54	B	64	A	74	D	84	B	94	C
5	B	15	A	25	C	35	D	45	B	55	C	65	C	75	B	85	A	95	D
6	C	16	A	26	C	36	C	46	C	56	B	66	A	76	B	86	D	96	A
7	A	17	B	27	C	37	B	47	A	57	D	67	B	77	B	87	D		
8	B	18	C	28	B	38	C	48	C	58	D	68	B	78	D	88	B		
9	A	19	A	29	D	39	D	49	D	59	A	69	A	79	C	89	D		
10	A	20	C	30	A	40	B	50	D	60	C	70	B	80	D	90	C		

EXPLANATORY NOTES

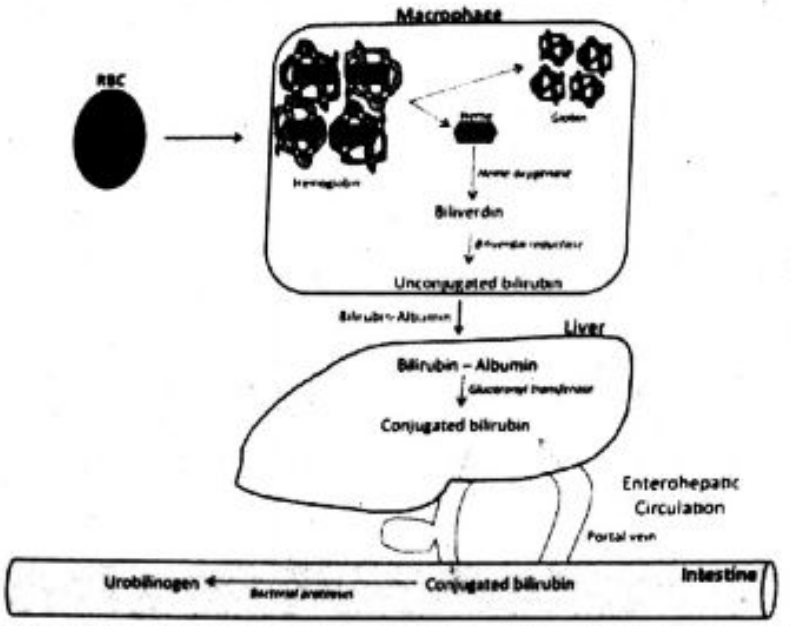
TOPIC-WISE MCQs

1. Myoglobin is muscle haemoglobin. It is responsible for oxygen storage in muscles.
2. Heparin acts as an anticoagulant, preventing the formation of clots and extension of existing clots within the blood.
3. Blood plasma is a yellowish colored liquid component of blood that normally holds the blood cells in whole blood in suspension. It makes up about 55% of the body's total blood volume.
4. The most important function of human erythrocytes is to transport respiratory gases within the body which is attributed due to the presence of haemoglobin.
5. In foetus, liver is also involved in the production of RBCs up to the age of 7 months.
6. To some extent, all the plasma proteins provide colloid osmotic pressure of the blood. Albumin, however, is the most abundant protein of blood plasma and play vital role in maintaining colloid osmotic pressure.
7. Average life-span of RBC's is about 120 days or 4 months, and after that they will be destroyed mainly in spleen.
8. The inorganic salts constitute up to 0.9% in plasma and 2/3rd is constituted by NaCl.
9. Monocytes are a type of a-granulocytes that stay from 10-20 hours in the blood, then enter tissues and become tissue macrophages, performing phagocytic function.
10. Antibodies are synthesized by the activated B-lymphocytes e.g. plasma clone cells.
11. Two systems are included under the heading of circulatory system; cardiovascular system and lymphatic system.
12. Plasma proteins that form 7-9% of blood plasma are albumin, globulin, prothrombin and immunoglobulin.
13. Serum is colored; it is plasma protein rich liquid which separates out when blood coagulates. Plasma without blood clotting proteins is termed as serum.
14. Prothrombin first change to thrombin by a clotting factor, it will convert fibrinogen to fibrin that will form blood clot.
15. Histamine is the inflammation producing substance synthesized and stored in basophils.
16. Albumin, fibrinogen and prothrombin are the plasma proteins synthesized by the liver while immunoglobulins are synthesized by the activated B-lymphocytes.
17.

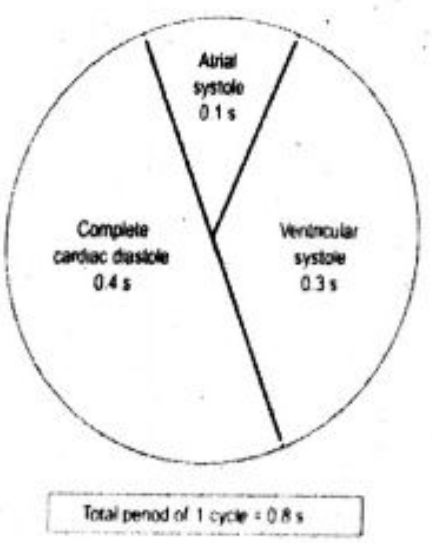
WBCs	Percentage
Neutrophils	62%
Lymphocytes	32%
Monocytes	3%
Eosinophils	2%
Basophils	<1%

18. Interferon's are a group of signaling proteins made and released by host cells in response to the presence of several pathogens, such as viruses, bacteria, parasites, and also tumor cells.
19. At embryonic stage three germ layers are form (ectoderm, endoderm and mesoderm) mesoderm will form circulatory system.

20. Unlike – most other equlcayatic cells, mature RBCS do not have nuclei when they enter the Blood stream for first time. They eject their nuclei and organelles. So they can carry more hemoglobin and oxygen
21. Leukemia is a blood disorder
22.



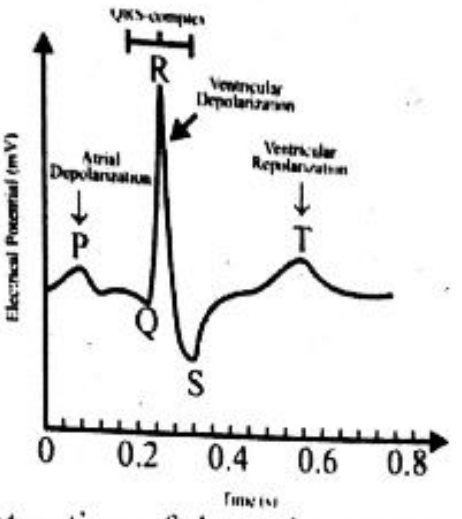
23. Deoxygenated blood from heart via pulmonary artery enter to lungs for oxygenation and return back through pulmonary vein to heart after carrying oxygen that contain oxygenated blood.
24. Neutrophils are the blood phagocytes because they involve in phagocytosis of small particles from blood.
25. Immunoglobulins are defense proteins.
26. Plasma proteins that form 7-9% of blood plasma are albumin, globulin, prothrombin and immunoglobulin.
27. These flaps are attached with fibrous cords called chordae tendinae, to the papillary muscles which are extensions of the wall of the ventricles.
28. The wall of left ventricle is thicker (3 times) than that of right ventricle
29. The nature of valves present in the heart is muscular and muscles ensure the unidirectional flow of blood in circulation.
30. The right ventricle pumps deoxygenated blood into the pulmonary circulation for oxygenation and the left ventricle pumps oxygenated blood into the systemic circulation through aorta.
31. Mitral valve is another name used for bicuspid valve and prevents the entry of blood from left ventricle to left atrium.
32. At the base of aorta, first pair of arteries, the coronary arteries arise and supply blood to heart.
33.



34. The hepatic portal vein is a vessel that moves blood from the spleen and gastrointestinal tract to the liver. It is approximately three to four inches in length and is usually formed by the merging of the superior mesenteric and splenic veins behind the upper edge of the head of the pancreas.

35. When ventricle contraction start, atrio-ventricular valve close to prevent back flow of blood and semilunar valve open to move blood out form heart.

36.



37. The lag time between the contraction of the atria and ventricles results from a delay of about 0.15 seconds, imposed on the conduction system at the atrio-ventricular node.

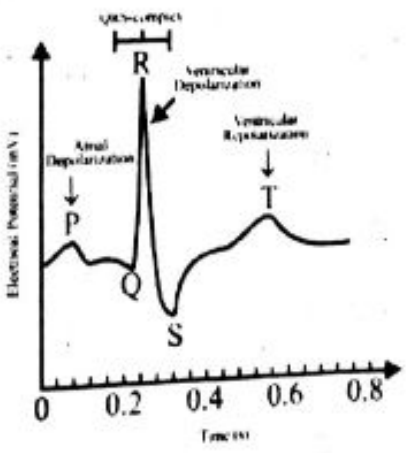
38. During atrial systole, the atrio-ventricular valves remain open while semi-lunar valves remain closed because the pressure gradient between the atrium and ventricle is preserved during late ventricular diastole.

39. At the end of ventricular systole, atrio-ventricular and semilunar valves are closed.

40. In healthy adults, there are two normal heart sounds, often described as a *lubb* and a *dubb*, that occur in sequence with each heartbeat. These are the first heart sound (S_1) and second heart sound (S_2), produced by the closing of the atrio-ventricular valves and semilunar valves, respectively.

41. The SA node is the heart's natural pacemaker. The SA node consists of a cluster of cells that are situated in the upper part of the wall of the right atrium.

42.



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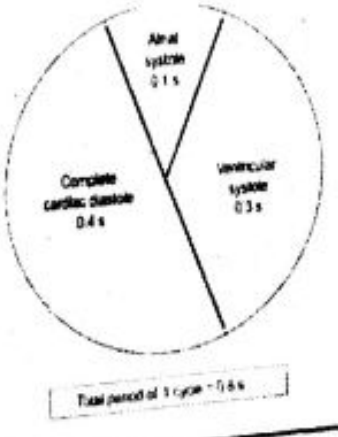
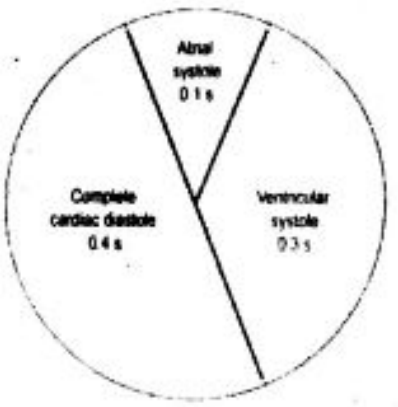
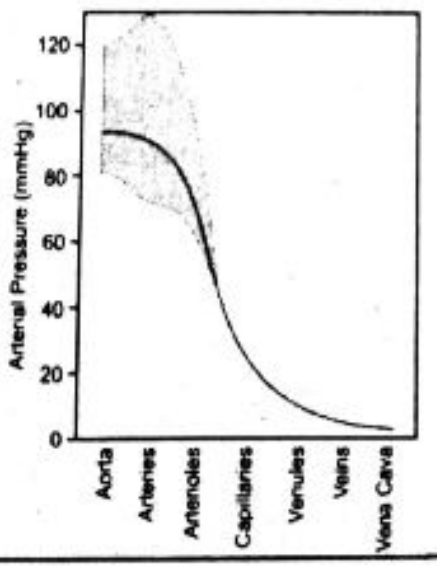


44. The main role of a sinoatrial node is to initiate action potentials, which spread throughout the heart and cause contraction.
45. The atrioventricular node or AV node is a part of the electrical conduction system of the heart that coordinates the top of the heart. It electrically connects the atria and ventricles.
46. On ventricular contraction blood from right ventricle is pumped into pulmonary trunk and from left ventricle blood is pumped into aorta. To prevent backflow of blood into ventricles there are semilunar valves at the base of aorta and pulmonary trunk.
47. Myocardium of heart has striations which show similarity with skeletal muscles but cardiac muscles are involuntary in action.
48.



Total period of 1 cycle = 0.8 s

49. ECG is a test to check electrical events of heart that determined by the electrodes placing on body.
50. During ventricle contraction two heart sounds produce, 1st sound is "Lub" produce when AV-valves close while the 2nd heart sound is "Dub" which produce when semilunar valves close
51. In humans, only left systemic arch is present.
52. First artery that arises from base of aorta is coronary artery which supplies oxygenated blood to the heart.
53. Descending aorta is bifurcated into two iliac arteries which on further division form femoral artery that supply blood to thigh muscles of legs.
54. The pulmonary vein carries oxygenated blood from the lungs to the left atrium.
55. The hepatic portal vein is a vessel that moves blood from the spleen and gastrointestinal tract to the liver. It is approximately three to four inches in length and is usually formed by the merging of the superior mesenteric and splenic veins behind the upper edge of the head of the pancreas.
56. Arteriosclerosis is a degenerative disorder which is the result of continuous process based on degenerative cellular changes affecting tissues or organs, and will increasingly deteriorate over time.
57.



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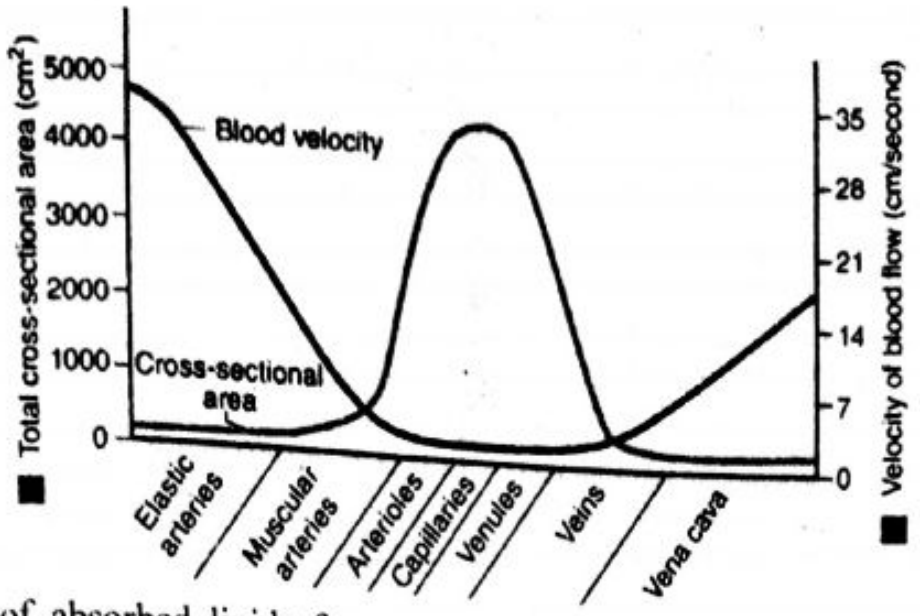


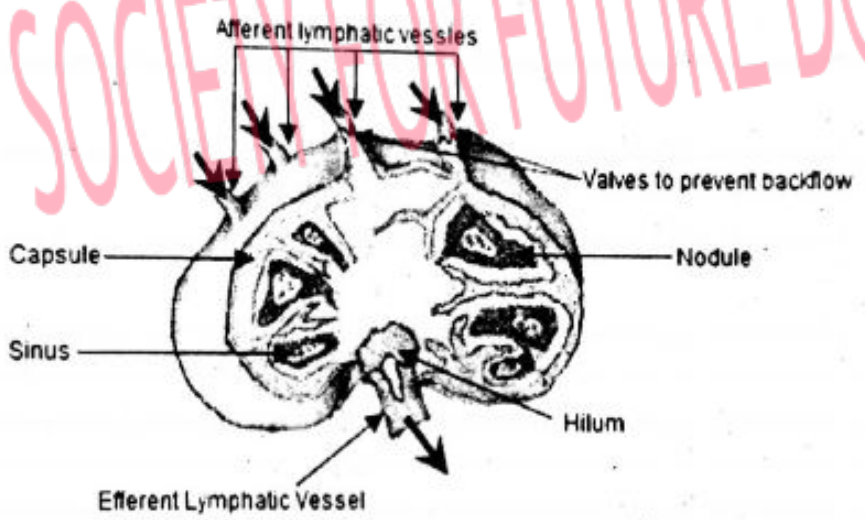
59. Transportation of absorbed lipids from small intestine, filtration of blood by spleen and immunity are related to the lymphatic system while filtration of urea is the function of kidneys.

60. Lymph is extra cellular fluid present in lymph vessels. Subclavian vein is a part of blood circulatory system.

61. The lymph is formed when the interstitial fluid (the fluid which lies in the interstices of all body tissues) is collected through lymph capillaries.

62.

Lymph Node Structure



63. The largest lymphoid structure present in the human body is spleen while thymus, adenoid and tonsils are relatively small structures.

64. Blood pressure, cardiac contraction and relaxation and gravity do not assist the flow of lymph in the body, while semilunar valves can assist in the flow of lymph.

65. Lymph flow from body parts assisted by the movement of viscera, breathing movement and skeletal muscles.

66. Lymph nodes are important for the proper functioning of the immune system, acting as filters for foreign particles and cancer cells. Lymph nodes do not have a detoxification function, which is primarily dealt by liver.

67. The thoracic duct is the largest lymphatic vessel within the human body. Lymph before entering into the blood passes through lymphatic duct.

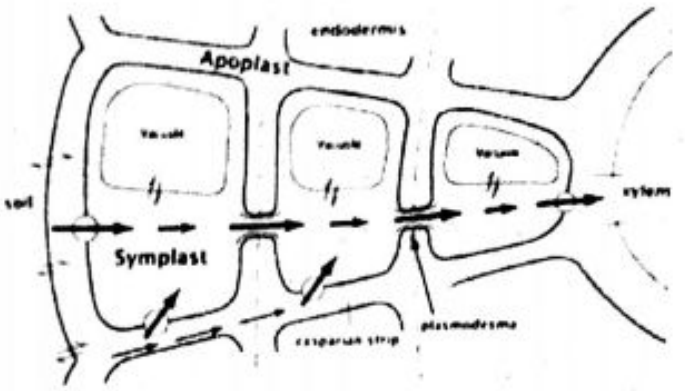
68. Lymph movement control by the contraction of skeletal muscles, the calf muscles are skeletal muscles in lower limbs that will assist the movement of lymph.

69. After some fatty meal fat globules will form 1% of lymph that return to blood.

70. Active transport is the uphill movement of material by using energy in the form of ATP, which synthesize by the process of cellular respiration.

71. A root hair or the rhizoid of a vascular plant, these are hairs-forming cell on the epidermis of a plant root. As they are lateral extensions of a single cell and only rarely branched, they are visible to the naked eye and developed in maturation region of roots.

72.



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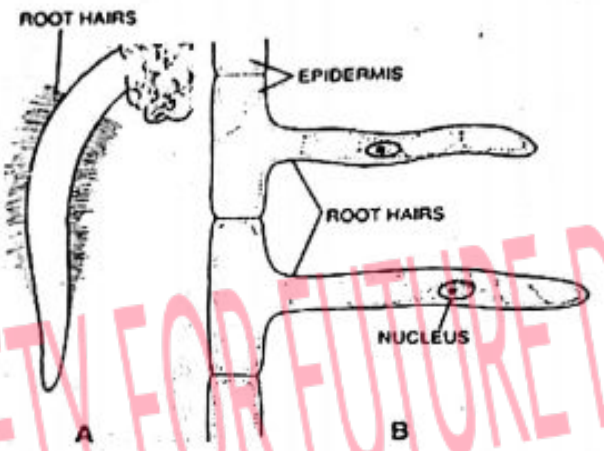


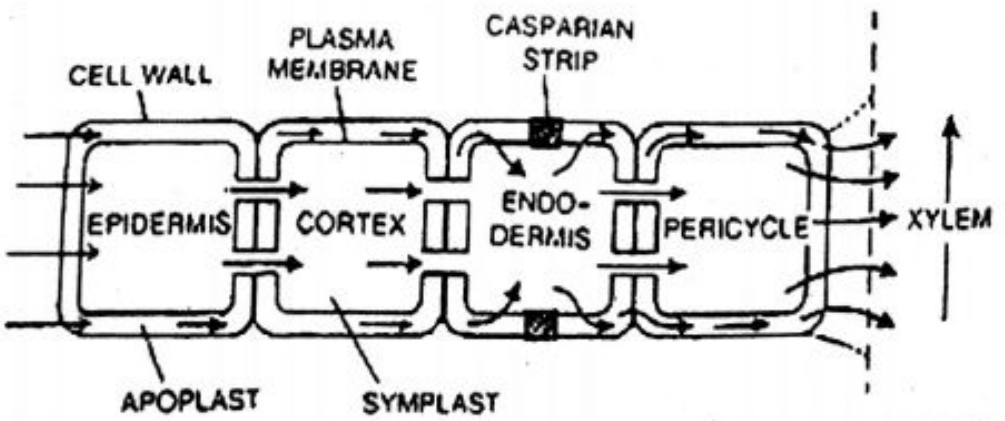
...ot hair. A. young seedling of radish with root hairs developing acropetally; B. highly magnified mature root hairs with vacuolated cytoplasm.

74. A vacuole is a membrane-bound organelle (tonoplast). They are a kind of vesicle. Vacuoles are closed sacs, made of membranes with inorganic or organic molecules inside, such as enzymes. Protoplast is cell without cell wall. Cisternae are the structure present in endoplasmic reticulum, while cristae are the inholdings of inner mitochondrial membrane.

75. Facilitated diffusion is the transport of substances across a biological membrane from an area of higher concentration to an area of lower concentration with the help of a transport molecule.

76. The point at which the protoplast is just pulled away from the cell wall at corners is called as incipient plasmolysis. When protoplast is completely detached from the cell wall, it is called as evident plasmolysis. When cytoplasm is found at the center of the cell, it is called as final plasmolysis.

77.



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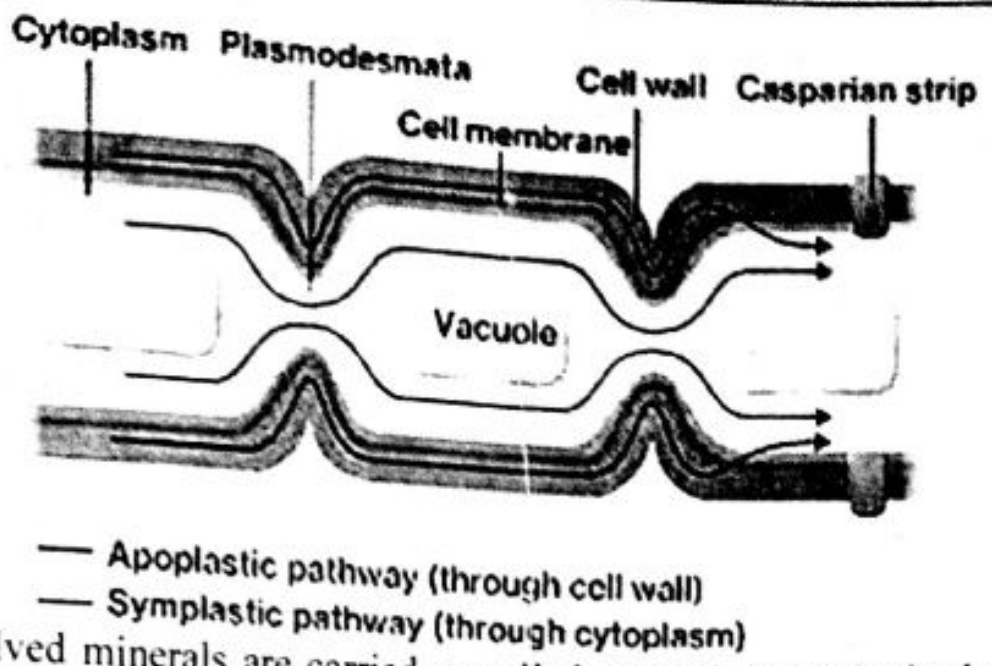
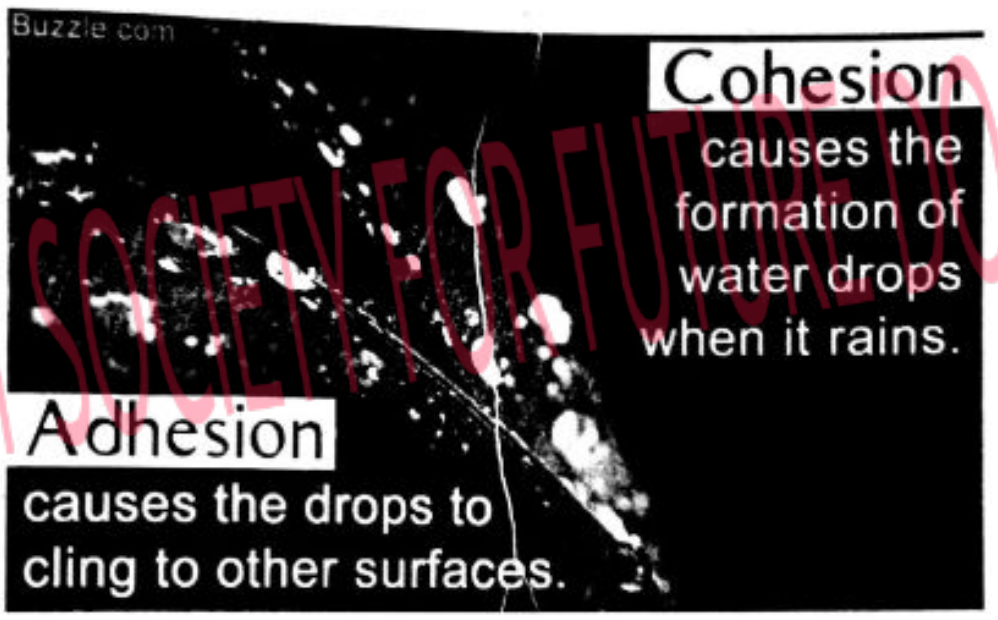
78.

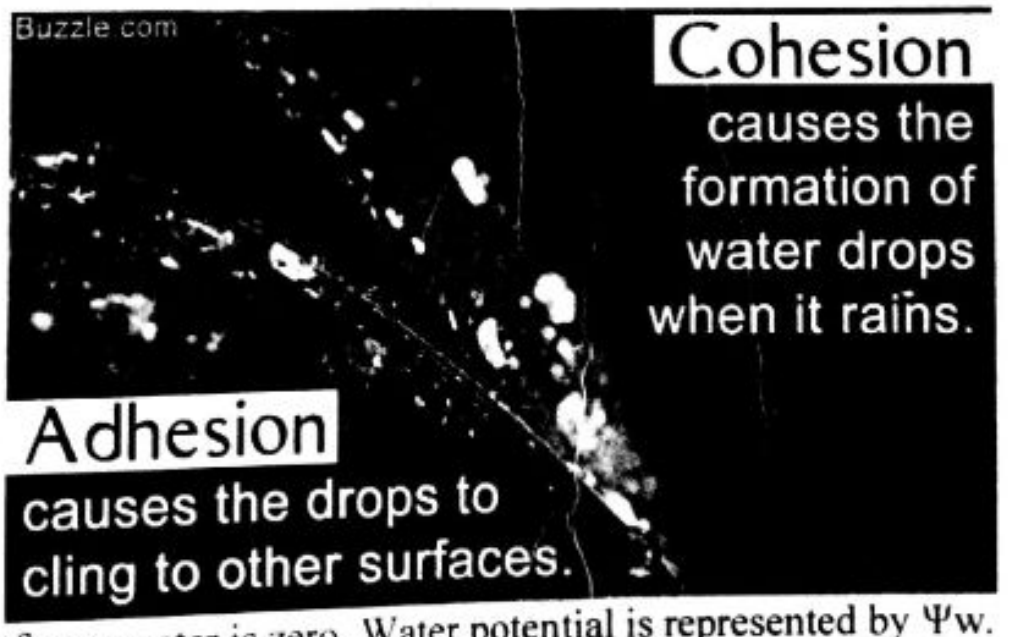


79. Water and dissolved minerals are carried or pulled upwards towards the leaves through xylem tissue. This is called ascent of sap. This may involve the following mechanisms; root pressure, cohesion tension theory and imbibition.

80.



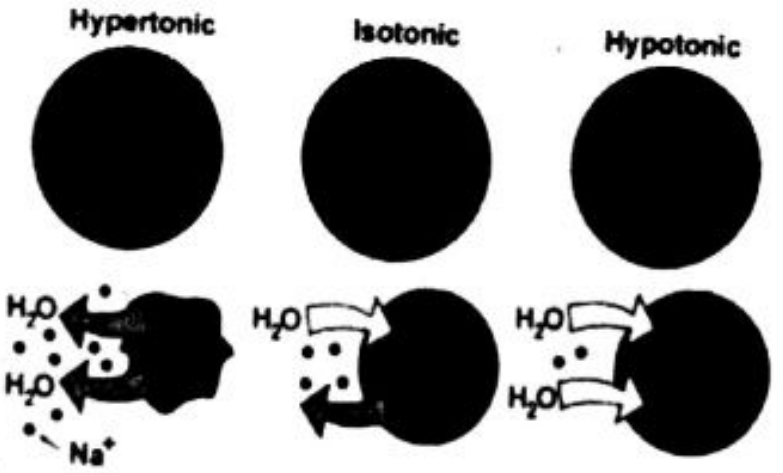
81.



82. Water potential of pure water is zero. Water potential is represented by Ψw.

83. For maximum pressure potential a cell placed in pure water or distilled water due to entry of water inside the cell.

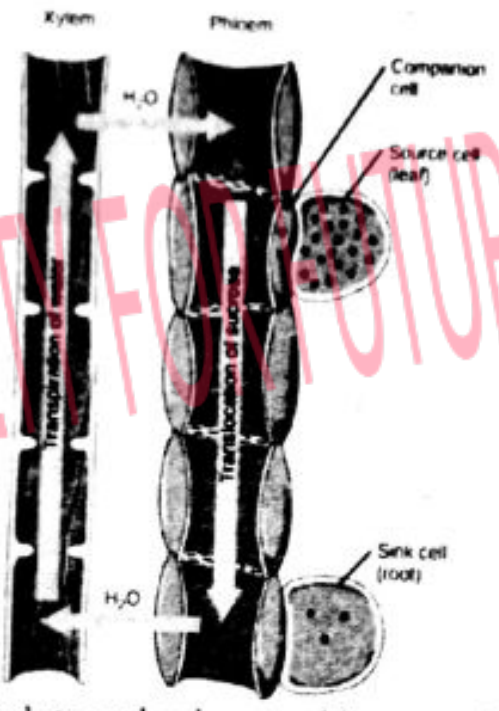
84.



85. Sieve elements are thin-walled cells that are alive at maturity, although the protoplast is greatly changed, and they generally lack nuclei. Sieve elements are elongated and function as the basic photosynthate-conducting cell type in the phloem of vascular plants.

86. Composite of honey dew drop is 10-25% dry mater, 90% or more of it is made by sucrose and nitrogenous compounds are 1%.

87.



88. Diffusion is the movement of solute and solvent, while osmosis is the movement of only solvent molecules from higher concentration to lower concentration.

89. Transpiration is the loss of water from aerial parts of plants in the form of vapours. Out of total water absorbed by plants 1% use for photosynthesis, while 5-7% water loss by cuticular transpiration, 1-2% by lenticular transpiration and remaining by stomatal transpiration.

90. Lenticels are one of many raised pores in the stem of a woody plant that allows gas exchange between the atmosphere and the internal tissues.

91. Lenticels are one of many raised pores in the stem of a woody plant that allows gas exchange between the atmosphere and the internal tissues.

92. Rate of transpiration is directly proportional to light, temperature and wind, while it is inversely proportional to humidity in air.

93. More the rate of transpiration more will be the minerals and water absorption from the soil. Transpiration provides necessary force for ascent of sap. Sap movement is accomplished through cohesion (attraction between water molecules), adhesion (the attachment of water molecules to surface of xylem).

94. Out of total water absorbed by plants, only 1% water use for photosynthesis, while 99% of water transpire from plants surface in the form of vapours.

95. Recognition of antigen is important in both types of responses. However, tissue rejection is a cell mediated response, on the other hand production of antibodies and plasma clone formation is achieved by cell humoral response.

96. Transplant rejection occurs when transplanted tissue is rejected by the recipient's cell mediated response, which destroys the transplanted tissue. Transplant rejection can be lessened by determining the molecular similarity between donor and recipient and by use of immunosuppressant drugs after transplant.

97. Tetanus vaccine, also known as tetanus toxoid, is an inactive vaccine used to prevent tetanus. It is considered as artificial active immunity.

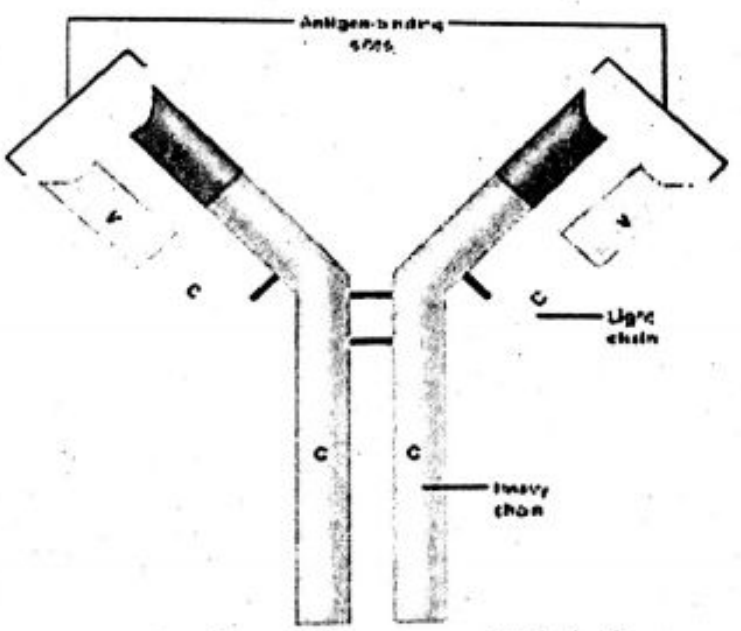
98. Passive immunity can occur naturally, when maternal antibodies are transferred to the fetus through the placenta and it can also be induced artificially, when high levels of antibodies specific to a pathogen or toxin (obtained from humans, horses, or other animals) are injected to affected person.

99.

Two light and two heavy chains are visible in given diagram.

100. An antibody (Ab), also known as an immunoglobulin (Ig), is a large, Y-shaped globular protein produced mainly by plasma cells that is used by the immune system to phagocytose the antigens or neutralize their toxins.

101. As we can see antigen binding sites are present on variable region of both heavy and light chains



102. Antigen is a toxin or other foreign substance which induces an immune response in the body, especially the production of antibodies.

103. Hemoglobin mobilization is the function of blood and heart that comes under circulatory system.

104. HIV is dangerous because the virus destroys the cells of *immune* system. HIV replicates within helper T lymphocytes and destroys them.

105. Specific immunity is the result of 3rd line of defense which includes lymphocytes.

106. Phagocytes are type of cell within the body capable of engulfing and absorbing bacteria and other small cells or particles. These are neutrophils and monocytes that form 2nd line of defense.

107. Skin, HCl and mucous are examples of barriers which constitute 1st line of defense while antibodies produced by lymphocytes which belongs to 3rd line of defense.

108. Cyclosporine is used to prevent organ rejection (cell mediated) in people who have received a liver, kidney, or heart transplant. It is usually taken along with other medications to allow your new organ to function normally. Cyclosporine belongs to a class of drugs known as immuno-suppressants.

109. The innate immunity, also known as the non-specific immunity or in-born immunity, is an important subsystem of the overall immune system that comprises the cells and mechanisms that defend the host from infection by other organisms.

110. Artificially acquired active immunity can be induced by a vaccine, (a substance that contains antigen). A vaccine stimulates a primary response against the antigen without causing symptoms of the disease.

111. In passive immunization we inject antibodies in the body; body does not make its own antibodies.

112. **And 113**

114. Vaccines have been prepared against different types of bacterial and viral infections, but there is not any vaccine against fungus still discovered.

115. For immunity purpose antibodies or immunoglobulin are produced by all vertebrates which protect them against pathogens.

116. Any foreign substance which induce an immune response in the body of organism especially by producing antibodies.

117. Vaccine is prepared by using a microorganism that shows association to disease. Antigen use to prepare vaccine may be weakened or killed. It will provide active acquired immunity against a particular disease.

118. In humoral immune response B-lymphocytes proliferate and form plasma clone cell and memory cells. Plasma clone cells produce antibodies which phagocytose an antigen or neutralize toxins produced by pathogens.

119. B-lymphocytes are cells of immune system that produced from bone marrow in human but in case of birds they are originated from Bursa of Fabricius which is a lymphoid mass.

120. Cell mediated immune response is a type of response in which antibodies does not involve. This type of immune response is actually due to involvement of T-lymphocytes and produce different types of chemical substance (cytokines) in response to antigen.

121. Anti-venom serum is actually antisera, containing antibodies against specific type of antigens. These antibodies are injected to body after antigen entry, for immediate action. This type of immunity is called artificial passive immunity.

122. Antigen entry to body restricted first by physical or chemical barrier, if barrier unable for this then 2nd line of defense (phagocytes) will activate to remove them.

123. Process of body that provide resistance to infectious agents or toxins is called immune system, while the study of body defense mechanism is called immunology.

124. Myoglobin is actually muscles haemoglobin use for oxygen storage and transformation to muscles. It has no role in immunity.

125. Immune system comprises of B & T –lymphocytes that provide immunity by producing antibodies or different types of other chemical substances that will form 3rd line of defense.

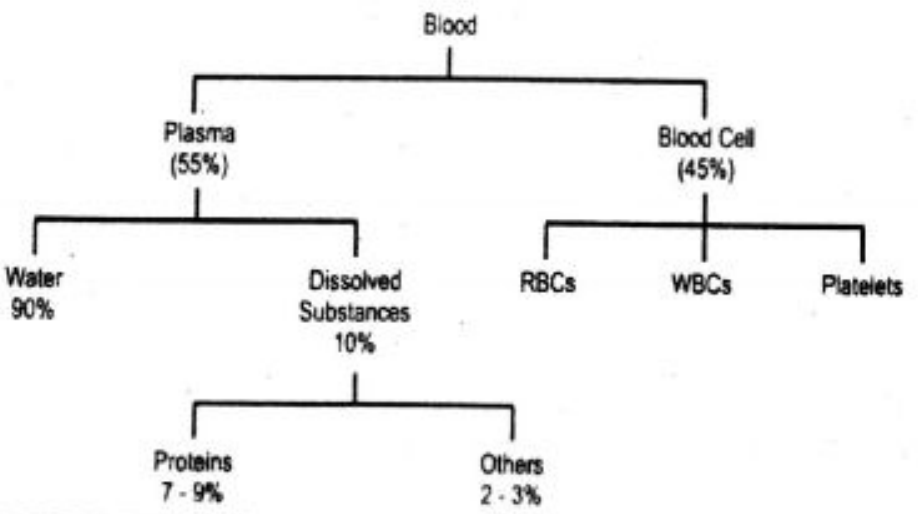
126. Immune system comprises of B & T –lymphocytes that provide immunity by producing antibodies or different types of other chemical substances that will form 3rd line of defense.

127. Immune system comprises of 3rd line of defense that form by lymphocytes, and it is specific type of immunity because against specific antigen specific antibodies are produce by lymphocytes. Monocytes are included in 2nd line of defense, which produce nonspecific immune response.

PAST PAPERS MCQs

1. The main role of a sinoatrial node is to initiate action potentials, which spread throughout the heart and cause contraction.
2. Arteriosclerosis is a degenerative disorder which is the result of continuous process based on degenerative cellular changes affecting tissues or organs, and will increasingly deteriorate over time.
3. Heparin acts as an anticoagulant, preventing the formation of clots and extension of existing clots within the blood.
4. The main role of a sinoatrial node is to initiate action potentials, which spread throughout the heart and cause contraction.
5.

6. Lymph flow from body parts assisted by the movement of viscera, breathing movement and skeletal muscles.
7. Deoxygenated blood from body via superior and inferior vena cava is poured into right atrium.
8. Monocytes are a type of agranulocytes that stay from 10-20 hours in the blood, then enter tissues and become tissue macrophages, performing phagocytic function.
9. To some extent, all the plasma proteins provide colloid osmotic pressure of the blood. Albumin, however, is the most abundant protein of blood plasma and play vital role in maintaining colloid osmotic pressure.
10. The thoracic duct is the largest lymphatic vessel within the human body. Lymph before entering into the blood passes through lymphatic duct.
11. The pulmonary vein carries oxygenated blood from the lungs to the left atrium.
12. When red blood cells (erythrocytes) are produced in the bone marrow, they initially do contain a nucleus. In maturation the cell will extrude its nucleus, a process called enucleation.
13.



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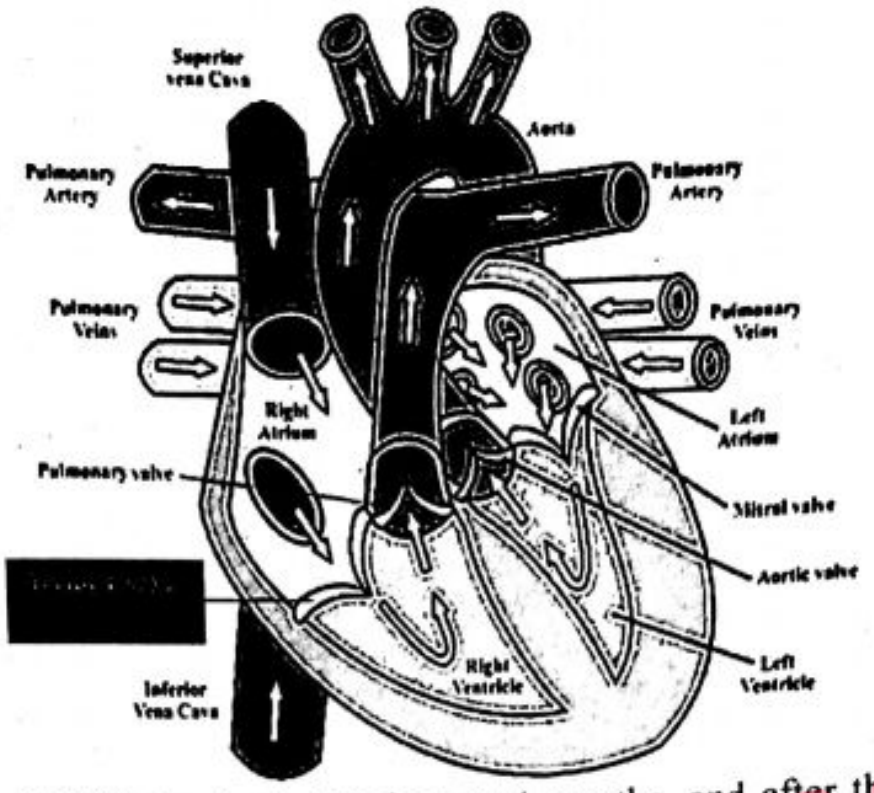
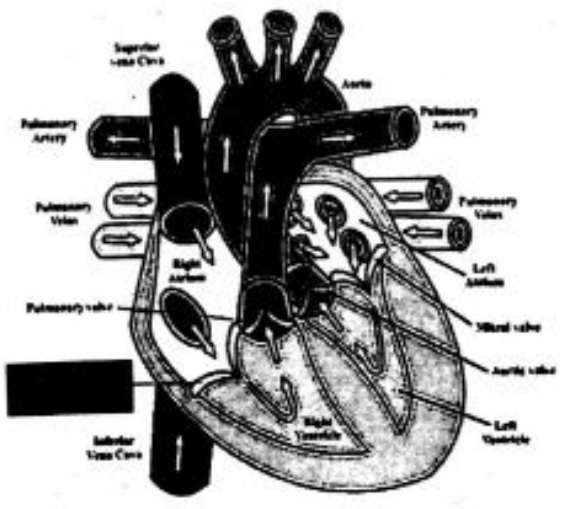


15. Average life-span of RBC's is about 120 days or 4 months, and after that they will be destroyed mainly in spleen.
16. Antibodies are synthesized by the activated B-lymphocytes e.g. plasma clone cells.
17. The thoracic duct is the largest lymphatic vessel within the human body. Lymph enters into left subclavian vein through thoracic duct.
18. The pulmonary vein carries oxygenated blood from the lungs to the left atrium.
19. Histamine is the inflammation producing substance synthesized and stored in basophils.
20.

WBCs	Percentage
Neutrophils	62%
Lymphocytes	32%
Monocytes	3%
Eosinophils	2%
Basophils	<1%

21. Thrombin acts as a catalyst in blood clotting process. Fibrinogen takes part in blood clotting process.
22.



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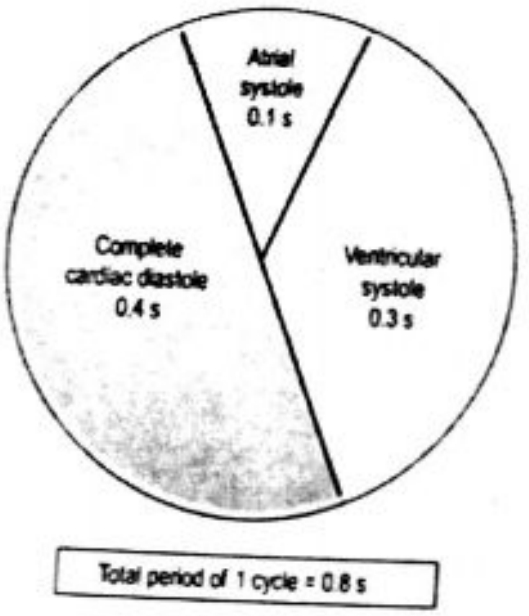
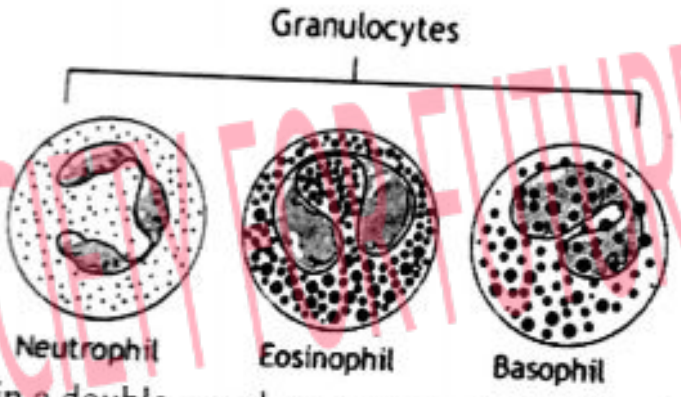


24. These flaps of heart valves are attached with fibrous cords called chordae tendinae, to the papillary muscles which are extensions of the wall of the ventricles.

25. The SA node is the heart's natural pacemaker. The SA node consists of a cluster of cells that are situated in the upper part of the wall of the right atrium.

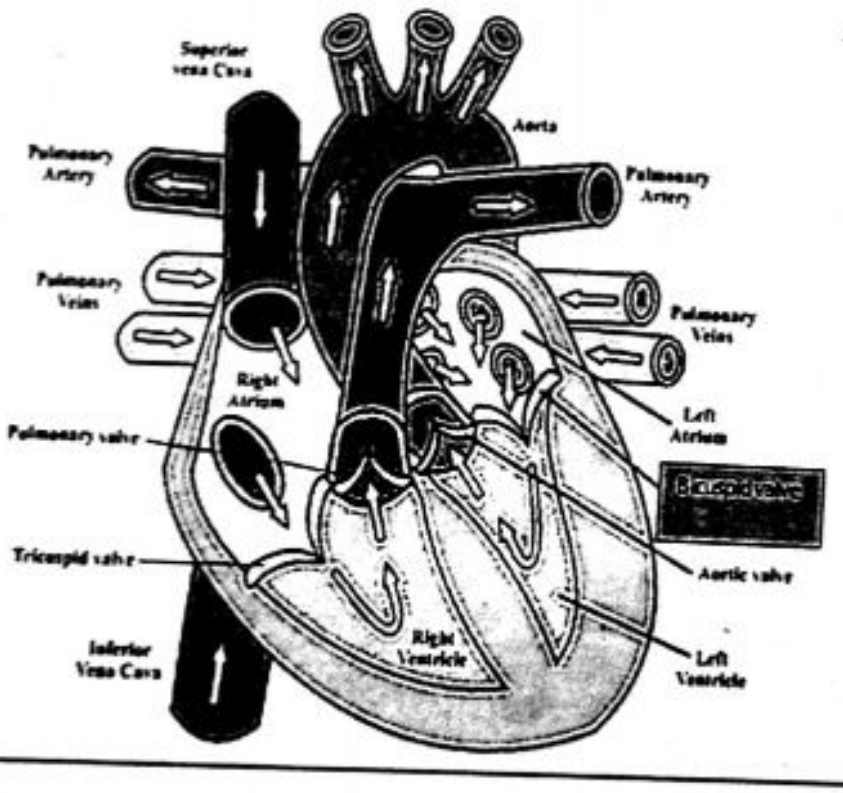
26.



27. The heart is enclosed in a double membranous sac – the pericardial cavity, which contains the pericardial fluid.

28. These flaps of heart valves are attached with fibrous cords called chordae tendinae, to the papillary muscles which are extensions of the wall of the ventricles.

29.



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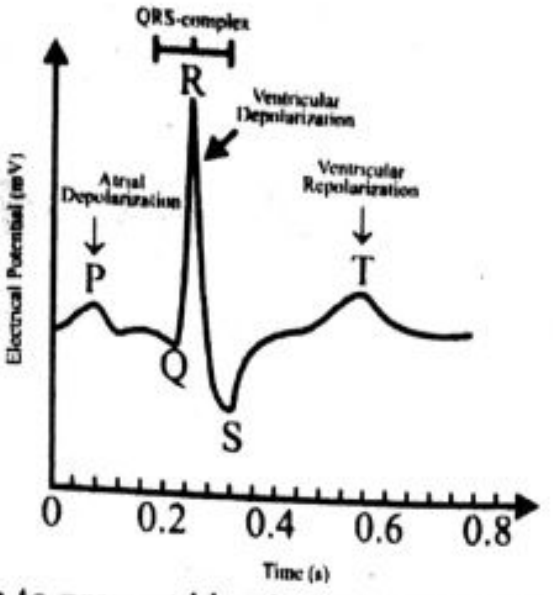
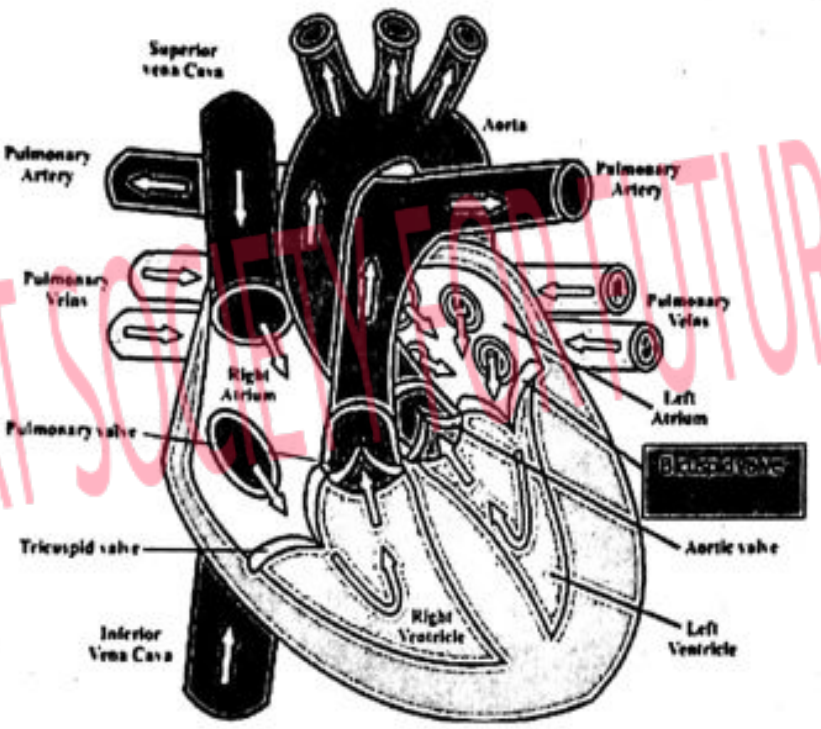


31. Basophil release heparin to prevent blood clots and histamine to cause inflammation.

32. The thoracic duct is the largest lymphatic vessel within the human body. Lymph enters into left sub-clavian vein through thoracic duct.

33.



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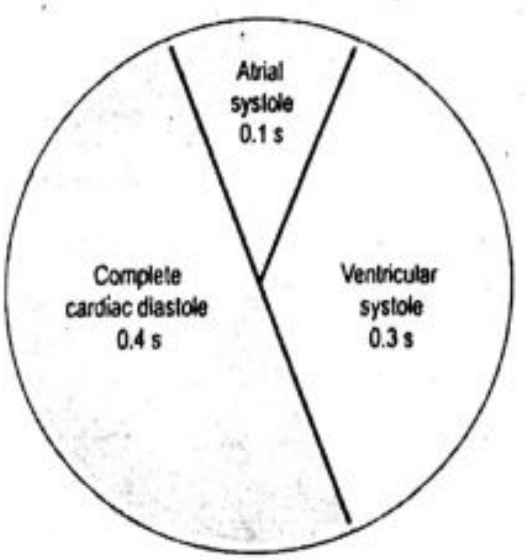
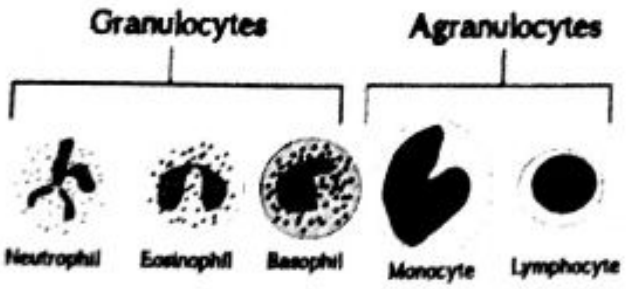


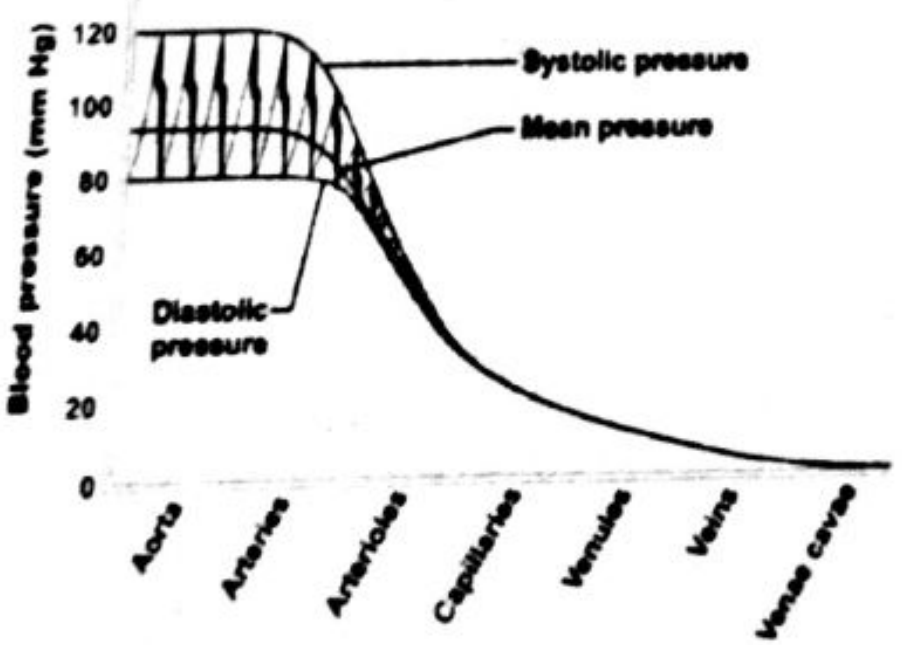
Total period of 1 cycle = 0.8 s

35.



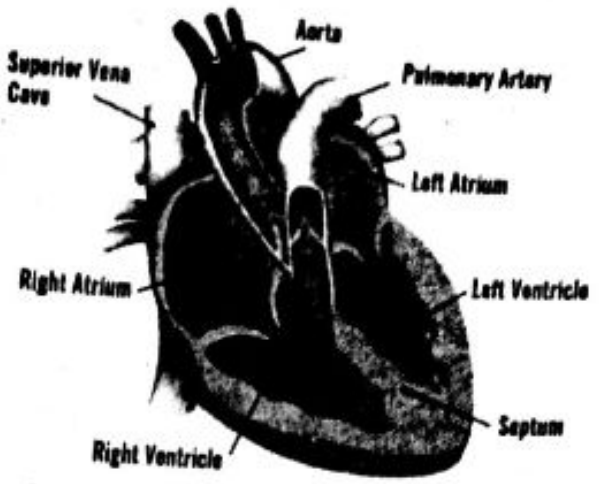
36. Plasma proteins that form 7-9% of blood plasma are albumin, globulin, prothrombin and immunoglobulin.
37. The wall of left ventricle is thicker (3 times) than that of right ventricle.
38. The SA node is the heart's natural pacemaker. The SA node consists of a cluster of cells that are situated in the upper part of the wall of the right atrium.
39. During atrial systole following event occur:
    - AV valves open
    - SL valves closed
    - Muscles of atria contract and pump blood to ventricles
    - Ventricles are relaxed and receive blood from atria.
40. Platelets are not cells, have no nucleus and membrane bounded Cytoplasmic fragments of large cells called megakaryocytes.
41. Semilunar valves are present in veins to prevent back flow of blood.
42. Basophil release heparin to prevent blood clots and histamine to cause inflammation.
43. The thoracic duct is the largest lymphatic vessel within the human body. Lymph enters into left sub-clavian vein through thoracic duct.
44. The chordae tendineae (tendinous cords), colloquially known as the heart strings, are tendon-resembling fibrous cords of connective tissue that connect the papillary muscles to the tricuspid valve and the mitral valve in the heart.
45. Pulmonary vein carries oxygenated blood from lungs to left atrium of heart.
46. Lymphocytes are white blood cells that are also one of the body's main types of immune cells. They are made in the bone marrow and found in the blood and lymph tissue. The immune system is a complex network of cells known as immune cells that include lymphocytes.

47.



48. An autoimmune disease is a condition in which your immune system mistakenly attacks your body. The immune system normally guards against germs like bacteria and viruses. When it senses these foreign invaders, it sends out an army of fighter cells to attack them.

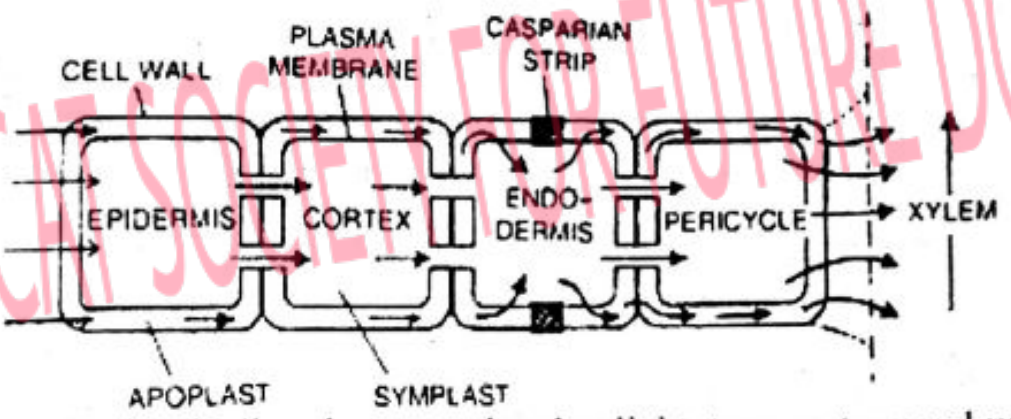
49.



50. B cells differentiate into plasma cells that produce antibody molecules closely modeled after the receptors of the precursor B cell. Once released into the blood and lymph, these antibody molecules bind to the target antigen (foreign substance) and initiate its neutralization or destruction.

51. Cohesion or cohesive attraction or cohesive force is the action or property of like molecules sticking together, being mutually attractive.

52.

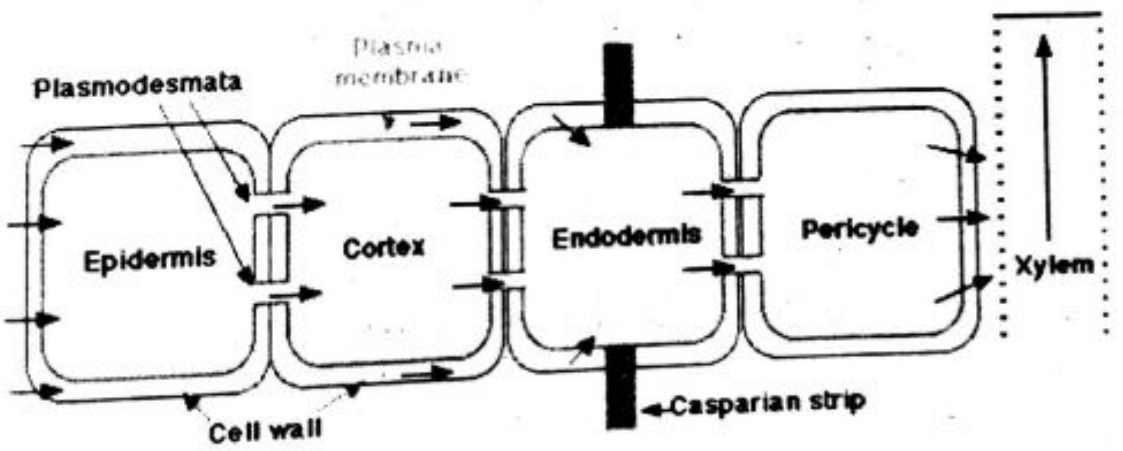


53. Rate of transpiration is directly proportional to light, temperature and wind, while it is inversely proportional to humidity in air.

54. Plants use carbohydrates to meet their respiratory activity and rest are transported in the form of sucrose.

55. Xerophytes face extreme scarcity of water so they are adapted to prevent water shortage by reducing transpiration. During driest conditions, they shed their leaves to reduce rate of transpiration.

56.



57. Transplant rejection occurs when transplanted tissue is rejected by the recipient's immune system, which destroys the transplanted tissue. Transplant rejection can be lessened by determining the molecular similitude between donor and recipient and by use of immunosuppressant drugs after transplant.

58. The thymus is a specialized primary lymphoid organ of the immune system. Within the thymus, thymus cell lymphocytes or T cells mature. T cells are critical to the adaptive immune system, where the body adapts specifically to foreign invaders.

59. The skin, mucous membranes, and endothelia throughout the body serve as physical barriers that prevent microbes from reaching potential sites of infection. Tight cell junctions in these tissues prevent microbes from passing through.

60. The humoral immune system deals with antigens from pathogens that are freely circulating, or outside the infected cells. Cellular immunity occurs inside infected cells and is mediated by T lymphocytes.

61. The short-term immunity which results from the introduction of antibodies from another person or animal.

62. The short-term immunity which results from the introduction of antibodies from another person or animal.

63. Antibodies, also called immunoglobulins, Y-shaped molecules are proteins manufactured by the body that help fight against foreign substances called antigens. Antigens are any substance that stimulates the immune system to produce antibodies. Antigens can be bacteria, viruses, or fungi that cause infection and disease.

64. B cells differentiate into plasma cells that produce antibody molecules closely modeled after the receptors of the precursor B cell. Once released into the blood and lymph, these antibody molecules bind to the target antigen (foreign substance) and initiate its neutralization or destruction.

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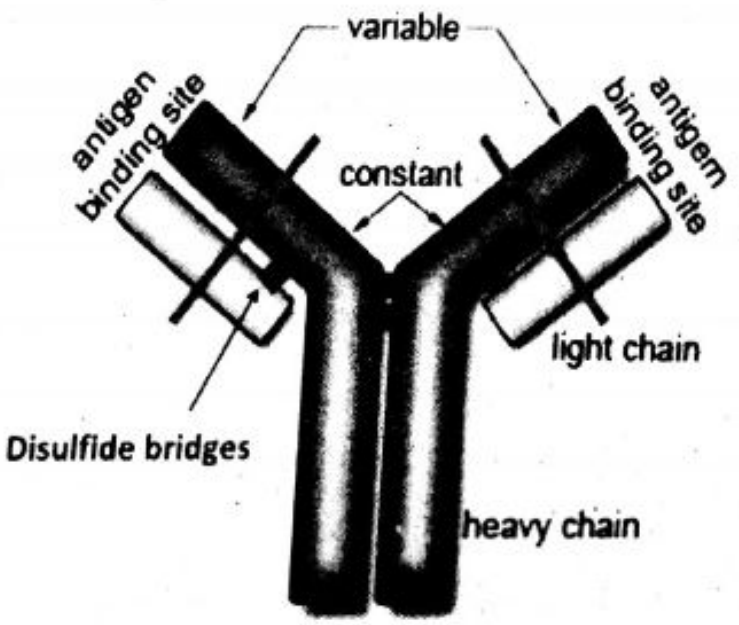
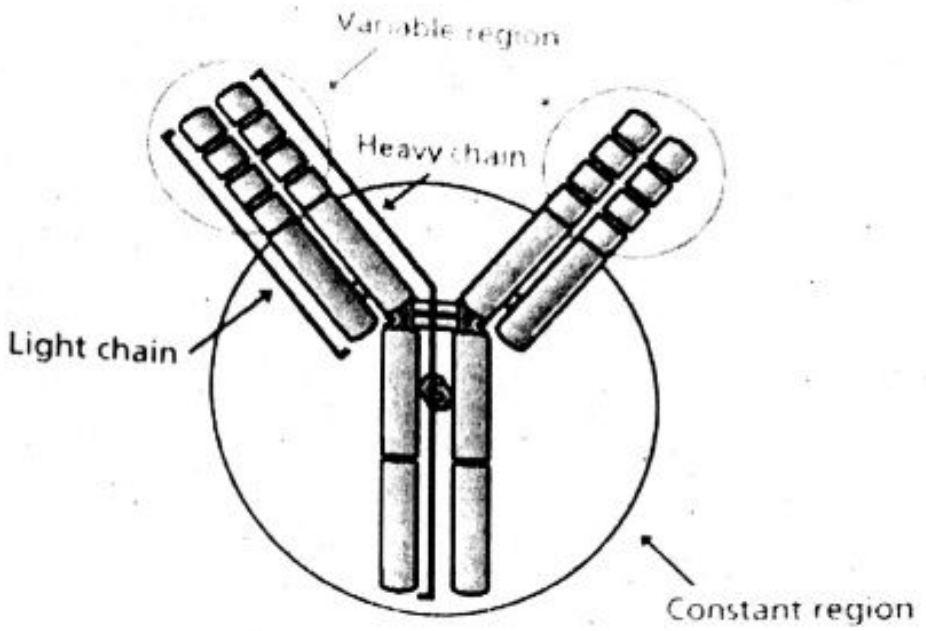
66. The skin, mucous membranes, and endothelia throughout the body serve as physical barriers that prevent microbes from reaching potential sites of infection. Tight cell junctions in these tissues prevent microbes from passing through.

67. Anti-venom produce artificial passive immunity.

68. **And 69**

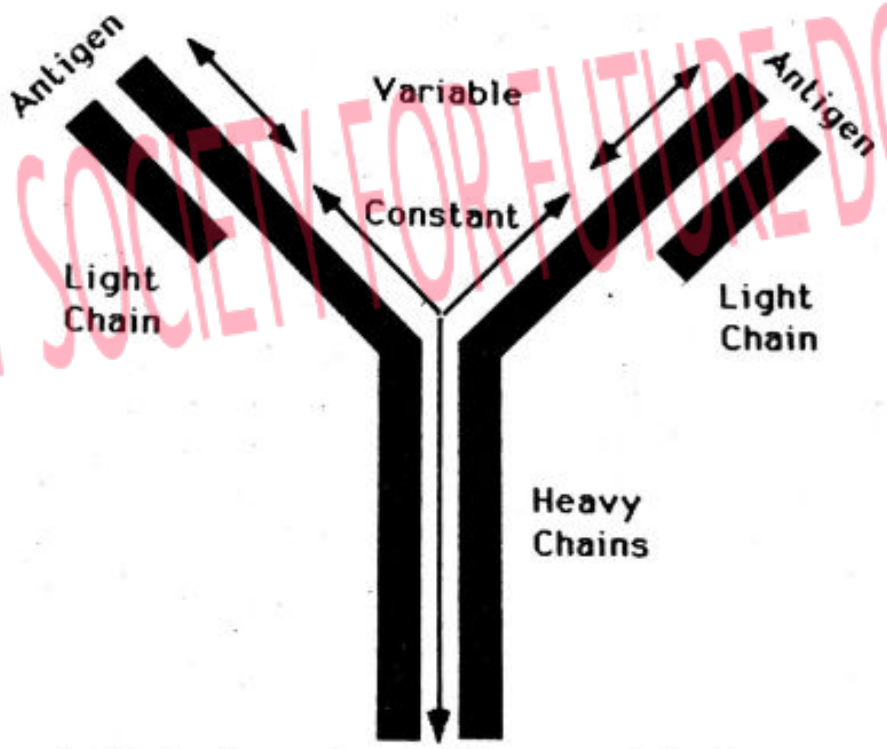


70.



71. Immunoglobins are antibodies produced by B-lymphocytes.

72.



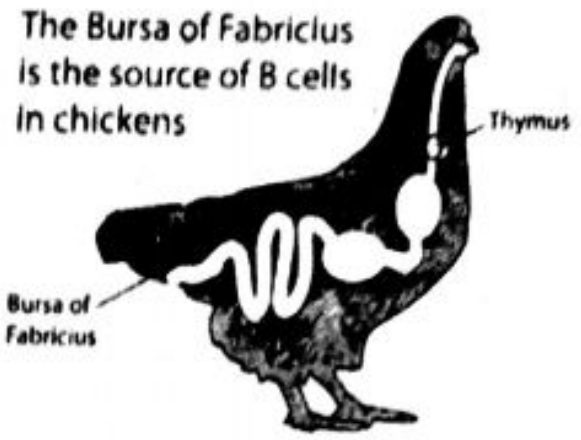
73. The thymus is a specialized primary lymphoid organ of the immune system. Within the thymus, thymus cell lymphocytes or T cells mature. T cells are critical to the adaptive immune system, where the body adapts specifically to foreign invaders.

74. Antibodies form by four polypeptide chains (Two heavy and two light chains).

75. The humoral immune system deals with antigens from pathogens that are freely circulating, or outside the infected cells. Cellular immunity occurs inside infected cells and is mediated by T lymphocytes.

76. Two types of immunity exist — active and passive: Active immunity occurs when our own immune system is responsible for protecting us from a pathogen. Passive immunity occurs when we are protected from a pathogen by immunity gained from someone else.

77.



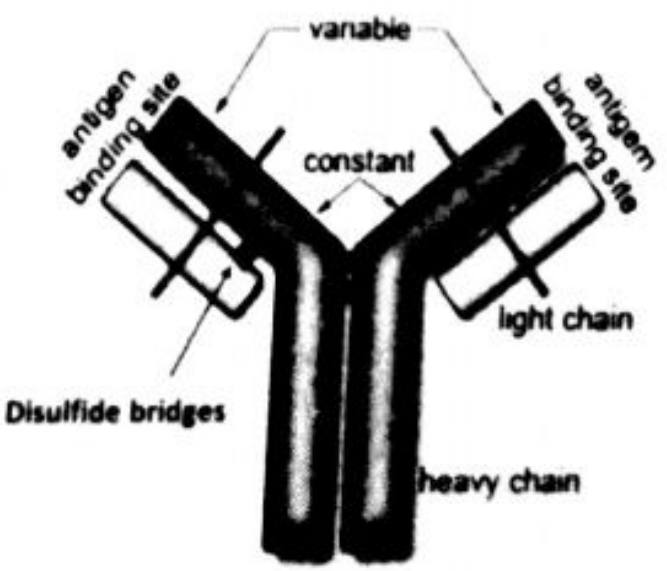
78.

79. Humoral immunity is the aspect of immunity that is mediated by macromolecules found in extracellular fluids such as secreted antibodies, complement proteins, and certain antimicrobial peptides. Humoral immunity is named so because it involves substances found in the humors, or body fluids.

80. Transplant rejection is caused primarily by a cell-mediated immune response to HLA antigens expressed on donor antigen-presenting cells (APCs) transferred along with the transplanted organ. Recognition of donor HLA antigens on the cells of the graft induces vigorous T cell proliferation in the recipient.

81. Tetanus is a bacterial infection, which can be treated by anti-tetanus serum.

82.



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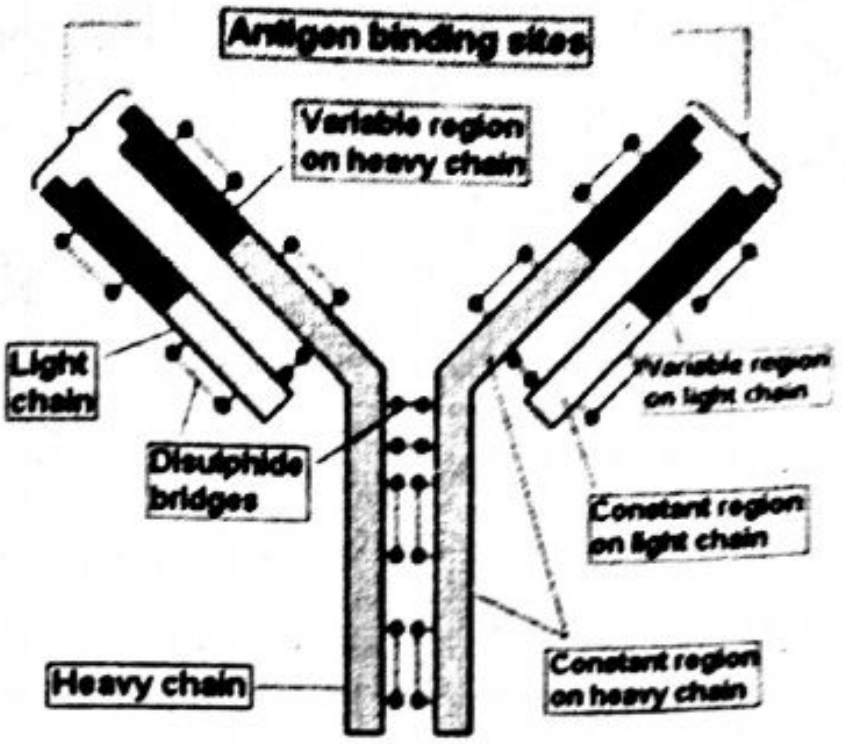


84. Humoral immunity is the aspect of immunity that is mediated by macromolecules found in extracellular fluids such as secreted antibodies, complement proteins, and certain antimicrobial peptides. Humoral immunity is named so because it involves substances found in the humors, or body fluids.

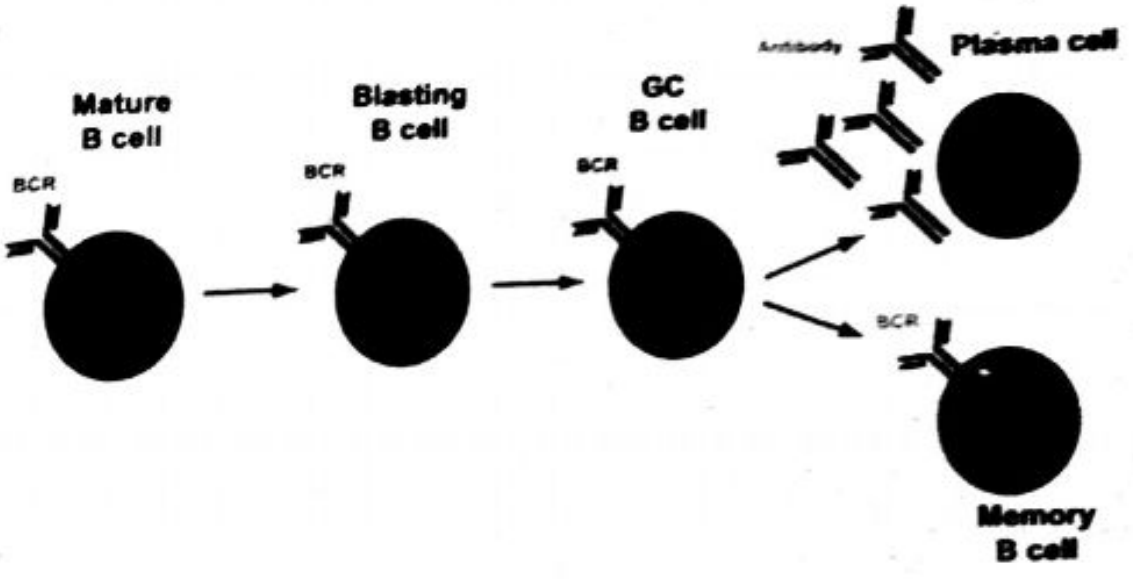
85. Passive immunity is given from mother to child through the placenta before birth, and through breast milk after birth. It can also be given medically through blood products that contain antibodies, such as immune globulin. This type of immunity is fast acting but lasts only a few weeks or months.

86. The passive rabies immunization is commonly used after a certain type of wild animal bites an accident etc.

87. A typical antibody has four polypeptide chains.

88. Two heavy and two light chains are present in an antibody molecule.

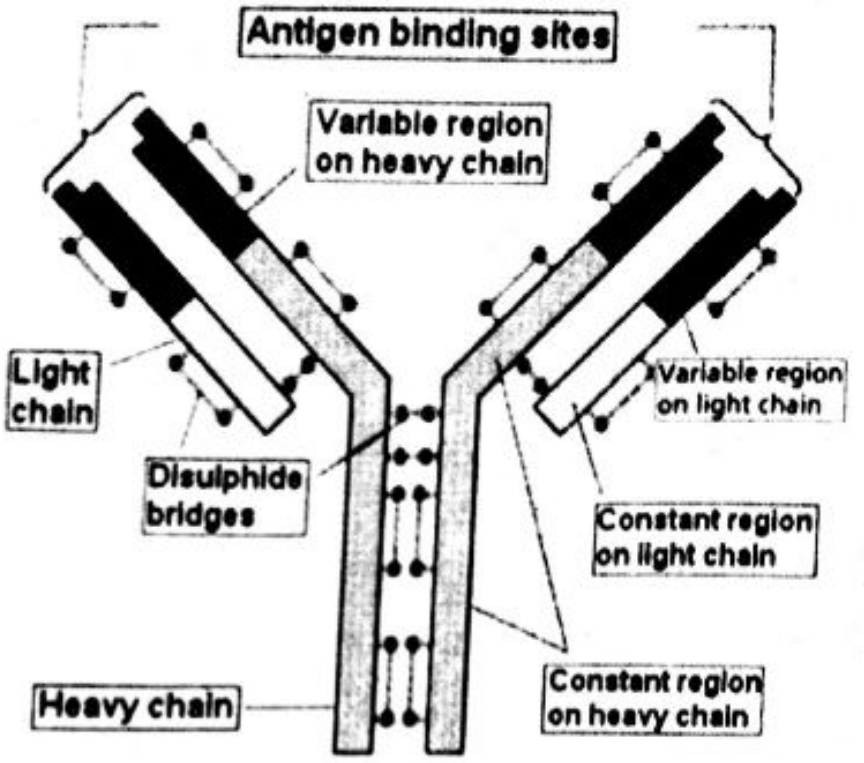
89.



90. Two types of immunity exist; active and passive: Active immunity occurs when our own immune system is responsible for protecting us from a pathogen. Passive immunity occurs when we are protected from a pathogen by immunity gained from someone.

91. The action of making a person or animal immune to infection, typically by inoculation.

92.



93. Cell-mediated immunity is an immune response that does not involve antibodies. Rather, cell-mediated immunity is the activation of phagocytes, antigen-specific cytotoxic T-lymphocytes, and the release of various cytokines in response to an antigen.

94. Anti-venom, also known as antivenin, venom antiserum, and anti-venom immunoglobulin, is a specific treatment for envenomation. It is composed of antibodies and used to treat certain venomous bites and stings. Anti-venoms are recommended only if there is significant toxicity or a high risk of toxicity.

95. A substance used to stimulate the production of antibodies and provide immunity against one or several diseases, prepared from the causative agent of a disease, its products, or a synthetic substitute, treated to act as an antigen without inducing the disease.

96. Naturally acquired active immunity occurs when the person is exposed to a live pathogen, develops the disease, and becomes immune as a result of the primary immune response. Artificially acquired active immunity can be induced by a vaccine, a substance that contains the antigen.

11 TOPIC HOMEOSTASIS

PRACTICE EXERCISE

TOPIC-WISE MCQs

MECHANISM OF HOMEOSTASIS (RECEPTORS, CONTROL CENTER, EFFECTORS)

Q.1 Which of the following is homeostasis?
A) Osmoregulation
B) Maintenance of temperature
C) Elimination of wastes
D) All A, B, C

Q.2 Important components of mechanism of homeostatic regulation are:
A) Receptors, control center and effectors
B) Sensory, motor and associative neurons
C) CNS, peripheral nervous system and diffused nervous system
D) Cerebrum, cerebellum and pons

HOMEOSTATIC FEEDBACK MECHANISM

Q.3 Body functions which are controlled through feed back mechanism are mostly:
A) Negative
B) Delayed
C) Positive
D) Rapid

OSMOREGULATION

Q.4 Osmoregulation is the regulation of:
A) Water only
B) Organic solutes only
C) Inorganic solutes only
D) Water, organic and inorganic solutes

Q.5 Ability of an organism to regulate its fluid contents is:
A) Osmoregulation
B) Thermoregulation
C) Excretion
D) Homeostasis

Q.6 To eliminate 0.5 gram of nitrogen in the form of urea, how much water will be required?
A) 50 ml
B) 25 ml
C) 0.25 ml
D) 30 ml

Q.7 Ureotely and uricotely are actually adaptations to:
A) Conserve water
B) Remove ammonia
C) Conserve urea and uric acid
D) Remove water

OSMOREGULATION IN ANIMALS OF DIFFERENT ENVIRONMENT

Q.8 Kangaroo rat survives without drinking water by feeding on seeds of desert plants containing more carbohydrates. This type of behavior in terrestrial animals is called:
A) Osmoconformation
B) Osmoregulation
C) Anhydrobiosis
D) Dehydration

Q.9 Which of the following fish have adapted themselves to drink large amount of sea water and excrete concentrated?
A) Bony
B) Hag
C) Cartilaginous
D) All A, B, C

Q.10 Some of the fishes retain a chemical trimethylamine oxide for protection against:
A) Creatinine
B) Urea
C) Xanthine
D) Water

NITROGEN CONTAINING EXCRETORY PRODUCTS

Q.11 Nitrogenous wastes in body are generally produced during metabolism of:
A) Long chain carbohydrates
B) Energy rich nutrients
C) Genetic material
D) Saturated fatty acids

Q.12 Nitrogenous wastes in our body are the metabolic products of:
A) Proteins
B) Vitamins
C) Carbohydrates
D) Lipids

Q.13 Birds, insects, many reptiles and land snails produce nitrogenous waste in the form of:
A) Uric Acid
B) Ammonia
C) Urea
D) Hypoxanthine

Q.14 Metabolism of which of the following mainly results in the production of urea?
A) Nucleic acids
B) Palmitic acid
C) Creatine phosphate
D) Amino acids

Q.15 Urea is detoxified form of:
A) Proteins E
B) Amino acids
C) Ammonia
D) Creatinine

EXCRETORY SYSTEM OF HUMAN

Q.16 System that has main role in filtering liquid waste from blood is:
A) Lymphatic system
B) Circulatory system
C) Urinary system
D) Digestive system

Q.17 Four metabolic processes are listed below:
1- Synthesis of plasma proteins
2- Regulation of fat metabolism
3- Storage of vitamin A
4- Synthesis of digestive enzymes
Which of these are functions of the liver?
A) 1, 2 and 3 only
B) 1, 3 and 4 only
C) 1, 3 and 4 only
D) 2, 3 and 4 only

Q.18 Liver is involved in detoxification of all the following except:
A) Drugs
B) Pesticides
C) Glycogen
D) Food additives

Q.19 Metabolism of nucleic acid produces:
A) Urea
B) Uric Acid
C) Bilirubin
D) Ammonia

STRUCTURE AND FUNCTIONS OF KIDNEY

Q.20 Which blood vessel enters the kidney?
A) Afferent arteriole
B) Efferent arteriole
C) Renal artery
D) Aorta

Q.21 Which of the following hormone is produced by kidneys?
A) Erythropoietin
B) Aldosterone
C) Epinephrine
D) ADH

Q.22 It is a sequence that correctly traces the path of urine after it leaves the kidneys:
A) Ureters→ urinary bladder→ urethra
B) Urinary bladder→ ureters→ urethra
C) Urethra→ urinary bladder→ ureters
D) Urinary bladder→ urethra→ ureters

Q.23 Outermost covering of kidney is:
A) Renal cortex
B) Renal medulla
C) Renal capsule
D) Renal hilus

Q.24 If body weight of a person is 70kg, then weight of a kidney will be:
A) 07Kg
B) 0.70Kg
C) 0.35Kg
D) 3.5Kg

Q.25 Sphincter muscles are located near the junction of:
A) Pelvis and ureter
B) Ureter and urinary bladder
C) Urinary bladder and urethra
D) Ureter and urethra

Q.26 Urine leaves the body from bladder through a tube called:
A) Collecting tube
B) Ureters
C) Urethral orifice
D) Urethra

Q.27 A desert animal will most probably excrete nitrogen in the form of:
A) Ammonia
B) Amino acids
C) Urea
D) Uric acid

Q.28 Maximum amount of water which can be conserved by the human kidneys is:
A) 90. 5%
B) 99.1%
C) 95.9%
D) 99.5%

Q.29 Urinogenital duct is another name used for:
A) Ureter in male
B) Ureter in female
C) Urethra in female
D) Urethra in male

Q.30 Urine is collected in the central cavity of the kidney called:
A) Renal hilus
B) Ureter
C) Renal pelvis
D) Renal medulla

Q.31 All of the following functions are performed by kidneys except:
A) Help in blood cell formation
B) Hormone production
C) Maintaining acid base balance
D) Ammonia production

Q.32 In human kidneys, which of the following process does not occur?
A) Deamination
B) Ultrafiltration
C) Reabsorption
D) Tubular secretion

Q.33 Renal artery is the branch of:
A) Ascending aorta
B) Common iliac artery
C) Descending abdominal aorta
D) Arch of aorta

Q.34 Highly concentrated portion of the kidney is:
A) Inner medulla
B) Outer medulla
C) Inner cortex
D) Outer cortex

NEPHRON

Q.35 Initial filtering component of a nephron is:
A) Collecting duct
B) Renal corpuscle
C) Renal tubule
D) Renal pelvis

Q.36 Which of the following is occurring at Bowman's capsule?
A) Secretion of Na^+
B) Ultra-filtration
C) Counter current mechanism
D) Reabsorption of useful materials

Q.37 All nephrons have _____ in renal cortex.
A) Loop of Henle
B) Collecting duct
C) Renal corpuscle
D) Vasa recta

Q.38 When a person eats a meal with high contents of salts, then:
A) Dilute urine volume increases
B) Water reabsorption increases
C) Concentrated urine volume increases
D) Salt absorption increases

Q.39 When pH of blood is increased than normal value, nephron responds by:
A) H^+ secretion is increased
B) HCO_3^- secretion is decreased
C) Na^+ secretion is suppressed
D) H^+ secretion is suppressed

Q.40 The reabsorption of water in collecting ducts is under the control of:
A) Parathormone
B) Cortisol
C) Oxytocin
D) ADH

Q.41 The ascending limb of loop of Henle is permeable for:
A) Ammonia
B) Na^+
C) Glucose
D) Water

Q.42 Which of the following is normal component of glomerular filtrate but absent in urine?
A) Water
B) Glucose
C) Salts
D) Urea

Q.43 Lower water level is detected by osmo-receptors in brain which results in the release of:
A) Aldosterone
B) ACTH
C) ADH
D) TSH

Q.44 The processing of filtrate takes place at/in:
A) Renal corpuscle
B) Renal hilus
C) Collecting duct
D) Renal tubule

Q.45 ADH is released into blood from:
A) Anterior pituitary lobe
B) Posterior pituitary lobe
C) Hypothalamus
D) Thalamus

Q.46 It is not involved in production of concentrated urine:
A) Counter-current flow
B) High medullary osmolarity
C) Juxtamedullary nephrons
D) Cortical nephron

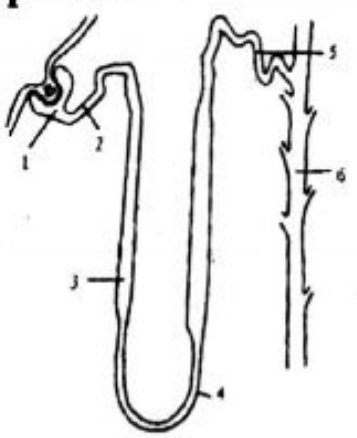
Q.47 It makes kidney interstitium more concentrated:
A) ADH
B) Aldosterone
C) Oxytocin
D) Cortisol

Q.48 In nephron, highest concentration of amino acids can be found in:
A) Proximal tubule
B) Collecting tubule
C) Distal tubule
D) Loop of Henle

Q.49 It will stimulate ADH secretion:
A) Hypotonic environment
B) Isotonic environment
C) Hypo-osmotic environment
D) Hypertonic environment

Q.50 Trace the pathway of water reabsorbed by ADH:
A) Blood → kidney interstitium → lymph
B) Lymph → blood → kidney interstitium
C) Blood → lymph → kidney interstitium
D) Kidney interstitium → lymph → blood

Q.51 The diagram represents a nephron:



Where does ADH affect the permeability of membranes to reabsorb water?
A) 1 and 2
B) 2 and 3
C) 3 and 4
D) 5 and 6

Q.52 Podocytes are found in:
A) Glomerulus
B) Bowman's capsule
C) PCT
D) DCT

Q.53 The reabsorption of glucose from the glomerular filtrate occurs at:
A) Bowman's capsule
B) Proximal convoluted tubule
C) Loop of Henle
D) Distal convoluted tubule

Q.54 Bowman's capsule is found around a ball of _____.
A) Arteriole
B) Nephron
C) Capillaries
D) Tubules

Q.55 Following is not a function of kidney:
A) pH balance
B) Control of blood pressure
C) Stimulation of RBC formation
D) Storage of wastes

Q.56 During urine formation, maximum water reabsorption occurs at:
A) Collecting tube
B) Loop of Henle
C) Proximal convoluted tubule
D) Distal convoluted tubule

Q.57 The process that pushes out water and other dissolved materials from blood in the glomerulus inside the Bowman's capsule:
A) Dialysis
B) Secretion
C) Filtration
D) Reabsorption

Q.58 Under normal conditions, which one is completely reabsorbed in the renal tubule?
A) Urea
B) Uric acid
C) Glucose
D) Salts

Q.59 Reabsorption of useful substances from glomerular filtrate mainly occurs in:
A) Collecting tube
B) Loop of Henle
C) Proximal convoluted tubule
D) Distal convoluted tubule

RENAL DISORDERS

Q.60 Ultimate choice of treatment for uremia is:
A) ESWL
B) Peritoneal dialysis
C) Hemodialysis
D) Kidney transplantation

Q.61 All can be present in dialysis fluid except:
A) Urea
B) Glucose
C) Electrolytes
D) Water

Q.62 Lithotripsy is an example of:
A) Chemotherapy
B) Radiotherapy
C) Gene therapy
D) Physical therapy

Q.63 Which part of the nephron is affected in renal failure?
A) Distal convoluted tubule
B) Proximal convoluted tubule
C) Collecting duct
D) Renal corpuscle

Q.64 These are not the stones found in kidney:
A) Calcium oxalate
B) Calcium phosphate
C) Uric acid stones
D) Cholesterol stones

Q.65 Renal failure results in increase in plasma level of:
A) Glucose
B) Proteins
C) Urea
D) Glycogen

Q.66 A person is suffering from kidney stones due to hormonal imbalance. Which of the following glands can be responsible for his kidney stones?
A) Parathyroid gland
B) Pancreas
C) Adrenal gland
D) Thyroid gland

Q.67 A person having renal failure becomes anemic due to:

A) Loss of erythropoietin
B) Loss of growth hormone
C) Over-activity of erythropoietin
D) Over-activity of growth hormone

Q.68 Incidence of uric acid stones can be up to:

A) 75%
B) 15%
C) 10%
D) 85%

CLASSIFICATION OF ANIMALS BASED ON THERMOREGULATION

Q.69 Which of the following pair, on the basis of primitive temperature classification, is not related to others?

A) Invertebrates, fishes
B) Fishes, reptiles
C) Birds, mammals
D) Reptiles, amphibians

Q.70 Which of the following statement is true about endotherms?

A) Do not regulate their body temperature
B) Generate body heat as by product
C) Absorb heat from their surrounding
D) All A, B, C

Q.71 On the basis of source of heat production; fish, amphibians and reptile are included in:

A) Endotherms
B) Ectotherms
C) Heterotherms
D) Homeotherms

THERMOREGULATION IN MAMMALS (HUMAN)

Q.72 Decreasing body temperature due to cold surroundings stimulates hypothalamus that for the purpose of heat conservation causes:

A) Vasodilation at skin
B) Vasoconstriction at skin
C) Vasoconstriction at abdomen
D) No change to blood vessels

Q.73 Thermoregulatory adaptation in baby mammals specifically associated with rapid heat generation is:

A) Shivering Thermogenesis
B) Non-shivering Thermogenesis
C) Vasodilation and vasoconstriction
D) Brown fat

Q.74 Shivering thermogenesis is which type of adaptations?

A) Structural
B) Behavioral
C) Physiological
D) Histological

Q.75 Which of the following is not a structural adaptation for temperature regulation in animals?

A) Skin
B) Pelage
C) Plumage fluffing
D) Modified lungs for panting

Q.76 Which of the following gland is involved in heat production?

A) Pituitary
B) Parathyroid
C) Thyroid
D) Pancreas

Q.77 Marine mammals possess which type of insulating material for heat production?

A) Skin
B) Pelage
C) Brown fat
D) Blubber

Q.78 For evaporative cooling, bats use:

A) Saliva
B) Solid excreta
C) Urine
D) A and C

PAST PAPER MCQs

2009

Q.1 A central cavity of the kidney where urine is collected after filtration is known as:
A) Ureter
B) Pelvis
C) Urethra
D) Urinary Bladder

Q.2 Aldosterone plays role in:
A) Transport of water
B) Transport of K+ ions into kidney
C) Uptake of sodium in loop of Henle
D) Reabsorption of water

2010

Q.3 The muscles that control urine in bladder are known as:
A) Striated muscles
B) Smooth muscles
C) Sphincter muscles
D) Circular muscles

2011

Q.4 Reabsorption of water by counter current multiplier mechanism takes place at:
A) Proximal Tubule
B) Distal Tubule
C) Collecting Duct
D) Loop of Henle

Q.5 Antidiuretic hormone helps in reabsorption of water by changing permeability of:
A) Proximal Tubule
B) Distal Tubule
C) Collecting Duct
D) Loop of Henle

Q.6 Aldosterone helps in conservation or active absorption of:
A) Sodium
B) Calcium
C) Potassium
D) Bicarbonate ions

Q.7 Maximum reabsorption takes place in which part of the nephron?
A) Distal tubule
B) Villi
C) Cortical tissue
D) Proximal tubule

2012

Q.8 In nephron, most of the reabsorption takes place in the:
A) Distal tubule
B) Proximal tubule
C) Ascending limb
D) Descending limb

Q.9 Blood enters the glomerulus through:
A) Efferent arteriole
B) Afferent arteriole
C) Renal artery
D) Renal vein

Q.10 Which portion of nephron is under the control of ADH?
A) Bowman's capsule
B) Ascending arm
C) Distal and collecting ducts
D) Descending arm

Q.11 Detection of change and signaling for effector's response to the control system is a:
A) Negative feedback
B) Positive feedback
C) Inter-coordination
D) Feedback mechanism

Q.12 What are three components of mechanism of homeostatic regulations?
A) Receptors, control center and effectors
B) Sensory, motor and associative neurons
C) CNS, PNS and diffused nervous system
D) Cerebrum, cerebellum and pons

2013

Q.13 The process through which the body maintains the internal environment from the harms of fluctuations in an external environment is called as:
A) Behavior of organisms
B) Adaptation
C) Thermoregulation
D) Homeostasis

Q.14 Site of filtration in nephron is:
A) Glomerulus and Bowman's capsule
B) Proximal and distal end
C) Ascending and descending arm
D) Loop of Henle

Q.15 Antidiuretic hormone increases the reabsorption of:
A) Amino acids
B) Salts
C) Ammonia
D) Water

Q.16 Active uptake of_____ in the ascending limb or thick loop of Henle is promoted by the action of aldosterone.
A) K^+
B) Cl^-
C) Ca^{2+}
D) Na^+

Q.17 Active pumping out of Na^+ occurs at which part of nephron?
A) Proximal tubule
B) Descending loop of Henle
C) Ascending loop of Henle
D) Collecting duct

2014

Q.18 Which one of the following is the main nitrogenous waste product in humans?
A) Urea
B) Ammonia
C) Salts
D) Uric acid

Q.19 Which one of the following is responsible for the production of concentrated urine?
A) Juxtamedullary nephrons
B) Cortical nephrons
C) Proximal tubule
D) Distal tubule

Q.20 Reabsorption of useful constituents normally takes place in which one of the following?
A) Proximal tubule
B) Distal tubule
C) Bowman's capsule
D) Glomerulus

Q.21 Which one of the following parts of excretory system in humans acts as a site of counter current multiplier?
A) Kidney
B) Cortex
C) Medulla
D) Loop of Henle

Q.22 Anti-Diuretic Hormone (ADH) is released from:
A) Anterior pituitary lobe
B) Posterior pituitary lobe
C) Hypothalamus
D) Thalamus

2015

Q.23 Those nephrons which are present along the border of the cortex and medulla are called:
A) Juxtamedullary nephrons
B) Cortical nephrons
C) Internal nephrons
D) Outer nephrons

Q.24 When water is in short supply, increased water retention occurs through the:
A) Cortical nephrons
B) Proximal convoluted tubule
C) Juxtamedullary nephrons
D) The tissue of cortex

Q.25 In nephrons, counter-current multiplier occurs at:
A) Loop of Henle
B) Collecting Duct
C) Bowman's capsule
D) Glomerulus

Q.26 Ascending loop of Henle does not allow outflow of:
A) Na^+ ions
B) K^+ ions
C) Cl^- ions
D) Water

Q.27 A larger quantity of dilute urine is produced in diabetes insipidus. This disease is due to the deficiency of:
A) Antidiuretic Hormone
B) Aldosterone
C) Thyroxin
D) Cortisol

2016
Q.28 **The removal of metabolic wastes from the blood is called:**
A) Thermoregulation
B) Osmoregulation
C) Kidney Failure
D) Excretion

Q.29 **Bowman's capsule continues as an extensively convoluted portion known as:**
A) Peritubular capillaries
B) Proximal convoluted tubules
C) Efferent arterioles
D) Afferent arterioles

Q.30 **The concentration of sodium ions in body fluids is controlled by the hormone:**
A) Renin
B) Aldosterone
C) Angiotensin
D) CPK

Q.31 **A hormone released from posterior pituitary lobe acts to Actively transport water from collecting tubules back to kidney is known as:**
A) Renin
B) Antidiuretic hormone
C) Angiotensin
D) Growth Factor

Q.32 **Humans have homeostatic thermostat present in a specified portion of the brain that is:**
A) Lateral ventricle
B) Thalamus
C) Spinal Cord
D) Hypothalamus

2017
Q.33 **Select the part of nephron which is not permeable to water and stops its outflow:**
A) Glomerulus
B) Proximal Tubule
C) Ascending loop
D) Descending loop

Q.34 **When water content in body becomes high, what will happen?**
A) ADH release will be inhibited
B) ADH will be released in large amount
C) Aldosterone will be released
D) Anterior pituitary will produce ADH

Q.35 **The major factor in producing hypertonic urine is:**
A) Glomerulus
B) Influence of aldosterone
C) ADH influencing on collecting duct
D) Gradual increase in osmolarity from cortex to inner medulla

Q.36 **What is the least selective process during urine formation?**
A) Reabsorption
B) Pressure filtration
C) Secretion
D) Differential permeability

Q.37 **Vessel which carry blood to the glomerulus is called:**
A) Efferent arteriole
B) Renal vein
C) Vasa recta
D) Afferent arteriole

2017 RE-TAKE
Q.38 **The mechanism of regulation and its environment, of solute and the gain and loss of water is called:**
A) Thermoregulation
B) Osmoregulation
C) Excretion
D) Relaxation

Q.39 **All of the following are endotherms except:**
A) Birds
B) Some fishes
C) Amphibians
D) Flying insects

2018
Q.40 **The hormone which controls the uptake of the sodium ions in kidney and its maintenance in blood pressure:**
A) Gonadotrophic hormone
B) Somatotropin hormone
C) Thyroxine hormone
D) Aldosterone hormone

Q.41 The capillaries of glomerulus rejoin to form a/an _____.
A) Collecting duct
B) Peritubular capillaries
C) Afferent arteriole
D) Efferent arteriole

Q.42 When filtration is completed the waste products through distal tube of nephrons empties to:
A) Proximal tubules
B) Efferent arterioles
C) Peritubular capillaries
D) Collecting tubules

Q.43 Blood solute potential is controlled by following hormone:
A) Vasopressin
B) Thyroxine
C) Epinephrine
D) Estrogen

Q.44 Keeping correct balance of ions and water in our body is called as:
A) Excretion
B) Thermoregulation
C) Osmoregulation
D) Selective reabsorption

2019

Q.45 The main nitrogenous excretory product of humans is:
A) Uric acid
B) Ammonia
C) Urea
D) Ammonium

Q.46 Given below is the diagram of nephron without vascular supply.

What is the name of Part C?
A) Collecting tubule
B) Proximal tubule
C) Distal tubule
D) Loop of Henle

Q.47 The route of urine excretion from kidney to outside of body is:
A) Kidney → ureter → urinary bladder → urethra
B) Urinary bladder → kidney → ureter → urethra
C) Kidney → ureter → urethra → urinary bladder
D) Kidney → urethra → urinary bladder → ureter

Q.48 Substances responsible for increasing the set point of the hypothalamus are called:
A) Pepsin
B) Pyrogens
C) Prions
D) Androgens

2020

Q.49 When the temperature of the surrounding rises, body responds by:
A) Vasoconstriction
B) Vasodilation
C) Shivering
D) Raising body hairs

Q.50 The excretion of hypertonic urine in humans is associated best with the:
A) Glomerular capsule
B) Proximal convoluted lobule
C) Loop of Henle
D) Distal convoluted tubule

Q.51 In humans, the temperature regulation control center is located in:
A) Kidneys
B) Brain
C) Liver
D) Lungs

Q.52 As an excretory organ, liver:
A) Detoxifies many chemical poisons
B) Produces ammonia for excretion by the kidneys
C) Produces urea and uric acid from the nitrogen of amino acids
D) All of the above

Q.53 The active uptake of sodium in the ascending limb or thick loop of Henle is promoted by the action of:
A) Aldosterone
B) Thyroxine
C) ADH
D) Cortisone

ANSWER KEY

TOPIC-WISE MCQs

1	D	11	C	21	A	31	D	41	B	51	D	61	A	71	B
2	A	12	A	22	A	32	A	42	B	52	B	62	B	72	B
3	A	13	A	23	C	33	C	43	C	53	B	63	D	73	D
4	D	14	D	24	C	34	A	44	D	54	C	64	D	74	C
5	A	15	C	25	C	35	B	45	B	55	D	65	C	75	C
6	B	16	C	26	D	36	B	46	D	56	C	66	A	76	C
7	A	17	A	27	D	37	C	47	B	57	C	67	A	77	D
8	C	18	C	28	D	38	B	48	A	58	C	68	C	78	D
9	A	19	B	29	D	39	D	49	D	59	C	69	C		
10	B	20	C	30	C	40	D	50	D	60	D	70	B		

PAST PAPERS MCQs

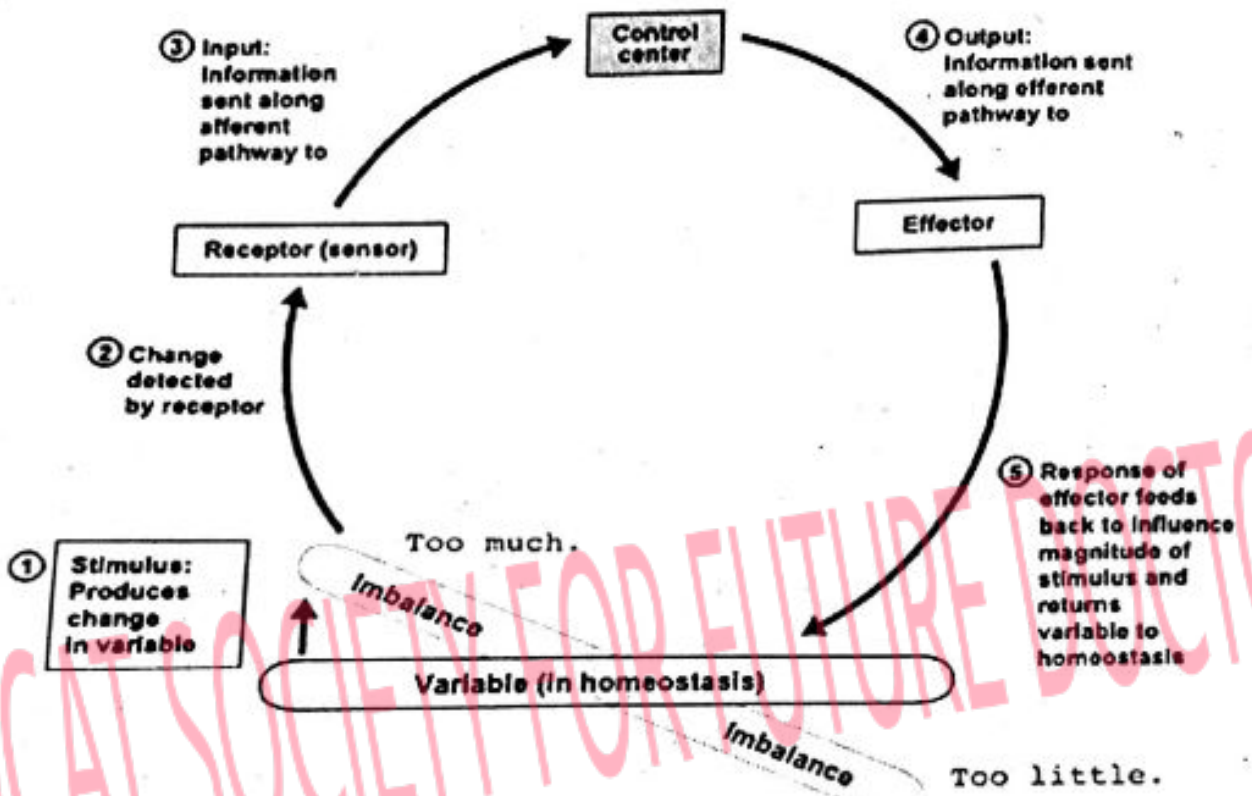
1	B	11	D	21	D	31	B	41	D	51	B
2	C	12	A	22	B	32	D	42	D	52	C
3	C	13	D	23	A	33	C	43	A	53	A
4	D	14	A	24	C	34	A	44	C		
5	C	15	D	25	A	35	D	45	C		
6	A	16	D	26	D	36	B	46	C		
7	D	17	C	27	A	37	D	47	A		
8	B	18	A	28	D	38	B	48	B		
9	B	19	A	29	B	39	C	49	B		
10	C	20	A	30	B	40	D	50	C		

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. The protection of internal environment from the harms of fluctuations in external environment is termed as homeostasis. Most susceptible components of internal environment that may be affected by fluctuations in external environments are water, solutes and temperature.

2.



3. Feedback mechanism is a type of interaction in which a controlling mechanism is itself controlled by the products of reactions it is controlling. Negative feedback is an inverse response to change in environment e.g. increase in body temperature will stimulate that system which lowers body temperature.

4. And 5
Osmoregulation is the regulation of body organic, inorganic solutes and solvent concentration.

6. To eliminate 1 gram of nitrogen in the form of urea, 50 ml of water is required by decreasing the value of nitrogen to 0.5 gram, water quantity to be required, will also decrease to 25 ml.

7. One gram of nitrogen in the form of ammonia requires 500ml of water to be remove from the body. One gram of nitrogen in the form of urea requires 50ml of water to be removed. Similarly one gram of nitrogen in the form of uric acid requires 1ml of water to be removed from the body.

8. Terrestrial animals can tolerate dehydration and it differs in various animals. This character is known as anhydrobiosis.

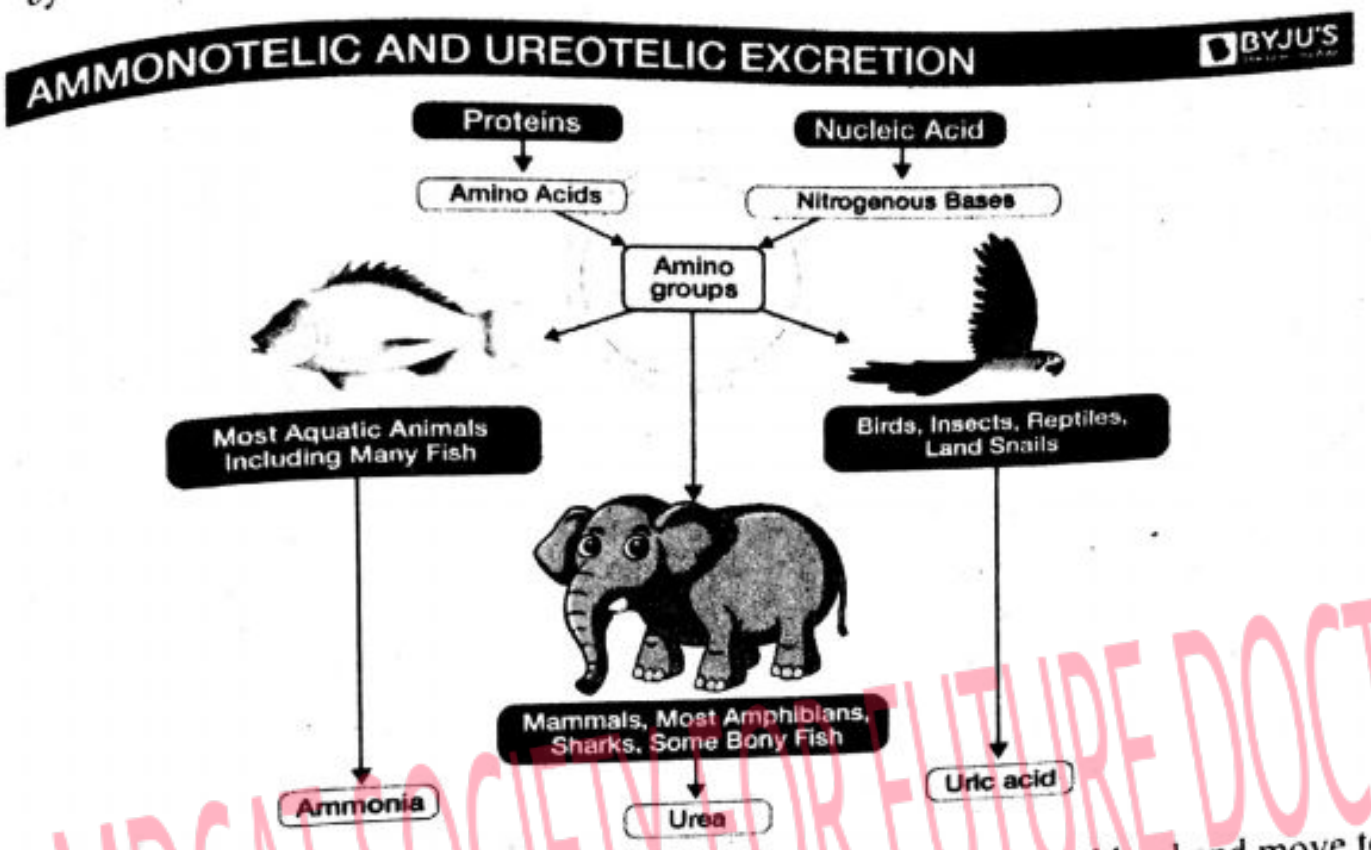
9. Bony fishes, the descendants of fresh water ancestors but later became marine constantly lose water from their hypotonic body fluids to hypertonic environment. These fishes have adapted themselves to drink large amount of seas water and excrete concentrated urine resulting in maximum salt excretion and minimum water loss.

10. Urea in high concentration is damaging so these fishes retain another chemical trimethylamine oxide for protection against urea)

11. Nitrogen wastes produce by deamination of amino acids as well as metabolism of nucleic acid.

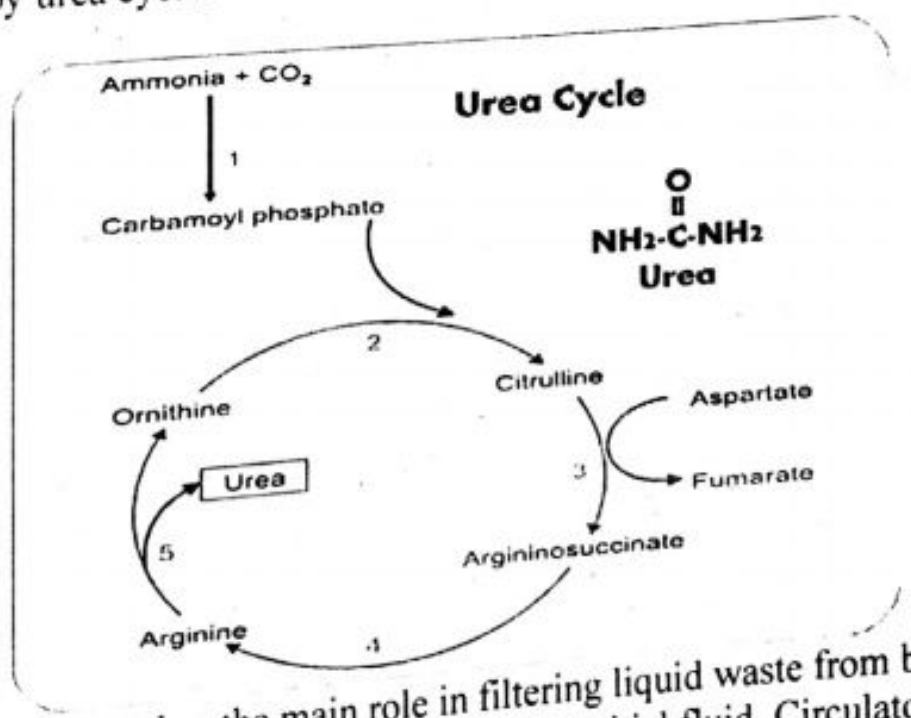
12. Nitrogenous waste may be metabolic product that contains nitrogen and mainly produce by the metabolism of proteins and nucleic acids.

13.



14. Proteins after their complete hydrolysis in small intestine enters to blood and move to liver by hepatic portal vein, where deamination of amino acid occur and form NH_3 which change to urea by urea cycle.

15.



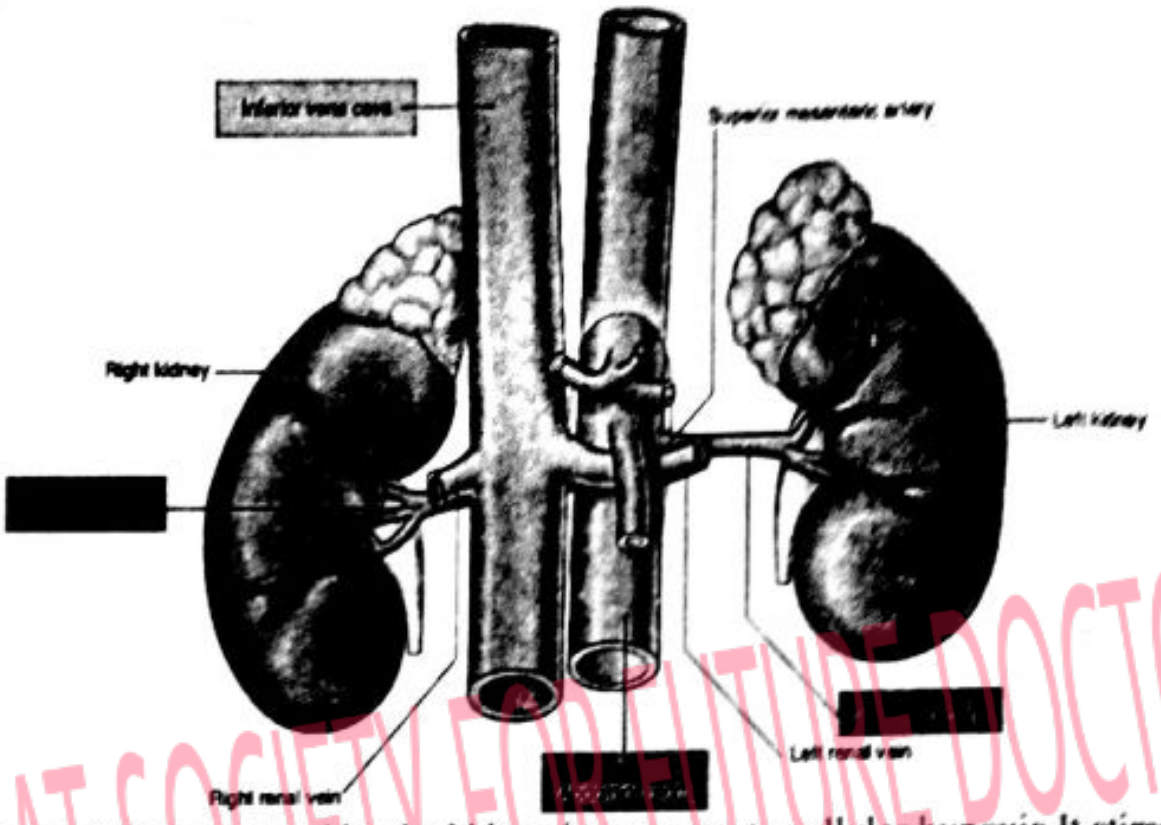
16. The urinary/renal system has the main role in filtering liquid waste from blood. Lymphatic system has main role in returning of interstitial fluid. Circulatory system is responsible for the transport of nutrients and digestive system has the role in digestion.

17. Liver synthesis plasma proteins e.g. albumin, prothrombin and fibrinogen, it also involve in vitamin B storage and synthesis of bile for the emulsification of fats in small intestine.

18. Liver is involved in the detoxification of drugs, pesticides and food additives. Glycogen is not detoxified in the liver, rather synthesized and stored as energy reserve and converted to glucose when require.

19. In birds, insects and reptiles, when nucleic acids are completely metabolized, they produce uric acid.

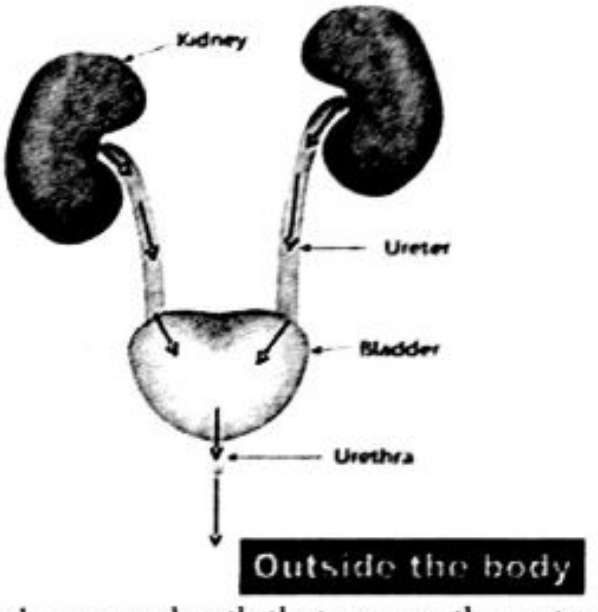
20.



21. Erythropoietin is secreted by the kidney in response to cellular hypoxia It stimulates red blood cell production in the bone marrow.

22.

Path of urine

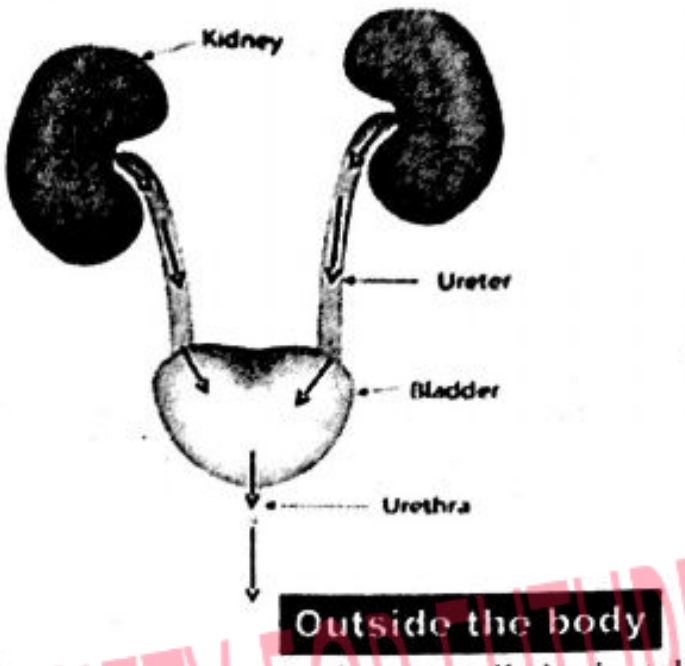


23. Renal capsule is a thin membranous sheath that covers the outer surface of each kidney.

24. Average weight of human kidneys is less than 1% of the total body weight. If weight of human body is 70 Kg then 1% of 70 Kg would be 0.7 Kg for both kidneys and each kidney will be of 0.35 Kg.

25. Sphincter muscles are present near the junction of the urethra and the bladder and control the flow of urine from bladder to urethra.

26. Path of urine



27. As desert animals need to conserve water, so they are called uricotelic and excrete uric acid as main nitrogenous wastes. Because removal of uric acid requires least amount of water as compared to ammonia and urea.

28. Mammalian kidney including human is adapted to conserve water by over 99.5% reabsorption of glomerular filtrate.

29. Urinogenital duct is another name used for urethra in males because it is common duct for the removal of urine and to transfer sperms into the female body.

30. Urine after formation collected inside kidney in a cavity called renal pelvis.

31. Kidneys are involved in the production of RBCs via erythropoietin, maintain acid-base balance of the body. Urea/Ammonia production, however, is the function of liver.

32. In human body, deamination primarily takes place in liver. It is the process by which amino acids are broken down if there is an excess of protein intake. This process allows the system to convert excess amino acids into usable resources such as hydrogen and carbon and also plays a vital role in removing nitrogen waste from the body.

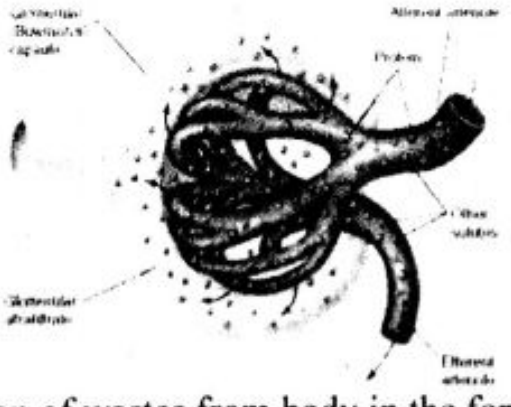
33. The renal arteries normally arise from the left interior side of the abdominal aorta, immediately below the superior mesenteric artery, and supply the kidneys with blood.

34. Highly concentrated portion of mammalian kidney is the inner medulla. This hyper-osmotic condition is maintained by urea and Na^+, helps in H_2O conservation.

35. The filtration of blood plasma occurs at renal corpuscle comprises of glomerulus and Bowman's capsule, while processing of the filtrate is the function of renal tubules.

36. The Bowman's capsule is the cup-shaped structure that surrounds a cluster of capillaries called the glomerulus. The blood is put under high pressure. Ultra-filtration of the blood happens in which water, ions, glucose and other small molecules pass into the tubule.

37. Renal corpuscles of both types of nephrons e.g. cortical and juxtamedullary nephrons, are present in renal cortex while loops of Henle of juxtamedullary nephrons are looping deep into inner medulla.
38. When a person eats a meal with high salt contents, then absorption of salts from GIT increases, making blood plasma hyper-osmotic. As a result of that, reabsorption of H_2O from kidneys increases due to over-secretion of ADH from posterior pituitary.
39. When pH of blood is increased than normal value e.g. becomes more alkaline, then tubular secretion of H^+ will be suppressed in order to maintain the pH in a narrow range.
40. ADH increases reabsorption of water from collecting ducts of the nephrons. Secondly, ADH constricts arterioles and raises arterial blood pressure.
41. The ascending limb of loop of Henle is permeable for Na^+ which is promoted by the action of aldosterone. Ascending limb of loop of Henle is impermeable for water.
42. Glucose is present in normal glomerular filtrate and completely reabsorbed back at PCT.
43. Lower H_2O level is detected by the osmo-receptors located in hypothalamus and releases more ADH which in return reabsorbs more H_2O from nephrons to maintain osmoregulation.
44. The processing of urine is the function of entire renal tubular parts of nephron.
45. ADH is produced by the neuro-secretory cells of hypothalamus and transported to posterior pituitary for storage via axon terminal, from which it release into blood circulation to reabsorb H_2O.
46. Juxtamedullary nephrons are specifically used for the production of concentrated urine via counter current mechanism which uses high medullary osmolarity. Cortical nephrons are, however, used when body is well-hydrate.
47. Aldosterone is responsible for active transport of Na^+ from ascending limb of loop of Henle, making kidney interstitium more concentrate.
48. The highest level of amino acids is found in proximal convoluted tubule and maximum reabsorption also takes place at the same point.
49. ADH release from posterior pituitary will be stimulated if body fluids are hyperosmotic and ADH in return reabsorbs water from nephrons.
50. Water reabsorbed due to the action of ADH follows the path giving below:
    Kidney interstitium→lymph→blood
51. ADH is released from posterior pituitary when blood osmotic balance is low. It acts on distal part of nephron to absorb H_2O.
52. Podocytes are cells in Bowman's capsule in the kidney that wrap around glomerulus.
53. Glucose from blood filtered out in Bowman's capsule which completely reabsorbed at the level of proximal convoluted tubules except diabetes mellitus patients.
54.



55. Kidneys involve in elimination of wastes from body in the form of urine.
56. After filtration Bowman's capsule has glomerular filtrate that contains amino acids, glucose, salts, water and waste products. All useful substances including maximum H_2O reabsorb in PCT while remaining H_2O reabsorb in loop of Henle and distal tubule.

57. Filtration is a process in which waste substances come out from blood.
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60. The permanent treatment for kidney failure is transplantation.
61. Dialysis fluid/dialysate is a solution of pure H_2O, electrolytes and salts etc. It use to remove waste from blood.
62. Lithotripsy is an example of radiotherapy because in lithotripsy, high intensity X-rays or ultrasound rays are directed from a machine outside the body to the stone inside.
63. Damage to the renal corpuscle can lead to renal failure or end stage renal disease.
64. Cholesterol type stones are present in gall bladder.
65. Due to destruction of glomerulus, filtration process of blood is not proper due to which waste especially urea increase in blood.
66. Parathyroid gland produces a hormone known as parathormone which is responsible for maintenance of calcium level in blood and hypercalcemia is one of promising causes of kidney stone.
67. Kidneys produced a hormone called erythropoietin, responsible for production of red blood cells in bone marrow.
68. The incidence of different type of stones are as follows:
    - Calcium oxalate= 70%
    - Calcium phosphate=15%
    - Uric acid =10%
69. All invertebrates, fishes, amphibians and reptiles are poikilotherms while birds and mammals are homeotherms on the basis of temperature classification.
70. Endotherms are the animals that generate their own body heat through heat production as by product during metabolism.
71. Ectotherms are the animals that produce metabolic heat at low level and that is also exchanged quickly with the environment, however absorb heat from the surrounding. Such type of temperature adaptation is seen in fish amphibians and reptiles.
72. Vasoconstriction occurs at skin which reduces rate of blood flow and also the heat loss.
73. Some mammals have brown fat, which is specialized for rapid heat production.
74. The rate of heat production is increased by increased muscle contraction by movements or shivering so called shivering thermogenesis.
75. Plumage fluffing is physiological adaptation in animals for thermoregulation.
76. Thyroid gland is responsible for production of heat during non-shivering thermogenesis.
77. Marine mammals such as whales and seals inhabit much colder water than their body temperature, have a very thick layer of insulating fat called as blubber just under skin.
78. Bats use saliva and urine for evaporative cooling in warm temperature.

PAST PAPERS MCQs

1. Urine after formation collected inside kidney in the central cavity called renal pelvis.
2. The ascending limb of Loop of Henle is permeable for Na^+ which is promoted by the action of aldosterone. Ascending limb of loop of Henle is impermeable for water.
3. Sphincter muscles are present near the junction of the urethra and the bladder and control the flow of urine from bladder to urethra.
4. Juxtamedullary nephrons are specifically used for the production of concentrated urine via counter current mechanism which occurs at loop of Henle.
5. ADH release form posterior pituitary when blood osmotic balance is low. It acts on distal part of nephron to absorb H_2O.
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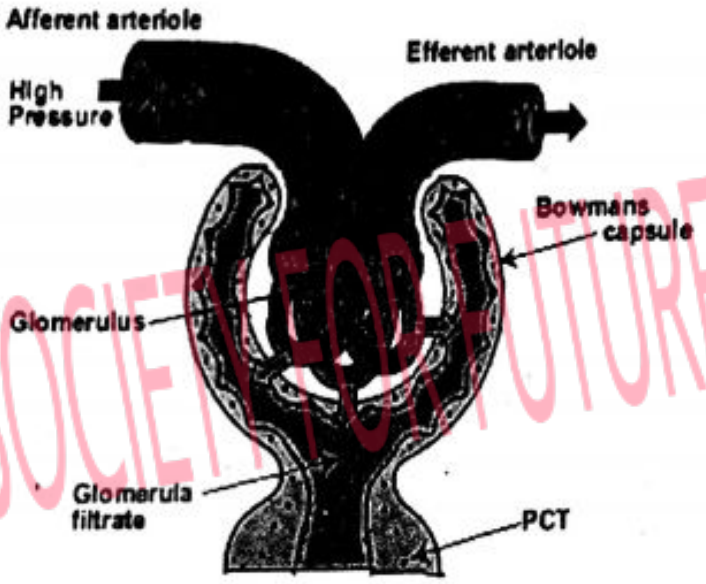

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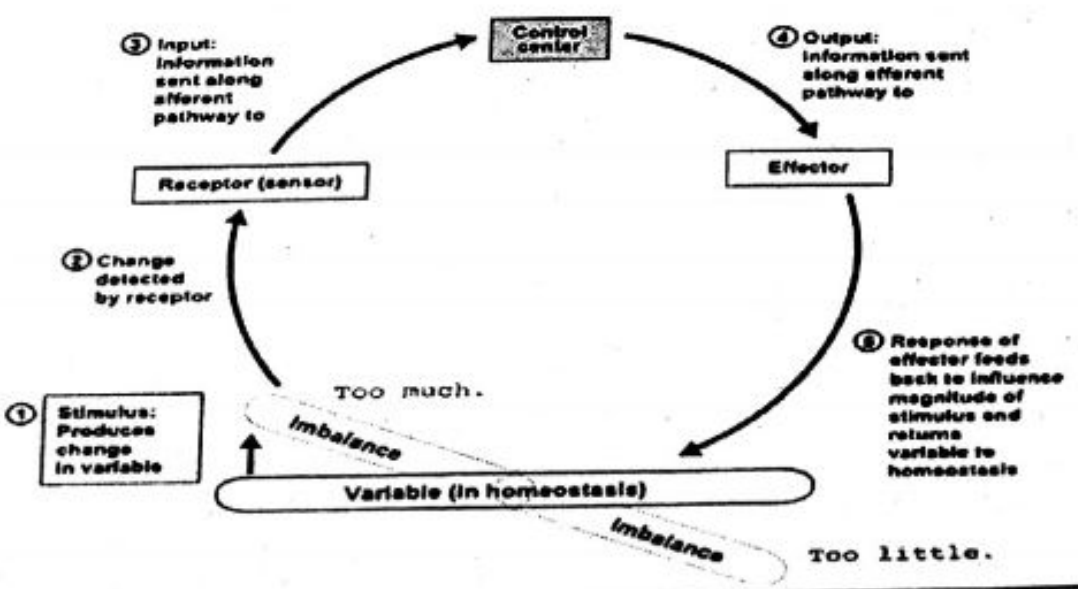

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18. Humans are ureotelic. They excrete urea as the main nitrogen containing excretory product.
19. Juxtamedullary nephrons are specifically used for the production of concentrated urine via counter current mechanism which uses high medullary osmolarity. Cortical nephrons are, however, used when body is well-hydrated.
20. After filtration Bowman's capsule has glomerular filtrate that contains amino acids, glucose, salts, water and waste products. All useful substances including maximum H_2O reabsorb in PCT while remaining H_2O reabsorb in loop of Henle and distal tubule.
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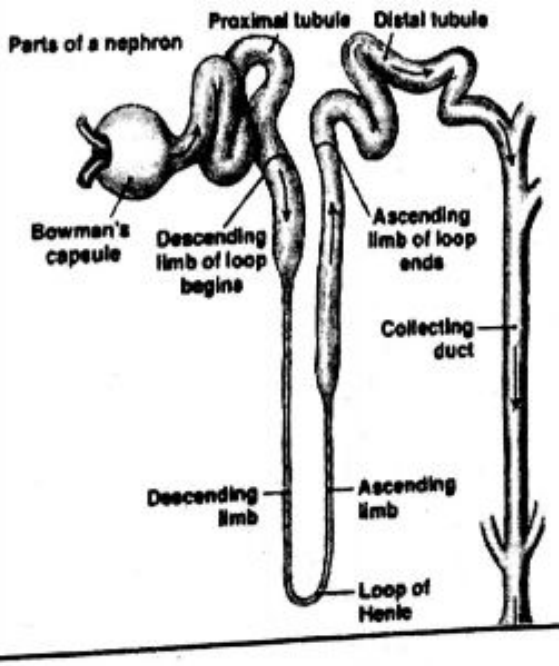
22. ADH is produced by the neuro-secretory cells of hypothalamus and transported to posterior pituitary for storage via axon terminal, from which it release into blood circulation to reabsorb H_2O.
23. Those nephrons that are present along the border of cortex and medulla, with tubular system looping deep in inner medulla are called juxtamedullary nephrons.
24. Juxtamedullary nephrons are specifically used for the production of concentrated urine via counter current mechanism which uses high medullary osmolarity. Cortical nephrons are, however, used when body is well-hydrated.
25. Juxtamedullary nephrons are specifically used for the production of concentrated urine via counter current mechanism which occurs at loop of Henle.
26. The ascending limb of Loop of Henle is permeable for Na^+ which is promoted by the action of aldosterone. Ascending limb of loop of Henle is impermeable for water.
27. If ADH is absent in the body, dilute urine is formed which causes great thirst and leads to dehydration. It is termed as diabetes insipidus.
28. Excretion is this process of removal of wastes that are produced within a body. There are various organs that help in excretion of such wastes from our body. They are kidney, lungs, skin etc.
29.

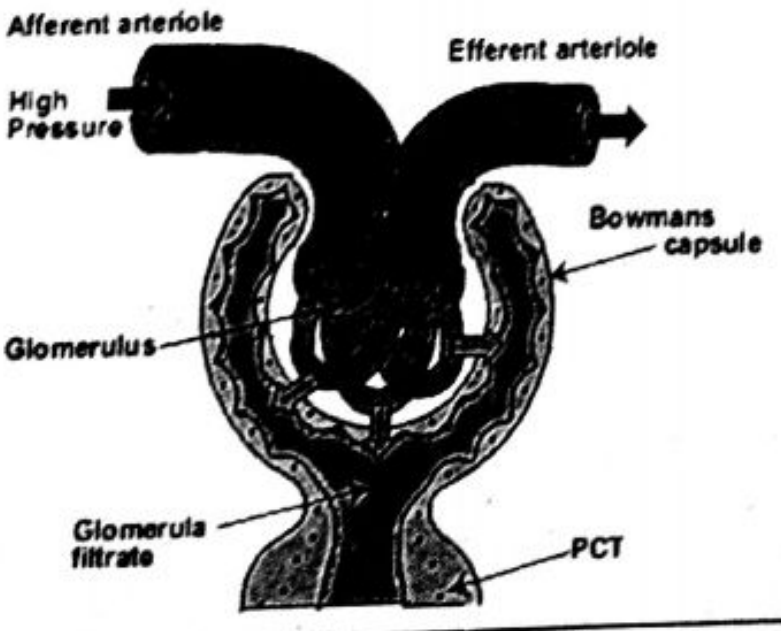


30. Aldosterone is responsible for active transport of Na^+ from ascending limb of loop of Henle, making kidney interstitium more concentrated.
31. ADH increases reabsorption of water from collecting ducts of the nephrons. Secondly, ADH constricts arterioles and raises arterial blood pressure.
32. The body's temperature control center is the hypothalamus. The hypothalamus is a bit like a thermostat. It works with the autonomic nervous system to track body temperature and keep it in the appropriate range.
33. The ascending limb of Loop of Henle is permeable for Na^+ which is promoted by the action of aldosterone. Ascending limb of loop of Henle is impermeable for water.
34. ADH increases reabsorption of water from collecting ducts of the nephrons. If ADH is limited in quantity then less water will be reabsorbed. As a result dilute urine will be produced.
35. Juxtamedullary nephrons are specifically used for the production of concentrated urine via counter current mechanism which uses high medullary osmolarity.
36. Filtration is a process in which waste substances comes out from blood from glomerulus to Bowman's capsule and it is said to be the least selective.

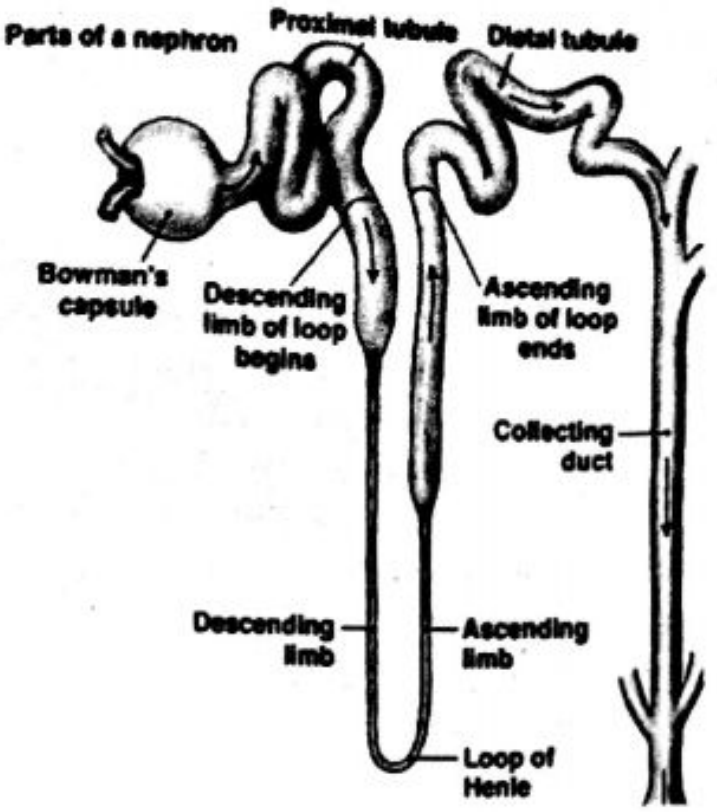
37.

38. Osmoregulation is the regulation of body organic, inorganic solutes and solvent concentration.
39. Most invertebrates, fish, amphibians and reptiles are ectotherms. Birds, some fish and flying insects are included in endotherms. Bats and humming birds are heterotherms.
40. Aldosterone release from adrenal cortex and acts on thick part of ascending loop of Henle and cause active reabsorption of sodium ions.

41.



42.

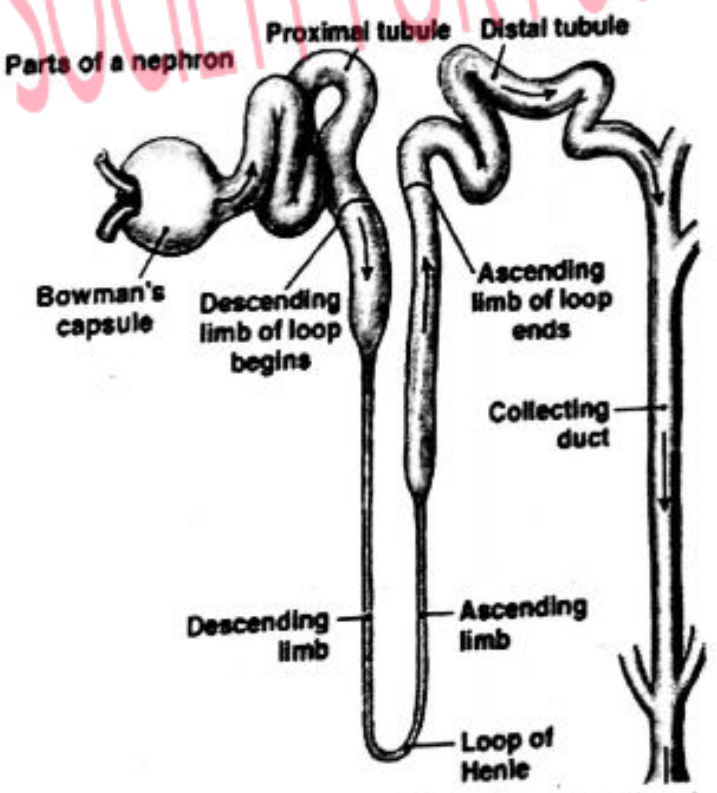


43. ADH/Vasopressin increases reabsorption of water from collecting ducts of the nephrons. Secondly, ADH constricts arterioles and raises arterial blood pressure.

44. Osmoregulation is the regulation of body organic, inorganic solutes and solvent concentration.

45. Humans are ureotelic. Urea is excreted as waste product in humans.

46.



47. Urine is formed in the kidneys through a filtration of blood. The urine is then passed through the ureters to the bladder, where it is stored. During urination, the urine is passed from the bladder through the urethra to the outside of the body.

48. Pyrogens are the substances, typically produced by a bacterium, which produces fever when introduced or released into the blood.

49. In case of increase in temperature above the set point, certain warm temperature sensitive thermoreceptors in skin, hypothalamus and other parts of nervous system send the signals to the system that increase the blood flow to the skin (vasodilation) and also causes sweat gland activation.
50. The interstitial fluid of the kidney is gradually concentrated from cortical to medullary part, thus inner medulla is highly concentrated with the presence of urea and through a mechanism of counter current multiplier. This causes gradual osmotic outflow of water from the filtrate back to kidney as it passes downward in the descending Loop of Henle. Furthermore, ascending Loop of Henle restricts outflow of water and transports Na ions actively into kidney making urine more concentrated.
51. The homeostatic thermostat is present in the hypothalamus, a brain part. It responds to the changes in the temperature above and below a set point which is 37°C.
52. By synthesizing nitrogenous wastes in the form of ammonia, urea and uric acid, and bile, liver assists kidney in waste disposal.
53. The active uptake of sodium in the ascending limb or thick loop of Henle is promoted by the action of aldosterone, the hormone secreted from adrenal cortex.

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12 TOPIC SUPPORT & MOVEMENT

PRACTICE EXERCISE

TOPIC-WISE MCQs

HUMAN SKELETON (BONE AND CARTILAGE)

Q.1 Bones protect critical internal organs like:
A) Brain, spinal cord, heart
B) Heart, stomach, eyes
C) Brain, all nerves, spinal cord
D) Spinal cord, pinna of ears, lungs

Q.2 A statement not true about bones and cartilages:
A) Both contain living cells
B) Both have ground matrix of collagen
C) Both contain various types of living cells
D) Both are part of endoskeleton

Q.3 Which type of cartilage is/are present in our respiratory passage?
A) Fibro cartilage
B) Hyaline cartilage
C) Elastic cartilage
D) All A, B, C

Q.4 All of the following are true about collagen except:
A) Inelastic
B) Living
C) Flexible
D) Protein

Q.5 Phagocytic cells of bone are called as:
A) Fibroblast
B) Osteoblast
C) Osteoclast
D) Osteocyte

AXIAL SKELETON

Q.6 Total number of 'free ribs' in human body are:
A) 1
B) 2
C) 4
D) 8

Q.7 How many unpaired bones are found in skull?
A) 6
B) 14
C) 8
D) 22

Q.8 All bones in skull are immovable except:
A) Maxilla
B) Nasal
C) Mandible
D) Lacrimal

Q.9 Skull forms joint with:
A) Atlas
B) Axis
C) 1st thoracic vertebrae
D) Last cervical vertebrae

Q.10 The first rib is attached with:
A) 1st vertebra
B) 1st thoracic vertebra
C) Last cervical vertebra
D) First rib is not attached

Q.11 Cervical vertebrae are found in:
A) Tail
B) Abdomen
C) Thorax
D) Neck

Q.12 Number of cervical vertebrae in neck of human skeleton:
A) 4
B) 7
C) 9
D) 14

Q.13 How many bones are present in human skull?
A) 22
B) 12
C) 28
D) 42

Q.14 Human vertebral formula is:
A) $C_7T_9L_5S_4Cd_1$
B) $C_7T_{12}L_4S_1Cd_1$
C) $C_7T_{12}L_5S_5Cd_4$
D) $C_7T_{12}L_4S_4Cd_1$

Q.15 Which one of the following is paired cranium bone?
A) Frontal
B) Occipital
C) Parietal
D) Sphenoid

Q.16 How many bones present in our arms?
A) 32
B) 25
C) 60
D) 45

Q.17 Total number of tarsals are:
A) 16
B) 7
C) 14
D) 8

APPENDICULAR SKELETON

Q.18 Longest bone of lower limb is:
A) Ulna
B) Radius
C) Tibia
D) Femur

Q.19 Which one is bone of fore limb?
A) Humerus
B) Femur
C) Tibia
D) Fibula

Q.20 Which pair does not possess corresponding bones?
A) Carpals and tarsals
B) Atlas and coccyx
C) Pectoral girdle and pelvic girdle
D) Humerus and femur

Q.21 Ilium is part of:
A) Small intestine
B) Pectoral girdle
C) Pulmonary tract
D) Pelvic girdle

Q.22 The total number of vertebrae in lumber and pelvic regions are:
A) 9
B) 14
C) 16
D) 13

DISORDERS OF HUMAN SKELETON

Q.23 Fortified milk and calcium are used for the treatment of:
A) Disc slip
B) Microcephaly
C) Rickets
D) Sciatica

Q.24 Which one of the following is correct about sciatic?
A) Result due to injury in pectoral area
B) Foot-ankle movement is lost
C) Inflammatory and infectious disorder
D) ERT

Q.25 Type of arthritis spurred by wear and tear to the spine:
A) Osteomalacia
B) Arthritis
C) Rickets
D) Spondylosis

Q.26 In_____ individuals have their upper lip folded or the individual has harelip.
A) Microcephaly
B) Osteoporosis
C) Osteomalacia
D) Cleft palate

BONE FRACTURES

Q.27 Fracture in which there is an open wound or break in the skin near the site of the broken bone is called as:
A) Complex fracture
B) Open fracture
C) Compound fracture
D) Both B & C

Q.28 Callus replaces the original blood clot and holds the end of the bones together in:
A) 8 days
B) 3-4 weeks
C) 2-3 weeks
D) 3-4 months

JOINTS

Q.29 Knee and elbow joints are examples of:
A) Ball and socket joint
B) Hinge joint
C) Cartilaginous joint
D) Fibrous joint

Q.30 Which of the following is an example of synovial joint?
A) Joint between clavicle and scapula
B) Joint between rib and vertebral column
C) Joint between radius and ulna
D) Joints between skull bones

Q.31 The joint present between the bones of forearm and wrist is called as:
A) Pivot joint
B) Ball and socket joint
C) Multistage joint
D) Hinge joint

Q.32 Elbow joint is an example of:
A) Ball and socket joint
B) Hinge joint
C) Fibrous joint
D) Pivot joint

JOINT INJURIES

Q.33 Injury to ligament is called as:
A) Herniation of joint
B) Strain
C) Rheumatoid arthritis
D) Sprain

Q.34 Icing and physical therapy are the methods for the treatment of:
A) Disc slip
B) Cleft palate
C) Joint dislocation
D) Sprain

COMPARISON OF MUSCLES TYPES

Q.35 Muscles are the specialized type of tissues having _____ origin.
A) Ectodermal
B) Mesodermal
C) Endodermal
D) Hyperdermal

Q.36 Connective tissue wrapping around a muscle that is found continuous with tendons:
A) Perimysium
B) Epimysium
C) Endomysium
D) Perichondrium

Q.37 Sarcoplasmic reticulum is like:
A) Golgi bodies
B) Cytoskeletal fibers
C) Smooth endoplasmic reticulum
D) Ribosome

Q.38 Irregular striations and involuntary control is related to:
A) Smooth muscle cells
B) Skeletal muscle cells
C) Cardiac muscle cells
D) Fibroelastic cartilage cells

Q.39 Which one of the following is correct regarding ligaments and tendons?
A) Both are inelastic
B) Both are elastic
C) Both are specialized connective tissue fibrils
D) Both form joint capsule

Q.40 Brachioradialis:
A) Originates from radius
B) Is inserted into radius
C) Originates from ulna
D) Is inserted into ulna

Q.41 The main functional partners of bones are:
A) Tendon
B) Skeletal muscle
C) Ligament
D) Nerves

Q.42 Sarcolemma is primarily made up of:
A) Lipoprotein
B) Glycoprotein
C) Glycolipids
D) Nucleoproteins

Q.43 Earliest form of muscles is:
A) Cardiac
B) Smooth
C) Skeletal
D) Striated

STRUCTURE AND ULTRASTRUCTURE OF SKELETAL MUSCLES

Q.44 Which one of the following structures serves as a center of sarcomere?

A) H-Zone
B) M-line
C) Z-band
D) A-band

Q.45 Which one of the following is correct regarding A-band?

A) It is non-polarizing
B) It is isotropic
C) It contains only myosin
D) Myosin acts as a polarizer of light

Q.46 Cross bridges form between:

A) Troponin and tropomyosin
B) Calcium and sodium
C) Actin filaments and myosin heads
D) Sarcolemma and sarcoplasmic reticulum

Q.47 When a muscle is at rest, what blocks myosin from binding to actin?

A) Tropomyosin
B) Troponin
C) Tubulin
D) Sarcomere

Q.48 Which triggers the release of calcium ions from sarcoplasmic reticulum?

A) Formation of actin-myosin cross bridges
B) Sarcomere contraction
C) An action potential
D) An increase in calcium ion concentration

Q.49 T-tubules in human skeletal muscles are present at:

A) Z-line
B) A-I junction
C) M-line
D) H-zone

Q.50 Diameter of each myofibril is _____.

A) 2μm
B) 100 nm
C) 10μm
D) 100μm

Q.51 Which of the following is a true statement?

A) Muscle cell has many muscle fibers
B) Muscle cell has many myofibrils
C) Muscle fiber has many muscle cells
D) Sarcomere has bundles of muscle fibers

Q.52 Which of the following band allows most of the light to pass through it?

A) A-band
B) I-band
C) Muscle bundle
D) Muscle fiber

Q.53 A protein that is complex of three polypeptide chains is:

A) Actin
B) Myosin
C) Tropomyosin
D) Troponin

Q.54 Chief component of thin filaments is:

A) Actin
B) Myosin
C) Troponin
D) Fibrous proteins

Q.55 The sliding protein of muscle:

A) Tubulin
B) Myosin
C) Myoglobin
D) Actin

SLINDING FILAMENT MODEL AND ENERGY FOR MUSCLES CONTRATION

Q.56 The point of attachment of the nerve to the muscle is called a _____ junction.

A) Neuro-muscular
B) Chemical
C) Mechanical
D) Synaptic

Q.57 All of the following are true regarding muscle contraction except:

A) I band shortens
B) Z-lines gets closer
C) A band remains unchanged
D) M-line disappears

Q.58 Contractile protein of skeletal muscle cells involving ATPase activity is:

A) Actin
B) Troponin
C) Myosin
D) Tropomyosin

Q.59 When muscle contracts, thick and thin filaments undergo:

A) Overlapping
B) Lengthening
C) Shortening
D) Contraction

Q.60 A motor unit is made up of:

A) All the muscle fibers within a given muscle
B) A motor neuron and the muscle fibers it innervates
C) All the neurons going into an individual section of a body
D) A fascicle and a nerve

Q.61 It acts as immediate source of energy for muscles contraction:

A) ATP
B) Fatty acids
C) Phosphocreatine
D) Glycogen

MUSCLES DISORDERS

Q.62 All of the followings are muscles disorders except:

A) Tetany
B) Fatigue
C) Cramp
D) Tetanus

Q.63 Straining, overusing of muscles, dehydration, lack of minerals in diet of depletion of minerals in body, and not enough blood getting to muscles leads to:

A) Muscles fatigue
B) Tetanus
C) Muscular tetany
D) Cramp

Q.64 Overproduction of calcitonin is the cause of:

A) Muscular tetany
B) Tetanus
C) Muscles fatigue
D) Cramp

PAST PAPER MCQs

2010

Q.1 During muscle contraction:
A) I-band shortens
B) Myosin filaments shorten
C) Actin filaments shorten
D) Z-line disappears

2011

Q.2 Muscle is made up of many cells which are referred to as:
A) Myofilaments
B) Myofibrils
C) Sarcolemma
D) Muscle Fibers

Q.3 The pigment which stores oxygen in muscles is:
A) Hemoglobin
B) Myoglobin
C) Myosin
D) Actinomyosin

Q.4 The length of myofibril from one Z-band to the next is known as:
A) Sarcomere
B) Sarcolemma
C) Sarcoplasm
D) Muscle Fiber

Q.5 Calcium ions released during a muscle fiber contraction attach with:
A) Myosin
B) Actin
C) Tropomyosin
D) Troponin

2012

Q.6 Each muscle fiber is surrounded by membrane which is called:
A) Sarcomere
B) Sarcolemma
C) Twitch fiber
D) Capsule

Q.7 When calcium ions are released from the sarcoplasmic reticulum they bind with _____ during muscle contraction.
A) Tropomyosin
B) Sarcolemma
C) Cytosol's ions
D) Troponin

2013

Q.8 Where can we find H-zone in the figure of fine structure of skeletal muscle's myofibril?
A) In the mid of A-band
B) In I-band
C) Besides the Z-line
D) Along the I-band

Q.9 The length of myofibril from one Z-band to the next is described as:
A) Sarcolemma
B) Sarcoplasm
C) Sarcomere
D) Muscle fiber

Q.10 The Ca^{2+} ions released during a muscle fiber contraction attach with:
A) Myosin
B) Actin
C) Troponin
D) Tropomyosin

2014

Q.11 The repeated protein pattern of myofibrils is called:
A) Sarcomere
B) Zyomere
C) Sarcolemma
D) Cross bridges

Q.12 When more energy is required in muscle contraction then that energy can also be produced by _____ as a secondary source.
A) Glucose
B) Phosphocreatine
C) Fructose
D) Lactic acid

2015

Q.13 A sarcomere is the region of a myofibril between two successive:
A) M-lines
B) Z-lines
C) I-bands
D) T-tubules

Q.14 The sarcolemma of muscle fiber folds inwards and forms a system of tubes which runs through the sarcoplasm called:
A) Myofilaments
B) Sarcoplasmic reticulum
C) Z-lines
D) Transverse tubules

Q.15 According to sliding filament theory, when muscle fibers are stimulated by nervous system, which of the following changes occurs?
A) I-bands shorten
B) H-zone becomes more visible
C) Z-lines move further apart
D) A-bands shorten

2016

Q.16 Each muscle fiber is surrounded by a modified cell membrane called:
A) Sarcolemma
B) Sarcomere
C) Myosin Filament
D) Myofilament

2017

Q.17 Each muscle fiber is surrounded by a modified cell membrane called:
A) Sarcolemma
B) Sarcomere
C) Myosin Filament
D) Myofilament

2017 Re-Take

Q.18 Over lapping of thick filament occurs in:
A) A-Band
B) I-Band
C) M-line
D) Z-line

2019

Q.19 Thin filaments of muscles contain _____ chains of actin molecules.
A) Four
B) One
C) Three
D) Two

Q.20 The thick filaments in a myofibril of muscles are made up of _____.
A) Haemoglobin
B) Myoglobin
C) Actin
D) Myosin

Q.21 The function of calcium ions in muscle contraction is to:
A) Bind to troponin molecule and cause them to move
B) Aid in the transmission of nerve impulse
C) Polarize visible light
D) Bind to tropomyosin molecule and cause them to form cross bridges=

2020

Q.22 Which one of the following muscles are considered as "Voluntary muscles"?
A) Smooth muscles
B) Cardiac muscles
C) Skeletal muscles
D) Glandular muscles

Q.23 Which one of the following are "myogenic" type of muscles?
A) Smooth muscles
B) Cardiac muscles
C) Skeletal muscles
D) Glandular muscles

Q.24 What do we call the cell surface membrane of a muscle fiber?
A) Sarcolemma
B) Plasma membrane
C) Sarcoplasm
D) Myofibrils

ANSWER KEY

TOPIC-WISE MCQs

1	A	11	D	21	D	31	C	41	B	51	B	61	A
2	C	12	B	22	B	32	B	42	A	52	B	62	D
3	B	13	A	23	C	33	D	43	B	53	D	63	D
4	B	14	C	24	B	34	D	44	B	54	A	64	A
5	C	15	C	25	D	35	B	45	D	55	D		
6	C	16	C	26	D	36	B	46	C	56	A		
7	A	17	B	27	D	37	C	47	A	57	D		
8	C	18	D	28	B	38	C	48	C	58	C		
9	A	19	A	29	B	39	C	49	B	59	A		
10	B	20	B	30	C	40	B	50	A	60	B		

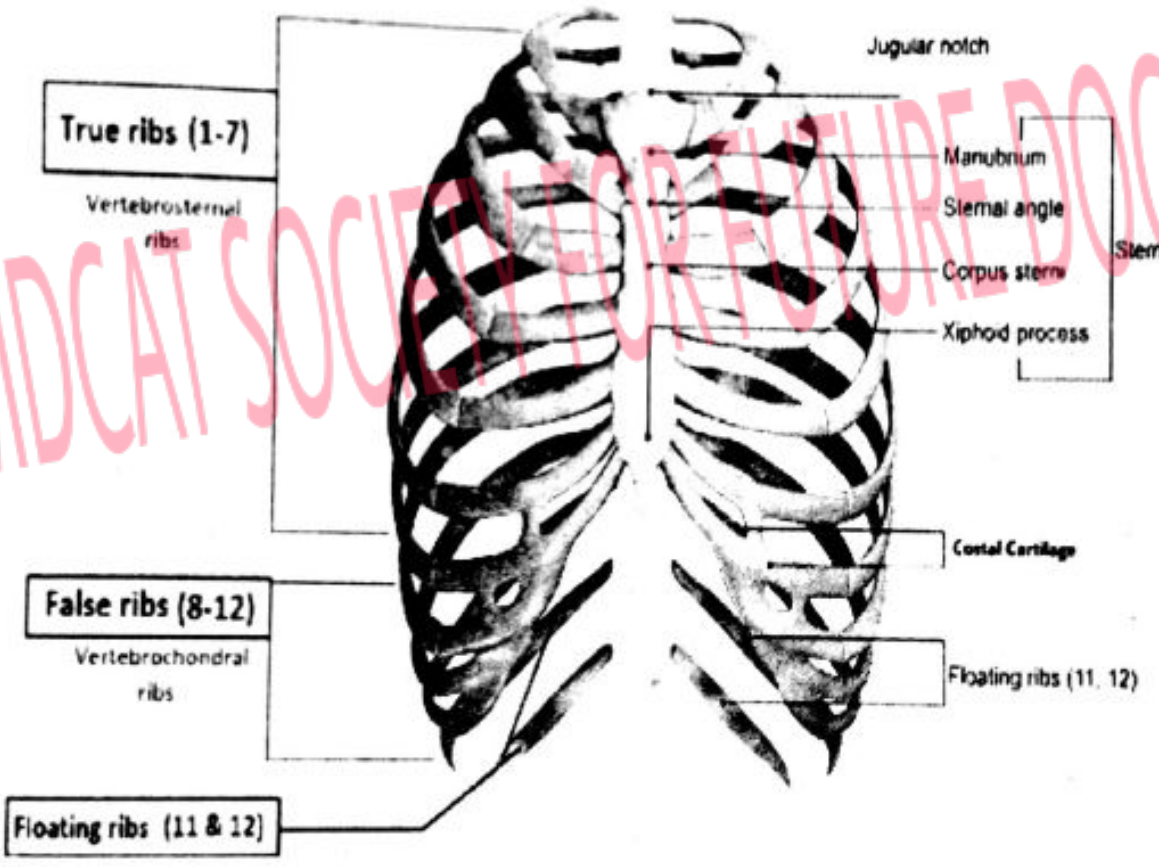
PAST PAPERS MCQs

1	A	11	A	21	A
2	D	12	B	22	C
3	B	13	B	23	B
4	A	14	D	24	A
5	D	15	A		
6	B	16	A		
7	D	17	A		
8	A	18	A		
9	C	19	D		
10	C	20	D		

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Cranium, vertebral column and rib cage etc., are the bony structures which protect brain, spinal cord and heart respectively.
2. Bones have living tissues like osteoblast, osteocytes and osteoclast, while cartilage have chondrocytes that produce large amount of collagenous extracellular matrix.
3. Fibrocartilage present in intervertebral disc.
   Elastic cartilage present in ear pinna, epiglottis.
   Hyaline cartilage is found at the end of long bones and in the nose, at larynx and trachea
4. Collagen is the most abundant protein in your body. It is the major component of connective tissues that make up several body parts, including tendons, ligaments, skin, and muscles
5. Osteoblast are Bone-forming cells.
   Osteocyte are mature bone cell.
   Osteoclast are bone dissolving cells.
6.

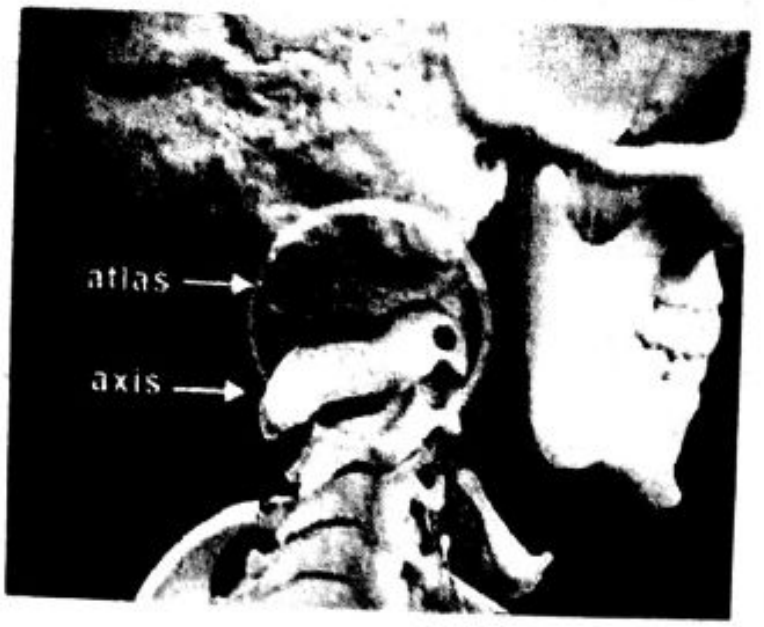


7.

Paired bones	Unpaired bones
Temporal	Vomer
Parietal	Mandible
Zygomatic	Sphenoid
Maxilla	Ethmoid
Lacrimal	Frontal
Inferior concha	Occipital
Nasal bone	
Palatine	

8. Only movable bone of skull is mandible.

9.



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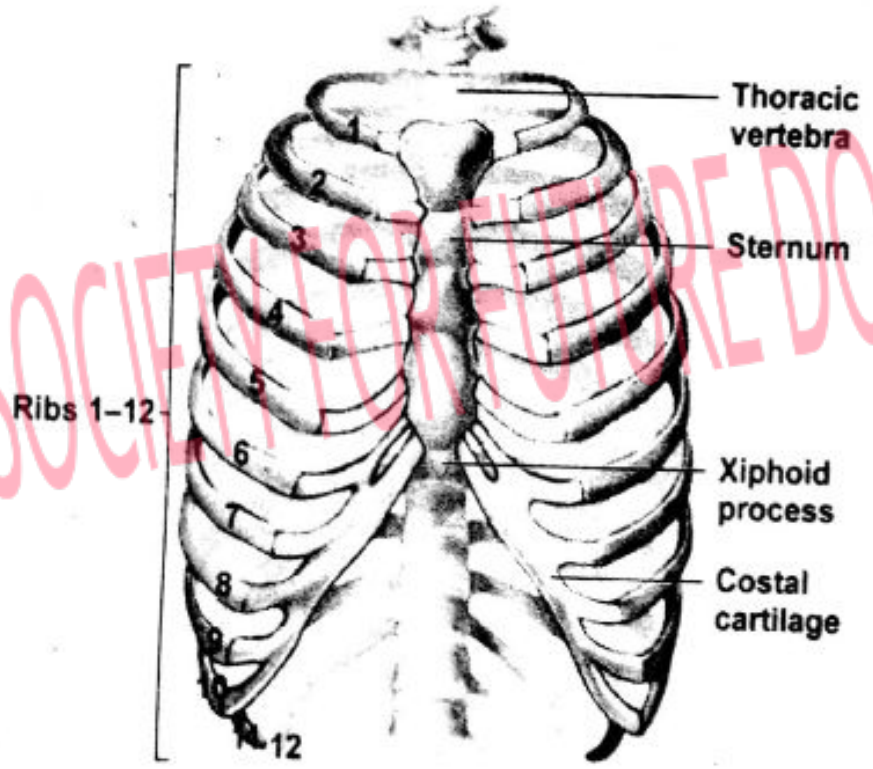

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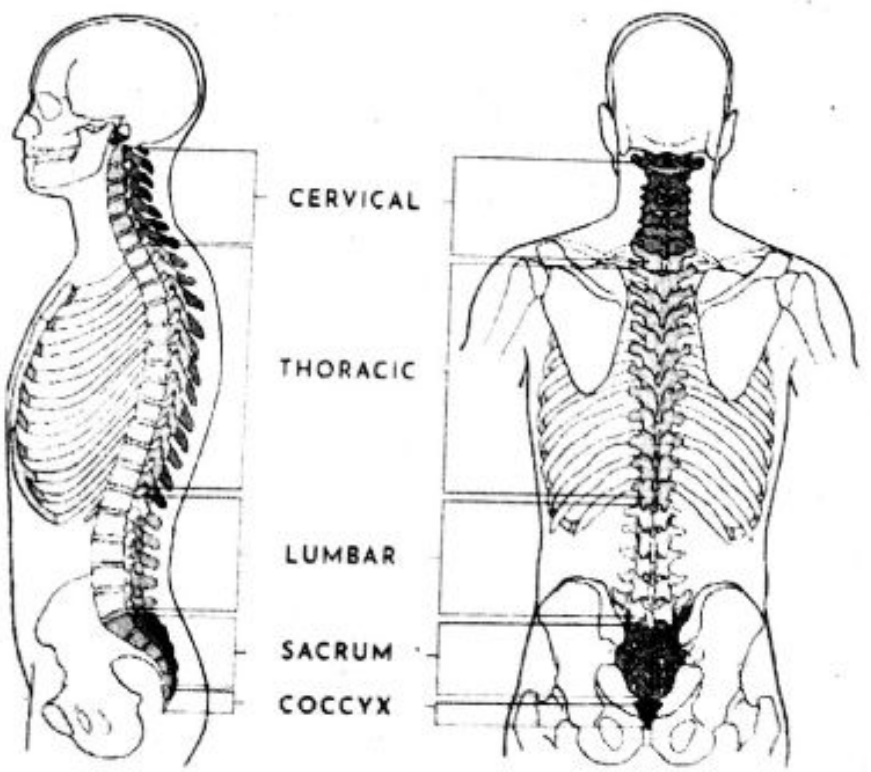

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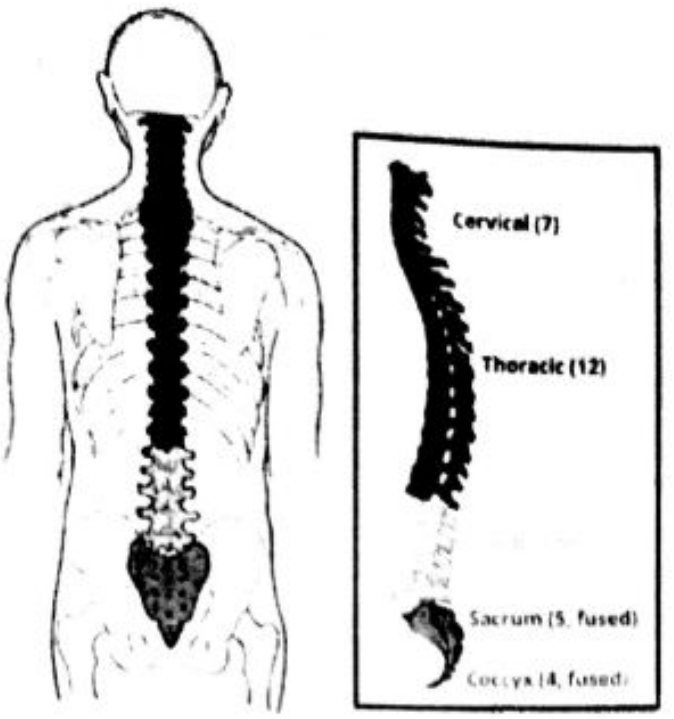
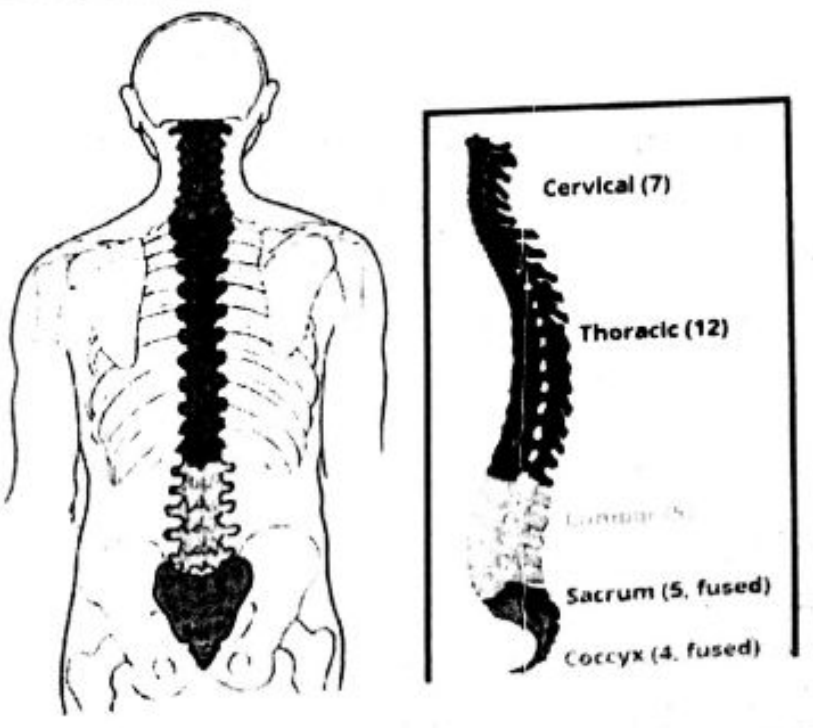


13.

Facial bones	
Paired bones	**Unpaired bones**
Zygomatic Maxilla Lacrimal Inferior concha Nasal bone Palatine	Vomer Mandible
Cranial bones	
Paired bones	**Unpaired bones**
Temporal Parietal	Sphenoid Ethmoid Frontal Occipital

14.



15.

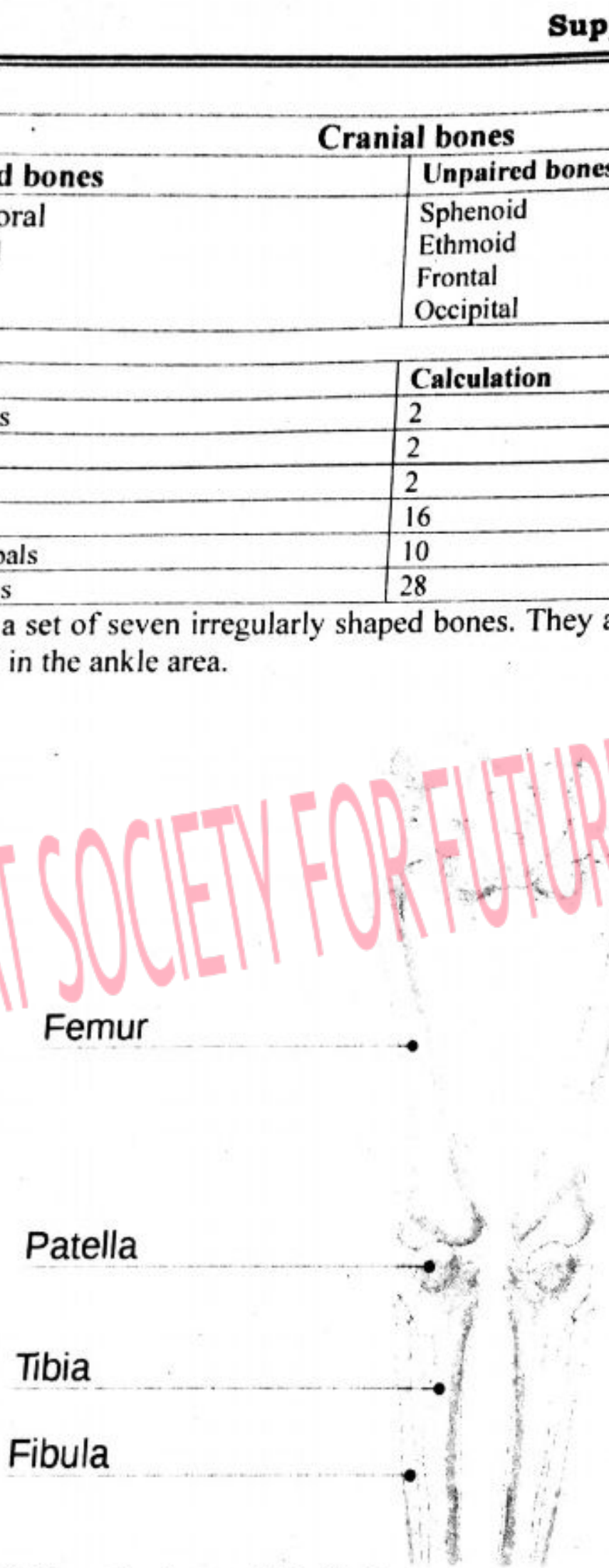
Cranial bones	
Paired bones	**Unpaired bones**
Temporal Parietal	Sphenoid Ethmoid Frontal Occipital

16.

Bones	Calculation
Humerus	2
Radius	2
Ulna	2
Carpals	16
Metacarpals	10
Phalanges	28

17. Tarsals is a set of seven irregularly shaped bones. They are situated proximally in the foot in the ankle area.

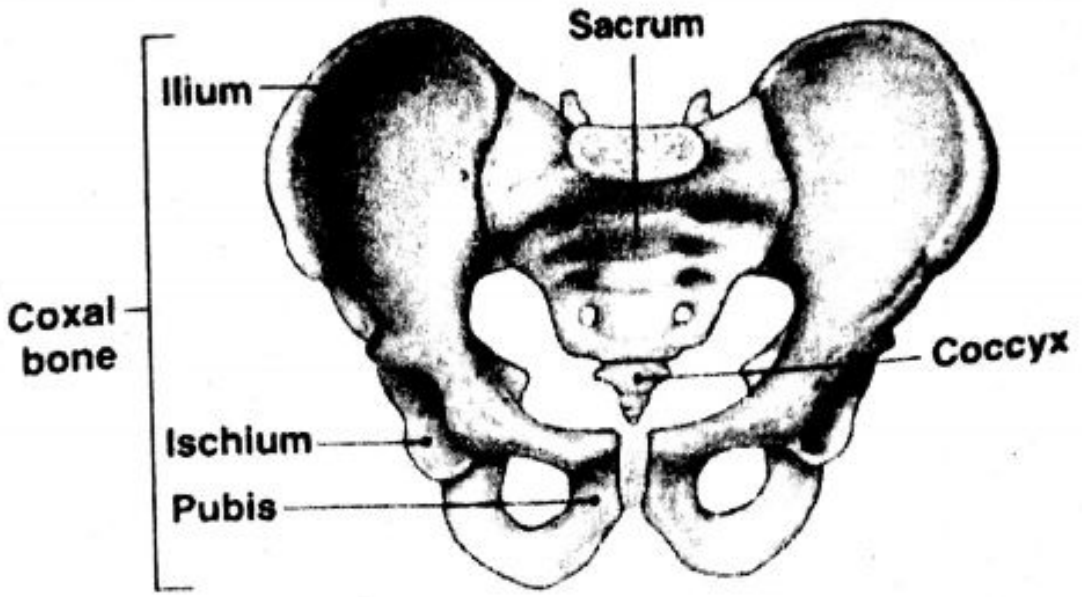
18.



). Femur, tibia and fibula are the bones of hind limbs.

). Atlas is first cervical vertebrae, whereas coccyx is formed by the fusion of four posterior vertebrae.

21.



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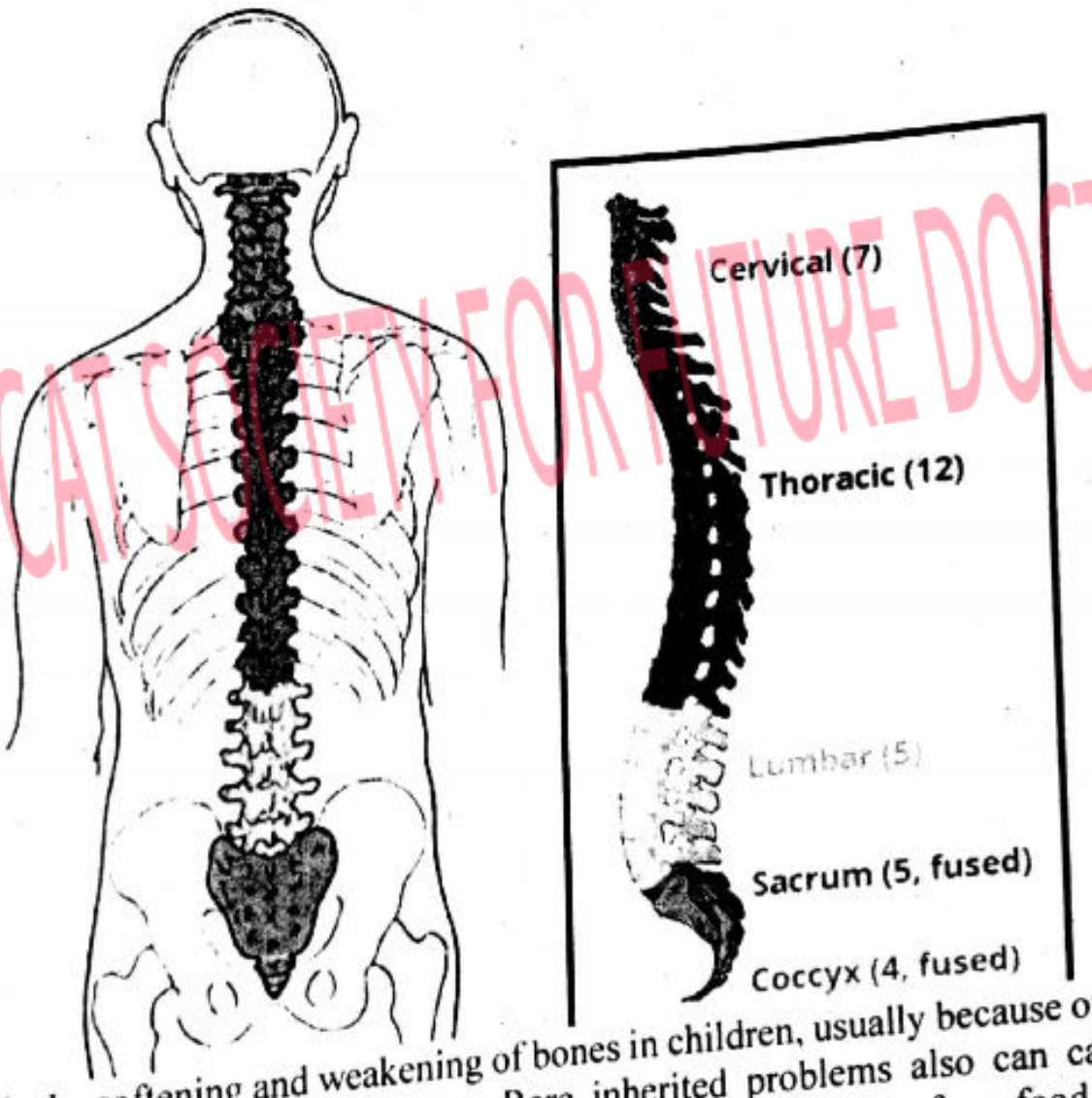


23. Rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency. Rare inherited problems also can cause rickets. Vitamin D helps your child's body absorb calcium and phosphorus from food.

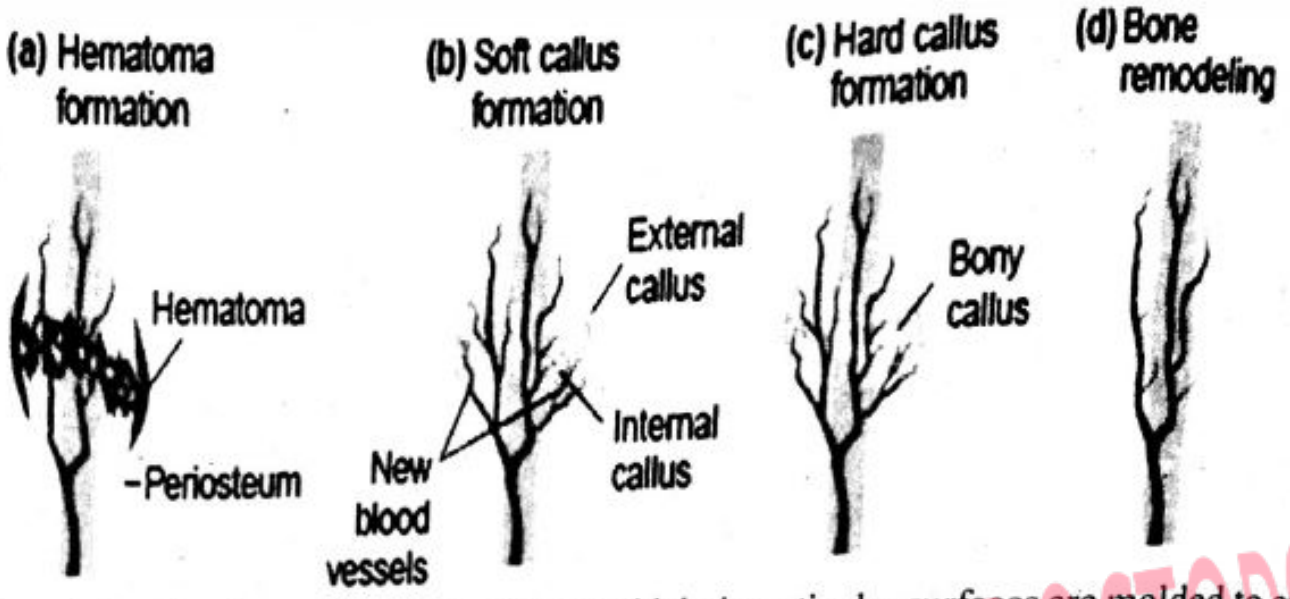
24. Sciatica is a term that describes symptoms of pain, numbness, and/or weakness that radiate along the sciatic nerve from the lower back to the buttocks and leg.

25. Osteomalacia is a nutritional problem in which the bones receive inadequate minerals. Arthritis is inflammatory or degenerative disease that damages joints. Rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency.

26. A cleft palate is an opening or split in the roof of the mouth that occurs when the tissue doesn't fuse together during development in the womb. A cleft palate often includes a split (cleft) in the upper lip (cleft lip) but can occur without affecting the lip.

27. Open fracture is type of fracture in which bone pokes through the skin and can be seen. Or a deep wound exposes the bone through the skin. Closed fracture (simple fracture). The bone is broken, but the skin is intact.

28.



29. A hinge joint (ginglymus) is a bone joint in which the articular surfaces are molded to each other in such a manner as to permit motion only in one plane. Ball and socket joint shows movement in all directions.

30. A synovial joint is the type of joint found between bones that move against each other, such as the joints of the limbs (e.g. shoulder, hip, elbow and knee).

31. And 32

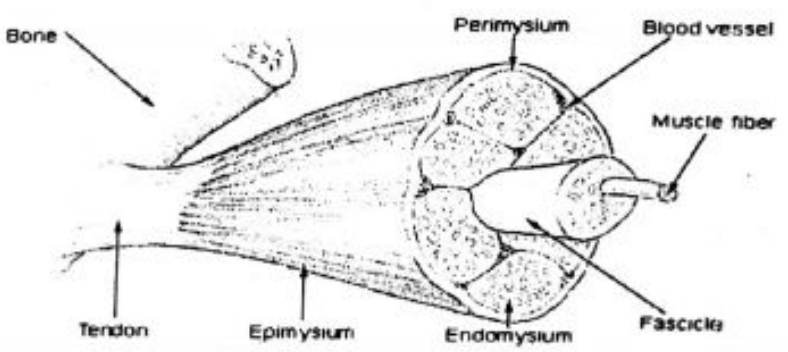
Joint	Examples
Pivot joint	Between proximal end of radius and ulna
Ball and socket	Pelvic and pectoral girdle
Hinge joint	Knee and elbow

33. Wrench or twist the ligaments of (an ankle, wrist, or other joint) violently so as to cause pain and swelling but not dislocation.

34. Sprain can be usually treated with treatments such as icing and physical therapy. Dressings, bandages, or ace-wraps should be used to immobilize the sprain and provide support.

35. Mesoderm gives rise to many tissues of the body, including the dermis of the skin, the heart, muscle system, urogenital system, bones, and bone marrow and therefore the blood.

36. Anatomy of muscle bundle is given below:



37. Sarcoplasmic reticulum is the modified form of smooth endoplasmic reticulum as they devoid of ribosomes and found in muscles. It regulates Ca^{2+} ions concentration in sarcoplasm.

38. Skeletal muscle cells have regular striation, while smooth muscle cells do not have striation. Cardiac muscle cells, however, have irregular striations with involuntary control.

39.

Tendon	Ligament
Inelastic, tough fibrous tissue	Strong, elastic fibrous tissue
Connects bone with muscle	Connects bone with bone (form joint)

40.

41. The main functional partner of bones is skeletal muscles. Both these can work together to bring about movement in the body.

42. Since sarcolemma is the membrane of muscle cells, so its chemical composition is lipoproteins.

43. Smooth muscles are found both in invertebrates and vertebrates while cardiac and skeletal muscles are found only in vertebrates and are most developed.

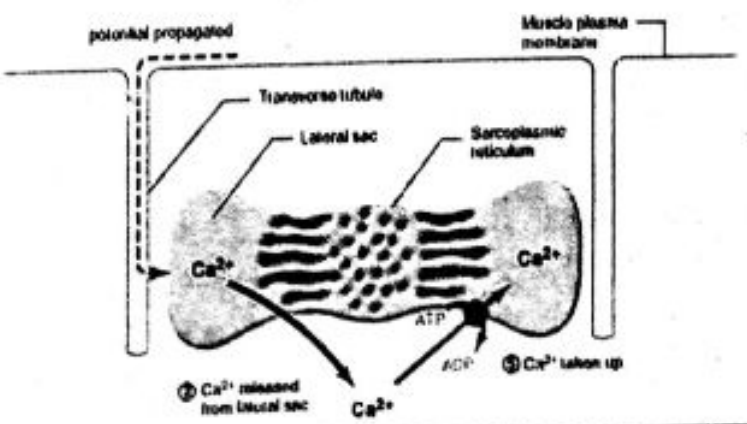
44. A sarcomere is bounded by two Z-lines and its center is bisected by dark line called M line.

45. Each dark band in the skeletal muscles is called A-band because it is anisotropic i.e. it can polarize visible light. This polarization of light is due the presence of myosin. It also contains overlapping actin.

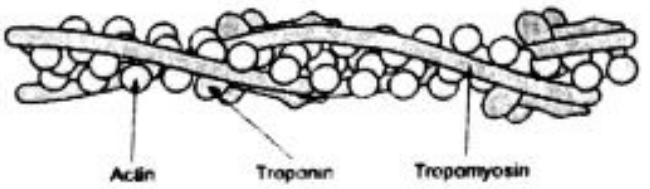
46. When muscles contract myosin heads attach to the actin.

47. When the muscle is at rest, the tropomyosin is disposed in such a way that it covers the sites on the actin chain where the head of myosin becomes attached.

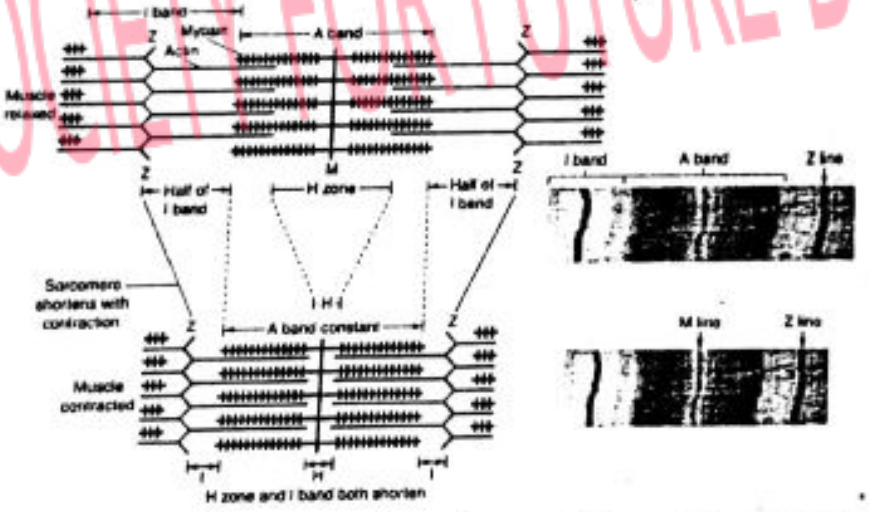
48.



49. T tubule is found at A-I junction in skeletal muscle while at Z-line in cardiac muscle.
50. Diameter of myofibrils is 2μm.
51. When viewed in high magnification, each muscle fiber is seen to contain large number of myofibrils 1-2μm in diameter that run in parallel fashion and extend entire length of the cell.
52. Isotropic bands contain only actin-containing thin filaments. They indicate the behavior of polarized light as it passes through I bands. These are with low refractive index thus appears brighter.
53. Thin filament contains three types of protein; actin (having 2 polypeptide chains), tropomyosin (having 2 polypeptide chains) and troponin (having 3 polypeptide chains).
54. Most abundant protein in thin filament is actin, while most abundant protein found in thick filaments is myosin.
55.



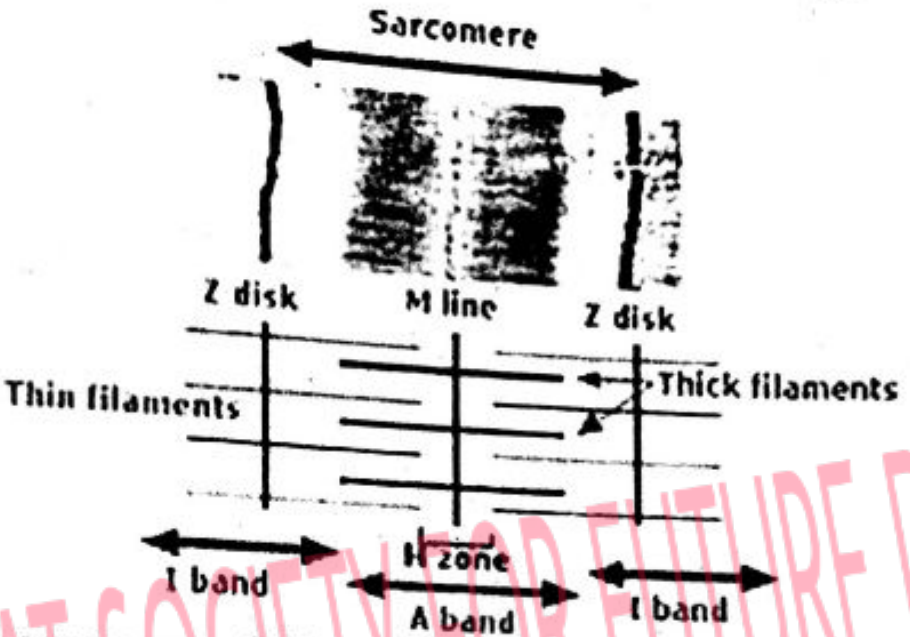
56. The point of attachment of the nerve to the muscle is called neuromuscular junction. All the fibres innervated by a single motor neuron are a motor unit and contract simultaneously in response the action potential fired by motor neurons.
57. During muscle contraction, I-band shortens, Z-lines get closer to each other and H-zone disappears. A-band and M- line remains unchanged.
58. In muscle, myosin is found abundantly. Its head region has ATPase activity and involves in ATP hydrolysis during muscle contraction.
59.



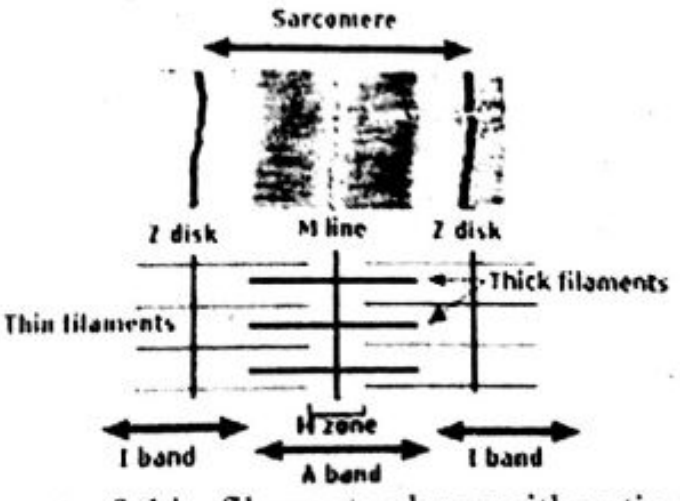
60. Muscle contraction is initiated by nerve impulse arriving at the neuromuscular junction. All the fibres innervated by a single motor neuron are a 'motor unit' and contract simultaneously in response to the action potential fired by the motor neurons.
61. ATP is energy currency which radially available for cellular working.
62. Tetanus is an infectious disorder caused by *Clostridium tetani.*
63. And 64
Muscles fatigue is due to accumulation of lactic acid and ionic imbalance Muscular tetany is due to low calcium level in blood. Muscle cramp is due to dehydration, lack of mineral or leak or blood supply to the muscles.

PAST PAPER MCQs

1. During muscle contraction;
   - Z-lines come brought closer together
   - I-band shortens
   - H-zone disappears
2. Muscles are made up of large number of cells called muscle fibers. These are cylindrical shaped and have more than one nucleus. They also have multiple mitochondria to meet energy needs.
3. Myoglobin is an iron- and oxygen-binding protein found in the muscle tissue of vertebrates in general and in almost all mammals. Its function is to store oxygen in muscles.
4.



5. Troponin is a component of thin filaments along with actin and tropomyosin, and is the protein complex to which calcium binds to trigger the process of muscle contraction.
6. The sarcolemma is a specialized cell membrane which surrounds striated muscle fiber cells. The sarcolemma is similar to a typical plasma membrane but has specialized functions for the muscle cell.
7. Troponin is a component of thin filaments along with actin and tropomyosin, and is the protein complex to which calcium binds to trigger the process the muscle contraction.
8. The H zone is the central region of the A zone and contains only thick filaments (myosin) and is shortened during contraction.
9.

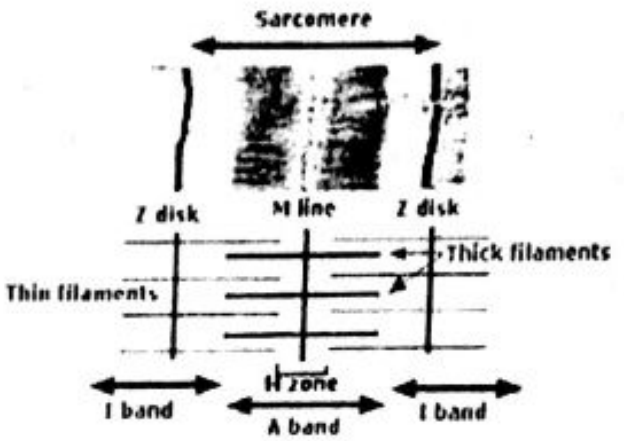


10. Troponin is a component of thin filaments along with actin and tropomyosin, and is the protein complex to which calcium binds to trigger the process the muscle contraction.

11. A myofibril is a basic rod-like unit of a muscle cell. The repeated protein pattern of myofibrils is called sarcomere and it is the complicated unit of striated muscle tissue. It is the repeating unit between two Z-lines.

12. Phosphocreatine, also known as creatine phosphate, is a phosphorylated creatine molecule that serves as a rapidly mobilizable reserve of high energy phosphates in skeletal muscle, myocardium and the brain to recycle ATP.

13.



14. T-tubules are extensions of the cell membrane that penetrate into the centre of skeletal and cardiac muscle cells. The function of T-tubules is to conduct impulses from sarcolemma down into the cell and specifically, to another structure in the cell called sarcoplasmic reticulum.

15. According to sliding filament model of muscle contraction, the following changes can occur
- Z-lines come brought closer together
- I-band shortens
- H-zone disappears

16. And 17
The sarcolemma is a specialized cell membrane which surrounds striated muscle fiber cells. The sarcolemma is similar to a typical plasma membrane but has specialized functions for the muscle cell.

18. Thick filaments occur only in the A band of a myofibril. The region at which thick and thin filaments overlap has a dense appearance, as there is little space between the filaments. Thin filaments do not extend all the way into the A bands, leaving a central region of the A band that only contains thick filaments.

19. Actin is a spherical protein that forms the thin filament in muscle cells. Thin filaments are composed of two long chains of these actin molecules that are twisted around one another. Each actin molecule has a myosin-binding site where a myosin head can bind.

20. Thick filaments composed of several hundred molecules of myosin. A myosin molecule is shaped like a golf club, with a tail formed of two intertwined chains and a double globular head projecting from it.

21. Inside the muscle, Ca^{2+} facilitates the interaction between actin and myosin during contractions. Calcium binds with the troponin, causing a position change in tropomyosin, exposing the actin sites that myosin will attach to, for a muscle contraction.

22. Cardiac and smooth muscles are involuntary in action, while skeletal muscles are voluntary in their functions.

23. The muscles of the human heart are stimulated to contract by nerve impulses generated by the Sino Atrial (SA) node. It is a cluster of cells which are part of the heart muscle. Hence the human heart is myogenic. It does not require nerves to start contracting, it can contract on its own.

24. The sarcolemma also called the myolemma, is the cell membrane of a striated muscle fiber cell. It consists of a lipid bilayer and a thin outer coat of polysaccharide material (glycocalyx) that contacts the basement membrane.

13 TOPIC COORDINATION & CONTROL

PRACTICE EXERCISE

TOPIC-WISE MCQs

STEPS INVOLVED IN NERVOUS COORDINATION

Q.1 Nervous coordination involves:

i. **Reception of stimulus**
ii. **Response to stimulus**
iii. **Analysis of information**

A) i → iii → ii
B) iii →
C) ii → iii → i
D) i→ ii → iii

Q.2 Information received by different receptors of body is analyzed by:

A) Autonomic nervous system
B) Parasympathetic nervous system
C) Central nervous system
D) Sympathetic nervous system

SENSORY RECEPTORS AND THEIR WORKING

Q.3 Sense of hearing is concerned with:

A) Cerebral cortex
B) Hypothalamus
C) Medulla
D) Cerebellum

Q.4 Ectoderm mainly gives rise to:

A) Musculo-skeletal system
B) Respiratory system
C) Nervous system
D) Cardiovascular system

Q.5 Pressure is felt by your body immediately after it is applied This is achieved with the help of:

A) Mechanoreceptors
B) Nociceptors
C) Thermoreceptors
D) Chemoreceptors

Q.6 Stimulus of touch, pain, cold and heat are recognized differently because:

A) For each sensation, different form of nerve impulse is generated
B) Different receptors are present for detection of stimuli
C) All nerves send their impulse to same part of brain
D) Each stimulus acts on different parts of body

NEURON (STRUCTURE AND TYPES)

Q.7 Non-neuronal cells encapsulating mainly axons of peripheral neurons are:

A) Microglia
B) Astrocytes
C) Oligodendrocytes
D) Schwann's cell

Q.8 Myelinated, single and long fiber that takes message towards the cell body is:

A) Dendron
B) Dendrite
C) Axon
D) Soma

Q.9 A motor nerve carries impulses from:

A) Spinal nerves to effectors
C) Effectors to CNS
C) Effectors to cranial nerves
D) CNS to effectors

Q.10 The largest number of the cell bodies of neurons are found in:

A) Brain
B) Sensory organs
C) Spinal cord
D) Effectors

Q.11 Which of the following is not correct about myelin sheath?

A) Composed of specialized lipids
B) Conduct impulses
C) Responsible for saltatory conduction
D) Absent on nodes of Ranvier

Q.12 Myelin sheath:
A) Is found in all axons
B) Speeds up conduction
C) Is found in all dendrons
D) Is proteinaceous

Q.13 Which one of the following are also known as efferent neurons?
A) Sensory
B) Motor
C) Associative
D) Mixed

Q.14 Regeneration is possible in all parts of neurons except:
A) Dendron
B) Dendrites
C) Axon
D) Cell body

Q.15 Grey matter is composed of:
A) Schwann cells
B) Cell bodies of neuron
C) Neuron fibres
D) Nissl's granules

Q.16 It is not true about cell body of neuron:
A) Main nutritional part
B) Biosynthesis of materials
C) It contains axoplasm
D) Regenerate axonal and dendrite fiber

Q.17 Which organelle cannot be found in synaptic knob of a neuron?
A) Mitochondria
B) Secretory vesicles
C) Ribosomes
D) Nucleus

Q.18 Which of the following is most abundant type of neurons in CNS?
A) Sensory neurons
B) Motor neurons
C) Associate neurons
D) Neuroglial cells

Q.19 Which one of the following gives a tree-like appearance to neurons?
A) Dendron
B) Dendrites
C) Soma
D) Axons

Q.20 Which of the following is not a part of neuron?
A) Axon
B) Nissl's granules
C) Dendrons
D) Synapse

REFLEX ACTION & REFLEX ARC

Q.21 Which of the following is not a component of reflex arc?
A) Afferent nerve
B) Efferent nerve
C) Brain
D) Effectors

Q.22 The primary function of spinal cord is to:
A) Produce CSF
B) Communicate two hemispheres
C) Produce hormones
D) Communicate brain with rest of body

Q.23 Which of the following describes the comprehensive pathway of reflex arc?
A) Prick on finger → Sensory nerve → Medulla → Motor nerve → Arm Muscle
B) Prick on finger → Sensory nerve → Spinal cord → Motor nerve → Finger muscles
C) Prick on finger → Sensory nerve → Cerebrum → Motor nerve → Finger muscle
D) Prick on finger → Sensory nerve → Cerebellum → Motor nerve → Finger muscle

NERVE IMPULSE

Q.24 Depolarization is the result of:
A) Influx of K^+
B) Efflux of K^+
C) Influx of Na^+
D) Efflux of Na^+

Q.25 Nerve impulse transmission is:
A) Mechanical process
B) Biological process
C) Chemical process
D) Physical process

Q.26 Which of the following causes the hyperpolarization across neurolemma?
A) Distribution of charge
B) Late closing of K^+ channels
C) Influx of Na^+
D) Outward diffusion of Na^+

Q.27 Which one of the following sets of ions is necessary for transmission nerve impulse?
A) Na^+ and K^+
B) Ca^{2+} and K^+
C) Ca^{2+} and Na^+
D) Na^+ and Mg^{2+}

Q.28 Nerve transmission is:
A) Mechanical process
B) Biological process
C) Chemical process
D) Physical process

Q.29 Which of the following will restore original ion gradients and RMP after hyperpolarization in neurons?
A) K^+ channels
B) Na^+ channels
C) Na^+/K^+ pumps
D) Ca^{++} channels

SYNAPSE

Q.30 Microscopic gap between the neurons is called:
A) Synapse
B) Collapse
C) Synaptic cleft
D) Pre-synapse membrane

Q.31 Which ion is involved in release of Acetylcholine from pre-synaptic fiber into extracellular fluid?
A) Calcium
B) Sodium
C) Potassium
D) Magnesium

Q.32 Neurotransmitter molecule binds to receptors that are located on:
A) Synaptic knob
B) Post synaptic membrane
C) Pre-synaptic membrane
D) Synaptic cleft

Q.33 After the depolarization of post synaptic neurolemma, neurotransmitters are mostly:
A) Taken up by Schwann cells
B) Degraded by enzymes
C) Remain in synaptic cleft
D) Taken up by post synaptic membrane

Q.34 Which of the following acts as a messenger in both chemical and nervous coordination?
A) Acetylcholine
B) Dopamine
C) Nicotine
D) Epinephrine

CENTRAL NERVOUS SYSTEM

Q.35 Breathing, blood pressure and swallowing is controlled by:
A) Pons
B) Cerebellum
C) Medulla
D) Midbrain

Q.36 Thinking and reasoning is the function of:
A) Cerebellum
B) Forebrain
C) Hindbrain
D) Midbrain

Q.37 The protective covering of the brain is:
A) Pericardium
B) Peritoneum
C) Pleura
D) Meninges

Q.38 The main function of cerebrospinal fluid is:
A) Nourishment of brain and spinal cord
B) Keeping the central nervous system moist
C) Functioning as cushion against shocks
D) All A, B, C

Q.39 Dorsal root of a spinal nerve contains:
A) Motor nerve fibers
B) Mixed nerve fibers
C) Sensory nerve fibers
D) No nerve fibers

Q.40 Collection of cell bodies of neurons in CNS is known as:
A) Ganglion
B) Nerve
C) Nuclei
D) Tract

Q.41 _____ is involved in screening information before they reach higher brain centers.
A) Midbrain
B) Reticular formation
C) Thalamus
D) Cerebellum

Q.42 Lack of co-ordination of movements is due to dysfunction of:
A) Basal ganglia
B) Midbrain
C) Cerebellum
D) Cerebrum

Q.43 Cerebrum is the largest part of brain and controls:
A) Voluntary movements, speech, memory
B) Breathing, heart rate, blood pressure
C) Balance and coordination
D) Hunger, thirst, menstrual cycle

Q.44 The primary function of spinal cord is to:
A) Produce CSF
B) Communicate two hemispheres
C) Produce hormones
D) Communicate brain with rest of body

Q.45 Portion of limbic system that is involved in formation of memory is:
A) Thalamus
B) Hypothalamus
C) Hippocampus
D) Amygdala

Q.46 It appears to influence transitions between sleep and wakefulness and the rate and pattern of breathing:
A) Thalamus
B) Hypothalamus
C) Pons
D) Medulla

PERIPHERAL NERVOUS SYSTEM

Q.47 Constriction of pupil in bright light is an example of:
A) Spinal reflex
B) Cranial reflex
C) Sensory fatigue
D) Voluntary action

Q.48 A motor nerve carries impulses from:
A) Cranial nerves to effectors
C) Effectors to central nervous system
C) Effectors to cranial nerves
D) Central nervous system to effectors

Q.49 Parasympathetic nervous system is not involved in:
A) Peristalsis
B) Secretion of saliva
C) Dilation of pupil
D) Excitation of reproductive organs

Q.50 Effect of the sympathetic nervous system on the GIT causes:
A) Contraction of sphincters
B) Increase peristalsis
C) Dilation of pupil
D) Increase motility

Q.51 Glands, visceras and smooth muscles are innervated by:
A) Peripheral nervous system
B) Central nervous system
C) Sympathetic nervous system
D) Autonomic nervous system

Q.52 Cranial nerves and spinal nerves are collectively studied in which nervous system?
A) Autonomic
B) Peripheral
C) Somatic
D) Sympathetic

Q.53 All voluntary muscles are innervated by _____.
A) Sympathetic nervous system
B) Parasympathetic nervous system
C) Autonomic nervous system
D) Somatic nervous system

Q.54 Cranial nerves and spinal nerves are collectively studied in which nervous system?
A) Autonomic
B) Peripheral
C) Somatic
D) Sympathetic

Q.55 In comparison of sympathetic and parasympathetic nervous system, which one of the following feature is correctly described:

		Sympathetic	Parasympathetic
A)	Salivary Glands	Stimulates secretion	Inhibits secretion
B)	Pupil of the eye	Constricts	Dilates
C)	Heart Rate	Increases	Decreases
D)	Intestinal Peristalsis	Stimulates	Inhibits

NERVOUS DISORDERS

Q.56 Aluminium deposition leads to neuron degeneration in which disorder?
A) Huntington's disease
B) Alzheimer's disease
C) Epilepsy
D) Parkinsonism

Q.57 Now a day, symptomatically cure of which disease is medicated by L-Dopa?
A) Spinal cord lesions
B) Alzheimer's
C) Parkinsonism
D) Epilepsy

Q.58 Activity of brain is recorded by:
A) ECG
B) EEG
C) MRI
D) CT-scan

Q.59 GDNF may be used in near future for humans in the treatment of:
A) Parkinson's disease
B) Alzheimer's disease
C) Grave's disease
D) Epilepsy

HORMONES – THE CHEMICAL MESSENGERS

Q.60 The incorrect statement regarding hormones is:
A) Endocrine secretion
B) Organic in nature
C) Initiate biochemical reaction
D) Transported by blood

Q.61 Which one of the following gland produces steroidal hormones?
A) Pancreas
B) Hypothalamus
C) Gut
D) Testes

Q.62 Cholesterol serves as precursor of:
A) Proteins hormones
B) Adenoid hormones
C) Steroid hormones
D) Glucoid hormones

Q.63 Pick the system which transports hormone in the body:
A) Endocrine system
B) Circulatory system
C) Nervous system
D) Muscular system

ENDOCRINE SYSTEM OF MAN (HYPOTHALAMUS)

Q.64 What results in production of large quantities of urine and great thirst?
A) Lack of aldosterone
B) Lack of ADH
C) Lack of oxytocin
D) Over-secretion of oxytocin

Q.65 Hypothalamus produces all of the following except:
A) CRF
B) ADH
C) TRF
D) ACTH

Q.66 Which of the following option correctly depicts neuro-secretory hormone?
A) Oxytocin and ADH
B) ICSH and TRF
C) ACTH and LH
D) TSH and STH

PITUITARY GLAND

Q.67 The pituitary gland is also called as:
A) Adenohypophysis
B) Neurohypophysis
C) Hypophysis cerebri
D) Epiphyses cerebri

Q.68 Term master gland is used for:
A) Anterior pituitary
B) Posterior pituitary
C) Median pituitary
D) Pituitary gland

Q.69 High level of TSH can be seen in all conditions except:
A) Stress
B) Growth and development
C) Low thyroxin in blood
D) Low TRF level

Q.70 All of the following are releasing factor except:
A) CRF
B) PIF
C) TRF
D) SRF

Q.71 Hyper functioning of anterior pituitary causes all except:
A) Hyperthyroidism
B) Hypercortical steriodism
C) Gigantism
D) Diabetes insipidus

Q.72 Which one of the following is not a tropic hormone?
A) TSH
B) ACTH
C) GH
D) ADH

Q.73 High level of MSH can be seen in all except:
A) Addison's disease
B) Strong light
C) Pregnancy
D) Cushing disease

THYROID GLAND

Q.74 Active thyroxin is also called:
A) T1
B) T3
C) T2
D) T4

Q.75 Hormones involve in ossification of bones:
A) Calcitonin
B) Thyroxin
C) Oxytocin
D) Parathormone

Q.76 High level of TSH can be seen in all conditions except:
A) Stress
B) Brain differentiation
C) Growth
D) High thyroxin level in blood

Q.77 Brain cells fail to differentiate in:
A) Cretinism
B) Grave's disease
C) Dwarfism
D) Addison's disease

Q.78 Metamorphosis in amphibians is under control of:
A) Sex hormones
B) Thyroid hormone
C) Pituitary hormone
D) Parathyroid hormone

Q.79 Due to hypersecretion of thyroxin, there is increased BMR and exophthalmic goiter. This occurs in:
A) Addison's disease
B) Cushing's disease
C) Grave's disease
D) Diabetes mellitus

PARATHYROID GLAND

Q.80 Tetany is a serious muscle's disorder which is due to under secretion of:
A) Calcium
B) Secretin
C) Parathormone
D) Vasopressin

Q.81 Parathormone is related to metabolism of Ca^{2+} ions and it is antagonistic to:
A) Calcium
B) Aldosterone
C) Calcitonin
D) ADH

PANCREAS

Q.82 Most portion of pancreas acts as:
A) Endocrine
B) Mesocrine
C) Exocrine
D) Autocrine

Q.83 Which of the following statement is incorrect regarding insulin?
A) Inhibit glycogen hydrolysis
B) Convert glucose to protein
C) Increase glycolysis
D) Increase lipolysis

Q.84 All are functions of glucagon except:
A) Glucogensosis
B) Lipolysis
C) Gluconeogenesis
D) Protein synthesis

Q.85 Major endocrine cells in pancreas are:
A) Alpha cells
B) Gamma cells
C) Beta cells
D) Delta cells

Q.86 Release of hormones from islets of Langerhans is under the influence of:
A) STH
B) Blood glucose level
C) ACTH
D) All A, B, C

Q.87 Tumor in beta cells result in all except:
A) More insulin production
B) Destruction of alpha cells
C) Low glucose in blood
D) Low calcium in blood

ADRENAL GLAND

Q.88 Which one of the following is only glucocorticoid?
A) Cortisol
B) Corticosterone
C) Aldosterone
D) Androgen

Q.89 Which one of the following is exclusively a mineralocorticoid?
A) Cortisol
B) Corticosterone
C) Aldosterone
D) Androgen

Q.90 One which is not due to adrenal cortical abnormality:
A) Addison's disease
B) Failure to cope stress
C) Cushing disease
D) Tay-Sach's disease

Q.91 A tumor in inner part of adrenal cortex in female result in all except:
A) Sterility
B) Over androgen production
C) Male like character in female
D) High steroid level in blood

Q.92 Action of epinephrine and nor-epinephrine differ on vessels supplying blood to:
A) All parts of body
B) Brain and muscles
C) Skin and gut
D) Skin and muscles

Q.93 Stress conditions such as cold which normally be overcome, leads to collapse and death in:
A) Cushing's disease
B) Diabetes
C) Addison's disease
D) Cretinism

Q.94 Adrenalin and nor-adrenalin promote the release of glucose from the liver:
A) Protein
B) Glycogen
C) Fats
D) Starch

GONADS

Q.95 If estrogen is deficient then possible reason would be less amount of:
A) Testosterone
B) Oxytocin
C) FSH
D) ICSH

Q.96 In castrated male, there is under-secretion of:
A) Testosterone
B) LTH
C) FSH
D) STH

Q.97 Testosterone is involved in production of primary sex organ in male:
A) Before birth
B) After birth
C) After puberty
D) Before puberty

Q.98 Estrogen is produced from all except:
A) Developing follicle
B) Follicle under FSH
C) Maturing follicle
D) Ruptured follicle

Q.99 A significant constant level of testosterone can be seen in male:
A) Before birth
B) After birth
C) After puberty
D) Before puberty

HORMONAL FEEDBACK MECHANISM

Q.100 The hormones which works mostly on the basis of positive feedback mechanism:
A) ADH
B) Oxytocin
C) Insulin
D) Aldosterone

Q.101 Normal serum level of hormones is controlled by:
A) Target site
B) Effector's response
C) Feedback mechanism
D) Precursor activation

PAST PAPER MCQs

2008

Q.1 Which of the following promotes both leaf and fruit growths?

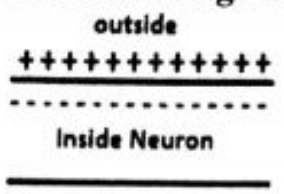
A) Auxins
B) Gibberellins
C) Abscisic acid
D) Ethane

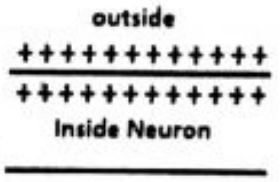
Q.2 Which of the following receptors produce sensation of pain?

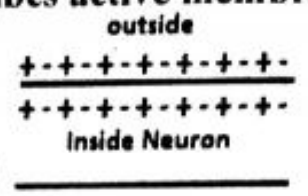
A) Mechanoreceptor
B) Nociceptors
C) Chemoreceptors
D) Thermoreceptors

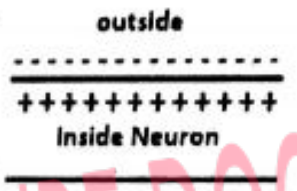
2009

Q.3 Which one of the following conditions best describes active membrane potential?

A) 

B) 

C) 

D) 

Q.4 Which of the following neurotransmitters lies outside the central nervous system?

A) Serotonin
B) Dopamine
C) Acetylcholine
D) Adrenaline

2010

Q.5 A typical neuron at rest:

A) Is more positive outside than inside
B) Is more negative outside than inside
C) Has no charge on either side
D) Has an equal charge on either side

Q.6 Which one of the following is a precursor of steroid hormones?

A) Glycerol
B) Sterol
C) Amino acids
D) Cholesterol

Q.7 Hormones are the organic compounds of varying structural complexity. Which of the following is not a function or property of these compounds?

A) They initiate new biochemical reactions
B) They are poured directly into blood
C) They may be proteins
D) They affect target cells

2011

Q.8 Which group of hormones is made up of amino acids and their derivatives?

A) Vasopressin and ADH
B) Epinephrine and Non-Epinephrine
C) Estrogen and Testosterone
D) Insulin and Glucagon

Q.9 Which of the following is the function of glucagon hormone?

A) Glycogen to Glucose
B) Glucose to Glycogen
C) Glucose to Lipids
D) Glucose to Proteins

2012

Q.10 The part of neuron fiber which conducts nerve impulses from the cell body is:

A) Dendron
B) Dendrites
C) Axon
D) Peripheral branch

Q.11 Ductless glands are known as:

A) Endocrine gland
B) Exocrine gland
C) Salivary glands
D) Bile glands

Q.12 Vasopressin and Oxytocin are released from the:
A) Placenta
B) Ovary
C) Anterior pituitary
D) Posterior pituitary

Q.13 β-cells of pancreas secrete a hormone that is called:
A) Insulin
B) Glucagon
C) Antidiuretic hormone
D) Gastrin

2013
Q.14 Alpha cells of Islets of Langerhans secrete hormone called:
A) Glucocorticoid
B) Insulin
C) Glucagon
D) Aldosterone

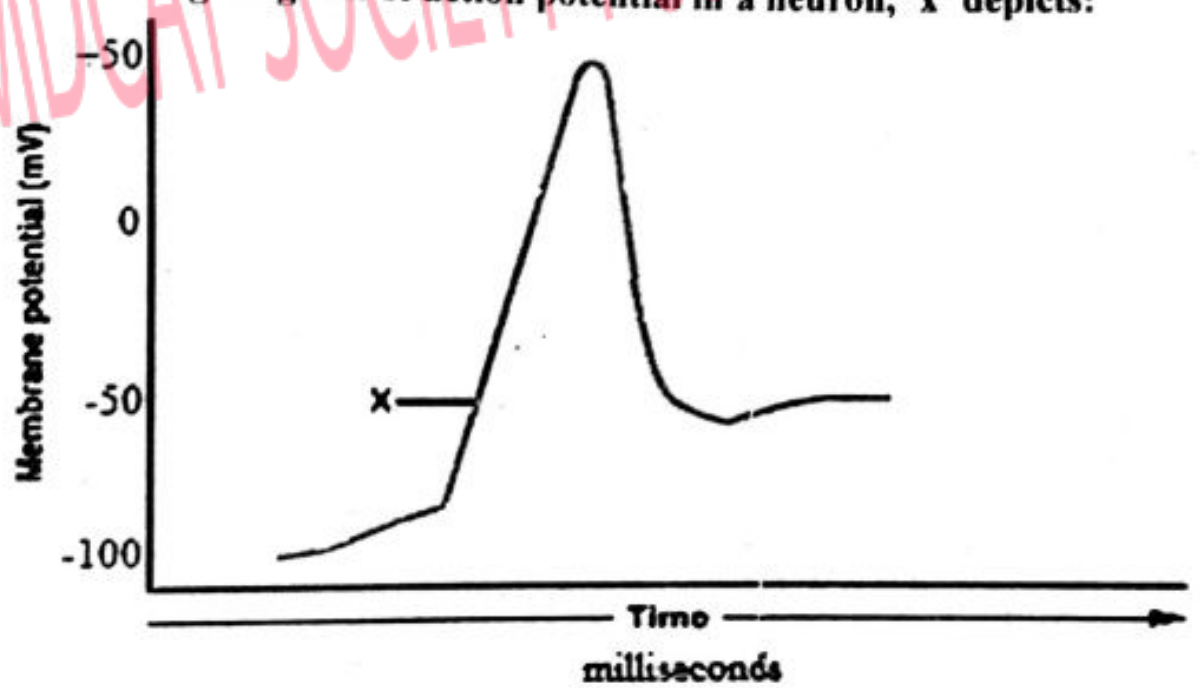
Q.15 Which of the following is the function of glucagon hormone?
A) Glucose to lipids
B) Glucose to proteins
C) Glucose to glycogen
D) Glycogen to glucose

Q.16 Chemically, insulin and glucagon are:
A) Carbohydrates
B) Proteins
C) Lipids
D) Nucleic acids

2014
Q.17 Which one of the following is a steroid hormone?
A) Glucagon
B) Thyroxin
C) Epinephrine
D) Estrogen

2015
Q.18 Conduction of action potentials from one node of Ranvier to another in myelinated neurons is through:
A) Hyperpolarization
B) Resting Membrane Potential
C) Depolarization
D) Saltatory Conduction

Q.19 In the following diagram of action potential in a neuron, 'x' depicts:



A) Depolarization
B) Polarization
C) Repolarization
D) Hyperpolarization

Q.20 Neurotransmitter secreted at synapse outside the central nervous system is:
A) Dopamine
B) Polypeptide
C) Androgen
D) Acetylcholine

Q.21 α-cells of pancreas secrete a hormone known as:
A) Glucagon
B) Insulin
C) Gastrin
D) Rennin

2016

Q.22 **_____hormone is antagonistic to insulin and causes increase in blood glucose level.**
A) Glucagon
B) Nor-epinephrine
C) Calcitonin
D) Thyroxin

Q.23 **Beta cells of islets of Langerhans produce _____ hormone.**
A) Glucagon
B) Insulin
C) Pancreatic Juice
D) Parathormone

2017

Q.24 **The nerve impulse which jumps from node to node in myelinated neurons is called as:**
A) Resting membrane potential
B) Saltatory nerve impulse
C) Threshold stimulus
D) Initial nerve impulse

2017 Re-Take

Q.25 **Pick out the pressure receptors:**
A) Chemoreceptors
B) Mechanoreceptors
C) Photoreceptors
D) Thermoreceptors

Q.26 **Which of the following produce response?**
A) Effectors
B) Stimulators
C) Nerve
D) Brain

2018

Q.27 **Taste buds on the tongue are example of:**
A) Thermoreceptors
B) Photoreceptors
C) Pressure receptors
D) Chemoreceptors

Q.28 **When a nerve impulse jumps from one node of Ranvier to the next in a myelinated neuron, it is called _____.**
A) Saltatory conduction
B) Synapses
C) Resting potential
D) Membrane potential

Q.29 **How many sodium ions are pumped out in response to two potassium ions transported into the membrane?**
A) 4
B) 2
C) 1
D) 3

Q.30 **In nervous system, chemical messengers are called _____.**
A) Enzymes
B) Neurotransmitters
C) Chemoreceptors
D) Hormones

Q.31 **_____hormone is released from posterior lobe of pituitary gland.**
A) Thyroid stimulating hormone
B) Adrenaline
C) FSH
D) Antidiuretic hormone

2019

Q.32 **The reflex action is the phenomena which only involves:**
A) Brain, receptors, spinal cord
B) Receptors, effectors and spinal cord
C) Receptors, neurons, brain
D) Receptors and effectors

Q.33 **In an action potential, the permeability of sodium ions in the neuron increases due to:**
A) Repolarization
B) The opening of sodium channels/gates
C) The action of the acetylcholinesterase enzyme
D) Sodium ions forming an ionic bonding

Q.34 **If stimulation is above _____, impulses travel to the brain along the sensory neuron.**
A) Action Potential
B) Threshold
C) Resting Potential
D) Recovery Period

Q.35 **Acetylcholine and nor-adrenalin are two types of _____ used in our nervous system.**
A) Hormones
B) Channel and carrier proteins in the cell membrane of a neuron
C) Enzymes
D) Neurotransmitters

Q.36 The main neurotransmitter for synapses is _____ which lie outside the CNS.
A) Choline
B) Acetylcholine
C) Acetaldehyde
D) Phosphatidylcholine

2020 Q.37 Which of the following neurotransmitters function, both as neurotransmitter and hormones, decreasing our perception of pain?
A) Epinephrine
B) Serotonin
C) Dopamine
D) Endorphins

Q.38 Which body function is controlled through positive feedback mechanism?
A) Labor contractions
B) Body temperature
C) Insulin production
D) Thyroxin release

Q.39 Which one of the following is common to all neurons?
A) A cell body which contains a nucleus
B) A thick myelin sheath
C) Presence of node of Ranvier
D) Presence of Schwann cells

Q.40 Neurons are cells adapted for the rapid transmission of electrical impulses. To do this, they have long thin processes called:
A) Axons
B) Dendrites
C) Myelin sheath
D) Schwann cell

Q.41 A _____ is a junction between two neurons or between a motor neuron and a muscle cell.
A) Impulse
B) Synapse
C) Axon
D) Cleft

ANSWER KEY

TOPIC-WISE MCQs

1	A	11	B	21	C	31	A	41	B	51	D	61	D	71	D	81	C	91	A	101	C
2	C	12	B	22	D	32	B	42	C	52	B	62	C	72	D	82	C	92	C		
3	A	13	B	23	B	33	B	43	A	53	D	63	B	73	D	83	C	93	C		
4	C	14	D	24	C	34	D	44	D	54	B	64	B	74	D	84	D	94	B		
5	A	15	B	25	B	35	C	45	C	55	C	65	D	75	A	85	C	95	C		
6	B	16	C	26	B	36	B	46	C	56	B	66	A	76	D	86	D	96	A		
7	D	17	D	27	A	37	D	47	B	57	C	67	C	77	A	87	D	97	A		
8	A	18	C	28	C	38	D	48	D	58	B	68	A	78	B	88	A	98	D		
9	D	19	B	29	C	39	C	49	C	59	A	69	D	79	C	89	C	99	C		
10	A	20	D	30	A	40	C	50	A	60	C	70	B	80	C	90	D	100	B		

PAST PAPERS MCQs

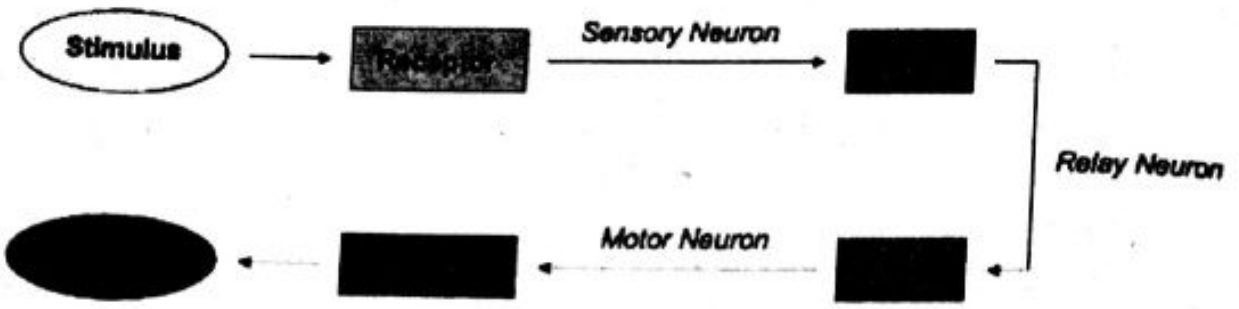
1	B	11	A	21	A	31	D	41	B
2	B	12	D	22	A	32	B		
3	D	13	A	23	B	33	B		
4	C	14	C	24	B	34	B		
5	A	15	D	25	B	35	D		
6	D	16	B	26	A	36	B		
7	A	17	D	27	D	37	D		
8	B	18	C	28	A	38	A		
9	A	19	A	29	D	39	A		
10	C	20	D	30	B	40	A		

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. The nervous system takes in information through our senses, processes the information and triggers reactions, such as making your muscles move or causing you to feel pain. For example, if you touch a hot plate, you reflexively pull back your hand and your nerves simultaneously send pain signals to your brain.

2.



3. Cerebral cortex contains primary sensory areas where signals originating in sensory organs such as eyes and ears are received and converted into subjective impressions, such as light and sound.

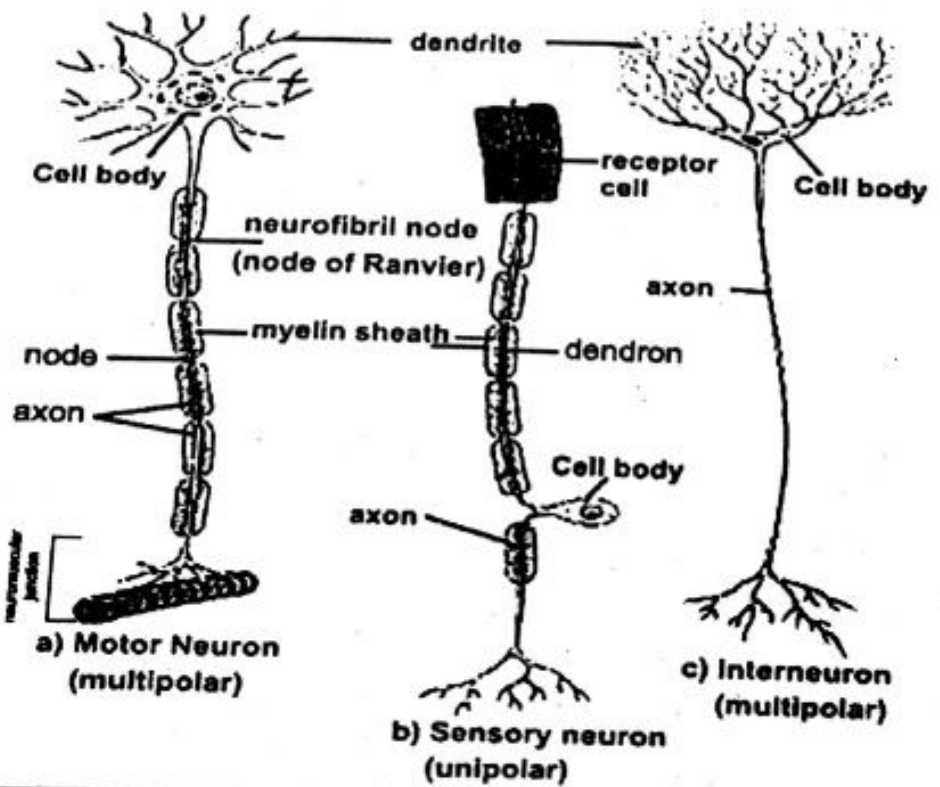
4. Ectoderm mainly gives rise to nervous system and integumentary systems while mesoderm give rise to all other tissues of the body, including heart, the muscle system, the urogenital system, bones, and bone marrow and therefore the blood.

5. These detect stimuli of touch, pressure, hearing and equilibrium (e.g. Free nerve endings + expanded tip endings + stray endings)

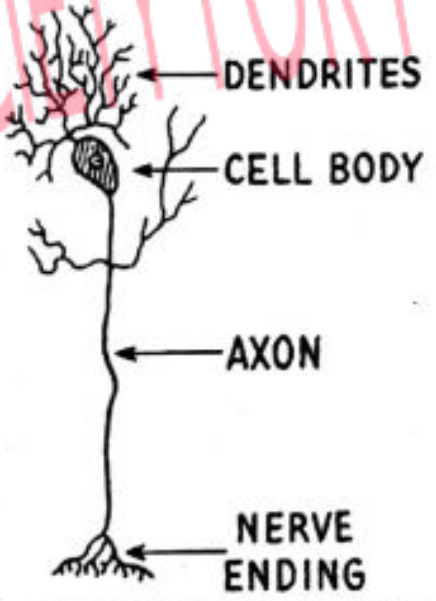
6. Stimuli are always detected by specific receptors present in different parts of the body. Stimulus of touch, pain, cold and heat are recognized differently because these stimuli are detected by different receptors present in different parts of the body.

7. Some cells are attached with the neurons, along the length of axon that are specialized for the production of myelin sheath; these are type of neuroglia cells in PNS named as Schwann cells.

8.

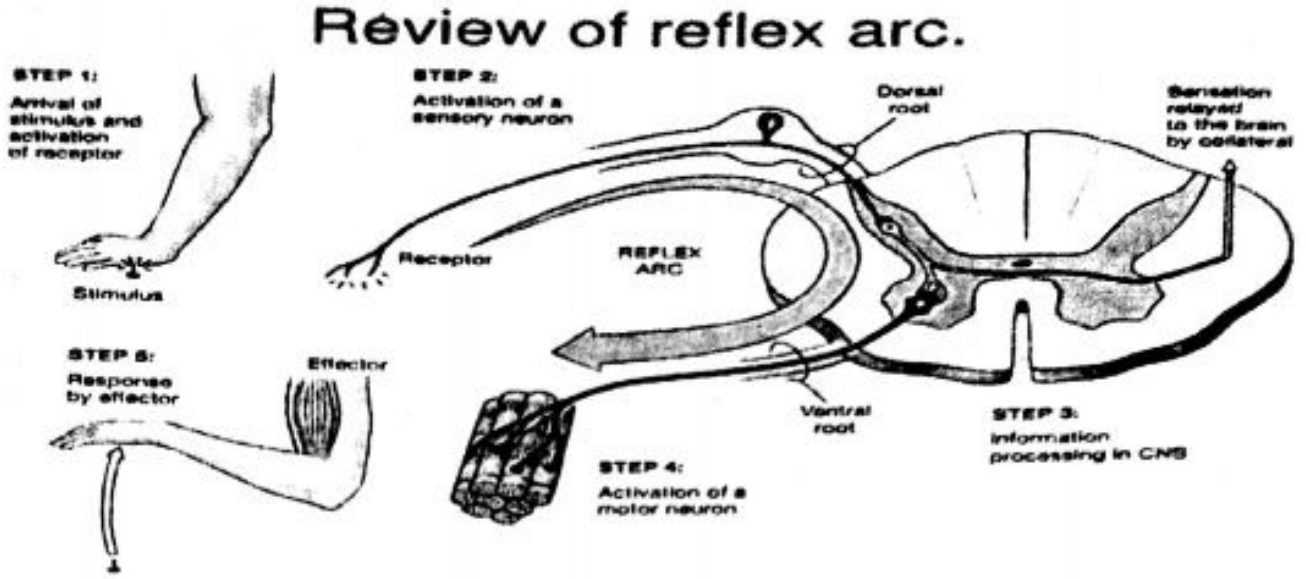


9. Efferent neurons are meant to conduct messages from CNS to the effectors as they are emerging from CNS that's why they are known as motor neurons.
10. Number of neurons present in body varies, brain contains the highest number and spinal cord comes on second number.
11. Myelin is a fatty substance that surrounds the axon of nerve cells, forming an electrically insulating layer. It facilitates the saltatory conduction of impulses but since, it is lipid in nature, it itself does not conduct impulses.
12. Myelin sheath is a mixture of proteins and lipids, and not present in all types of axons and dendron, and it is meant to increase the speed of conduction
13. Efferent neuron is another name used for motor neurons which are meant for the conduction of messages from CNS to the effectors
14. Extensions of neuron have the ability to regenerate only when if its cell body is intact because the nucleus of the neurons is present in it but cell body is devoid of that property.
15. Grey matter is mainly composed of cell bodies of neurons while white matter is composed of myelin sheath.
16. Cell body of a neuron is main nutritional part. It is the part where biosynthesis of required materials is taking place. It also provides the genetic information for the regeneration of neuronal processes. Axoplasm is the cytoplasm of nerve axon.
17. Mitochondria, ribosomes and secretary vesicles are found in synaptic knob while nucleus is present in the cell body of neuron.
18. Associated neurons, also called inter-neurons or relay neurons are neurons that are found exclusively in the central nervous system. It means that they are found in the brain and spinal cord and not in the peripheral segments of the nervous system.
19.



20. Axon, Nissl's granules and dendron are the parts of a neuron while synapse is a structure that permits a neuron to pass an electrical or chemical signal to another neuron or to the target effector cell/tissue.
21. The simplest arrangement of a reflex arc consists of the receptor, an interneuron, and an effector; together these units form a functional reflex group. Brain is, however, excluded in the reflex arc)
22. The spinal cord functions primarily in the transmission of nerve signals from the motor cortex to the body, and from the afferent fibers of the sensory neurons to the sensory cortex. It is also a center for coordinating many reflexes and contains reflex arcs that can independently control reflexes.

23.



24. The influx of Na^+ increases the concentration of positively charged ions in the cell and causes depolarization, where the potential of the cell is higher than the cell's resting potential. The sodium channels close at the peak of the action potential, while potassium continues to leave the cell.

25. Nerve impulse is a wave of electrochemical changes, which travels along the length of neurons involving movement of ions across the membrane and chemical reactions.

26. Hyperpolarization is a change in a cell's membrane potential that makes it more negative. It is the opposite to that of a depolarization. It is mainly caused by late closing of K^+ channels.

27. Sodium and potassium plays key role in the conduction of nerve impulse by their respective movement across the membrane.

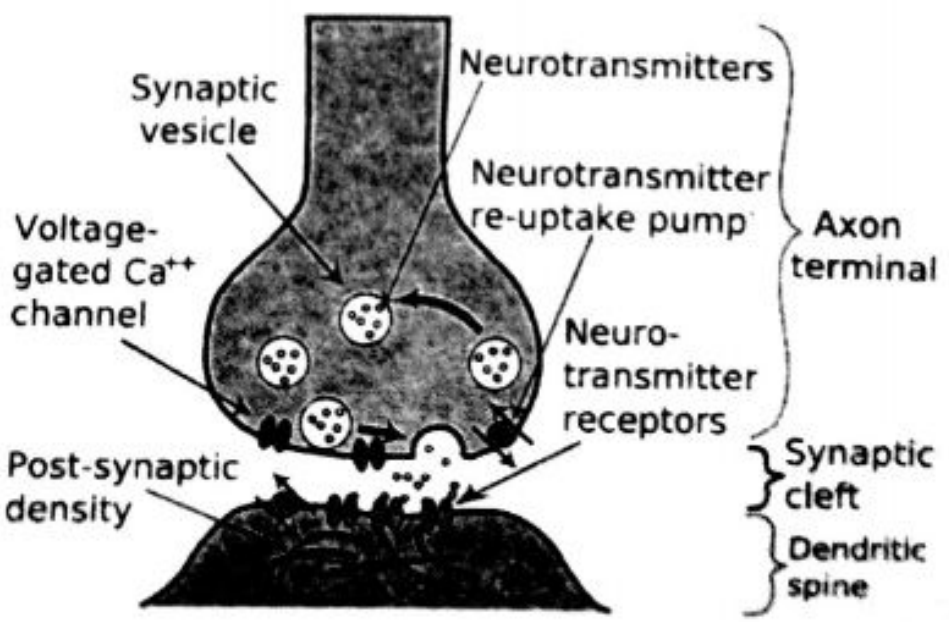
28. As the process proceeds by the change in the permeability that is influenced by chemicals and that stimulus is propagated by the charges ions (sodium and potassium) across membranes.

29. In neuro-lemma, a specialized ATP dependent Na^+-K^+ pump is present which will restore original ion gradient and hence the resting membrane potential.

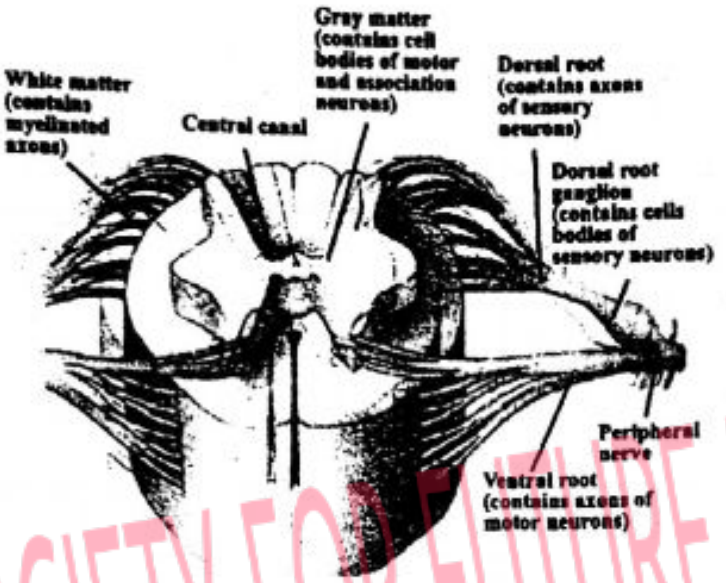
30. In the nervous system, a synapse is a structure that permits a neuron to pass an electrical or chemical signal to another neuron or to the target effector cell. Synaptic cleft is the space between neurons at a nerve synapse across which a nerve impulse is transmitted by a neurotransmitter.

31. When the action potential reaches the nerve terminal, voltage dependent Ca^{2+} channels will open and Ca^{2+} rushes into the neuron terminal due to a greater extracellular concentration, causing release of neurotransmitter molecules from pre-synaptic membrane into synaptic cleft.

32.



33. After the depolarization of post synaptic neuro-lemma, neurotransmitters are mostly degraded by the enzymes or taken up actively by pre-synaptic neuro-lemma) For example, acetylcholinestrase is an enzyme that degrades acetylcholine after synaptic transmission.
34. Epinephrine or adrenaline produced both by adrenal gland as well as by brain and it will act both as a hormone and neurotransmitter.
35. Given involuntary actions are controlled by medulla)
36. Thinking process is the function of forebrain.
37. Heart is covered by pericardium, while stomach lining is named as peritoneum whereas pleura cover lungs.
38. Fluid circulating around brain is to meant nourishment, moisten and provide protection to brain.
39.



40. Inside the CNS concentration of cell bodies is nuclei whereas concentration of cell bodies inside PNS is named as ganglia)
41. Networking and interlinking between hind brain and mid brain in order to coordinate with forebrain is done by a network known as reticular formation in order to send information to the subsequent region.
42. While enlisting the functions of cerebellum coordinated movements is the most obvious one.
43. The principal and most anterior part of the brain in vertebrates, located in the front area of the skull and consisting of two hemispheres, left and right, separated by a fissure. It is responsible for the integration of complex sensory and neural functions and the initiation and coordination of voluntary activity in the body.
44. Spinal cord serves as a relay center to serve as a connection between body and brain, spinal cord also serves as coordinator in reflex arc)
45. Short term memory is a character related to hippocampus, while long term is related to cerebrum.
46. Rate and pattern of breathing is the sole responsibility of pons.
47. Eyes are directly attached with nervous system through cranial nerves that's why reflex controlled related to eyes will be conducted by cranial nerves.
48. A motor nerve is a nerve that carries command information out of the central nervous system (CNS) and toward effectors (muscles or glands) that will execute the commands. It is an enclosed, cable-like bundle of efferent nerve fibers (the axons of motor neurons) in the peripheral nervous system (PNS).

49. A few cranial nerves (including vagus nerve) together with nerves from bottom portion of spinal cord form parasympathetic nervous system.
It promotes all the internal response, which are associated with the relaxed state i.e.
- Contracts pupils
- Promotes digestion of food
- Retards heart beat
- Normalizes breathing rate and blood flow

50. The sympathetic nervous system (SNS) is part of the autonomic nervous system (ANS), which also includes the parasympathetic nervous system (PNS). The sympathetic nervous system activates what is often termed the fight or flight response.

51. Involuntary systems are controlled by autonomic branch of the nervous system.

52. The peripheral nervous system (PNS) is one of the two components of the nervous system, the other part is the central nervous system (CNS). The PNS consists of the nerves and ganglia outside the brain and spinal cord)

53. Somatic nervous system mainly deals with the action that are under the voluntary control and skeletal muscles are above all.

54. The peripheral nervous system (PNS) is one of the two components of the nervous system, the other part is the central nervous system (CNS). The PNS consists of the nerves and ganglia outside the brain and spinal cord)

55. Sympathetic system is activated during fight and flight mode whereas para sympathetic system works in rest and digest state.

56. Metal deposition in brain cells mainly results in malfunctioning of brain mainly in memory formation and retention.

57. Disturbance in the level of dopamine causes uncoordinated movements and the disease is known as Parkinsonism and can be treated by maintaining the level of dopamine.

58. Electrocardiography is meant for the examination of heart and electroencephalography is used to record electrical activity of the brain.

59. GDNF is glial cell derived neurotrophic factor, are responsible for cell survival and cell differentiation that will help to maintain the damaged cells that were producing dopamine.

60. Hormones are the organic secretion produced by the endocrine glands which are transported to the target tissue via blood stream and they cannot initiate a chemical reaction, but they can only regulate.

61. Mammalian testes produce testosterone which is steroid in nature. Pancreas produces insulin and glucagon which are protein hormones. Hypothalamus produces neuro-secretions which are polypeptide in nature.

62. Cholesterol is the precursor of the five major classes of steroid hormones: progestogens, glucocorticoids, mineralocorticoids, androgens, and estrogens. These hormones are powerful signaling molecules that regulate many functions.

63. Endocrine glands are ductless glands and release their secretions into blood) They reach the target site through bloodstream.

64. ADH is responsible for reabsorption of H_2O from collecting tubules and lack of ADH results in production of large quantities of urine and increased thirst.

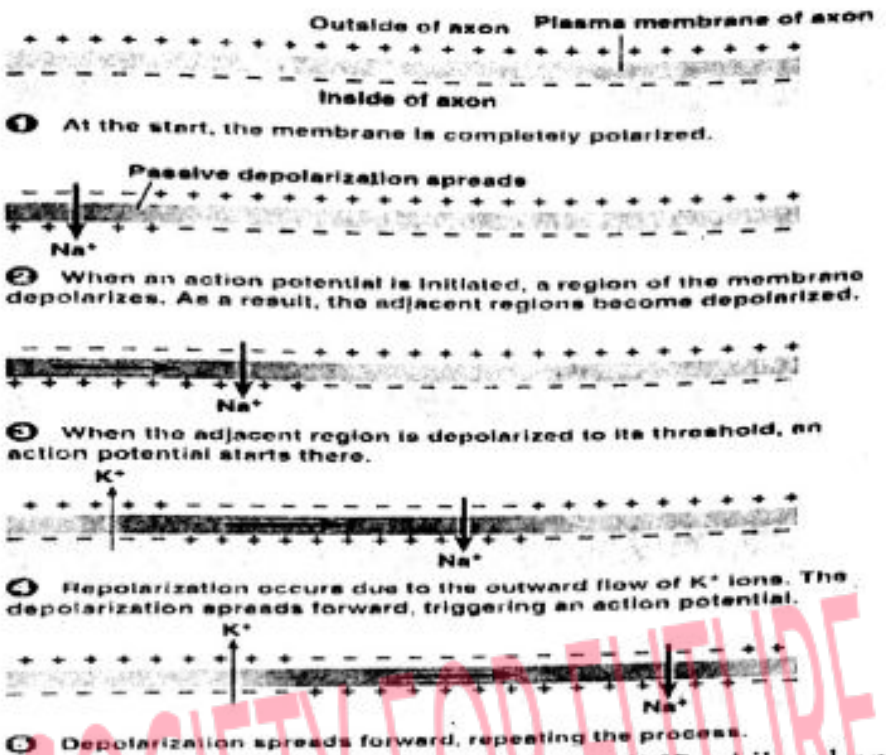
65. Adrenocorticotropic hormone is a polypeptide tropic hormone produced and secreted by the anterior pituitary gland)

66. Neurosecretory cells in the hypothalamus release oxytocin and ADH into the posterior lobe of the pituitary gland) These hormones are stored or released into the blood)
67. The term hypophysis (from the Greek for "lying under")-another name for the pituitary-refers to the gland's position on the underside of the brain.
68. The anterior pituitary gland is often dubbed the "master gland" because its hormones control other parts of the endocrine system, namely the thyroid gland, adrenal glands, ovaries, and testes.
69. More the Thyrotrophin releasing factor from hypothalamus more will be Thyroid Stimulating Hormone (TSH). TSH is released under stress condition; its level is high during growth and development.
70. Prolactin-inhibiting hormone (PIH) inhibits the secretions of prolactin hormone from anterior lobe of pituitary gland)
71. Diabetes insipidus is due to low level of ADH.
72. The hormones released from anterior lobe of pituitary glands are called tropic hormones as the control the secretions from other glands in the body.
73. In Cushing's disease too much cortical hormone is produced) MSH is produced from Median lobe of pituitary gland and it is produced under sun light, its level is increased during pregnancy and in Addison's disease.
74. T_4 is main thyroid hormone, also called as thyroxin, it is tetraiodo-thyronin. T_3 is produces in small quantity and is unstable and is degraded during its travelling.
75. Calcitonin acts to reduce blood Ca^{2+}, opposing the effects of parathyroid hormone, by deposition of Ca^{2+} in the bones.
76. Low level of thyroxin stimulates hypothalamus to release thyrotrophin releasing factor which stimulates the production of thyroid stimulating hormone from anterior lobe of pituitary gland) TSH acts on thyroid gland which starts producing thyroxin. If the level of thyroxin is already high, then the TSH will not be produced)
77. Cretinism is a condition of severely stunted physical and mental growth owing to untreated congenital deficiency of thyroid hormone (congenital hypothyroidism) usually owing to maternal hypothyroidism.
78. In addition, the fact that frog metamorphosis is regulated by thyroid hormones (THs), promoting the remodeling of the aquatic larvae into an adult tetrapod, means that the dramatic structural and functional changes of larval tissues can be readily applied as parameters reflecting endocrine disruption.
79. Grave's disease is an autoimmune disease that affects the thyroid) It frequently results in increased BMR. It also often results in an enlarged thyroid)
80. Under activity causes a drop in blood calcium ions which in turn leads to muscular tetany.
81. Parathormone is secreted when the calcium level of blood is low while calcitonin is secreted at high level of calcium ions in the blood) So, both the hormones are antagonistic to each other in terms of controlling level of calcium in the blood)
82. The pancreas is divided into an exocrine portion and an endocrine portion (islets of Langerhans). The exocrine portion, comprising 85% of the mass of the pancreas, and secretes pancreatic juice into the duodenum while about 15% of the mass of pancreas is the endocrine portion which secrete various hormones into the bloodstream.
83. Insulin is responsible to decrease glucose by the conversion of glucose into glycogen. It is also responsible for increase glucose uptake by the cell and converts glucose into lipids and proteins.

84. Glucagon strongly opposes the action of insulin; it raises the concentration of glucose in the blood by promoting breakdown of glycogen by stimulating production of glucose from lipids.
85. Pancreatic islets house two major cell types, each of which produces a different endocrine product: Alpha cells secrete the hormone glucagon. Beta cells produce insulin and are the most abundant of the islet cells.
86. Release of hormones from islets of Langerhans is under control of the pituitary trophic hormones, STH and ACTH and also responds directly to the level of blood glucose.
87. Beta cells have no relation with calcium regulation.
88. Cortisol bring about the increase in blood glucose. It is principal glucocorticoid)
89. Cortisol bring about the increase in blood glucose. Corticosterone is responsible for the increase of mineral and glucose level in blood) Aldosterone is principal mineralocorticoid, brings about increase in mineral level in blood mainly Na^+.
90. Tay-Sach's is due to abnormality in lysosomal non-functioning.
91. Tumor in adrenal cortex leads to the excessive secretions of androgen hormone which results in the development of secondary sex characters in female and also results in high steroid level in the blood) It has no role for sterility of an individual.
92. Adrenaline dilates the blood vessels in certain parts of the body such as skeletal muscles. But nor-adrenaline constricts blood vessels again in certain parts of the body such as gut, so the effect of the two hormone is synergistic in raising blood pressure.
93. Destruction of the adrenal cortex such as, occurs in Addison's disease, will lead to general metabolic disturbance, in particular weakness of muscle action and loss of salts.
94. These hormones provide glucose to handle stress.
95. Follicle-stimulating hormone (FSH) is secreted by the anterior pituitary in response to gonadotropin-releasing hormone (GnRH) released by the hypothalamus. In women, LH stimulates estrogen production from the ovary.
96. At puberty testosterone helps in the development of secondary sex characteristics in males. When testes are surgically removed then the level of testosterone is lower and leads to sterile male.
97. In fetus the testosterone hormone initiates the development of primary sex organs but at puberty its secretion helps in the development of secondary sex characters.
98. Estrogen is produced from developing follicles under the action of FSH. Ruptured follicles are responsible for progesterone production.
99. After puberty the supply of LH (ICSH) is constant and therefore the level of testosterone remains constant.
100. Positive feedback system, the output enhances the original stimulus. A good example of a positive feedback system is child birth. During labor, a hormone called oxytocin is released that intensifies and speeds up contractions.
101. Most hormones are regulated by feedback mechanisms. A feedback mechanism is a loop in which a product feeds back to control its own production. Most hormone feedback mechanisms involve negative feedback loops. Negative feedback keeps the concentration of a hormone within a narrow range.

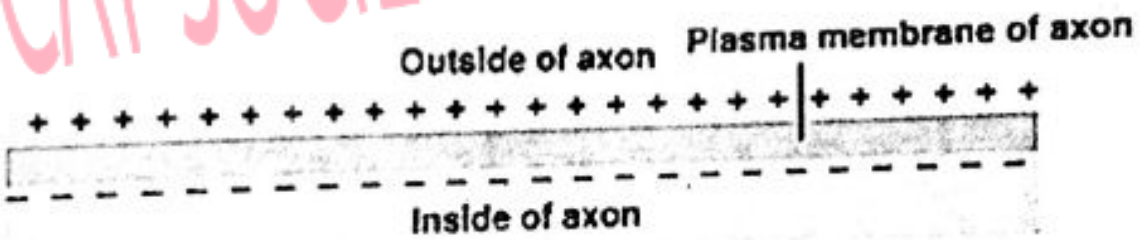
PAST PAPERS MCQs

1. Gibberellins promotes both leaf and fruit growth.
2. Nociceptors, also called pain receptor, is an undifferentiated nerve ending that responds to damaging or potentially damaging stimuli by sending "possible threat" signals to the spinal cord and the brain.
3.



4. Acetylcholine is neurotransmitter for synapse outside CNS while adrenalin, nor-epinephrine, serotonin and dopamine in are the neurotransmitter involved in synaptic transmission within the CNS.

5.

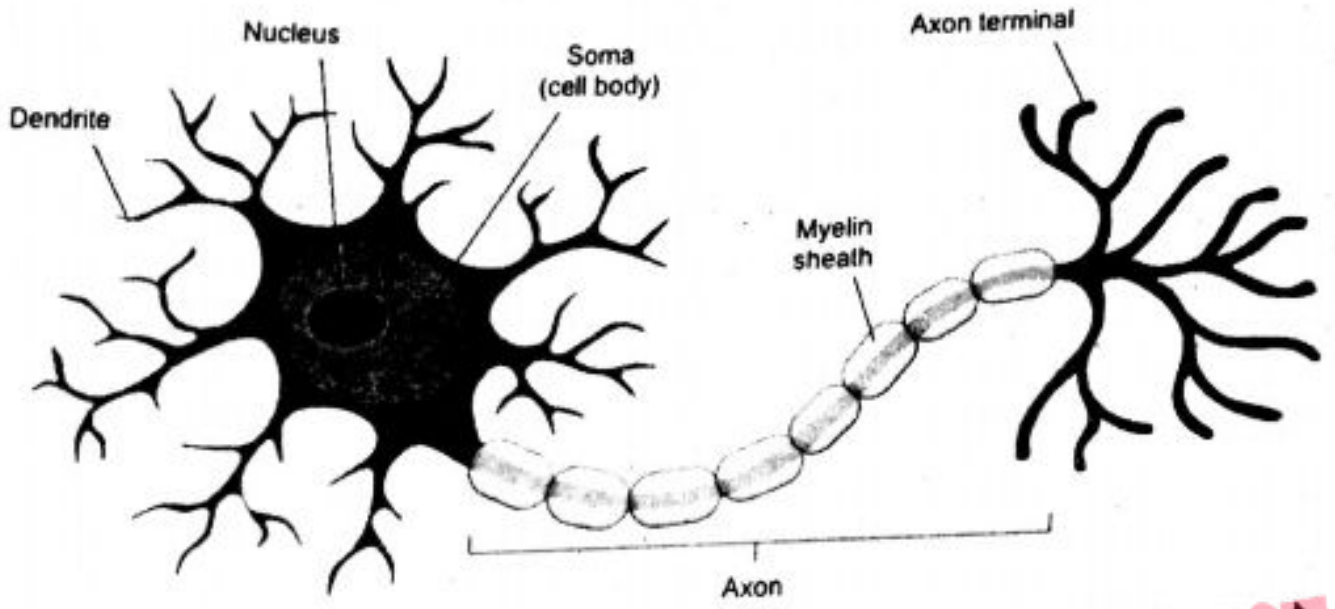


6. Cholesterol is the precursor of the five major classes of steroid hormones: progestagens, glucocorticoids, mineralocorticoids, androgens, and estrogens. These hormones are powerful signaling molecules that regulate many functions.
7. Hormones the organic secretion produced by the endocrine glands which are transported to the target tissue via blood stream and they cannot initiate a chemical reaction, but they can only regulate the biochemical reactions.
8.

Chemical Nature of Hormones	Glands	Examples
Protein	Islets of Langerhans	Insulin, Glucagon
Polypeptides	Posterior pituitary	ADH, Oxytocin
Amino Acids and Derivatives	Thyroid, Adrenal Medulla	T3, T4, Epinephrine, Nor-epinephrine
Steroid	Gonads, Adrenal Cortex	Estrogen, Testosterone, Cortisone.

9. Glucagon is essentially antagonistic to insulin and causes an increase in blood glucose levels. It does this mainly by:
   - Promoting breakdown of glycogen to glucose in the liver and muscles.
   - Increasing the rate of breakdown of fats.

10.



11. Endocrine glands are ductless glands and release their secretions into blood) They reach the target site through blood)
12. ADH and oxytocin are secreted by neurosecretory cells of hypothalamus. They are temporarily stored in nerve endings in posterior lobe of pituitary gland)
13. Pancreatic islets house two major cell types, each of which produces a different endocrine product: Alpha cells (α cells) secrete the hormone glucagon. Beta cells (β cells) produce insulin and are the most abundant of the islet cells.
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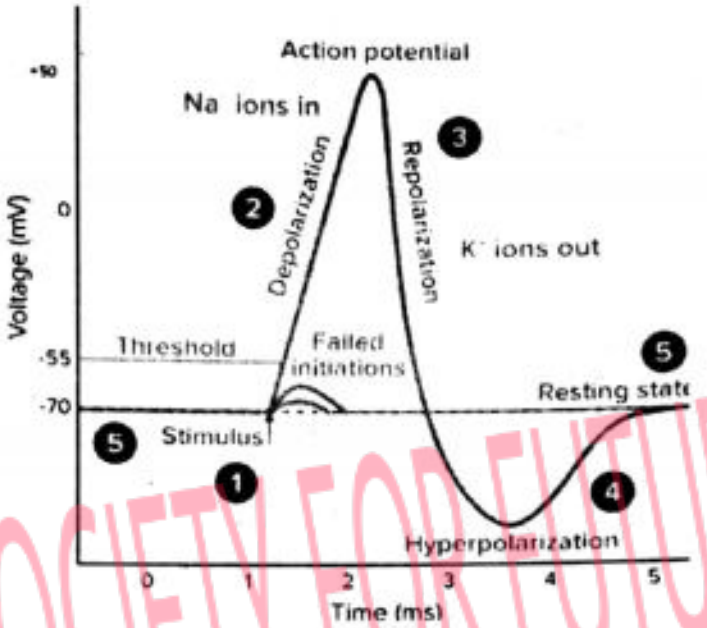
16.

Chemical Nature of Hormones	Glands	Examples
Protein	Islets of Langerhans	Insulin, Glucagon
Polypeptides	Posterior pituitary	ADH, Oxytocin
Amino Acids and Derivatives	Thyroid, Adrenal Medulla	T3, T4, Epinephrine, Nor-epinephrine
Steroid	Gonads, Adrenal Cortex	Estrogen, Testosterone, Cortisone.

17.

Chemical Nature of Hormones	Glands	Examples
Protein	Islets of Langerhans	Insulin, Glucagon
Polypeptides	Posterior pituitary	ADH, Oxytocin
Amino Acids and Derivatives	Thyroid, Adrenal Medulla	T3, T4, Epinephrine, Nor-epinephrine
Steroid	Gonads, Adrenal Cortex	Estrogen, Testosterone, Cortisone.

18.



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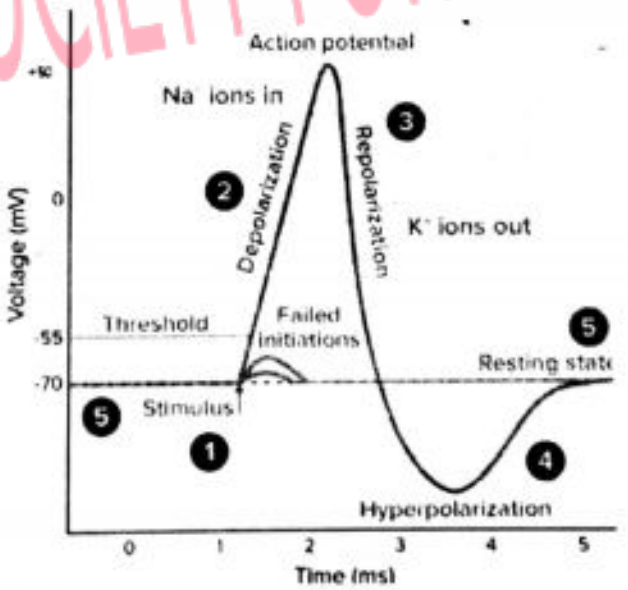
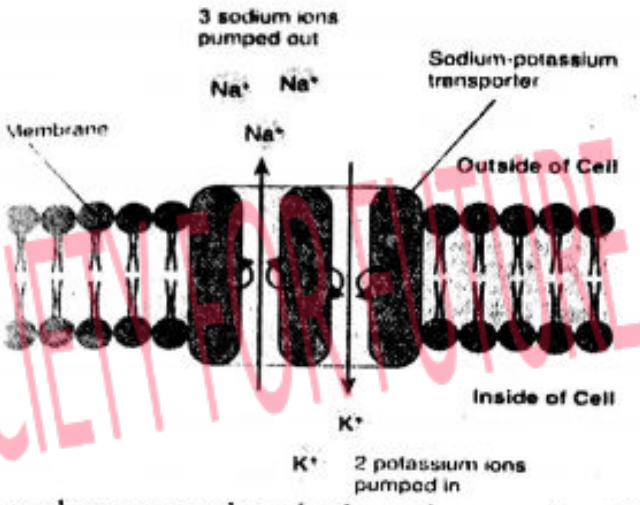


20. Acetylcholine is neurotransmitter for synapse outside CNS while adrenalin, nor-epinephrine, serotonin and dopamine in CNS.

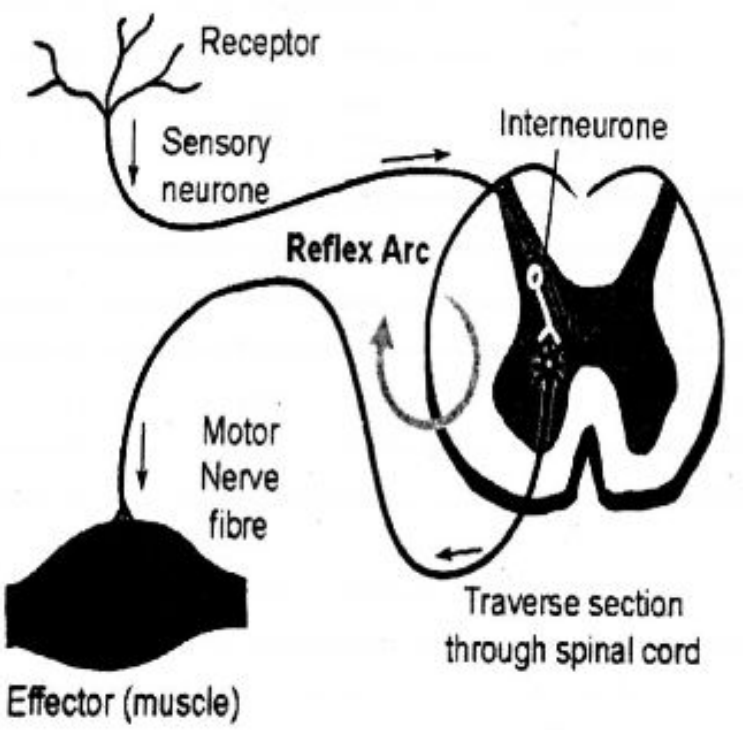
21. Pancreatic islets house two major cell types, each of which produces a different endocrine product: Alpha cells (α cells) secrete the hormone glucagon. Beta cells (β cells) produce insulin and are the most abundant of the islet cells.

22. Glucagon is essentially antagonistic to insulin and causes an increase in blood glucose levels. It does this mainly by:
- Promoting breakdown of glycogen to glucose in the liver and muscles.
- Increasing the rate of breakdown of fats.

23. Pancreatic islets house two major cell types, each of which produces a different endocrine product: Alpha cells (α cells) secrete the hormone glucagon. Beta cells (β cells) produce insulin and are the most abundant of the islet cells.
24. The nerve impulse is conducted from node to node in jumping manner. This kind of jumping nerve impulse is called saltatory impulse.
25. Mechanoreceptors are receptors in the skin and on other organs that detect sensations of touch. They are called mechanoreceptors because they are designed to detect mechanical sensations or differences in pressure.
26. Effector a structure or organ that brings about an action of' effect' as a result of a stimulus received through a receptor which can come from the CNS or from a hormone.
27. The taste receptors are located around the small structures known as papillae found on the upper surface of the tongue, these are chemoreceptors.
28. The nerve impulse is conducted from node to node in jumping manner. This kind of jumping nerve impulse is called saltatory impulse.
29.



30. Neurotransmitters are endogenous chemicals acting as signaling molecules that enable the transmission of nerve impulse.
31. ADH and oxytocin are secreted by neuromuscular cells of hypothalamus. They are temporarily stored in nerve endings in posterior lobe of pituitary gland) Then they are released from posterior lobe of pituitary into blood).
32.



33. The passage of nerve impulse is associated with increase in permeability of Na^+ due to the opening of Na^+ channels, moving inwards upsetting the potential momentarily, making the inside more positive than outside.
34. Minimum intensity of stimulus that is required to initiate a nerve impulse is called threshold stimulus.
35. Neurotransmitters are endogenous chemicals acting as signaling molecules that enable the transmission of nerve impulse. Acetylcholine is neurotransmitter for synapse outside CNS while adrenalin, nor-epinephrine, serotonin and dopamine in CNS.
36. Acetylcholine is an organic chemical that functions in the brain as a neurotransmitter i.e. a chemical message released by nerve cells to send signals to other cells, such as neurons, muscle cells and gland cells.
37. The endorphins are peptides that function as both neurotransmitters and hormones, decreasing our perception of pain.
38. Stretch-receptive neurons in the cervix respond to this extension by signaling the hypothalamus, which response by triggering the release of oxytocin that stimulates more and stronger uttering contractions.
39. The cell body or soma is the main nutritional part of the cell and is concerned with the biosynthesis of materials necessary for the growth and maintenance of the neuron.
40. Axons are the protoplasmic part of the cell body of neuron and are responsible for carrying the impulses away from the cell body.
41. Consecutive neurons are so arranged that the axon endings of one neuron are connected to the dendrites of the next neuron. There is no cytoplasmic connection between the two neurons and microscopic gaps are left between them. Each of these contact points is known as synapse.

14 TOPIC REPRODUCTION

PRACTICE EXERCISE

TOPIC-WISE MCQs

MALE REPRODUCTIVE SYSTEM

Q.1 Which one of the following is a diploid structure?
A) Secondary spermatocyte
B) Primary spermatocyte
C) Spermatid
D) Spermatozoa

Q.2 Which one of the following causes growth and development of germinal epithelium of the testes?
A) Inhibin
B) Testosterone
C) LH
D) FSH

Q.3 Production of slightly acidic fluid with citrate as a main nutrient source is the function of:
A) Bulbourethral gland
B) Seminal vesicles
C) Prostate gland
D) Cowper's gland

Q.4 Structure that undergoes meiosis I is:
A) Primary spermatocyte
B) Secondary spermatocyte
C) Spermatid
D) Spermatogonium

Q.5 Spermatozoa are formed from spermatids as a result of:
A) Mitosis
B) Meiosis I
C) Differentiation
D) Meiosis II

Q.6 Prior to emission and ejaculation, spermatozoa are stored in:
A) Urethra
B) Epididymis
C) Seminal vesicles
D) Prostate gland

Q.7 Fructose production as nutritional component for sperms is the function of:
A) Bulbourethral gland
B) Seminal vesicles
C) Prostate gland
D) Seminiferous tubules

Q.8 Human sperm and ova show similarities in following respect:
A) Both are haploid
B) Both are having approximately same size
C) Both carry identical genetic makeup
D) Both possess good mobility

Q.9 All of the following contributes to the formation of semen except:
A) Seminal vesicles
B) Prostate gland
C) Cowper's gland
D) Vas deferens

Q.10 Correct sequence of events in spermatogenesis is:
A) Spermatogonia > Spermatids > Spermatocytes > Spermatozoa
B) Primary spermatocytes > Secondary spermatocytes > Spermatozoa
C) Spermatogonia>Primary spermatocyte > Secondary spermatocytes>Spermatid> Spermatozoa
D) Secondary spermatocyte > Spermatozoa > Spermatogonia> Spermatids

Q.11 All of the following structures are paired except:
A) Testes
B) Bulbourethral gland
C) Seminal vesicles
D) Prostate gland

Q.12 Main function performed by bulbourethral gland in humans is/are:
A) Sperm maturation
B) Sperm production
C) Neutralization of urethra
D) Semen formation

Q.13 How many spermatozoa and ova are produced from 50 primary spermatocytes and 50 primary oocytes?
A) 200 spermatozoa and 100 ova
B) 100 spermatozoa and 50 ova
C) 200 spermatozoa and 50 ova
D) 100 spermatozoa and 100 ova

Q.14 Motile and completely mature cell with flagelium is:
A) Spermatid
B) Spermatogonium
C) Spermatocyte
D) Spermatozoa

FEMALE REPRODUCTIVE SYSTEM

Q.15 Fertilization of a secondary oocyte by sperm takes place at:
A) Proximal part of cervix
B) Proximal part of uterine tube
C) Distal part of oviduct
D) Distal part of cervix

Q.16 Oogenesis in human females start:
A) At puberty
B) Before puberty
C) Before birth
D) After puberty

Q.17 Uterus opens into vagina through a narrow entrance that is:
A) Cervix
B) Fallopian tube
C) Birth canal
D) Uterine body

Q.18 First polar body is formed as a result of:
A) Differentiation of oocyte
B) Mitotic cell division in spermatocytes
C) 1st meiotic division in primary oocyte
D) 2nd meiotic division in primary oocyte

Q.19 How many spermatozoa and ova are produced from 50 primary spermatocytes and 50 primary oocytes?
A) 200 spermatozoa and 100 ova
B) 100 spermatozoa and 50 ova
C) 200 spermatozoa and 50 ova
D) 100 spermatozoa and 100 ova

Q.20 What will be the effect on the duration of menstrual cycle if one of the ovaries is removed?
A) Duration will be more than 28 days
B) Duration will be less than 28 days
C) Menstrual cycle stops completely
D) Menstrual cycle remains unaffected

MENSTRUAL CYCLE

Q.21 Layer of uterus that is under control of oestrogen:
A) Mesometrium
B) Myometrium
C) Endometrium
D) Perimetrium

Q.22 Progesterone production within ovaries is accomplished by following structure:
A) Primary follicle
B) Graffian follicle
C) Ruptured follicle
D) Corpus albicans

Q.23 The layer of uterus that is shed with each reproductive cycle is:
A) Mesometrium
B) Myometrium
C) Endometrium
D) Perimetrium

Q.24 Maximum chances of fertilization in human females exist usually during _____ of reproductive cycle.
A) 11th to 14th day
B) 14th to 16th day
C) Immediately after menstruation
D) 6th to 9th day

Q.25 After fertilization, embryo implants itself to the _____ part of uterus.
A) Endometrium
B) Mesometrium
C) Myometrium
D) Perimetrium

Q.26 In a menstrual cycle of 45 days, what would be the most probable day of ovulation?
A) 14th
B) 40th
C) 31th
D) 20th

Q.27 Endometrium shows maximum thickness during:
A) Start of proliferative phase
B) End of Proliferative phase
C) Secretary phase
D) Menstruation

Q.28 Menstruation is the discharge of:
A) Blood, water and cellular debris
B) Lymph, mucous and solid debris
C) Blood, mucous and cellular debris
D) Lymph, blood and cellular debris

Q.29 The development of secondary oocyte into ovum is completed in:
A) Uterine tube
B) Uterus
C) Ovary
D) Graffian follicle

Q.30 What will be the effect on the duration of menstrual cycle if one of the ovaries is removed?
A) Duration will be more than 28 days
B) Duration will be less than 28 days
C) Menstrual cycle stops completely
D) Menstrual cycle remains unaffected

Q.31 Menstruation usually continues:
A) 3–7 days
B) 1–3 days
C) 20–22 days
D) 15–17 days

Q.32 In young females, ovulation occurs at _____ day of reproductive cycle.
A) 18th
B) 28th
C) 14th
D) 24th

Q.33 Multiple births may occur in humans when:
A) There is an excess of sperms
B) Menstruation occurs
C) Over activity of pituitary occurs
D) Multiple ovulations occurs

SEXUALLY TRANSMITTED DISEASES

Q.34 Viral STD that mainly results in immune dysfunction:
A) AIDS
B) Gonorrhea
C) Herpes simplex
D) Syphilis

Q.35 Causative agent of syphilis is:
A) *Bacillus*
B) *Coccus*
C) *Coccobacillus*
D) *Spirochete*

Q.36 Which of the following pair of STD's is caused by obligate intracellular parasite?
A) Gonorrhea and Syphilis
B) AIDS and Syphilis
C) Genital herpes and Herpes simplex
D) AIDS and Genital herpes

Q.37 Transmission of *Neisseria gonorrheae* is best described by which one of the following method?
A) Oro-fecal route
B) Unsafe sex
C) Vector borne
D) Droplet infection

PAST PAPER MCQs

2009

Q.1 Which of the following will happen if fertilization does not occur?
A) Menopause starts
B) Corpus luteum degenerates
C) FSH secretion is increased
D) Progesterone secretion is increased

2010

Q.2 Which of the following sequence is correct?
A) LH → FSH → Estrogen →Progesterone
B) FSH → LH → Progesterone → Estrogen
C) FSH → Estrogen → Progesterone → LH
D) FSH → Estrogen → LH → Progesterone

Q.3 The first cells produced by the repeated cell division of germinal epithelium of testis are:
A) Interstitial cells
B) Spermatogonia
C) Secondary spermatocytes
D) Spermatids

2011

Q.4 A type of cell in human testes which produces testosterone is called:
A) Interstitial Cells
B) Germ Cells
C) Sertoli Cells
D) Spermatocytes

Q.5 Breakdown of endometrium during menstruation is due to:
A) Increase in Level of LH
B) Decrease in Level of Progesterone
C) Increase in Level of Progesterone
D) Increase in Level of Estrogen

Q.6 Luteinizing hormone triggers:
A) Cessation of Oogenesis
B) Breakdown of Oocyte
C) Ovulation
D) Development of Zygote

Q.7 Oogonia are produced in the germ cells:
A) Both Uterus and Cervix
B) Cervix
C) Uterus
D) Ovary

2012

Q.8 Second meiotic division in the secondary oocyte proceeds as far as:
A) Metaphase
B) Prophase
C) Anaphase
D) Telophase

Q.9 Discharge of ovum or secondary oocyte from ovary or from Graffian follicle is called:
A) Fertilization
B) Pollination
C) Follicle formation
D) Ovulation

Q.10 Which one of the following differentiates directly into mature sperm?
A) Primary spermatocyte
B) Secondary spermatocyte
C) Spermatogonia
D) Spermatid

2013

Q.11 What is the location of interstitial cells in testes?
A) Inside the seminiferous tubules
B) Between the seminiferous tubule
C) Among the germinal epithelial cells
D) Around the testes

Q.12 A type of cells in human testes which produce testosterone are called?
A) Germ cells
B) Sertoli cells
C) Interstitial cells
D) Spermatocytes

Q.13 The hormone produced from corpus luteum is:
A) Prolactin
B) FSH
C) Progesterone
D) LH

Q.14 Spermatogonia differentiate directly into?
A) Primary spermatocytes
B) Secondary spermatocytes
C) Spermatozoa
D) Spermatids

2014

Q.15 Testosterone is produced by which one of the following?
A) Sertoli cells
B) Germinal epithelium
C) Interstitial cells
D) Spermatogonia

Q.16 The oocyte released during ovulation is in:
A) Anaphase I
B) Prophase I
C) Metaphase I
D) Metaphase II

Q.17 Yellowish glandular structure formed after the release of egg from follicle is called:
A) Corpus callosum
B) Graffian follicle
C) Corpus luteum
D) Follicle atresia

Q.18 On puberty, the development of primary follicles is stimulated by:
A) ICSH
B) FSH
C) LH
D) Estrogen

2015

Q.19 In females, FSH stimulates the ovary to produce:
A) Progesterone
B) Prolactin
C) Estrogen
D) Oxytocin

Q.20 In which phase of human female menstrual cycle, endometrium prepares for the implantation of embryo?
A) Proliferative phase
B) Menstrual phase
C) Secretory phase
D) Ovulation phase

2016

Q.21 Events of menstrual cycle are regulated by the:
A) Ethylene
B) Gonadotrophins
C) Auxins
D) Gibberellins

Q.22 Decrease of FSH and increase of estrogen cause pituitary gland to secrete:
A) Somatotropin
B) Luteinizing hormone
C) Testosterone
D) Spermatogonium

2017

Q.23 FSH stimulates the production of estrogen hormone which has two targets_____ and _____.
A) Uterus, posterior pituitary
B) Ovaries, uterus
C) Uterus, anterior pituitary
D) Ovaries, hypothalamus

Q.24 Ovulation is suppressed by progesterone via:
A) Inhibition of LH only
B) Inhibition of FSH & stimulation of LH
C) Inhibition of LH & stimulation of FSH
D) Inhibition of both FSH & LH

Q.25 Which of the following directly develops into sperms?
A) Primary spermatocytes
B) Spermatids
C) Secondary spermatocytes
D) Spermatogonia

2017 Re-Take

Q.26 Which of the following hormone suppresses ovulation?
A) Progesterone
B) Insulin
C) FSH
D) Prolactin

Q.27 Which of the following hormone causes ovulation?
A) LH
B) Progesterone
C) Estrogen
D) FSH

Q.28 Meiosis occurs in human females during:
A) Ovulation
B) Gametogenesis
C) Spermatogenesis
D) Spermiogenesis

2018
Q.29 Which hormone is released in female in response to FSH from pituitary gland?
A) Oxytocin
B) ADH
C) Estrogen
D) Progesterone

Q.30 Which of the following hormone acts on the uterus wall for thickening?
A) Zona pellucida
B) Progesterone
C) Oxytocin
D) Follicle stimulating hormone

2019
Q.31 Which hormonal pair would maintain the endometrium and make it receptive for implantation of embryo?
A) Luteinizing Hormone and Progesterone
B) Estrogen and Follicle Stimulating Hormone
C) Luteinizing Hormone and Follicle Stimulating Hormone
D) Estrogen and Progesterone

Q.32 Which of the following hormone stimulates the ovulation from the follicle into oviduct?
A) Luteinizing hormone
B) Follicle stimulating hormone
C) Estrogen
D) Progesterone

Q.33 During spermatogenesis, the _____, which are haploid cells eventually mature into spermatozoa/mature sperms?
A) Secondary spermatocytes
B) Primary spermatocytes
C) Spermatogonia
D) Spermatids

2020
Q.34 Which one of the following represents the changes that occur in the ovary and the uterus approximately every 28 days involving ovulation with the breakdown and loss of the lining of the uterus?
A) Ovulation
B) Menstrual cycle
C) Uterine cycle
D) Embryo formation

Q.35 Which of the following diseases is sexually transmitted?
A) Tuberculosis
B) AIDS
C) Cholera
D) Dengue fever

Q.36 Which of the following hormones of the pituitary gland regulate the menstrual cycle?
A) Follicle stimulating hormone and estrogen
B) Luteinizing hormone and estrogen
C) Follicle stimulating hormone and Luteinizing hormone
D) Estrogen and progesterone

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	D	21	C	31	A
2	D	12	C	22	C	32	C
3	C	13	C	23	C	33	D
4	A	14	D	24	B	34	A
5	C	15	B	25	A	35	D
6	B	16	C	26	C	36	D
7	B	17	A	27	C	37	B
8	A	18	C	28	C		
9	D	19	C	29	A		
10	C	20	D	30	D		

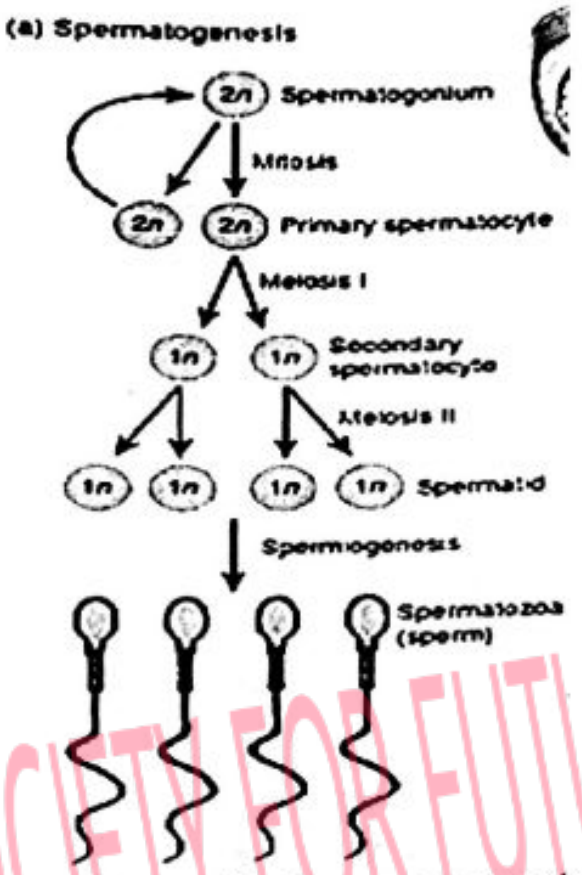
PAST PAPERS MCQs

1	B	11	B	21	B	31	D
2	D	12	C	22	B	32	A
3	B	13	C	23	C	33	D
4	A	14	A	24	A	34	B
5	B	15	C	25	B	35	B
6	C	16	D	26	A	36	C
7	D	17	C	27	A		
8	A	18	B	28	B		
9	D	19	C	29	C		
10	D	20	C	30	B		

EXPLANATORY NOTES

TOPIC-WISE MCQs

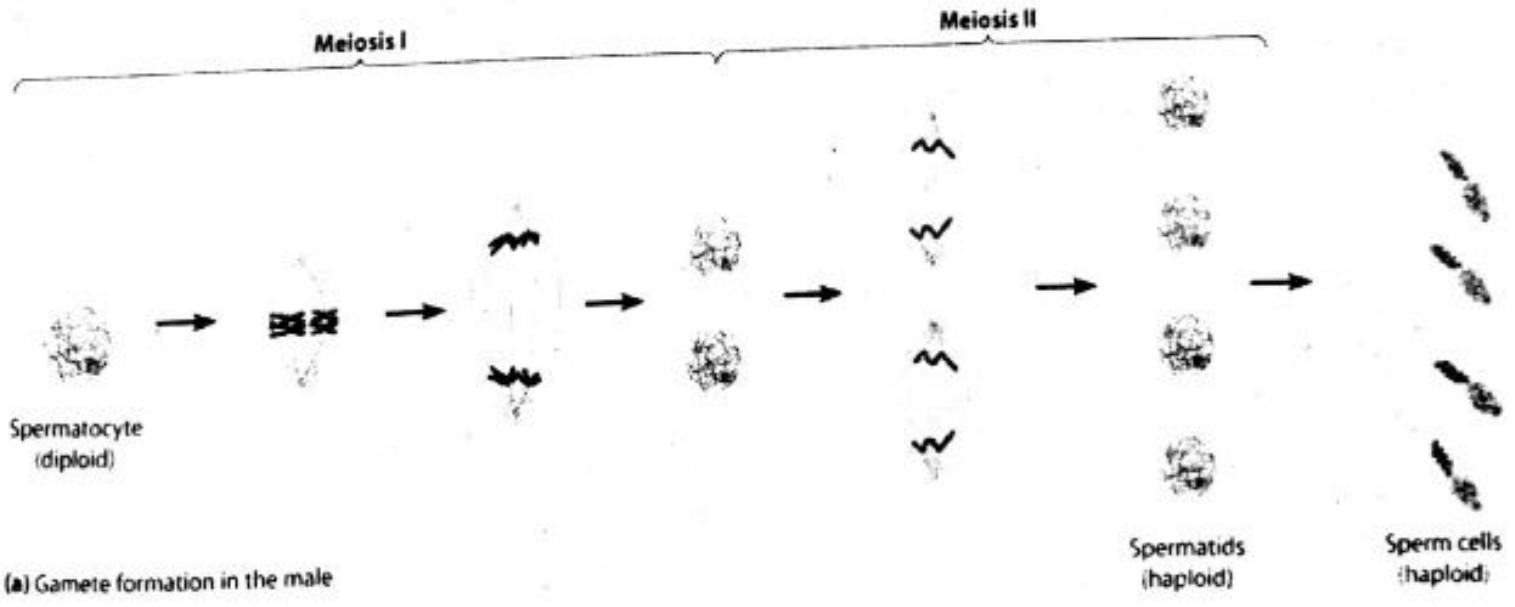
1.



2. Follicle stimulating hormone is one of the hormones essential to pubertal development and the function of women's ovaries and men's testes. In women, this hormone stimulates the growth of ovarian follicles in the ovary before the release of an egg from one follicle at ovulation.

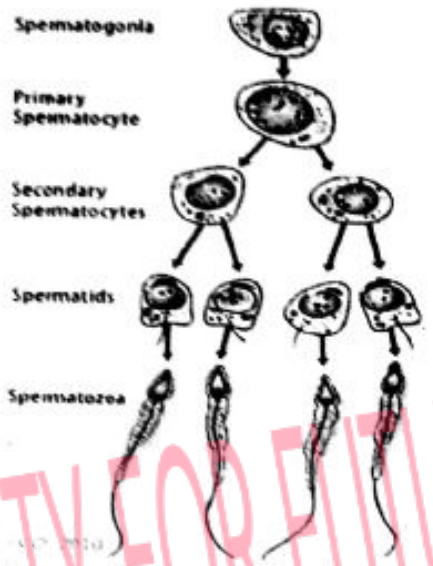
3. The prostate gland is a male reproductive organ whose main function is to secrete prostate fluid (acidic fluid with citrate), one of the components of semen.

4.

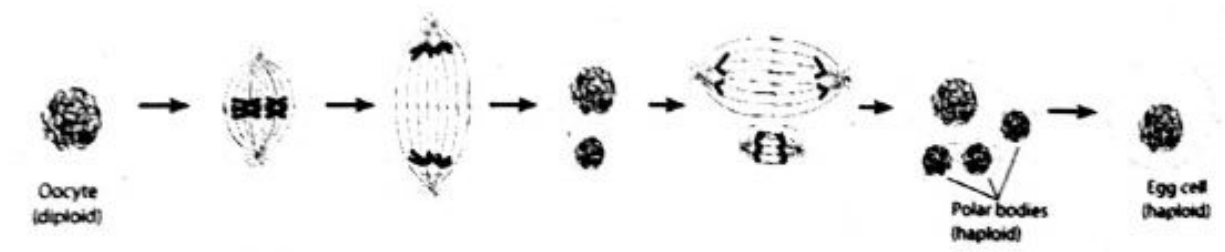


(a) Gamete formation in the male

5. Spermatid is spherical, non-motile cell. Through differentiation, it is changed into spermatozoa where it forms tail and becomes motile.
6. The epididymis is a tightly coiled mass of thin tubes that carries sperm from the testes to the vas deferens. Sperm matures as it passes through the epididymis.
7. Seminal vesicles release up to 60% of the fluid found in semen. The other 40% is produced by the prostate and bulbourethral glands. The fluid produced by seminal vesicles contains several key components: Fructose: which is a sugar that is produced to provide energy for swimming sperm cells.
8. Both the sperm and ova are haploid cells. All others are dissimilarities
9. The vas deferens transports mature sperm to the urethra.
10.



11. The accessory glands of the male reproductive system are the seminal vesicles (paired), bulbourethral gland (paired) and the prostate gland (unpaired). Testes are also paired.
12. Bulbourethral glands produce a mucus-like fluid called pre-ejaculate. This fluid is a viscous, clear, and salty liquid that neutralizes any residual acidity in the urethra
13. Each primary spermatocyte produces four sperms while each primary oocyte gives rise to one ovum (secondary oocyte) and three polar bodies.
14. The mature motile male sex cell of an animal, by which the ovum is fertilized, typically having a compact head and one or more long flagella for swimming.
15. Oviduct is also called as uterine tube. Its proximal end is important for fertilization.
16. In human female, the first part of meiosis begins in the embryo, and the signal to resume meiosis is not given until roughly 12 years later.
17. It is the lower most part of the uterus and is made up of strong muscles. The function of the cervix is to allow flow of menstrual blood from the uterus into the vagina, and direct the sperms into the uterus during intercourse. The opening of the cervical canal is normally very narrow.
18.

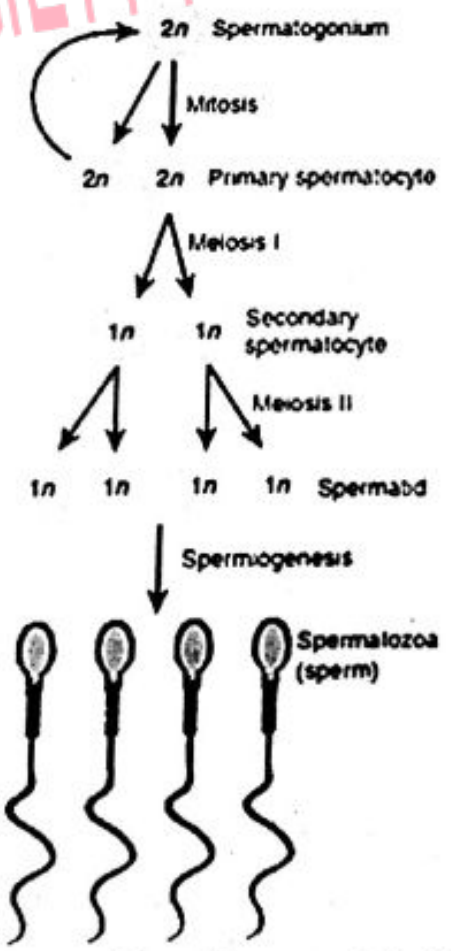


(b) Gamete formation in the female

19. Each primary spermatocyte produces four sperms while each primary oocyte gives rise to one ovum (secondary oocyte) and three polar bodies.
20. An oophorectomy is a surgical procedure to remove one or both ovaries. The ovaries produce eggs as well as the hormones estrogen and progesterone. Removal of one ovary still allows a woman to continue to menstruate and to have children, as long as the remaining ovary is not damaged.
21. Thickness of endometrium changes in different phases of menstrual cycle. Estrogen and progesterone make it more thick and spongy.
22. Progesterone is secreted from corpus luteum which contains ruptured follicles during luteal phase.
23. The endometrium changes throughout the menstrual cycle. It becomes thick and rich with blood vessels to prepare for pregnancy. If pregnancy does not occur, part of the endometrium is shed, causing menstrual bleeding.
24. Normally 14th day is the day of ovulation and according to the life span of egg and sperms option B is the most appropriate one.
25. Under normal circumstances, fertilization occurs in one of the Fallopian tubes, and then the fertilized egg begins to make its way to the uterus. By about the fifth day after conception, the embryo finally reaches the uterus, where it implants itself in the endometrium.
26. Under normal conditions, luteal phase of menstrual cycle is of 14 days. If cycle is going to be completed in 45 days, then 45-14=31 so C is the right answer.
27. During the secretory or luteinizing phase (14th to 28th day) the endometrium differentiates itself due to the influence of progesterone (from the corpus luteum) and attains its full maturity.
28. About half of menstrual fluid is blood. This blood contains sodium, calcium, phosphate, iron, and chloride, the extent of which depends on the woman. As well as blood, the fluid consists of cervical mucus, vaginal secretions, and endometrial tissue.
29. Secondary oocyte proceeds to ovum if it is fertilized. The site of fertilization is uterine tube.
30. The ovaries produce eggs as well as the hormones estrogen and progesterone. Removal of one ovary still allows a woman to continue to menstruate and to have children, as long as the remaining ovary is not damaged.
31. The menstrual cycle is governed by hormonal changes. It takes 3-7 days to regain original form of uterus for next cycle.
32. In normal menstrual cycle, ovulation usually occurs at mid cycle, i.e. 14th day.
33. A woman can have multiple ovulations in a single cycle. This means that several eggs (most often two) are released from the ovaries. However, both eggs will be released within 24h from the ovaries and result in multiple births.
34. AIDS is a set of symptoms and illnesses that develop as a result of advanced HIV infection which destroys the immune system.
35. Syphilis is a sexually transmitted infection caused by the bacterium *Treponema pallidum*.
36. AIDs and genital herpes are caused by virus, which are obligate intracellular parasites.
37. Gonorrhea, also spelled gonorrhoea, is a sexually transmitted infection caused by the bacterium *Neisseria gonorrhoeae*.

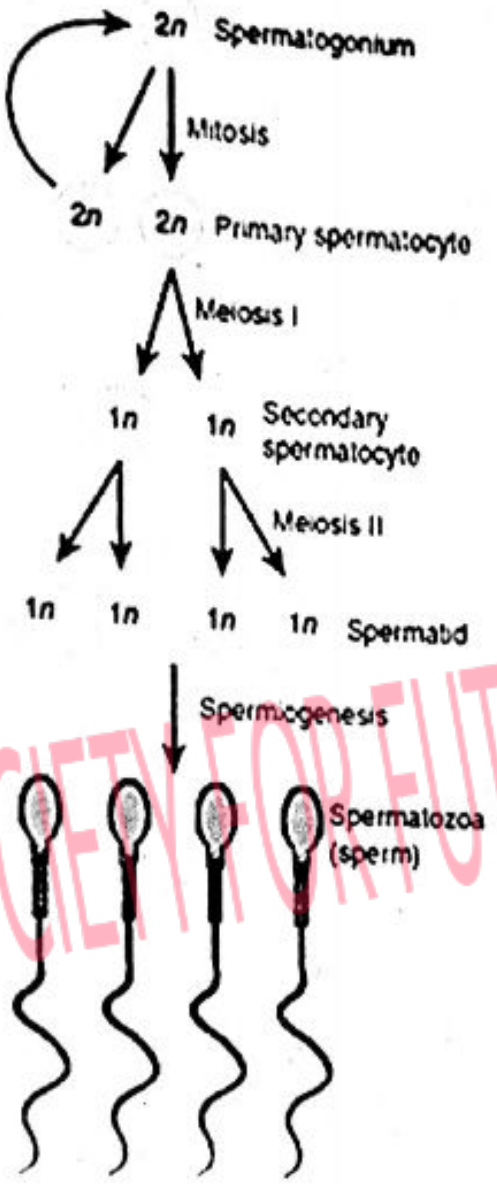
PAST PAPER MCQs

1. If fertilization does not occur, the corpus luteum starts degenerating. The progesterone secretion diminishes and its supporting effect on the spongy endometrium is reduced, which suffers a breakdown.
2. FSH from pituitary acts on follicle cells of ovary. During the development of follicles estrogen is secreted which inhibits the secretions of FSH and promotes the secretions of LH. LH causes ovulation, which results the formation of ruptured follicles known as carpus luteum which is source of progesterone.
3. Spermatogonium cell produced at an early stage in the formation of spermatozoa, formed in the wall of a seminiferous tubule and giving rise by mitosis to spermatocytes.
4. LH is also called as interstitial cells stimulating hormone (ICSH) which also act on interstitial cells to produce the testosterone.
5. If fertilization does not occur, the corpus luteum starts degenerating. The progesterone secretion diminishes and its supporting effect on the spongy endometrium is reduced, which suffers a breakdown.
6. Decrease of FSH and increase of estrogen, causes the pituitary gland to secrete LH which induces ovulation.
7. Oogenesis starts before birth in ovary when oogonia divide mitotically to produce primary oocytes.
8. Secondary oocyte undergoes through meiosis II but arrested in Metaphase II. It is released in this stage from ovary and does not proceed further until fertilized.
9. The release of the ripe egg (ovum) from the ovary. The egg is released when the cavity surrounding it (the follicle) breaks open in response to a hormonal signal.
10.



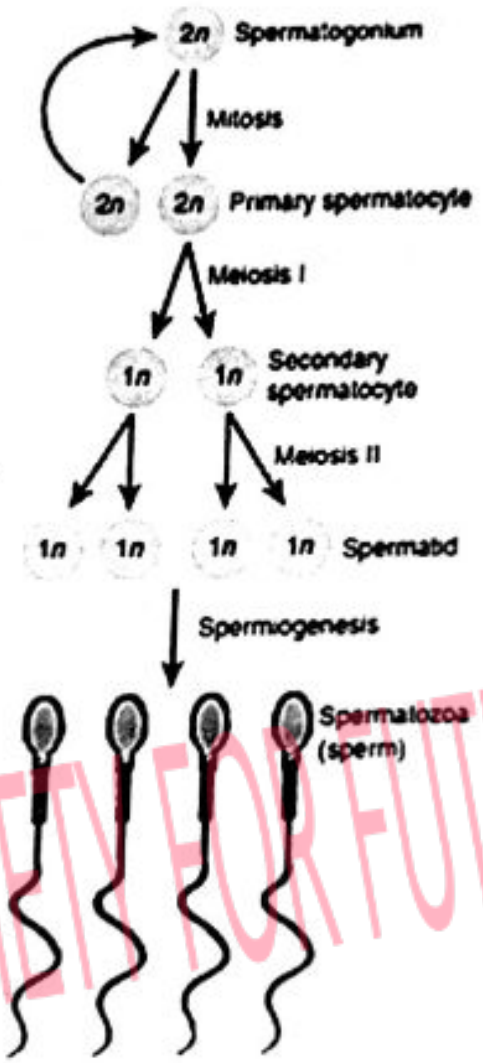
11. Leydig cells or interstitial cells are the cells present in the interstitial space of the testis. In fact, they are located in the connective tissue that surrounds the seminiferous tubules.

12. LH is also called as interstitial cells stimulating hormone (ICSH) which also act on interstitial cells to produce the testosterone.
13. LH causes ovulation, which results the formation of ruptured follicles known as carpus luteum which is source of progesterone.
14.

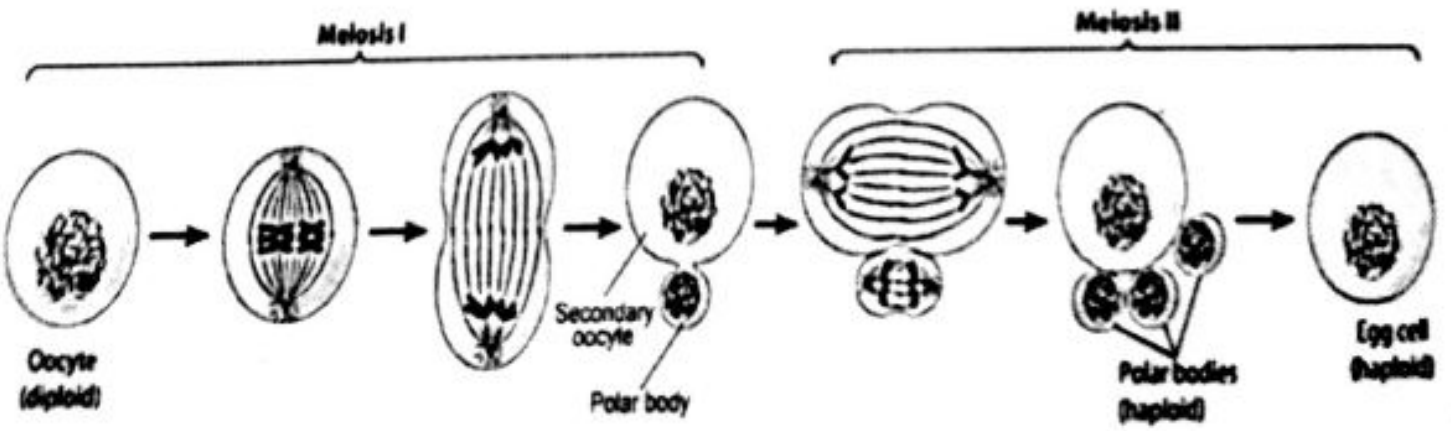


15. LH is also called as interstitial cells stimulating hormone (ICSH) which also act on interstitial cells to produce the testosterone.
16. Secondary oocyte undergoes through meiosis II but arrested in Metaphase II. It is released in this stage from ovary and does not proceed further until fertilized.
17. The follicle cells, after release of egg, are modified to form a special structure called corpus luteum. This yellowish glandular structure starts secreting progesterone, which develops endometrium and makes it receptive for implantation and placentation.
18. Pituitary gland on the onset of puberty, releases FSH which stimulates the development of several primary follicles.
19. Ovary under influence of FSH produces estrogen.
20. The second half of the menstrual cycle after ovulation: the corpus luteum secretes progesterone which prepares the endometrium for the implantation of an embryo.
21. Events of menstrual cycle are regulated by pituitary gonadotrophins.
22. Decrease of FSH and increase of estrogen, causes the pituitary gland to secrete LH which induces ovulation.

23. Estrogen, on one hand, stimulates the endometrium and vascularizes it. On the other hand, it inhibits secretion of FSH from anterior lobe of pituitary.
24. An increase of progesterone inhibits the release of LH, because that's what normally causes progesterone to be secreted.
25.



26. An increase of progesterone inhibits the release of LH, because that's what normally causes progesterone to be secreted.
27. LH causes ovulation, which results the formation of ruptured follicles known as carpus luteum which is source of progesterone.
28.

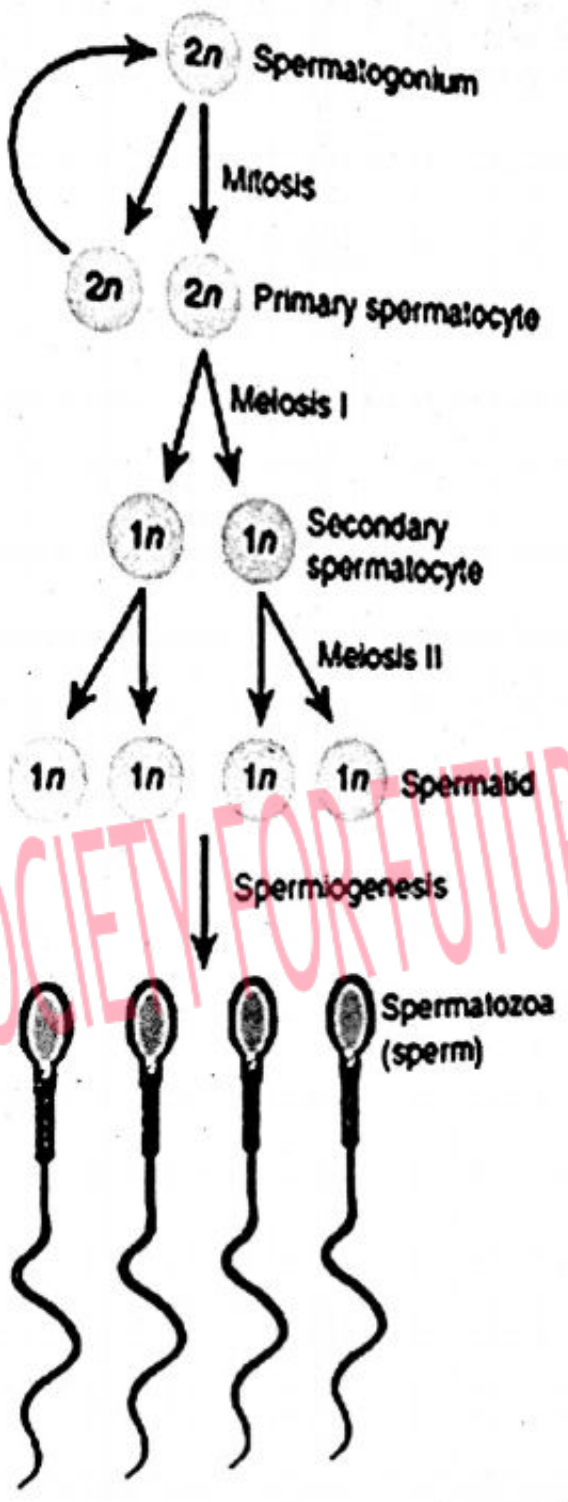


(b) Gamete formation in the female

29. Ovary under influence of FSH produces estrogen.
30. Thickness of endometrium changes in different phases of menstrual cycle. Estrogen and progesterone make it more thick and spongy.

31. Both estrogen and progesterone have supportive effect on endometrium.
32. LH causes ovulation, which results the formation of ruptured follicles known as carpus luteum which is source of progesterone.

33.



34. Menstrual cycle is the monthly cycle of changes in the ovaries and the lining of the uterus (endometrium), starting with the preparation of an egg for fertilization.
35. STDs are infections that are spread from person to person through sexual activity, including anal, vaginal, or oral sex. AIDS is a notorious STD.
36. The menstrual cycle is regulated by hormones. LH and FSH, which are produced by the pituitary gland, promote ovulation and stimulate the ovaries to produce estrogen and progesterone.

15 VARIATION & GENETICS / INHERITANCE

TOPIC » PRACTICE EXERCISE

TOPIC-WISE MCQs

MENDELIAN INHERITANCE

Q.1 The alleles are:
A) A pair of genes governing a specific character
B) Multiple forms of genes
C) Genes governing eye characters
D) Genes present on allosomes

Q.2 An organism's genetic constitution is called its:
A) Genotype
B) Phenotype
C) Genetics
D) Gene pool

Q.3 All the genes/alleles found in a breeding population at a given time are collectively termed as:
A) Genome
B) Genotype
C) Gene pool
D) Karyotype

LAW OF SEGREGATION

Q.4 An allele is said to be dominant if:
A) It is expressed only in heterozygous combination
B) It is expressed only in homozygous combination
C) It is expressed in both homozygous and heterozygous condition
D) It is expressed only in second generation

Q.5 An organism with two identical alleles for a given trait is:
A) Homozygous
B) Heterozygous
C) Dominant
D) Hermaphrodite

Q.6 In Mendel's experiment, nature of seed coat, flower colour, position of flower, pod colour, stem height, etc., are referred as:
A) Alleles
B) Genotypes
C) Phenotypes
D) Karyotype

Q.7 The dwarfness in plants of F_2 generation is due to:
A) Homozygous recessive alleles
B) Heterozygous dominant alleles
C) Homozygous dominant alleles
D) Heterozygous recessive alleles

Q.8 In Mendel's experiments, the phenotypic ratio of recessive to dominant plants was equal to:
A) 1:3
B) 3:1
C) 3:9
D) 9:3

LAW OF INDEPENDENT ASSORTMENT

Q.9 In Mendelism, the linkage was not observed due to:
A) Mutation
B) Independent assortment
C) Synapsis
D) Crossing over

Q.10 A cross between plants having RRYY and rryy composition will yield plants with:
A) Round and yellow seeds
B) Round and green seeds
C) Wrinkled and yellow seeds
D) Wrinkled and green seeds

Q.11 A cross between a homozygous recessive and a heterozygous plant is called:
A) Monohybrid cross
B) Dihybrid cross
C) Test cross
D) Back cross

Q.12 Self-cross between Tt and Tt plants results into the genotype ratio of:
A) 3:1
B) 1:2:1
C) 1:3
D) 4:0

Q.13 When a tall plant with rounded seeds (TTRR) is crossed with a dwarf plant with wrinkled seeds (ttrr), then the generation consists of tall plants with rounded seeds. How many types of gametes a plant would produce?

A) One
B) Three
C) Four
D) Eight

Q.14 In Mendelian dihybrid cross, how many of progeny in F_2 generation possess genotype rryy?

A) $\frac{1}{16}$
B) $\frac{2}{16}$
C) $\frac{3}{16}$
D) $\frac{4}{16}$

Q.15 In the dihybrid cross, the number of round green seeds that were homozygous for round trait:

A) 2
B) 3
C) 1
D) 4

DOMINANCE RELATIONS

Q.16 _____ is the physiological effect of an allele over its partner allele on the same gene locus.

A) Dominance
B) Epistasis
C) Pleiotropy
D) Polymeric gene interaction

Q.17 The contrasting pair of alleles for all the seven traits chosen by Mendel showed:

A) Complete dominance
B) Incomplete dominance
C) Partial dominance
D) Over dominance

Q.18 In humans, the blood group with MN phenotype has both the antigens, simultaneously produced by their allele L^M and L^N. It is because of:

A) Complete dominance
B) Over dominance
C) Co-dominance
D) Incomplete dominance

MULTIPLE ALLELS (ABO BLOOD GROUP SYSTEM)

Q.19 Inheritance of ABO blood group system is an example of

A) Multiple allelism
B) Partial dominance
C) Epistasis
D) Pleiotropy

Q.20 Multiple alleles are the altered forms of a gene whose number is more than two and may have as many as 300 alleles, but a diploid organism can:

A) Have just one of them in its genome
B) Have two of them in its genome
C) Have four of them in its genome
D) Have multiple of them in its genome

Q.21 In humans, the polymorphic gene 'I' has three multiple alleles which are the result of:

A) Epistasis
B) Pleiotropy
C) Mutation
D) Gene linkage

Q.22 The genotype of blood group 'A' can be:

A) I^AI^A
B) I^BI^B
C) I^AI^A or I^AI^O
D) I^AI^O

Q.23 A person with antigens 'B' present of membrane of RBCs and 'anti-A' antibodies in the blood plasma will have:

A) Blood group 'A'
B) Blood group 'B'
C) Blood group 'AB'
D) Blood group 'O'

Q.24 If a female has 'A' blood group and her husband has 'O' blood group, then the blood group of their children possibly be:

A) A and B groups only
B) AB only
C) A and O groups only
D) All four groups

Q.25 ABO blood grouping is controlled by gene I which has three alleles and show co-dominance. There are six genotypes. How many phenotypes are possible?
A) Six
B) Three
C) Four
D) Five

Q.26 Which of the following blood groups is not possible in a person whose father is of blood group O?
A) AB
B) A
C) B
D) O

Q.27 A man having a blood group O marries a woman having a blood group A whose father was also O. What is the probability of 'O' in their offspring?
A) 50%
B) 25%
C) 75%
D) 0%

Q.28 Which of the following blood group is considered as universal donor?
A) AB^{+ve}
B) AB^{-ve}
C) O^{-ve}
D) O^{+ve}

Q.29 Blood group antigens can be found in:
A) RBCs
B) Saliva
C) Body fluids
D) ALL A, B, C

Rh BLOOD GROUP SYSTEM

Q.30 Rh factor is named after:
A) Man
B) Rat
C) Monkey
D) Chimpanzee

Q.31 Which of the following is genetically dominant in man?
A) Colour blindness
B) Rh positive
C) Haemophilia
D) Albinism

MATERNAL FOETAL Rh INCOMPETIBILITY

Q.32 Rh factor may be responsible for:
A) Turner's syndrome
B) AIDS
C) Sickle-cell anaemia
D) Erythroblastosis fetalis

EPISTASIS AND BOMBAY PHENOTYPE

Q.33 Phenomenon of an allele of one gene suppressing the activity of allele of another gene is called:
A) Suppression
B) Epistasis
C) Dominance
D) Inactivation

Q.34 In cucurbita W is epistatic over Y and y normally responsible for yellow and green colour fruits. It produces white fruit. What is the ratio of fruits in the progeny of cross Ww Yy× ww Yy?
A) 9 white× : 7 yellow : 0 green
B) 3 white× : 4 yellow : 1 green
C) 4 white : 3 yellow : 1 green
D) 2 white : 1 yellow : 1 green

POLYGENIC INHERITANCE

Q.35 A wheat grain has genotype AabbCc. What will be its color?
A) Red
B) Light pink
C) Pink
D) Light red

Q.36 Which of the following is an example of multiple alleles?
A) Rh blood group system
B) Wheat grain color
C) Height
D) Tongue rolling

Q.37 In human beings, the colour of skin is controlled by
A) Multiple alleles
B) Lethal genes
C) Polygenic effect
D) Epistatic effect

GENE LINKAGE AND CROSSING OVER

Q.38 Which of the following will not result in variations among siblings?
A) Independent assortment of genes
B) Crossing over
C) Linkage
D) Mutation

Q.39 All of the following can form a linkage group on human chromosome 11 except:
A) Gout
B) Sickle cell anemia
C) albinism
D) Leukemia

RECOMBINATION FREQUENCY AND GENETIC MAP OF CHROMOSOMES

Q.40 The recombination frequency is 20% between the two genes. The distance between them in unit map is:
A) 20
B) 30
C) 60
D) 80

Q.41 Genes A, B, C, and D are located on the same chromosome. The recombination frequencies (RF) are as follows:

Relationship	RF
A-B	8%
A-C	23%
A-D	19%
B-C	10%
C-D	52%

What is the most likely order of the genes on the chromosome?
A) BCAD
B) ACBD
C) CBAD
D) DBAC

PATTEREN OF SEX DETERMINATION

Q.42 A couple has a baby boy, the chances of baby girl as a next child are:
A) 100%
B) 50%
C) No chances
D) Cannot predict

Q.43 How many chromosomes in human male and female are similar?
A) 23
B) 45
C) 46
D) 44

Q.44 If a 'Y' carrying sperm fertilizes the egg the zygote will be:
A) 45A+ YY
B) 44A+ XX
C) 44A+ XY
D) 43A+ X0

Q.45 _____ is male sex switch which triggers developmental process towards maleness.
A) Se
B) SRY
C) TFM
D) H

Q.46 Female heterogamy is found in:
A) Human
B) Drosophila
C) Chicks
D) Grasshopper

SEX LINKAGE IN *DROSOPHILA*

Q.47 Which one of the following conditions correctly describes the manner of determining the sex in the given example?
A) XO type of sex chromosomes determine male sex in grasshopper.
B) XO condition in humans as found in Turner syndrome, determines female sex.
C) Homozygous sex chromosomes (XX) produce male in Drosophila.
D) Homozygous sex chromosomes (ZZ) determine female sex in birds.

Q.48 Drosophila has four pairs of chromosomes. How many linkage groups does it have?
A) Eight
B) Four
C) One less than the pairs of chromosomes
D) One more than the pairs of chromosomes

Topic-15

SEX LINKAGE IN HUMANS (HEMOPHILIA AND COLOR BLINDNESS)

Q.49 Which of the following is not a genetic disorder?

A) Hemophilia
B) Phenylketonuria
C) Colour blindness
D) Epilepsy

Q.50 Example of X-linked dominant trait is:

A) Hemophilia A
B) Hemophilia B
C) Tritanopia
D) Hypophosphatemia

Q.51 All of the following are non-allelic X-linked traits except:

A) Hemophilia A
B) Hemophilia B
C) Hemophilia C
D) TFM syndrome

Q.52 Which is not related to color blindness?

A) Zigzag pattern of inheritance
B) Rhodopsin
C) Passes directly from father to son
D) More common in men

Q.53 Regarding color blindness when a normal male marries a carrier female, which is the correct statement?

A) All daughters will be color blind
B) All sons will be color blind
C) All daughters will be carriers
D) Half of the sons will be color blind

Q.54 All daughters of a diseased father and a normal mother are affected by the disease. This disease is probably:

A) Hemophilia
B) Hypophoshatemic rickets
C) Blue cone monochromacy
D) Protanopia

Q.55 All of the following diseases are related to X chromosome except:

A) Tritanopia
B) Hemophilia
C) Duchenne muscular dystrophy
D) Testicular feminization

Q.56 What is the probability of a hemophilic daughter of a normal man whose father was hemophilic and a carrier woman?

A) 0%
B) 25%
C) 50%
D) 75%

PAST PAPER MCQs

2008

Q.1 Position of a gene on the chromosome is called its:
A) Phenotype
B) Locus
C) Junction
D) Genotype

Q.2 The color phenotype of the grain is the sum of individual effects of _____ alleles.
A) Six
B) Four
C) Five
D) Five or three

Q.3 The genes of blue opsins are present on:
A) Autosome 9
B) Autosome 7
C) Autosome 1
D) Autosome 3

2009

Q.4 If all the members of a population are homozygous for the same allele, that allele is said to be:
A) Random in population's pool
B) Fixed in population's pool
C) Random in a species
D) Fixed in the gene pool

Q.5 Which one of the following is correct about 'Rh⁺⁺' blood?
A) Will produce anti-Rh antibodies if given Rh^+ blood
B) Cannot produce anti-Rh antibodies in any case
C) Rh+ antigens are present on RBCs
D) Rh+ antibodies are present in blood

Q.6 What is true about pattern baldness?
A) It is autosomal recessive disease in males
B) It is autosomal dominant disease in males
C) It is X-linked disease
D) It is Y-linked disease

2010

Q.7 The karyotype of an individual is _____ of chromosomes.
A) Number
B) Types
C) Number, types and chemical composition
D) Number and type

Q.8 Gene for albinism in man is present on chromosome number:
A) 11
B) 22
C) 21
D) 12

Q.9 When a disease is transmitted directly from an affected father to his son, it is called:
A) X-linked
B) Autosomal
C) Y-linked
D) X and Y-linked

2011

Q.10 Which trait in humans is an example of multiple alleles?
A) Eye colour
B) Skin colour
C) ABO-blood group
D) Rh-Blood group

Q.11 Which of the following will be hemophilic?
A) X^HX^h
B) X^HX^H
C) X^hY
D) X^HY

Q.12 Which of the following is an example of X-linked recessive trait in humans?
A) Hypophosphatemic rickets
B) Colour blindness
C) Baldness
D) Beard growth

2012

Q.13 The gene for ABO-blood group system in humans is represented by symbol:
A) X
B) I
C) Y
D) O

2014

Q.14 Position of a gene within a DNA molecule is:
A) Locus
B) Origin
C) Amplicon
D) Filial

2015

Q.15 ABO blood system is an example of:
A) Polygenes
B) Multiple genes
C) Multiple alleles
D) Multiple mutation

Q.16 Human skin color is a good example of:
A) Sex linked inheritance
B) Polygenic inheritance
C) X-linked inheritance
D) Y-linked inheritance

Q.17 Number of pairs of autosomes in humans is:
A) 23
B) 24
C) 21
D) 22

Q.18 X-linked recessive trait is:
A) Hypophosphatemia
B) Vitamin-D resistant rickets
C) Haemophilia
D) Diabetes mellitus

2016

Q.19 The total number of genes in a population is called:
A) Gene pool
B) Allele pool
C) Genome
D) Genomic library

Q.20 A character determined by three alleles is:
A) Human skin color
B) Human blood group
C) Human eye color
D) Human Rh factor

Q.21 Which one of the following is X-linked trait?
A) Male pattern baldness
B) Diabetes mellitus
C) Haemophilia
D) Erythroblastosis foetalis

2017

Q.22 Locus stands for:
A) Position of gene on homologous chromosomes
B) Regions of chromosomes
C) Position of an allele within a DNA molecule
D) Close regions of same chromosomes

Q.23 Self-fertilization of F_1 dihybrids, following independent assortment of alleles will result in:
A) 3/16 tall, round: 3/16 dwarf, wrinkled
B) 9/16 tall, wrinkled: 3/16dwarf, round
C) 9/16 tall, round: 1/16 3/16dwarf, round
D) 3/16 tall, wrinkled: 3/16 dwarf, round

Q.24 As a result of cross-fertilization of true breeding pea plant having purple colored flowers with that of white colored flowers, the offsprings will have flower with:
A) ¼ purple and ¾ white
B) ¼ white and ¾ purple
C) All white
D) All purple

Q.25 Pure breeding lines of Pea were taken regarding seed shape – Round and Wrinkled and were crossed with no intermediate between parents. All offsprings were found to be round. These results show:
A) Co-dominance
B) Dominant – recessive relationship of alleles
C) Incomplete dominance
D) Over dominance relationship

Q.26 The gene for red-green color blindness is present on:
A) Y–chromosome
B) X–chromosome
C) Autosome No. 7
D) Autosome No.9

2017-RETAKE

Q.27 Different alleles of a gene that are both expressed in a heterozygous condition are called:
A) Complete dominance
B) Incomplete dominance
C) Co-dominance
D) Over-dominance

2018

Q.28 The region of the chromosome or more specifically, a length of the DNA molecule, which has a particular nucleotides sequence that codes for specific protein, is called _____.
A) Locus
B) Gene
C) Allele
D) Kinetochore

Q.29 _____ is the exact position of a gene on the chromosome.
A) Genotype
B) Locus
C) Centromere
D) Trait

Q.30 Which one of the following is multiple allelic character?
A) Length of stem in pea plant
B) Shape of seed in pea plant
C) Blood group of the human being
D) Colour of flower in pea plant

Q.31 When two or more alleles do not show complete dominance or both the alleles are expressing independently in heterozygotic condition. Such a condition is called:
A) Complete dominance
B) Over-dominance
C) Co-dominance
D) Incomplete dominance

Q.32 There are_____ number of linkage groups in human.
A) 22
B) 23
C) 46
D) 80

Q.33 Chance of a cross over between two loci is directly proportional to their:
A) Length
B) Distance
C) Width
D) Thickness

2019

Q.34 Homozygous means:
A) Having two identical alleles of a gene
B) Having two identical genes
C) Alleles in an organism
D) Two different alleles of a gene

Q.35 In genetics, the term locus refers to the _____ of the gene on the chromosome.
A) Frequency
B) Copy
C) Position
D) Inversion

Q.36 A person was married to his cousin and both are heterozygous for sickle cell anemia. Among their four kids, what will be proportion of affected homozygotes?
A) 50%
B) 25%
C) 75%
D) 100%

Q.37 In which situation, genes are not assorted independently during meiosis in a chromosome?
A) When genes are not linked and their loci are far apart
B) When there are too many genes on a chromosome
C) When some genes have mutated on the chromosome
D) When genes are linked and their loci are close to each other

Q.38 If a carrier haemophilic female (X^HX^h) is married to a haemophilic male (X^hY). What will be the ratio of presence of haemophilia in the children? Select best answer from given condition.

$X^HX^hX^hY$

A) 100% all females and males will be haemophiliac
B) Carrier female 25% haemophilic female 25%, 25% normal male and 25% haemophilic male
C) Females and males both have 50% chances to getting haemophilia
D) Females have 50% chances of getting haemophilia and females will be 100% haemophilic.

2020

Q.39 Haemophilia A and B, color blindness and testicular feminization are example of:

A) X linked dominant trait
B) X linked recessive trait
C) Y linked inheritance
D) Pseudoautosomal trait

Q.40 Which traits are most likely to affect men than women?

A) X - linked recessive
B) X - linked dominant
C) Autosomal dominant
D) Autosomal recessive

Q.41 _____ alleles both have an effect on the phenotype of a heterozygous organism.

A) Dominant
B) Recessive
C) Codominant
D) Multiple

Q.42 When both the alleles of a gene pair are same, the organism is said to be:

A) Heterozygous
B) Genotype
C) Homozygous
D) Phenotype

Q.43 Law of independent assortment States:

A) That each pair of alleles assort independently of other pairs of alleles during formation
B) That alleles of each pair of contrasting trade have an equal probability to associate with the alleles of other pair
C) That the two coexisting alleles for each trait segregate from each other at meiosis so that each gamete receives only one of the two alleles.
D) That pertains to inheritance of single trait monohybrid cross

Q.44 Phenotype is:

A) The genetic complement i.e. the genes in an individual for a particular trait
B) Partner of gene pair
C) The form of appearance of a trait
D) The position of a gene on the chromosome

Q.45 Incomplete dominance:

A) Different alleles of a gene are both expressed in heterozygous condition
B) One allele is completely dominant over the other and the presence of the recessive allele is functionally hidden so the heterozygote has the same round phenotype as homozygote.
C) The phenotype of the heterozygote is intermediate between phenotypes of the two homozygotes.
D) Gene mutations may produce many different alleles of a gene.

Q.46 During meiosis, the homologous chromosomes come together and form pairs this process is called:

A) Linkage
B) Synapsis
C) Pairing
D) Crossing over

Q.47 At what phase the DNA content of a cell is doubled:

A) Prophase
B) Interphase
C) Anaphase
D) Telophase

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	C	21	C	31	B	41	D	51	C
2	A	12	B	22	C	32	D	42	B	52	C
3	C	13	A	23	B	33	B	43	B	53	D
4	C	14	A	24	C	34	C	44	C	54	B
5	A	15	C	25	C	35	C	45	B	55	A
6	C	16	A	26	A	36	C	46	C	56	A
7	A	17	A	27	A	37	C	47	A		
8	A	18	C	28	C	38	C	48	B		
9	B	19	A	29	D	39	A	49	D		
10	A	20	B	30	C	40	A	50	D		

PAST PAPERS MCQs

1	B	11	C	21	C	31	C	41	C
2	A	12	B	22	A	32	B	42	C
3	B	13	B	23	D	33	B	43	B
4	D	14	A	24	D	34	A	44	C
5	C	15	C	25	B	35	C	45	C
6	B	16	B	26	B	36	B	46	B
7	D	17	D	27	C	37	D	47	B
8	A	18	C	28	B	38	B		
9	C	19	A	29	B	39	B		
10	C	20	B	30	C	40	A		

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Partner of a gene pair is known as allele.
2. Genotype is a genetic makeup of organism that control the expression of a certain trait.
3. The total aggregate of genes in a population at any given time is called the population's gene pool. It consists of all the alleles at all genes loci in all individuals of the population.
4. Such an allele that masks the effect of other allele in a pair is called dominant allele and such trait is dominant.
5. When both alleles of a gene pair in an organism are same, the organism is homozygous for that gene pair.
6. Physical appearance of a trait is called phenotype. For example, round and wrinkled are phenotypes of seed shape as the shape is a trait.
7. The trait whose effect has been masked in F_1 generation but it reappears in F_2 generation is recessive.
8. In monohybrid cross the phenotypic ratio of dominant and recessive plants during F2 generation would is 3:1.
9. In Mendelism, the linkage was not observed due to independent assortment.
10. (RR) phenotype is dominant over wrinkle (rr) and yellow (YY) is dominant over green (yy). In F1 generation all plants will be round and yellow seeded.
11. It is a mating in which an individual showing a dominant phenotype is crossed with an individual showing its recessive phenotype. This cross finds out the homozygous or heterozygous nature of the genotype of dominant phenotypes.
12. When Tt is crossed with Tt then offsprings with TT, Tt, Tt and tt genotypes are produced.
13. When a tall plant with rounded seeds (TTRR) is crossed with a dwarf plant with wrinkled seeds (ttrr), then the generation consists of tall plants with rounded seeds, all plants will have TtRr genotype.
14. One out of sixteen plants of F2 dihybrid cross will have genotype rryy.
15. There is only single plant showing RRyy genotype in F2 generation of dihybrid cross.
16. Dominance is a physiological effect of an allele over its partner allele on the same gene locus.
17. The contrasting pair of alleles for all the seven traits chosen by Mendel showed complete dominance.
18. Both alleles are expressed fully in co-dominance. e.g., MN and AB blood group.
19. All such altered alternative forms of a gene, whose number is more than two are called multiple alleles.
20. Any two of these multiple alleles can be present in the genome of a diploid organism, but a haploid organism or a gamete has just one of them in its genome.
21. Gene mutations may produce many different alleles of a gene.
22. **And 23**

Phenotype	Genotype	Antigen	Antibody
A	I^AI^A, I^Ai	A	Anti-B antibody
B	I^BI^B, I^Bi	B	Anti-A antibody
AB	I^AI^B	A & B	No Antibody
O	ii	No	Anti-A antibody Anti-B antibody

24. Female has I^AI^A or I^Ai and male is ii, same conditions will be in offsprings.
25. ABO blood group shows four different phenotypes, A, B, AB, and O.
26. Father's genotype is ii so the blood group of offspring can't be AB.
27. Male has ii genotype and female is I^Ai, there are 50% chances for the child with O blood group.
28. Blood group without any antigen can be donated to any other blood.
29. Blood group antigens can be found in RBCs, body fluids and saliva.
30. The Rh blood group is one of the most complex blood groups known in humans. From its discovery 60 years ago where it was named after the Rhesus monkey, it has become second in importance only to the ABO blood group in the field of transfusion medicine.
31. Colour Blindness and Haemophilia are X linked recessive traits while Albinism is autosomal recessive; lastly Rh factor is autosomal dominant trait.
32. Erythroblastosis fetalis is hemolytic anemia in the fetus (or neonate, as erythroblastosis neonatorum) caused by transplacental transmission of maternal antibodies to fetal red blood cells. The disorder usually results from incompatibility between maternal and fetal blood groups, often Rho (D) antigens.
33. Epistasis is the interaction of genes that are not alleles, in particular the suppression of the effect of one such gene by another.
34. As the W is dominant over Y and y so in presence of only one W there will be white fruit.
Gametes Formation Formula

Ww Yy× ww Yy

Gametes of WwYy: WY, Wy, wY, wy

Gametes of wwYy: wY, wy

Punnett Square

	wY	**wy**
WY	WWYY	WwYy
Wy	WwYy	Wwyy
wY	wwYY	wwYy
Wy	wwYy	wwyy

Consider Epistasis Relation

WWYY, WwYy, WwYy, Wwyy= White Fruits:4

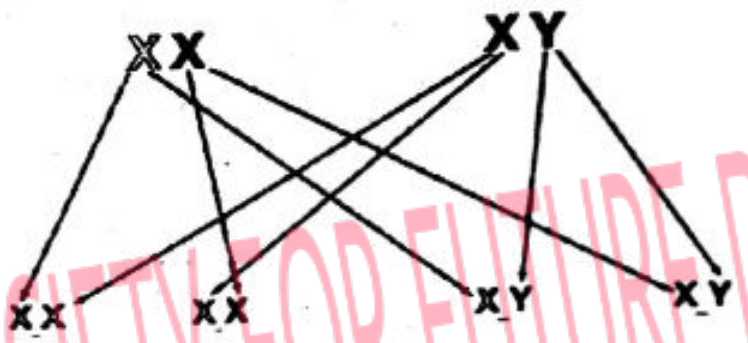
wwYY, wwYy, wwYy=Yellow fruit:3

wwyy= Green Fruit:1

35.

Genotype	Phenotype
AABBCC	Dark red
Aabbcc	White
Aabbcc/ aaBbcc/ aabbCc	Light pink
AAbbcc/ aaBBcc/ aabbCC/ AaBbcc/ aaBbCc/ AabbCc	Pink
AaBbCc/ AABbcc/ AabbCC	Light red
AABBcc/ aaBBCC/ AAbbCC	Red
AABBCc/ AABbCC/ AaBBCC	Moderately dark red

36. Height is multiple allelic trait others don't have multiple alleles.
37. A continuously varying trait is encoded by alleles of two or more different gene pairs found at different loci, all influencing the same trait in an additive way. Those quantitative traits are called ***polygenic traits*** and their genes are ***polygenes***.
Human skin colour is controlled by 3-6 gene pairs.
38. Gene linkage minimizes the chances of genetic recombination and variation among offsprings.
39. Genes for colour blindness, haemophilia, gout etc. form one linkage group on human X chromosome.
40. The recombination frequency is 20% between the two genes. The distance between them in unit map is 20.
41. A pair of genes with a larger recombination frequency are likely farther apart, while a pair with a smaller recombination frequency are likely closer together. Therefore, we should start with the largest recombination frequency (RF) of two genes. In this case, C and D are the farthest apart, so A and B must be between them.
42.



43. All 45 chromosomes are similar in human male and female except Y chromosome that is present in male but absent in female.
44. 44 chromosomes are autosomes in both male and female, egg has X while sperm has Y chromosome. When sperm fuses with egg resulting 44 autosomes+ XY sex chromosomes containing zygote will be produced.
45. SRY gene definition, a sex-determining gene on the Y chromosome in mammals that determines maleness and is essential for development of the testes.
46. Human and Drosophila are having XY-XX system and Grasshopper is having XO-XX system, in both of them male is heterogametic and female is homogametic. On the other hand, Birds, butterfly having XX-XY system in which female is heterogametic.
47. XO: Not a normal condition in Humans
Drosophila: In drosophila X/sets of autosomal chromosomes ratio determine the male and female sex.
In bird's sex determining organism is heterogametic female not male.
48. Number of linkage groups in an organism is equal to number of chromosomal pairs.
49. Hemophilia, colorblindness and Parkinson's disease are due to genetic disorders.
50. Testicular feminization syndrome is a rare X-linked recessive trait. Similarly Haemophilia is also X-linked recessive.
51. Haemophilia A and Bare non-allelic recessive sex-linked but hemophilia C is an autosomal recessive trait (Autosome 4).
52. Like any sex-linked recessive traits, colorblindness is also moves zigzags from maternal grandfather through a carrier daughter to a grandson.

53. Parental

Phenotypes: Carrier Female x Normal Male

Genotypes: X^NX^n x X^NY

Gametes: X^N X^n ; X^N Y

Offspring 1

Genotypes

		Female Gametes	
		X^N	X^n
Male Gametes	X^N	X^NX^N	X^NX^n
	Y	X^NY	X^nY

Phenotypes

Normal Female : Carrier Female : Normal Male : Colour blind Male

1 : 1 : 1 : 1

54. X-linked recessive traits are common in male while X-linked dominant traits are common in female because X chromosome containing disease gene directly pass on from father to daughter.

55. Tritanopia is autosomal recessive trait.

56. Female can be carrier but phenotypically will be normal.

Parental

Phenotypes: Carrier Female x Normal Male

Genotypes: X^NX^n x X^NY

Gametes: X^N X^n ; X^N Y

Offspring 1

Genotypes

		Female Gametes	
		X^N	X^n
Male Gametes	X^N	X^NX^N	X^NX^n
	Y	X^NY	X^nY

Phenotypes

Normal Female : Carrier Female : Normal Male : Colour blind Male

1 : 1 : 1 : 1

PAST PAPERS MCQs

1. The position of a gene on the chromosome is called its locus.
2.

Genotype	Phenotype
AABBCC	Dark red
Aabbcc	White
Aabbcc/ aaBbcc/ aabbCc	Light pink
AAbbcc/ aaBBcc/ aabbCC/ AaBbcc/ aaBbCc/ AabbCc	Pink
AaBbCc/ AABbcc/ AabbCC	Light red
AABBcc/ aaBBCC/ AAbbCC	Red
AABBCc/ AABbCC/ AaBBCC	Moderately dark red

3. The genes for red and green opsins are on X chromosome while the gene for blue opsin is present on autosome 7.
4. If all the members of a population are homozygous for the same allele, that allele is said to be fixed in gene pool.
5. Rh blood group system is defined on the basis of Rh factor present on the surface of RBCs.
6. Sex influenced traits occur in both males and females, but they are more common in one sex e.g. pattern baldness. These are influenced by hormonal differences. It is autosomal dominant disease in males.
7. The chromosomes of a cell, usually displayed as a systematized arrangement of chromosome pairs in descending order of size this is known as karyotype.
8. Gene for albinism in man is present on chromosome number 11.
9. Son receives Y chromosome from father and X chromosome from mother.
10. ABO blood group is first discovered multiple allelic blood group system in man.
11.

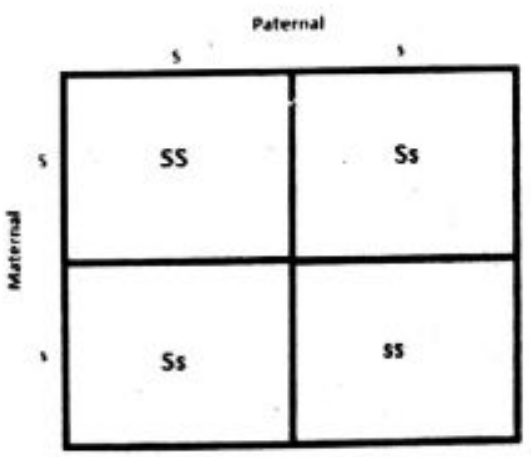
Gender	Genotype	Phenotype
Female	X^HX^H	Normal
	X^HX^h	Normal but Carrier
	X^hX^h	Haemophilic
Male	X^HY	Normal
	X^hY	Haemophilic

12. Haemophilia and colorblindness are X-linked recessive traits.
13. ABO blood group is first discovered multiple allelic blood group system in man. This blood group system is encoded by a single polymorphic gene I on chromosome 9. It has three multiple alleles I^A, I^B and i.
14. The position of a gene on the chromosome is called its locus.
15. ABO blood group is first discovered multiple allelic blood group system in man.
16. A continuously varying trait is encoded by alleles of two or more different gene pairs found at different loci, all influencing the same trait in an additive way. Those quantitative traits are called polygenic traits and their genes are polygenes. Human skin colour is controlled by 3-6 gene pairs.
17. 22 pairs of chromosomes are autosomes in human.
18. Haemophilia and colour blindness are X-linked recessive traits.

19. The total aggregate of genes in a population at any given time is called the population's gene pool. It consists of all the alleles at all genes loci in all individuals of the population.
20. ABO blood group is first discovered multiple allelic blood group system in man. This blood group system is encoded by a single polymorphic gene I on chromosome 9. It has three multiple alleles I^A, I^B and i.
21. Haemophilia and colour blindness are X-linked recessive traits.
22. The position of a gene on the chromosome is called its locus.
23.

Event No.1 Seed Shape Independent Probability	Event No.2 Seed Colour Independent Probability	Both Events at a Time Seed Shape & Colour Joint Probability
Round = 3/4	Tall = 3/4	Round tall = 3/4 x 3/4 = 9/16
Round = 3/4	dwarf = 1/4	Round dwarf= 3/4 x 1/4 = 3/16
Wrinkled = 1/4	Tall = 3/4	Wrinkled Tall = 1/4 x 3/4 = 3/16
Wrinkled = 1/4	dwarf = 1/4	Wrinkled dwarf = 1/4 x 1/4 = 1/16

24. Purple colour flowers are dominant over white colour plants.
25. It is a strictly relative effect between two alleles of a given gene of any function: one allele can be dominant over a second allele of the same gene.
26. The genes for red and green opsins are on X chromosome while the gene for blue opsin is present on autosome 7.
27. Relationship between elating to two alleles of a gene pair in a heterozygote that are both fully expressed is known as co-dominance.
28. Genes are actually parts of DNA comprising its basic sequence.
29. The position of a gene on the chromosome is called its locus.
30. ABO blood group is first discovered multiple allelic blood group system in man.
31. Relationship between two alleles of a gene pair in a heterozygote that are both fully expressed is known as co-dominance.
32. Number of linkage group is equal to number of homologous chromosomes in a cell. there are 23 linkage groups in human cell.
33. The value of Cross over or recombination frequency is directly proportional to distance between the genes on gene map.
34. When both alleles of a gene pair in an organism are same, the organism is homozygous for that gene pair.
35. The position of a gene on the chromosome is called its locus.
36.



SICKLE CELL DISEASE
Recessive

Each child's chances are:

25% of not having the disease (SS)
25% of having the disease (ss)
50% of carrying the disease

37. Linked genes do not obey law of independent assortment.

38.

Gender	Genotype	Phenotype
Female	X^HX^H	Normal
	X^HX^h	Normal but Carrier
	X^hX^h	Haemophilic
Male	X^HY	Normal
	X^hY	Haemophilic

39. Haemophilia A and B, color blindness are the example of X-Linked Recessive Traits.

40. X-Linked recessive traits affect male more ass compare to female and vice versa for X-linked dominant traits.

41. **Co-dominant:** Codominance means that neither allele can mask the expression of the other allele.
Dominant: Dominance, in genetics, greater influence by one of a pair of genes (alleles) that affect the same inherited character.
Recessive: Refers to a trait that is expressed only when genotype is homozygous; a trait that tends to be masked by other, inherited traits, yet persists in a population among heterozygous genotypes.
Phenotype: The term "phenotype" refers to the observable physical properties of an organism.

42. **Heterozygous:** Heterozygous is a state of having inherited different forms of a particular gene from each one of your biological parents
Homozygous: Homozygous describes the genetic condition or the genetic state where an individual has inherited the same DNA sequence for a particular gene from both their biological mother and their biological father
Genotype: In a broad sense, the term "genotype" refers to the genetic makeup of an organism
Phenotype: The term "phenotype" refers to the observable physical properties of an organism.

43. Mendel's law of independent assortment states that the alleles of two (or more) different genes get sorted into gametes independently of one another. In other words, the allele a gamete receives for one gene does not influence the allele received for another gene.

44. **Phenotype:** The term "phenotype" refers to the observable physical properties of an organism.

45. Incomplete dominance is when a dominant allele, or form of a gene, does not completely mask the effects of a recessive allele, and the organism's resulting physical appearance shows a blending of both alleles.

46. **Linkage:** Linkage is the close association of genes or other DNA sequences on the same chromosome.
Pairing: Process of making pair.
Synapsis: the fusion of chromosome pairs at the start of meiosis.
Crossing over: Crossing over is a basic concept of genetics and cell biology, often called recombination. It occurs during meiosis.

47. DNA doubles in "S" phase of cell cycle which is the part of interphase.

16 TOPIC CHROMOSOME & DNA

PRACTICE EXERCISE

TOPIC-WISE MCQs

CHROMOSOMES (NUMBER, STRUCTURE, COMPOSITION AND ORGANIZATION)

Q.1 Diameter of DNA double helix is:
A) 0.34 nm
B) 3.4 um
C) 2 um
D) 2nm

Q.2 Phosphodiester bond is formed between:
A) Two phosphate groups
B) One phosphate & two hydroxyl groups
C) Two phosphate & one hydroxyl group
D) Two phosphate & two hydroxyl groups

Q.3 DNA molecule is a:
A) Monomer
B) Dual polymer
C) Single polymer
D) Non-polymer

Q.4 Histones have abundance of amino acids:
A) Valine and lysine
B) Valine and arginine
C) Arginine and lysine
D) Histidine and threonine

Q.5 A portion of chromatin that is condensed only during cell division is:
A) Euchromatin
B) Bio-chromatin
C) Heterochromatin
D) Nucleochromatin

Q.6 Percentage of DNA in a chromosome is:
A) 60%
B) 80%
C) 40%
D) Vary small

Q.7 Histones are linked to:
A) Nitrogenous base of DNA
B) Phosphate of DNA
C) Sugar of DNA
D) All of these

Q.8 One turn of DNA duplex consists of:
A) 10 bases, one major groove
B) 20 bases, one major and two minor grooves
C) 10 bases, one major groove and on minor groove
D) 20 bases, one major groove and one minor groove

Q.9 Chromosomes were first observed by Walther Fleming in rapidly dividing cells of:
A) Sea urchin
B) *Drosophila*
C) Salamander
D) *Penicillium*

Q.10 A typical human chromosome contains _____ nucleotides in its DNA.
A) 240 million
B) 150 million
C) 140 million
D) 160 million

Q.11 A region of repetitive nucleotide sequences at each end of a chromosome is called:
A) Groove
B) Telomere
C) Single constriction
D) Centromere

Q.12 Number of chromosomes in mosquito are:
A) 6
B) 14
C) 8
D) 16

Q.13 Euchromatin is:
A) Condensed part of chromosome
B) Closed configuration
C) Never condensed
D) Open configuration

Q.14 Chromosome with arms of almost equal length are:
A) Telocentric
B) Metacentric
C) Acrocentric
D) Sub-metacentric

CHROMOSOMAL THEORY OF INHERITANCE

Q.15 In a diploid individual, homologous chromosomes are present in:
A) Single form
B) Tetrad form
C) Pair form
D) Identical form

Q.16 When gametes fuse together, they contribute equal:
A) Genetic information
B) Yolk
C) Cytoplasm
D) Organelles

CONCEPT OF GENE

Q.17 The sequence of nucleotides that determines the amino acid sequence of a protein is:
A) Codon
B) Triplet code
C) Anticodon
D) Gene

DNA AS HEREDITARY MATERIAL

Q.18 Which of the following can kill mice if injected separately?
A) Live R type *pneumococcus*
B) Live S type *pneumococcus*
C) Heat killed R type *pneumococcus*
D) Heat killed S type *pneumococcus*

Q.19 In Avery's experiment, transformation activity was stopped due to the action of:
A) Proteases
B) RNAse
C) DNAase
D) Lipase

MODEL OF DNA REPLICATION

Q.20 Each strand acts as template for formation of new DNA molecule according to:
A) Conservative model
B) Dispersive model
C) Semi-conservative model
D) Scale model

Q.21 _____ shows that each strand of all daughter molecules of DNA would be a mixture of old and new DNA:
A) Conservative model
B) Dispersive model
C) Semiconservative model
D) Scale model

MESELSON-STAHL EXPERIMENT

Q.22 In Meselson-Stahl experiment, after first round of replication, each daughter DNA duplex consist of:
A) Two heavy strands having N^{15}
B) Two light strands having N^{14}
C) Hybrid possessing heavy and light each
D) Not specified

Q.23 Separation of variable DNA strands in Meselson-Stahl experiments is achieved due variability in:
A) Pentose sugar
B) Bonding
C) Phosphate group
D) Bases

Q.24 Medium used by Meselson & Stahl for confirmation of semi conservative method was:
A) Calcium chloride
B) Cesium chloride
C) Calcium carbide
D) Silicon carbide

PROCESS OF DNA REPLICATION

Q.25 DNA leading strand is constructed through DNA polymerase III and Okazaki fragments are constructed through:
A) DNA polymerase I
B) DNA polymerase III
C) DNA polymerase II
D) DNA Ligase

Q.26 First step in DNA replication is:
A) Addition of primer
B) Unwinding
C) Polymerization
D) Rewinding

Q.27 In order to construct another Okazaki fragment, DNA polymerase III jumps:
A) Towards replication fork
B) Towards another DNA molecule
C) Away from replication fork
D) Towards other strand of DNA molecule

Q.28 Rate of synthesis by DNA polymerase III is:
A) 10 nucleotides/second
B) 1000 nucleotides/second
C) 100 nucleotides/second
D) 10000 nucleotides/second

Q.29 Which strand elongates towards the replication fork?
A) Parent strand
B) Lagging strand
C) Leading strand
D) None of these

Q.30 In prokaryotes, Okazaki fragments are _____ long.
A) 10-20 nucleotides
B) 1000-2000 nucleotides
C) 100-200 nucleotide
D) Variable

Q.31 It is the role of DNA polymerase I during replication:
A) DNA proof reading
B) DNA repair
C) Unwinding
D) Annealing

CENTRAL DOGMA OF GENE EXPRESSION

Q.32 The first step of central dogma is responsible for the conversion of:
A) RNA into DNA
B) RNA to RNA
C) DNA to RNA
D) RNA to Protein

Q.33 Transcription is initiated when the enzyme RNA polymerase binds to a particular binding site called a promoter located:
A) Downstream of the gene
B) Opening of double helix
C) Upstream of the gene
D) Formation of GC hair pin

Q.34 Which of the following reactions are included in central dogma?
A) Transcription
B) Translation
C) Reverse Transcription
D) Both A and B

TRANSCRIPTION

Q.35 It is the first step of transcription:
A) Attachment of primer
B) Opening of double helix
C) Binding of RNA polymerase
D) Formation of GC hair pin

Q.36 It is true for transcription in bacteria:
A) Transcribed strand is coding strand
B) RNA polymerase II synthesizes mRNA
C) RNA is synthesized from 5' to 3'
D) Reverse transcriptase is used

GENETIC CODE

Q.37 In mitochondria, UGA:
A) Acts as stop codon
B) Acts as start codon
C) Specifies tryptophan
D) Specifies arginine

Q.38 A synthetic mRNA molecule is made by using only two types of nucleotides containing adenine and cytosine. How many different codons could it contain?
A) 4
B) 16
C) 8
D) 64

Q.39 Which of the following terminate the protein synthesis in mitochondria?
A) UGA
B) AGA, AGG
C) AUA
D) None of these

Q.40 Which three codons are nonsense codons?
A) UAA, UAU, UUA
B) UGG,UGA,UAU
C) UGA, UAG, UAA
D) UGG,UAA,UAG

TRANSLATION

Q.41 Initiation complex in translation is composed of:
A) Ribosome and aminoacyl-tRNA
B) tRNA and aminoacyl-tRNA
C) Ribosome and tRNA
D) tRNA and amino acids

Q.42 During translation, it provides the site where polypeptides are assembled:
A) mRNA
B) rRNA
C) tRNA
D) DNA

Q.43 In prokaryotes, polypeptide synthesis begins with the formation of:
A) Promoter
B) Initiation complex
C) Aminoacyl-tRNA
D) Polysome

Q.44 Translocation of ribosome on mRNA occurs due to:
A) Polymerase
B) Elongation factor
C) Initiation factor
D) Release factor

Q.45 Which process does not occur during formation of mRNA?
A) Condensation
B) Polymerization
C) Replication
D) Transcription

MUTATION

Q.46 An example of mutation involving single or few bases is:
A) Mongolism
B) Phenylketonuria
C) Turner syndrome
D) Jacob syndrome

Q.47 Syndrome due to monosomy of chromosomes:
A) Turner syndrome
B) Down syndrome
C) Jacobs syndrome
D) Klinefelter's syndrome

Q.48 Removal of one or few nucleotides from a particular segment of DNA is called:
A) Deletion
B) Inversion
C) Duplication
D) Insertion

Q.49 Loss of single chromosome from diploid set is:
A) Nullisomy
B) Monosomy
C) Trisomy
D) Tetrasomy

Q.50 Which amino acid is found abnormally in sickle cells' haemoglobin at position 6?
A) Glutamic acid in α chain
B) Valine in α chain
C) Glutamic acid in β chain
D) Valine in β chain

PAST PAPER MCQs

2008
Q.1 In what direction, can a DNA polymerase work when catalyzing the addition of nucleotide monomers to build a strand of DNA?
A) From the 5' toward the 3' end of the new strand being assembled
B) From the replication centers in two directions called replication forks
C) From the 3' to the 5' end of the strand being assembled
D) In both directions if DNA ligase is present

Q.2 The two strands in DNA are coiled _____ to each other.
A) Parallel
B) Anti-parallel
C) Both A and B
D) None of these

2009
Q.3 The reaction between the phosphate group of one nucleotide and hydroxyl group of another is a _____ synthesis in DNA molecule.
A) Dehydration
B) Rehydration
C) Oxidation
D) Reduction

Q.4 Enzyme which attaches the Okazaki fragments in lagging strand is called:
A) Restriction endonuclease
B) Primase
C) DNA helicase
D) DNA ligase

Q.5 If DNA strand is GCTATGG, mRNA strand synthesized from it would be:
A) CGAUACC
B) CGTATGC
C) CGATACC
D) CGUTCC

2010
Q.6 The process of replication of DNA begins at:
A) One place only without any specific sequence of DNA
B) One or more places without any specific sequence of DNA
C) Any place with the uncoiling of two strands of DNA
D) One or more places where there is a specific sequence of nucleotides

Q.7 Amino acid attaches at which site of tRNA?
A) Anticodon site
B) Ribosomes recognition site
C) 3'-site with terminal OH^- group
D) Activation enzyme recognition site

2014
Q.8 In translation, the terminating codon is:
A) GUA
B) UAA
C) UUG
D) AGU

Q.9 If the genetic code is made up of three nucleotides, then total possible genetic codes will be:
A) 4
B) 20
C) 64
D) 61

2017 Re-Take
Q.10 If one were to unzip the molecule, one would need only to assemble the appropriate complementary nucleotides on the exposed single strand to form two daughter complexes with the same sequence" is the definition of:
A) Semi-conservative model
B) Conservative model
C) Dispersive model
D) Destruction model

Q.11 Formation of new strand of DNA from template strand is the function of:
A) DNA polymerase
B) RNA Polymerase
C) DNA ligase
D) Helicase

Q.12 Formation of RNA from DNA is called:
A) Translation
B) Transcription
C) Replication
D) Reverse transcription

2019

Q.13 As a result of replication, parental DNA would become completely dispersed and that each strand of all the daughter molecules would be a mixture of old and new DNA. This is called as:

A) Conservative idea
B) Dispersive idea
C) Disruptive idea
D) Semi-conservative idea

Q.14 Meselson and Stahl transferred few bacteria grown in N^{15}medium to N^{14} medium for replicating their DNA. What would be the result after two rounds of replication?

A) 50% hybrid duplex and 50% light duplex
B) 50% hybrid duplex and 50% heavy duplex
C) 100% heavy duplex
D) 100% hybrid duplex

Q.15 If sequence in DNA is CCCTAGAG, then what would be the sequence in messenger RNA after transcription?

A) GGGAUCUC
B) GGGATCTC
C) GGGGTCTC
D) GGAAUCUC

Q.16 The process in which a complimentary copy of the code from a gene is produced by RNA polymerase in the nucleus:

A) Proof reading
B) DNA Replication
C) Transcription
D) Translation

Q.17 Sequence of amino acids in a polypeptide chain of protein molecule corresponds to the sequence of nucleotides on mRNA for that protein. If reading frame of mRNA for a human protein is 993 nucleotides including a stop codon at the end, how many amino acids would be incorporated in the polypeptide chain?

A) 331
B) 993
C) 93
D) 330

2020

Q.18 Which one of the following is found in both messenger RNA and DNA mammalian cell?

A) Double helical structure
B) Ribose sugar
C) Thymine
D) Sugar phosphate backbone

Q.19 The cells in our body are all genetically identical apart from the:

A) Somatic cells
B) Reproductive cells
C) Muscle fibers
D) White blood cells

Q.20 Transcription is the process in which an RNA copy of the DNA sequence and coding the gene is produced with the help of an enzyme called:

A) DNA polymerase
B) RNA polymerase
C) DNA transcriptase
D) RNA transcriptase

Q.21 The particular array of chromosomes that an individual possesses is called its:

A) Genotype
B) Phenotype
C) Karyotype
D) Allele

Q.22 Which statement correctly describes the transcription of DNA:

A) It produces amino acids
B) It produces messenger RNA
C) It results in increased DNA synthesis
D) It is a semiconservative process

ANSWER KEY

TOPIC-WISE MCQs

1	D	11	B	21	B	31	A	41	A
2	B	12	A	22	C	32	C	42	B
3	B	13	D	23	D	33	C	43	B
4	C	14	B	24	B	34	D	44	B
5	A	15	C	25	B	35	C	45	C
6	C	16	A	26	B	36	C	46	B
7	B	17	D	27	A	37	C	47	A
8	D	18	B	28	B	38	C	48	A
9	C	19	C	29	C	39	B	49	B
10	C	20	C	30	B	40	C	50	D

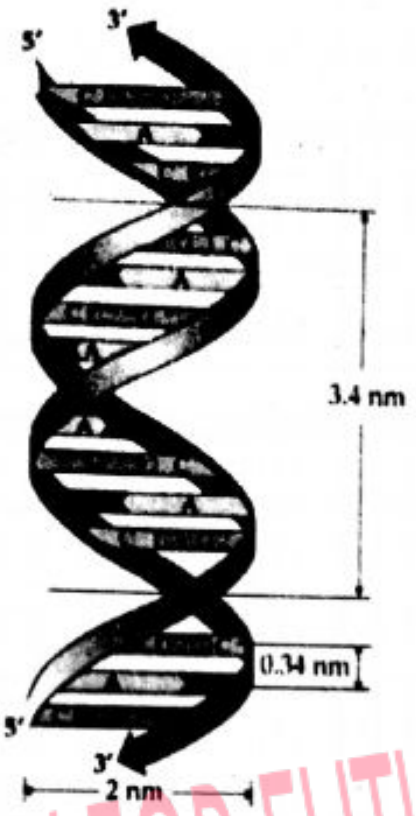
PAST PAPERS MCQs

1	A	11	A	21	C
2	B	12	B	22	B
3	A	13	B		
4	D	14	A		
5	A	15	A		
6	D	16	C		
7	C	17	D		
8	B	18	D		
9	C	19	B		
10	A	20	B		

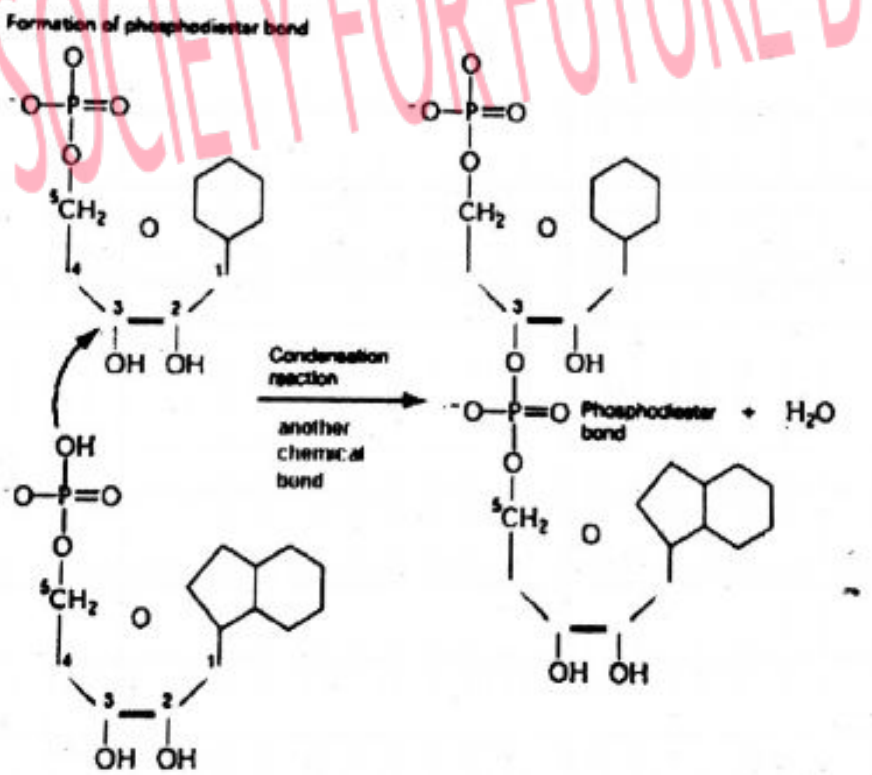
EXPLANATORY NOTES

TOPIC-WISE MCQs

1.



2.



3. DNA is a polymer made from four different monomers , called nucleotides . These join together in different combinations to make long strands. In a DNA molecule , two strands wrap around each other to form a double helix structure.

4. Histones are composed of mostly positively charged amino acid residues such as lysine and arginine. The positive charges allow them to closely associate with the negatively charged DNA backbone through electrostatic interactions.

5. Heterochromatin and euchromatin are two types of chromatin. The key difference between heterochromatin and euchromatin is the packaging. Heterochromatin is the highly packed form of chromatin while euchromatin is the loosely packed form of chromatin and condensed only during cell division.

6. Chromosomes are composed of DNA and histone proteins. Most are about 40% DNA and 60% histone proteins. A significant amount of RNA is also associated with the chromosomes.

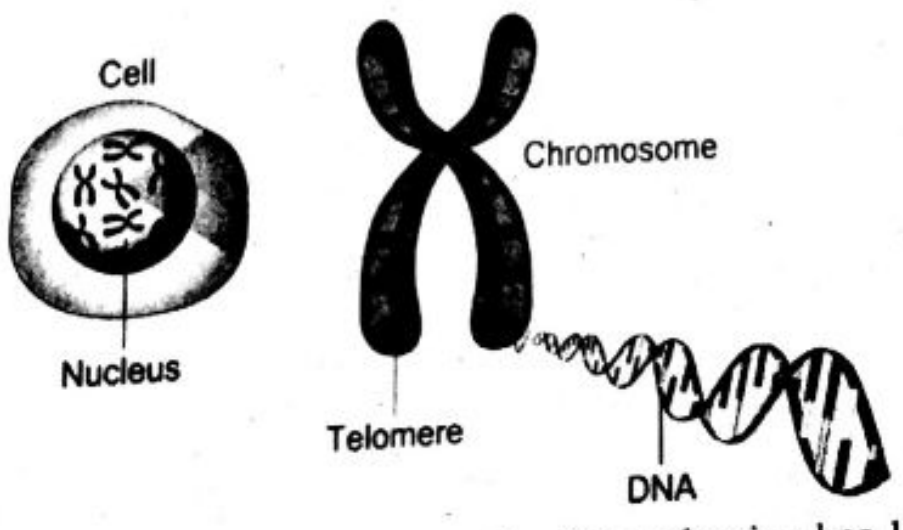
7. DNA is negatively charged due to phosphate group and overall charge on histone is positive. As opposite charges attract each other so histone and phosphate are linked together via electrostatic interactions.

8. Each turn of DNA has 10 base pairs bases which cover one major and one minor groove.

9. Chromosomes were first discovered in rapidly dividing cells of salamander larvae in 1882 by Walther Fleming.

10. A typical human chromosome contains 1.4×10^8 nucleotides in its DNA. The amount of information, one chromosome contains would fill about 280 printed books of 1000 pages each, if each nucleotide corresponds to a word and each page has 500 words on it.

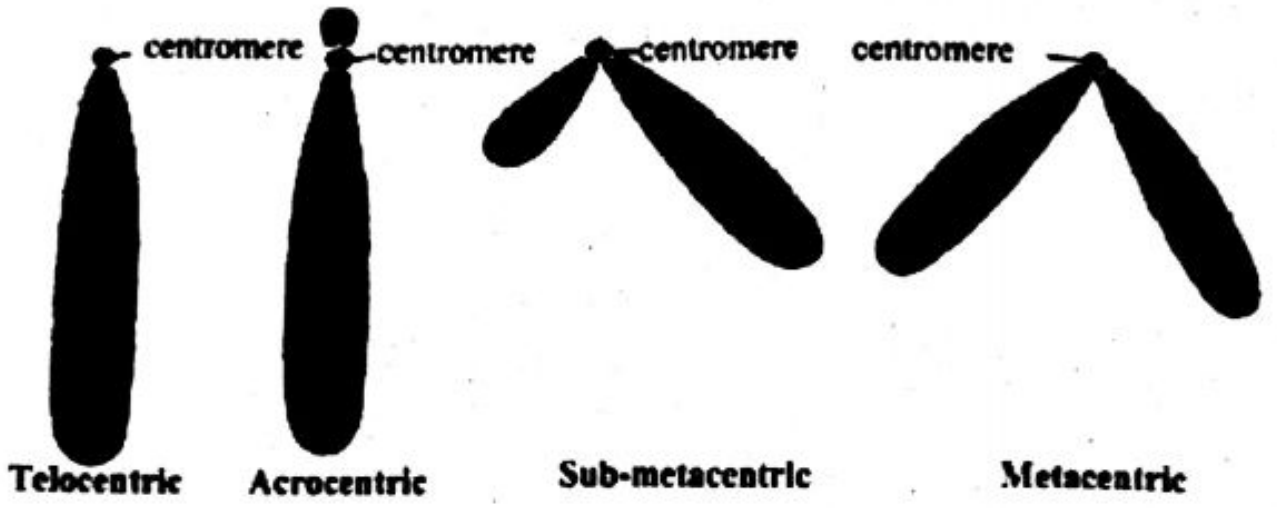
11.



12. Mosquito has 6, *Drosophila* has 8, garden pea has 14, and onion has 16 chromosomes in their diploid cells.

13. Heterochromatin and euchromatin are two types of chromatin. The key difference between heterochromatin and euchromatin is the packaging. Heterochromatin is the highly packed form of chromatin while euchromatin is the loosely packed form of chromatin.

14.



15. Diploid cells have two homologous copies of each chromosome, usually one from the mother and one from the father. Human diploid cells have 46 chromosomes (2n) and human haploid gametes have 23 chromosomes (n).

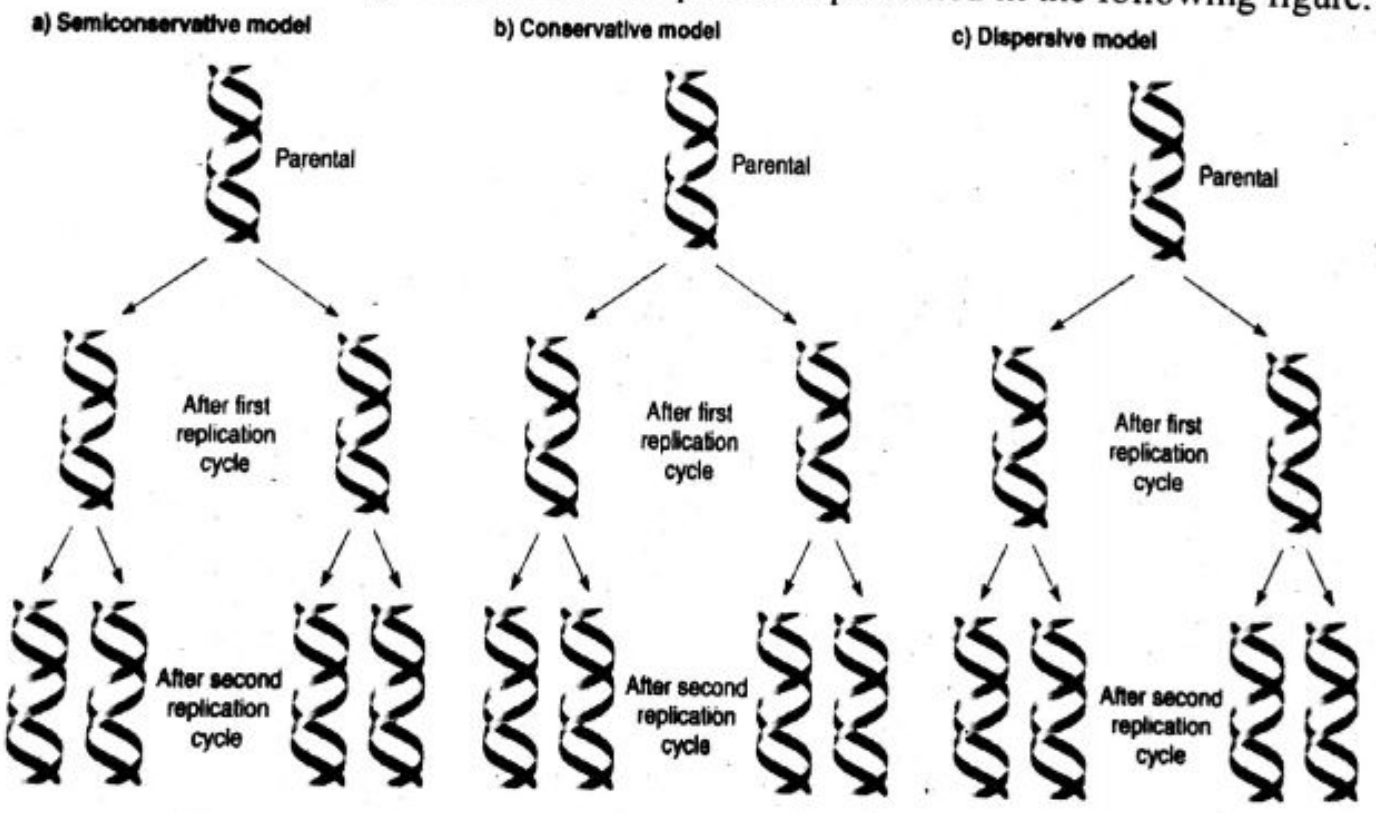
16. Gametes are haploid and have half set of chromosomes. During fertilization egg and sperm with equal number of chromosomes fuse to form zygote, and contribute equal genetic information for the development of baby.

17. A gene is a sequence of nucleotides in DNA that encodes the synthesis of a gene product, either RNA or protein.

18. Live S type pneumococcus is the virulent strain and caused disease in rats which leads to the death of mice.

19. DNAses are the enzymes which are responsible for the removal of DNA (genetic material) in the Avery experiment.

20. According to semi-conservative replication model, primary structure of DNA remains conserved but secondary structure is disrupted as represented in the following figure:



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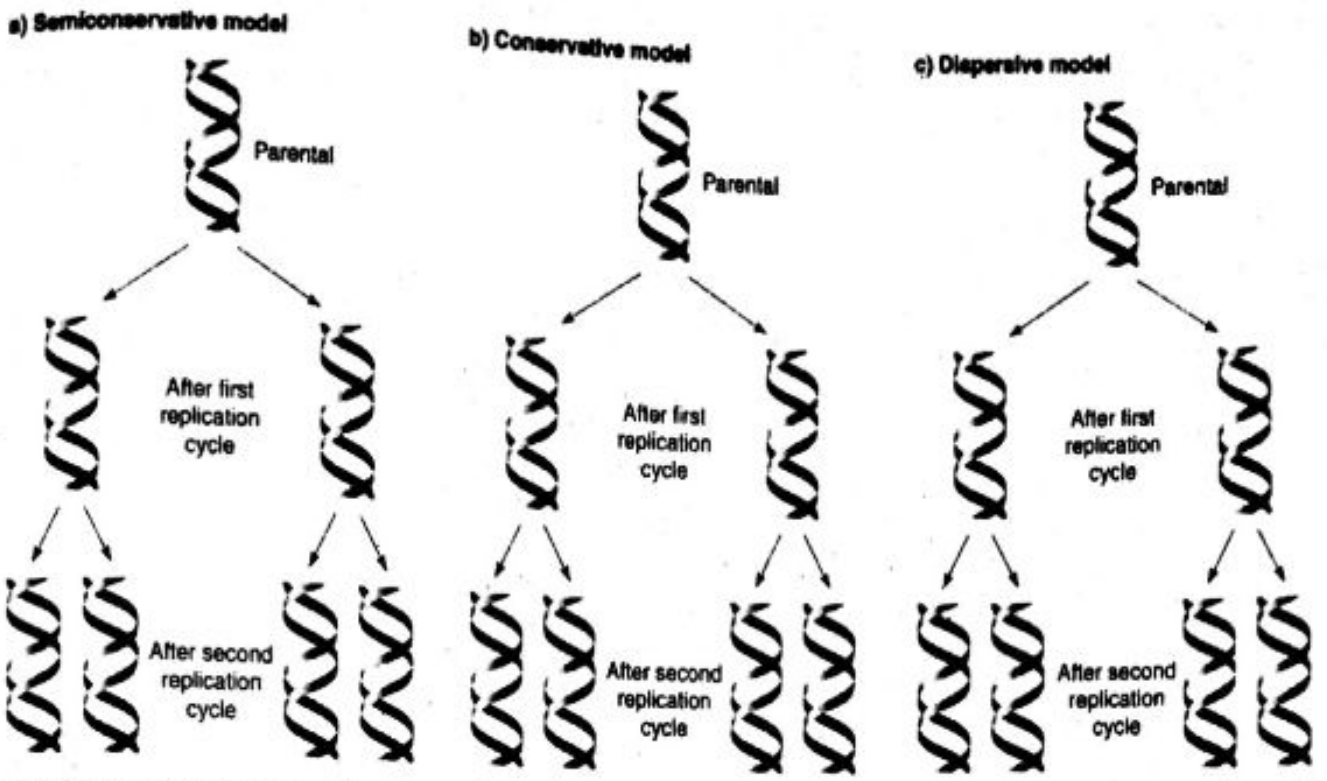


22. In Meselson-Stahl experiment, after first round of DNA replication, each daughter DNA duplex consist of hybrid DNA molecule possessing both heavy and light strands. When this hybrid duplex is replicated during second round of DNA replication, it contributed one heavy strand to form another hybrid duplex and one light strand to form light duplex.

23. In Meselson-Stahl's experiment, radioactive isotopes of nitrogen were used. This radioactive nitrogen became incorporated nitrogenous bases and aid in separation of variable DNA strands in Meselson-Stahl experiments.

24. In Meselson-Stahl's experiment, CsCl was used to create density gradient which help in the separation of DNA molecules according to their density. $CaCl_2$ is commonly used to treat competent bacteria so that they take up chimeric DNA while silicon carbide needles are used in vortex mixing method so that egg cell can take up DNA from the medium which has been placed on agitator.

25. DNA polymerase III is main replicating enzyme. It has two subunits. Both leading and lagging strands are constructed by DNA polymerase III.

26. For the initiation of replication, two strands of DNA must be separated with the help of helicase. Primase then adds specific primer so that DNA polymerase III can work.

27. Over all process of replication is always towards the replication fork. DNA polymerase III can add nucleotides only at 3' end of the primer, and in order to construct Okazaki fragment, DNA polymerase III jumps towards the replication fork.

28. DNA polymerase III is the main enzyme involved in prokaryotic DNA replication. This enzyme has high processivity and can add 1000 nucleotides per second.

29. The leading strand is the strand of nascent DNA which is synthesized in the same direction as the growing replication fork. This sort of DNA replication is continuous.

30. Okazaki fragments are DNA nucleotides sequence synthesized by DNA polymerase III during the replication of lagging strand variable length. In case of prokaryotes, these fragments are 1000-2000 nucleotides long and in case of eukaryotes, these fragments are 100-200 nucleotides long.

31. DNA polymerase enzyme has three types;
- DNA polymerase-I is involved in proof reading activities.
- DNA polymerase-II is involved in DNA repair.
- DNA polymerase-III is the main enzyme of replication.

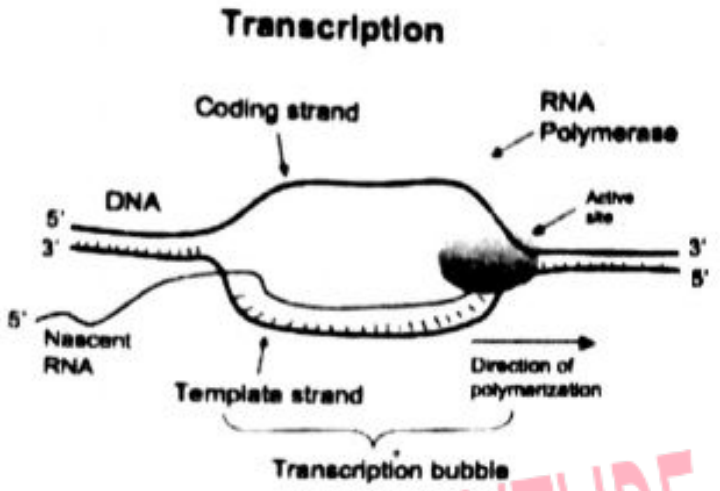
32. The first step of central dogma is transcription which is responsible for the conversion of double stranded DNA to single stranded RNA.

33. RNA polymerase starts the transcription process by binding the promoter site located upstream of the gene.

34. Central dogma is responsible for the expression of genetic information into protein followed by the processes of transcription and translation.

35. The first step of transcription is the binding of RNA polymerase by using its sigma factor with the promoter region. In the next step, DNA duplex get open and process of transcription is initiated by the core RNA polymerase and it will continue adding RNA nucleotides till it encounters stop signal.

36.



37.

Codon	Nuclear DNA	Mitochondrial DNA
UGA	Stop codon	Tryptophan
AUA	Isoleucine	Methionine

38. If there are only two types of nucleotides then possible codons consisting of two nucleotides in each codon will be 8. But if there four types of nucleotides and possible codons each containing two nucleotides will be 16.

39.

Codon	Nuclear DNA	Mitochondrial DNA
UGA	Stop codon	Tryptophan
AUA	Isoleucine	Methionine
AGA and AGG	Arginine	Stop codon

40. UGA, UAG and UAA are the codons which do not sense any amino acid and thus are known as nonsense codons.

41. Ribosome when attached with activated transfer RNA (aminoacyl-tRNA), combination is known as initiation complex.

42. Ribosomes are made up of rRNA and proteins. Ribosomes are factory of proteins synthesis.

43. Elongation of polypeptide starts after the formation of initiation complex. Initiation complex is formed when chemically modified N-formyl methionine binds with smaller ribosomal subunit with the help of initiation factor.

44. The ribosome moves (translocate) three nucleotides along the mRNA molecule in the 5' → 3' direction, guided by other elongation factors associated with tRNA molecules.

45. DNA replication is the process by which a ds-DNA molecule is copied to produce two daughter DNA molecules. Transcription is the process by which the information in a strand of DNA is copied into a new molecule of mRNA. Both of these processes involve dehydration condensation and polymerization of nucleotides.

46.

Point Mutation	Chromosomal Aberrations
Phenylketonuria	Turner syndrome
Sickle cell anemia	Jacob syndrome
	Down syndrome

47. Turner syndrome, a condition that affects only females, results when one of the X chromosomes (sex chromosomes) is missing or partially missing.

48. Deletion is the complete removal of one or few nucleotides from a particular segment of DNA.

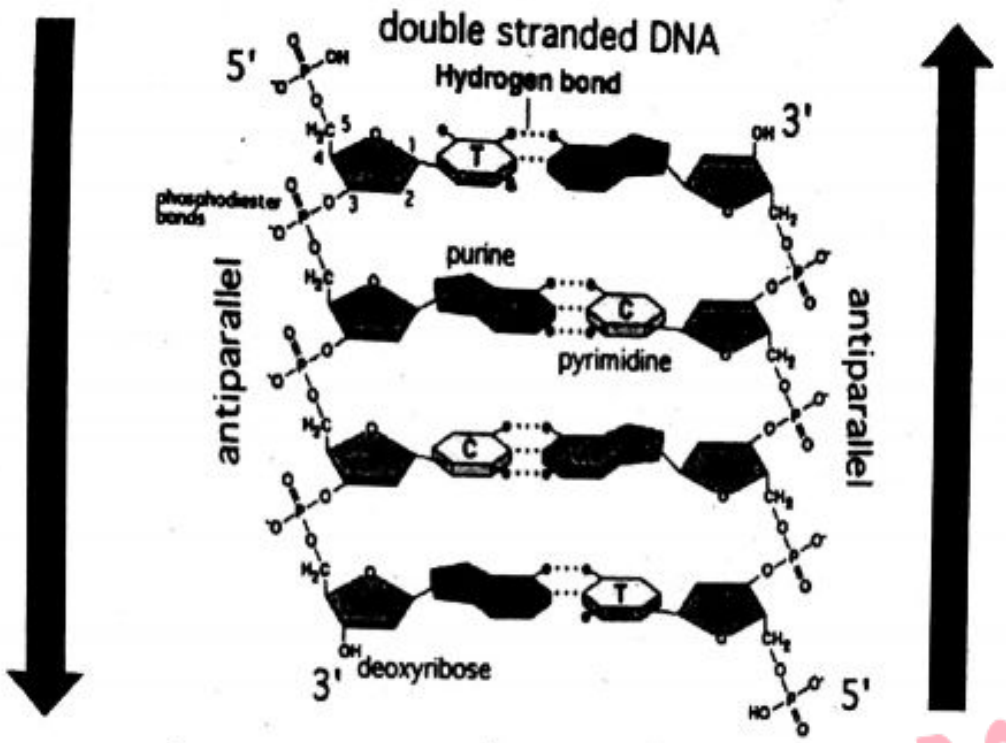
49. Monosomy is the state of having a single copy of a chromosome pair instead of the usual two copies found in diploid cells.

50. Sickle cell anemia is an inherited red blood cell disorder in which there aren't enough healthy red blood cells to carry oxygen throughout your body. It is caused by the mutation in hemoglobin beta chain at position 6.

PAST PAPER MCQs

1. DNA polymerase can only add new nucleotides at 3' end. The process of replication is 5' to 3' end of the growing strand.

2.



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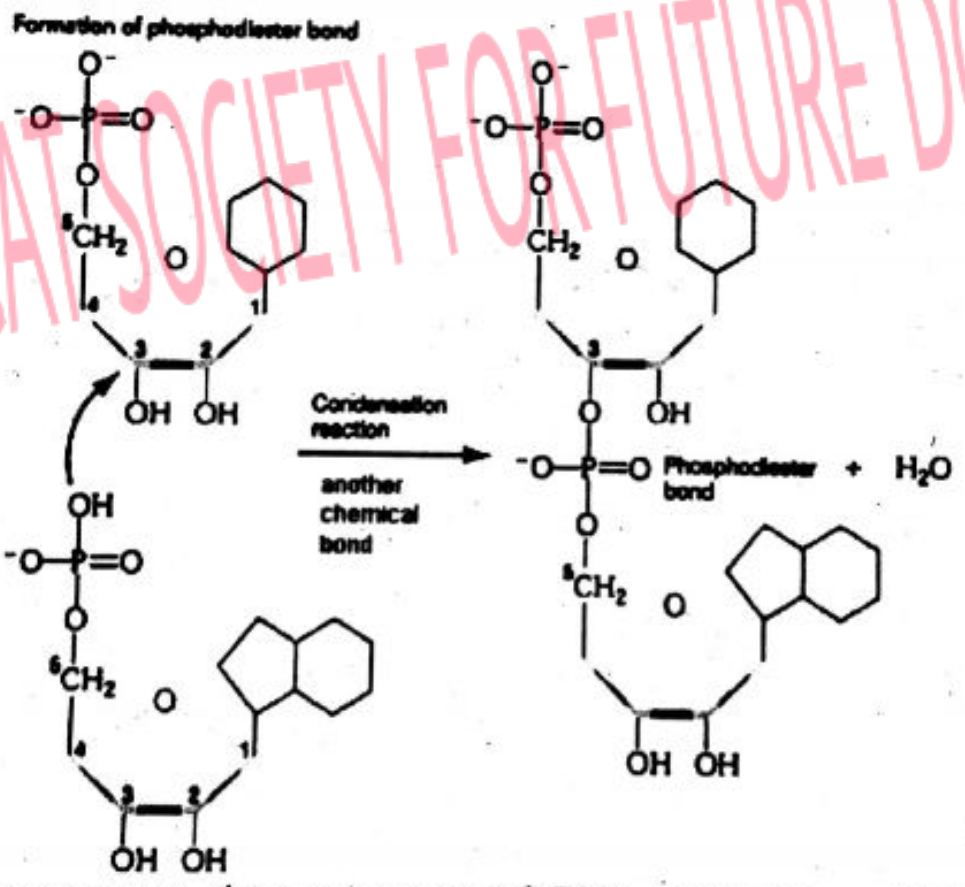
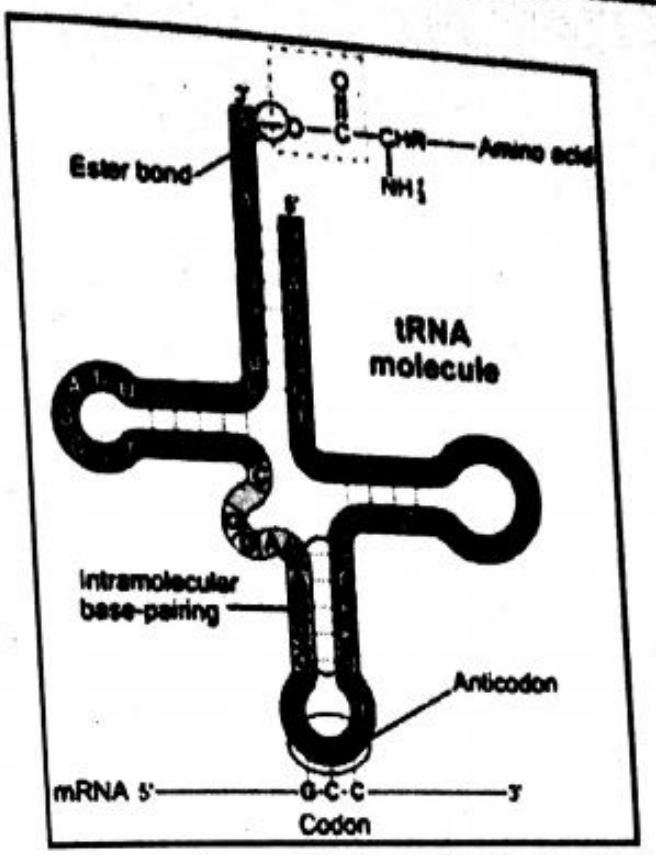


4. Okazaki fragments are short sequences of DNA nucleotides which are synthesized discontinuously and later linked together by DNA ligase to create the lagging strand during DNA replication..

5. The sequence of nucleotides on newly synthesized mRNA is same as on coding strand of DNA except 'U' is present in mRNA instead of 'T'.

6. An origin of replication is a sequence of DNA at which replication is initiated on a chromosome, plasmid or virus. For small DNAs, including bacterial plasmids and small viruses, a single origin is sufficient but in case eukaryotic genome, these can be multiple.

7.



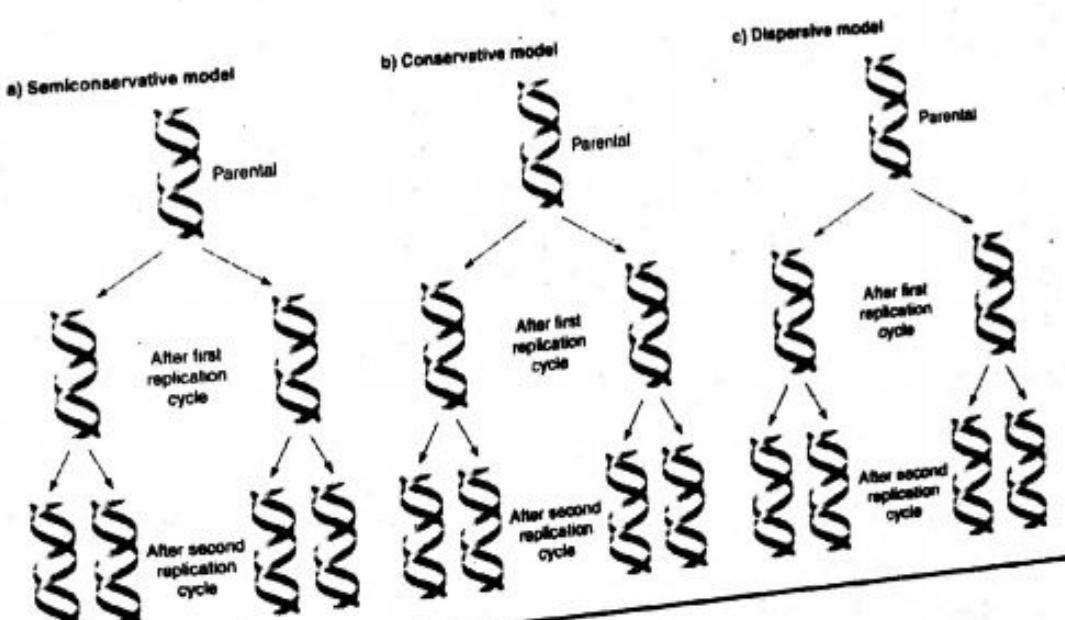
8. UAA, UAG and UGA are stop codons. Their anticodons on tRNA are not present. The presence of anyone of these codons will stops the translation process.

9.

Second Letter

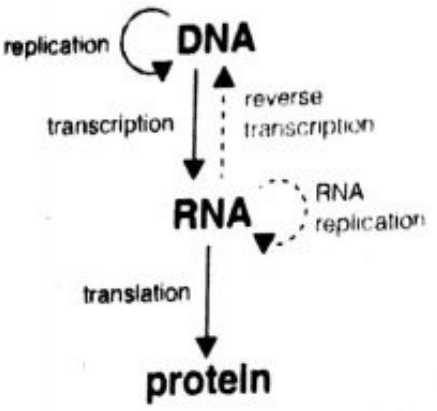
1st letter	U		C		A		G		3rd letter
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC		UCC		UAC		UGC		C
	UUA	Leu	UCA		UAA	Stop	UGA	Stop	A
	UUG		UCG		UAG	Stop	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	Gln	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	Lys	AGA	Arg	A
	AUG	Met	ACG		AAG		AGG		G
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	Glu	GGA		A
	GUG		GCG		GAG		GGG		G

10.



11. Formation of DNA from DNA molecule with the help of DNA polymerase is known as DNA replication.

12.

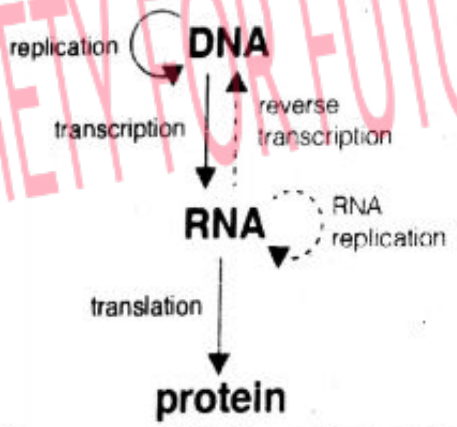


13. Dispersive replication a hypothetical model in which nucleotides of the parental DNA strand would be randomly scattered along the strands of the newly synthesized DNA, as compared with semiconservative and conservative DNA replication.

14. In Meselson-Stahl experiment, after first round of DNA replication, each daughter DNA duplex consist of hybrid DNA molecule possessing both heavy and light strands. When this hybrid duplex is replicated during second round of DNA replication, it contributed one heavy strand to form another hybrid duplex and one light strand to form light duplex.

15. The sequence of nucleotides on newly synthesized mRNA is same as on coding strand of DNA, except U is present in mRNA instead of T.

16.



17. The sequence of three nucleotides on mRNA is called codon. Each codon is responsible to specify a specific amino acid in a polypeptide chain. The total number of nucleotides in the reading frame of mRNA is 993 and it corresponds to the 331 codons. Among 331 codons, 330 are sense codons while 1 is the stop codon. The total number of sense codons is equal to the total number of amino acids incorporated in a polypeptide chain.

18. Sugar phosphate backbone is found in both single stranded and double stranded polynucleotide chains.

19. Reproductive cells are the cells which are dissimilar and responsible for gender determination of new born.

20. RNA polymerase starts the transcription process by binding the promoter site located upstream of the gene.

21. A karyotype is an individual's collection of chromosomes. The term also refers to a laboratory technique that produces an image of an individual's chromosomes. The karyotype is used to look for abnormal numbers or structures of chromosomes.

22. Transcription is the process of making an RNA copy of a gene sequence. This copy, called a messenger RNA (mRNA) molecule, leaves the cell nucleus and enters the cytoplasm, where it directs the synthesis of the protein, which it encodes.

17 TOPIC EVOLUTION

PRACTICE EXERCISE

TOPIC-WISE MCQs

CONCEPTS OF EVOLUTION

Q.1 Series of changes in the genetic composition of a population over time is called:
A) Revolution
B) Evolution
C) Population genetics
D) Succession

Q.2 Product of evolution is:
A) Ecosystem
B) Biome
C) Community
D) Species

Q.3 Who developed a theory of natural selection essentially identical to Darwin's?
A) Hardy-Weinberg
B) Alfred Wallace
C) Malthus
D) Lyell

EVOLUTION OF PROKARYOTES FROM EUKARYOTES

Q.4 Archaebacteria can survive at:
A) 150°C
B) 300°C
C) 120°C
D) 200°C

Q.5 What was the source of hydrogen for first photosynthetic organisms?
A) Water
B) Hydrogen present in soil
C) Hydrogen sulphate
D) Hydrogen sulphide

Q.6 Prokaryotes are considered to be evolved:
A) 3.5 billion years ago
B) 1.5 billion years ago
C) 4.5 billion years ago
D) 1000 million years ago

Q.7 Flagella might have arisen through the ingestion of:
A) Cyano-bacteria
B) Spirochetes
C) Chlamydomonas
D) Paramecium

LAMARCKISM

Q.8 Adaptations that an organism acquires by its own actions are:
A) Heritable
B) Not heritable
C) Can be made heritable through some modifications
D) Both heritable and not heritable

Q.9 Lamarck presented a mechanism to explain:
A) How earth formed
B) How life started
C) How specific adaptations evolved
D) How life changed

Q.10 Which one is according to Lamarckism is true?
A) Variation→adaptations→inheritance
B) Adaptations→variation→inheritance
C) Recombination → variation → adaptations
D) Mutations →variations → adaptations

Q.11 Which statement is contradictory to Lamarckism?
A) Acquired characteristics can be passed to offspring
B) Extensive usage causes hypertrophy
C) Disuse causes atrophy
D) Acquired characteristics can't be inherited

DARWINISM

Q.12 Unique fauna was observed by Darwin in:
A) Ecuador
B) Galapagos
C) Bahamas
D) Maldives

Q.13 Darwin perceived origin of new species and _____.
A) Fixation
B) Adaptation
C) Stabilization
D) Maladaptation

Q.14 What is the perception of Darwin about unity of life?
A) All organisms descent from a common ancestor
B) All organisms are created specially by a divine force
C) All organisms share a common biological composition
D) All organisms arise from nonliving things

Q.15 According to Darwin _____ become better adapted to local environment through natural selection.
A) Regional community
B) Population
C) Ecosystem
D) Flora

Q.16 Survival is only for the fittest is true for:
A) Artificial selection
B) Natural selection
C) Descent with modification
D) Revolution

Q.17 Survival in the struggle for existence depends upon:
A) Physical environment
B) Chemical constituents
C) Hereditary constitution
D) Environmental resources

Q.18 How many types of finches were observed by Darwin at Galapagos Island?
A) 12
B) 11
C) 13
D) 10

Q.19 Which one is related to natural selection?
A) More people → more resources → no competition
B) More people → less resources → more competition
C) Less people → more resources → no competition
D) Less people → less resources → no competition

EVIDENCES OF EVOLUTION

Q.20 Darwin's theory of evolution was mainly based on the evidences from_____.
A) Geographical distribution and fossil record
B) Fossil record and Embryology
C) Geographical distribution and comparative anatomy
D) Paleontology and Geology

Q.21 The Finches of Galapagos Islands provide evidence in favor of:
A) Evolution due to mutation
B) Retrogressive evolution
C) Evolution due to biogeography
D) Special creation.

Q.22 Modern biological sciences suggest that _____ are the ancestors of all life forms.
A) Protists
B) Protozoans
C) Prokaryotes
D) Parazoans

Q.23 Over many years two population could become dissimilar enough to be designated as separate species that is applied upon:
A) Galapagos finches
B) Black smith bicep
C) Giant Turtle
D) Giraffe neck

Q.24 Neo-Darwinism has integrated discoveries and ideas from all except:
A) Taxonomy
B) Paleontology
C) Genetics
D) Serology

Q.25 _____ provides a visual records in a complex series showing the evolution of an organism.
A) Comparative anatomy
B) Fossils record
C) Comparative embryology
D) Electron microscopy

Q.26 Which of the following is not an example of disuse of organs?
A) Snake's feet
B) Muscle atrophy
C) Shedding of teeth
D) Movement of ear

Q.27 All of the following are related to evolution except:
A) Change over time
B) Antibiotic resistance in bacteria
C) Muscle hypertrophy
D) Origin of new species

Q.28 The presence of gill slits, in the embryos of all vertebrates, supports the theory of:
A) Metamorphosis
B) Organic evolution
C) Recapitulation
D) Biogenesis

Q.29 Which is not related to the idea of use and disuse:
A) Extensively used body parts become longer and strong
B) Disused body parts deteriorated
C) Bigger bicep of black smith
D) Different type of beaks present in finches

Q.30 Which is not a geographical barrier?
A) Ocean
B) Mountains
C) Low land
D) Atmosphere

Q.31 Which is not a character of fossils?
A) Actual remains of ancient organisms
B) Traces of ancient organisms
C) Living
D) May be embedded in sand, resin or ice

Q.32 Modern biological sciences suggest that _____ are the ancestors of all life forms.
A) Protists
B) Protozoans
C) Prokaryotes
D) Parazoans

Q.33 Functionally different but structurally alike organs are:
A) Analogous
B) Anamolous
C) Homologous
D) Cosmopolitan

Q.34 Analogous organs help organism to live in:
A) Same habitat
B) Different habitats
C) Different biomes
D) Environment

Q.35 Which one of the following statement could not be used to describe a species:
A) A group with similar autosomes
B) A group with analogous structures
C) A group capable of producing viable offsprings
D) A group sharing same niche

Q.36 Which one of the following statements is correct?
A) There is no evidence of the existence of gills during embryogenesis of mammals
B) All plant and animal cells are totipotent
C) Ontogeny repeats phylogeny
D) Stem cells are specialized cells

Q.37 The Finches of Galapagos Islands provide evidence in favor of:
A) Evolution due to mutation
B) Retrogressive evolution
C) Biogeographical evolution
D) Special creation.

Q.38 When two species of different genealogy come to resemble each other as a result of adaptation, the phenomenon is termed?
A) Microevolution
B) Co-evolution
C) Convergent evolution
D) Divergent evolution.

Q.39 The actual remains or traces of organisms that lived in ancient geological times:
A) Vestigial remains
B) Fossils
C) Fuel
D) Analogous organs

Q.40 In humans gill pouches have modified into:
A) Nose
B) Ear
C) Eustachian tubes
D) External ear

Topic-17

PAST PAPER MCQS

2009

Q.1 The survival of an organism during the struggle for existence is not random, but depends on:
A) Its genetic constitution
B) Its ability to acquire characters
C) Its ability to over-produce
D) Its ability to over-eat

Q.2 Large population size, random mating, no mutation and no emigration or immigration are postulates of:
A) Hardy-Weinberg equation
B) Mendel's law of segregation
C) Mendel's law of independent assortment
D) Theory presented by Schleiden and Schwann

2017-Retake

Q.3 Change in frequency of alleles at a locus that occurs by chance is called:
A) Mutation
B) Migration
C) Non-random mating
D) Genetic drift

Q.4 Which of the following factor causes change in gene frequency:
A) Meiosis
B) Sexual recombination
C) Mutation
D) Random mating

Q.5 According to the theory of natural selection, organisms produce:
A) More offspring than supported
B) Less offspring than supported
C) Offspring according to the resources available
D) Offspring to create resources

Q.6 Change in frequency of alleles that occurs by chance is called as:
A) Natural selection
B) Migration
C) Mutation
D) Genetic drift

2020

Q.7 This theory says that mitochondria and chloroplasts are in fact ancient bacteria which now live inside the larger cells:
A) Darwin's theory of evolution
B) Lamarckism
C) Neo Darwinism
D) Endosymbiont theory

Q.8 The organs which are similar in function but different in structure, are called:
A) Analogous organs
B) Homologous organs
C) Convergent evolution
D) Divergent evolution

Q.9 _____ occurs because natural selection gives some alleles a better chance of survival than others.
A) Fitness
B) Evolution
C) Crossing over
D) Artificial selection

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	D	21	C	31	C
2	D	12	B	22	C	32	C
3	B	13	B	23	A	33	C
4	C	14	A	24	D	34	A
5	D	15	B	25	B	35	B
6	A	16	B	26	C	36	C
7	B	17	C	27	C	37	C
8	B	18	C	28	C	38	C
9	C	19	B	29	D	39	B
10	B	20	A	30	D	40	C

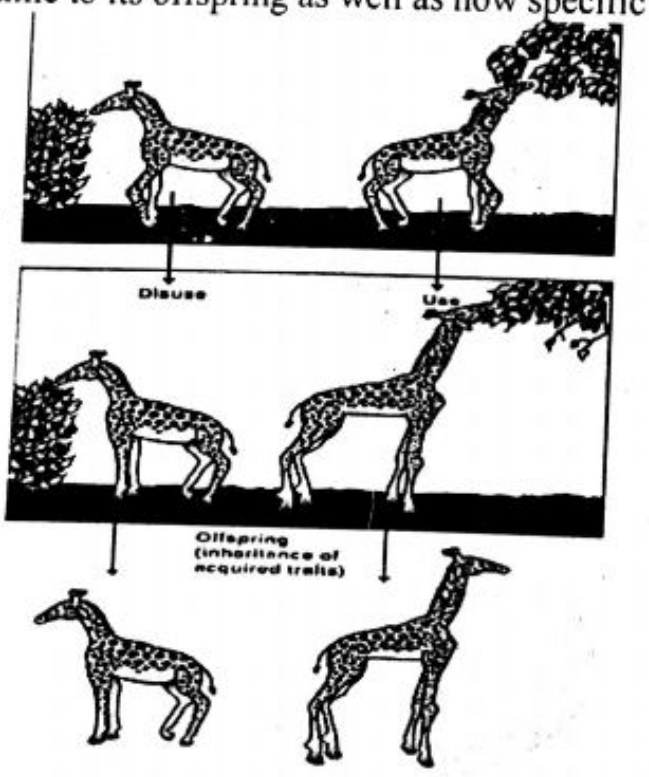
PAST PAPERS MCQs

1	A
2	A
3	D
4	C
5	A
6	D
7	D
8	A
9	B

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Evolution is heritable change in characteristics of biological populations over successive generations. Evolutionary processes give rise to biodiversity at every level of biological organization.
2. Final Product of evolution is always species and it is smallest unit of classification.
3. The research of British naturalist Alfred Russel Wallace (1823-1913) played a pivotal role in developing the theory of natural selection as it had the same theme to that of Darwin. But, he attributes his work to Charles Darwin.
4. Archaebacteria are thermophilic and live in hot spring. They can live at very high temperature (120°C).
5. Hydrogen sulphide was the source of hydrogen for first photosynthetic organisms.
6. Earth was formed about 5.6 billion years ago.
   a. Prokaryotes are considered to be evolved 3.5 billion years ago.
   b. Eukaryotes evolved from prokaryotes at about 1.5 billion years ago.
7. According to of endosymbiont hypothesis flagella has arisen through the ingestion of Spirochetes.
8. Darwin's theory has been supported by a lot of evidence. Lamarck's Theory of Inheritance of Acquired Characteristics has been disproved. This was done in two major ways. The first is by experiment. We have seen through many real examples and observations that changes which occur in an animal during life are not passed on to the animal's offspring. If a dog's ears are cropped short, its puppies are still born with long ears. If someone exercises every day, runs marathons, eats well, and is generally very healthy, the fitness is not passed on and the person's children still have to work just as hard to get that fit and healthy, because only germ cell mutation are inherited.
9. Lamarckism is the hypothesis that an organism can pass on characteristics that it has acquired during its lifetime to its offspring as well as how specific adaptations evolve.
10. Lamarckism is the hypothesis that an organism can pass on characteristics that it has acquired during its lifetime to its offspring as well as how specific adaptations evolve.



As we can observe the sequence Adaptations=➔ Variations➔ Inheritance.

11. The inheritance of acquired characteristics is a hypothesis that physiological changes acquired over the life of an organism may be transmitted to offspring and option D is contradictory to hypothesis.
12. Darwin visited the Galapagos Islands and observed unique fauna of this land.
13. After returning to Britain, Darwin perceived the origin of new species and adaptations as closely related processes for evolution.
14. The phrase descent with modification summarized Darwin's perception of the unity of life. The phrase refers to the view that all organisms are related through descent from an ancestor that lived in the remote past. In the Darwinian view, the history of life is like a tree with branches representing life's diversity.
15. Natural selection is the differential survival and reproduction of individuals (population) due to differences in phenotype. It is a key mechanism of evolution, the change in the heritable traits characteristic of a population over generations.
16. During artificial selection only fittest organisms are selected, while during natural selection survival restricts for the fittest organisms as they have such inherited characteristics which make them fit for their environment and leave more offspring than the less fit individuals.
17. Survival in struggle for existence depends upon hereditary constitutions and good variations.
18. From Galapagos Islands, Darwin collected 13 types of finches because these were although quite similar, seemed to be different species.
19. Logically when there are more people and fewer resources, there shall be high competition for struggle of existence and people with better inherited characteristics will be selected naturally
20. Darwin's theory of evolution was mainly based on the evidences from biogeography and fossil record as he observed and collected these evidences from expedition
21. Biogeographical evolution is a process in which gene pool of a population gradually changes in response to environmental pressures, natural selection and genetic mutations.
22. The oldest known fossil belongs to prokaryotes which suggest that they are the ancestors of all life forms.
23. Allopatric speciation is speciation that happens when two populations of the same species become isolated from each other due to geographic changes. Speciation is a gradual process by which populations evolve into different species and Galapagos finches are example of allopatric speciation.
24. The theory of evolution as expounded by later students of Charles Darwin, especially Weismann, holding that natural selection accounts for evolution and denying the inheritance of acquired characters and includes most of the advance sciences like Taxonomy, Palaeontology and Genetics but not serology (study of blood).
25. A fossil is any preserved remains, impression, or trace of any once-living thing from a past geological age. The totality of fossils is known as the fossil record.
26. Shedding of deciduous teeth is a term given to describe the physiological process that ultimately leads to replacement of the deciduous teeth by their corresponding permanent teeth and it is not an example of disuse of organs
27. Muscle hypertrophy involves an increase in size of skeletal muscle through an increase in size of its component cells, i.e. increased storage of glycogen etc.
28. The theory of recapitulation, also called the biogenetic law or embryological parallelism—often expressed using Ernst Haeckel's phrase "ontogeny recapitulates phylogeny"—is a historical hypothesis that the development of the embryo of an animal, from fertilization to gestation or hatching (ontogeny), goes through similar stages and presence of gill slits in all vertebrate embryos is one of the best example of this theory.

29. Darwin's finches are a classical example of an adaptive radiation. Their common ancestor arrived on the Galapagos about two million years ago. During the time that has passed Darwin's finches have evolved into 13 recognized species differing in body size, beak shape, song and feeding behavior.

30. A geographical barrier is something that blocks the pathway to something, this can be any natural feature such as mountains that prevents easy movement from one place to another and atmosphere is not a geographical barrier.

31. A fossil is any preserved remains, impression, or trace of any once-living thing from a past geological age.

32. Living things have evolved into three large clusters of closely related organisms, called "domains": Archaea, Bacteria, and Eukaryota. Archaea and Bacteria are small, relatively simple cells surrounded by a membrane and a cell wall, with a circular strand of DNA containing their genes. They are called prokaryotes and are considered as ancestors of all life forms on planet earth.

33. Homology in Animals. Organs such as bat's wing, wings of birds, seal's flipper, forelimb of a horse, and human arm have a common underlying anatomy that was present in their last common ancestors; therefore their forelimbs are homologous organs.

34. Analogous organs are the opposite of homologous organs, which have similar functions but different origins. An example of an analogous trait would be the wings of insects, bats and birds that evolved independently in each lineage separately but survive in same kind of habitat performing similar function

35. Analogous organs are the opposite of homologous organs, which have similar functions but different origins. An example of an analogous trait would be the wings of insects, bats and birds that evolved independently in each lineage separately but survive in same kind of habitat performing similar function and are not used to define species

36. Haeckel (1810) proposed that developing animal embryo passes through stages resembling adult forms of its ancestors. E. Haeckel (1868, 1874) formulated biogenetic law or recapitulation theory which states that ontogeny (developmental history of an individual) repeats phylogeny (development history of races), all other are incorrect.

37. Biogeographical evolution is a process in which gene pool of a population gradually changes in response to environmental pressures, natural selection and genetic mutations.

38. Convergent evolution is the process whereby organisms not closely related in origin, independently evolve similar traits as a result of having to adapt to similar environment or ecological niches. On a molecular level, this can happen due to random mutation unrelated to an adaptive change.

39. A fossil is any preserved remains, impression, or trace of any once-living thing from a past geological age. Examples include bones, shells, exoskeletons, stone imprints of animals or microbes, hair, petrified wood, oil, coal, and DNA remnants.

40. Ancestral characters are often, but not always, preserved in an organism's development. For example, both chick and human embryos go through a stage where they have slits and arches in their necks like the gill slits and gill arches of fish but in humans one of these gill pouches develop into Eustachian tubes.

PAST PAPER MCQs

1. During artificial selection only fittest organisms are selected, while during natural selection survival restricts for the fittest organisms as they have such inherited characteristics which make them fit for their environment and leave more offspring than the less fit individuals.
2. Following are the factors that affect allele frequency:
   - Mutation
   - Migration
   - Genetic Drift
   - Non-random Mating
   - Selection
3. Genetic drift is a change in frequency of alleles at a locus that occurs by chance.
4. Following are the factors that affect allele frequency:
   - Mutation
   - Migration
   - Genetic Drift
   - Non-random Mating
   - Selection
5. According to theory of natural selection, those organisms whose inherited characteristics fit them best to their environment are likely to leave more offsprings than the less fit individuals.
6. Genetic drift is a change in frequency of alleles at a locus that occurs by chance.
7. According to the endosymbiotic theory, mitochondria of eukaryotes derive from eubacteria. The host may be more closely related to the Archaea. Following endosymbiosis gave rise to the chloroplasts of algae and plants.
8. Analogous organs are the opposite of homologous organs, which have similar functions but different origins. An example of an analogous trait would be the wings of insects, bats and birds that evolved independently in each lineage separately after diverging from an ancestor without wings.
9. Evolution occurs because natural selection gives some alleles a better chance of survival than others.

18 TOPIC BIOTECHNOLOGY

PRACTICE EXERCISE

TOPIC-WISE MCQs

RECOMBINANT DNA TECHNILOGY

Q.1 Arrange the following events in the proper sequence for genetic recombination:
1 = Ligate gene into bacterial plasmid
2 = Isolate DNA from organisms containing desired gene
3 = Introduce cloned gene into bacterial cells
4 = Fragment DNA with restriction enzyme
A) 1,2,3,4
B) 2,4,1,3
C) 2,1,4,3
D) 2,4,3,1

Q.2 Restriction enzymes are naturally found in:
A) Bacteria
B) Bacteriophage
C) Viruses
D) Both A, B

Q.3 Which of the following structure is protein in nature?
A) pBR 322
B) pSC 101
C) EcoR1
D) Palindromic sequences

Q.4 What is the function of a vector in genetic engineering?
A) Separate fragments of DNA
B) Carry DNA into host cell
C) Link together fragments of DNA
D) Make millions of copies of DNA

Q.5 What is the function of DNA ligase in recombinant technology?
A) Cut DNA at palindromic sequence
B) Chemically modify the DNA
C) Enhance gene expression
D) Act as molecular gum

Q.6 Total number of restriction enzymes discovered so far:
A) 400
B) 350
C) 300
D) 500

Q.7 Specific sequence of four or six nucleotides arranged symmetrically in reverse order where restriction enzymes works:
A) Okazaki fragments
B) Palindromic sequences
C) Primers
D) Probes

Q.8 The key tool of genetic engineering is a special group of enzymes that recognizes specific short sequences of DNA and cleaves the DNA:
A) Interferons
B) Restriction endonucleases
C) Interleukin
D) Antibody

Q.9 Foreign DNA inserted into a plasmid and then replicated many times in a population of bacteria is a _____.
A) DNA clone
B) Gene library
C) DNA probe
D) Gene map

Q.10 By reverse transcription, _____ is assembled on _____.
A) mRNA; DNA
B) cDNA; mRNA
C) DNA; enzymes
D) DNA; agar

Q.11 Recombinant DNA is introduced into the host cell in the form of:
A) Fungus
B) Vector
C) Bacterium
D) Phage

Q.12 Which of these is a true statement?
A) Both plasmids and viruses can serve as vectors
B) Both Plasmids and viruses have antibiotic resistant genes
C) Both Plasmids and viruses are self-replicating molecules
D) Virus is a living organism

Q.13 Bacteria protect themselves from viruses by fragmenting viral DNA upon entry with:
A) Ligases
B) Vector
C) Endonucleases
D) Methylases

Q.14 Plasmids were discovered by study of which characteristic of bacteria?
A) Life cycle
B) Sex life
C) Nutrition
D) Respiration

Q.15 Which of the following plasmid have antibiotic resistant gene/s for both tetracycline and ampicillin?
A) pSC 101
B) pBR322
C) EcoRI
D) pBR 320

Q.16 Identify the restriction site of EcoR1:
A) GAATTC / CTTAAG
B) GATATC / CTATAG
C) GCCTTC / CGGAAG
D) GUUAAC / CAAUUG

Q.17 Restriction endonucleases restrict the growth of:
A) Fungi
B) Bacteria
C) Viroids
D) Bacteriophages

Q.18 The bacterial cell is treated with calcium chloride to enhance its:
A) Expression
B) Affinity for recombinant plasmid
C) Restriction
D) Cloning

Q.19 Bacterial virus uses in recombinant DNA technology as molecular carrier:
A) Plasmid
B) Lambda phage
C) T-2 Bacteriophage
D) T-4 Bacteriophage

POLYMERASE CHAIN REACTION

Q.20 Which statement is not true about PCR?
A) Developed by Kary Mullis
B) Take its name from DNA polymerase
C) Is not very specific
D) Taq polymerase is used

Q.21 What is the function of the PCR in genetic engineering?
A) Insertion of chimeric DNA into expression system
B) To increase gene expression
C) Make millions of copies of DNA
D) Transcription of gene of interest

Q.22 Hydrogen bonds between complementary base pairs during PCR are broken down using:
A) Helicase
B) Primase
C) Heat
D) DNA Gyrase

Q.23 Which one of the following is not related to PCR?
A) Amplification of DNA
B) Use to obtain protein
C) *In vitro* method
D) Quick method

Q.24 During PCR, primer always attaches to _____ end of DNA.
A) 5'
B) 5
C) 3'
D) 3

Q.25 In addition to DNA polymerase and primers, the polymerase chain reaction also requires:
A) A large amount of DNA template
B) Supply of the four DNA nucleotides
C) Restriction enzymes
D) Complementary sequences of RNA

Q.26 For PCR, Primers sequences of about _____ bases are needed.
A) 10
B) 15
C) 20
D) 30

Q.27 PCR is done by using specialized apparatus called:
A) Thermoregulator
B) Thermocycler
C) Thermostabilizer
D) PCR centrifuge

Q.28 DNA polymerase is a temperature-insensitive enzyme extracted from *Thermus aquaticus* which is a:
A) Protozoan
B) Fungus
C) Bacterium
D) Alga

Q.29 Sequence of events during PCR are:
A) Denaturation → Extension → Annealing
B) Denaturation → Annealing → Extension
C) Annealing → Extension → Denaturation
D) Extension → Annealing → Denaturation

Q.30 Annealing refers to:
A) Primer Attachment + High temperature
B) Denaturation + High temperature
C) Primers Attachment +Low temperature
D) Extension+ Medium temperature

GENOMIC LIBRARY

Q.31 A method used to detect a particular DNA sequence within a mixture of many DNA fragments is:
A) DNA sequencing
B) DNA probing
C) DNA fingerprinting
D) Gel electrophoresis

Q.32 Which one of the followings is not true about probe?
A) Genetic markers
B) Fluorescently labeled
C) Radioactively labeled
D) Inorganic

Q.33 It is not a character of probe used in biotechnology:
A) Radioactive
B) Fluorescent
C) Double stranded
D) RNA nucleotides

DNA ANALYSIS

Q.34 Which of the following is not used in DNA finger printing?
A) Restriction enzymes
B) Gel electrophoresis
C) Probe
D) Ligase

Q.35 Which of the following technique is not used in preparing DNA fingerprints?
A) Gene therapy
B) RFLP analysis
C) Gel electrophoresis
D) Polymerase chain reaction

Q.36 A pattern of bands made up of a specific DNA fragments is a:
A) Restriction enzyme
B) Homeotic gene
C) Cloning vector
D) DNA fingerprint

Q.37 DNA finger printing cannot apply on:
A) Sperm cell
B) RBCs
C) Skin cell
D) Hepatic cell

DNA SEQUENCING

Q.38 The technique used to separate bands of DNA on gel is called:

A) Water bath
B) Thermocycler
C) Electroporation
D) Electrophoresis

Q.39 RFLPs are separated by:

A) PCR
B) Northern blotting
C) Dideoxyribonucleotide sequencing
D) Gel Electrophoresis

Q.40 Di-deoxyribonucleosides are used in Sanger's gene sequencing method because of its _____unique character.

A) Presence of three phosphate group
B) Absence of 2'-OH group
C) Absence of 3'-OH group
D) Presence of radioactive phosphorous

Q.41 In Maxam-Gilbert method DNA threads are chemically cut into:

A) Pieces of single nucleotides
B) Pieces of oligonucleotides
C) Pieces of different size fragments
D) Pieces of polynucleotides

TRANSGENIC ORGANISMS

Q.42 To obtain bacteria that produce insulin, genetic engineers:

A) Remove repressor proteins that inhibit the expression of the bacterial insulin gene
B) Insert a vector containing the human gene for insulin into bacteria
C) Search for bacteria that can grow in a medium that lacks insulin
D) Grow normal bacteria in a nutrient medium that contains a large amount of sugar

Q.43 Chemical nature of biodegradable plastic is:

A) Diphydroxy butyrate
B) Polyhydroxy butyrate
C) Diphydroxy Propionate
D) Dihydroxyacetone

Q.44 Which of the following is mostly used to develop transgenic animals?

A) Sanger's method
B) Maxam Gilbert method
C) Particle gun method
D) Microinjections method

Q.45 To prevent blood clotting during surgery _____ is used.

A) Prothrombin II
B) Anti-thrombin II
C) Prothrombin III
D) Anti-thrombin III

Q.46 During formation of transgenic plants, electric current is used to make tiny hole in _____ for entrance of genetic material.

A) Nuclear membrane
B) Plasma membrane
C) Cell wall
D) Mitochondrial membrane

TISSUE CULTURE

Q.47 Analysis of DNA sequence is not done by:

A) Genome analysis
B) Electrophoresis
C) PCR
D) Cell culture

Q.48 The phenomena in which somatic cells have capacity to regenerate into whole plant is called:

A) Totipotency
B) Pluripotency
C) Unipotency
D) Multipotency

Topic-18

BIOTECHNOLOGY AND HEALTHCARE (GENE THERAPY)

Q.49 What is ex-vivo?
A) Normal gene is replaced by abnormal gene in the cell and implanted in the body
B) Normal gene is replaced by abnormal gene directly in to the body
C) Abnormal gene is replaced by normal gene in glass tube & implanted in body
D) Abnormal gene is replaced by normal gene directly into the body

Q.50 During cystic fibrosis:
A) Mucus prevents organ from drying out
B) Over dominance in the CFTR gene effect is present
C) Mucus produced is watery
D) Mucus obstructs the airways and endocrine glands

Q.51 During coronary artery angioplasty, balloon catheter is coated with:
A) Plasmid
B) Bacterium
C) Virus
D) Factor

Q.52 ADA needed for the maturation of T and B cells is not produced in patients of:
A) SCID
B) Cystic fibrosis
C) Parkinson disease
D) AIDS

Q.53 All of the following diseases can be treated with in vivo gene therapy except:
A) Haemophilia
B) Familial Hypercholesterolemia
C) Diabetes
D) AIDS

Q.54 When bone marrow stem cells are removed from the blood and infected with a retrovirus that carries a normal gene, this is an example of:
A) In-vitro gene therapy
B) In-vivo gene therapy
C) Chemotherapy
D) Ex vivo gene therapy

Q.55 Bone marrow stem cells for the treatment of SCID are taken from:
A) Bone
B) Blood
C) Bone marrow
D) Lymph

Q.56 The protein expressed by gene in coronary artery angioplasty:
A) Vascular endothelial growth inhibitor
B) Vascular endothelial growth promoter
C) Vascular epithelial growth factor
D) Vascular endothelial growth factor

Q.57 Retroviruses are not used for the treatment of:
A) Cystic fibrosis
B) SCID
C) Familial hypercholesterolemia
D) Hemophilia

Q.58 In familial hypercholesterolemia, liver cell lack:
A) Receptor gene
B) Trans-membrane protein
C) Channel protein
D) Receptor protein

Q.59 Organoids containing gene for clotting factor are mostly used for gene therapy of:
A) Haemophilia
B) Cystic fibrosis
C) Parkinson disease
D) SCID

Q.60 The role of gene of VEGF in coronary artery angioplasty is _____.
A) Angiogenesis
B) Proliferation of epithelial cells of heart
C) Proliferation of blood cells
D) Growth of blood cells

PAST PAPER MCQs

2009

Q.1 **_____ are used as important vectors in genetic engineering.**
A) Ribosomes
B) Plasmids
C) Nucleoids
D) Mesosomes

Q.2 **Temperature-insensitive (thermostable) enzyme used in PCR is:**
A) DNA polymerase I
B) DNA polymerase III
C) DNA ligase
D) *Taq* polymerase

2010

Q.3 **Gene can be synthesized in laboratory from messenger RNA by using:**
A) Restriction enzymes
B) cDNA (complementary DNA)
C) Vector
D) Reverse transcriptase

Q.4 **Antibiotic resistance gene for tetracycline and ampicillin are present in the plasmid:**
A) pSC 101
B) pCR 101
C) pBR 322
D) pBR 233

2011

Q.5 **The common vectors used in recombinant DNA technology are:**
A) Probes
B) Palindromes
C) Plasmids
D) Prions

Q.6 **The enzyme used to isolate gene from DNA is:**
A) Helicase
B) Reverse Transcriptase
C) Restriction enzyme
D) DNA polymerase

Q.7 **Which one of the following enzymes is temperature insensitive?**
A) DNA polymerase-I
B) *Taq* polymerase
C) DNA polymerase-III
D) RNA polymerase

Q.8 **Liposomes are used in gene therapy against:**
A) Hypercholesterolemia
B) Severe combined immunodeficiency syndrome
C) Cystic fibrosis
D) Coronary artery angioplasty

Q.9 **Genetically engineered cells are introduced into bone marrow cells in the treatment of:**
A) Hypercholesterolemia
B) Severe combined immunodeficiency syndrome
C) Cystic fibrosis
D) Coronary artery angioplasty

2012

Q.10 **In the recombinant DNA technology plasmids are used as:**
A) Genetic material
B) Enzymes
C) Vectors
D) Probes

Q.11 **In recombinant DNA technology _____ are tools for manipulating DNA.**
A) Viruses
B) Chromosomes
C) Enzymes
D) Genes

Q.12 **In which process multiple copies of the desired genes are produced?**
A) Polymerase chain reaction
B) Gene sequencing
C) Analyzing DNA
D) DNA finger printing

Q.13 **In DNA finger printing process, the use of _____ produces distinctive pattern on autoradiography or X-ray film.**
A) Restriction enzymes
B) Micro satellites
C) Macro satellites
D) Probes for genetic markers

Q.14 The enzyme adenosine deaminase is missing in person suffering from:
A) Cystic fibrosis
B) Hypercholesterolemia
C) Severe combined immunodeficiency
D) Parkinson's disease

2013
Q.15 The phage commonly used as a vector in genetic engineering is:
A) Gamma phage
B) T_2-phage
C) T_4-phage
D) Lambda phage

Q.16 Restriction endonucleases are naturally occurring enzymes of:
A) Viruses
B) Bacteria
C) Fungi
D) Plants

Q.17 The DNA molecule formed from mRNA by reverse transcriptase is called:
A) Complementary DNA
B) Recombinant DNA
C) Chimeric DNA
D) Plasmid DNA

Q.18 The agent which separates the two strands of DNA in PCR is:
A) DNA ligase
B) Primer
C) Heat
D) Helicase

Q.19 Cystic fibrosis patients lack a gene that codes for trans-membrane carrier of:
A) Na^+ ion
B) Cl^- ions
C) Ca^{+2} ions
D) K^+ ion

Q.20 Plants having foreign DNA incorporated into their cells are called:
A) Clonal plants
B) Transgenic plants
C) Biotech plants
D) Tissue cultured plants

2014
Q.21 pBR322 have antibiotic resistant genes for:
A) Ampicillin and aspirin
B) Streptomycin and metronidazole
C) Ampicillin and tetracycline
D) Penicillin and metronidazole

Q.22 The enzymes which act as molecular scissors in recombinant DNA technology:
A) Exonucleases
B) Polymerases
C) Endonucleases
D) Reverse transcriptase

Q.23 When two different pieces of DNA are joined together, the result is which one of the following?
A) Complementary DNA
B) Recombinant DNA
C) Mutated DNA
D) Cloned DNA

Q.24 The use of living organisms in industry for the production of useful products is known as:
A) Parasitology
B) Biochemistry
C) Biotechnology
D) Molecular biology

Q.25 Which one of the following is a correct sequence of PCR?
A) Heating → Cooling → Add Primer → Copying of strand
B) Heating → Add primer → Cooling → Copying of strand
C) Add primer → Heating → Cooling → Copying of strand
D) Cooling → Add primer → Heating → Copying of strand

Q.26 Cystic fibrosis affects which one of the following cells of the body?
A) Epithelial cells
B) Endothelial cells
C) Plasma cells
D) Blood cells

Q.27 Plants having foreign DNA incorporated into their cells are called:
A) Clone plants
B) Transgenic plants
C) Parthenocarpic plants
D) Mutant giants

2015
Q.28 Which one of the following is made up of radioactively labeled nucleotides?
A) Phage DNA
B) Genomic library
C) Recombinant DNA
D) Gene probe

Q.29 The DNA formed by the reverse transcription is called:
A) rDNA
B) dDNA
C) cDNA
D) DNA

Q.30 Bacterial cells take up recombinant plasmids when they are treated with:
A) $CaCl_2$
B) NaCl
C) KCl
D) NaOH

Q.31 In cystic fibrosis, liposomes-microscopic vesicles are used which are coated with:
A) Healthy gene
B) Chromosome
C) Protein
D) Carbohydrate

Q.32 A technique in transgenic animals in which desired gene is inserted into the eggs of animal is called:
A) Embryonic stem cell mediated transfer
B) Microinjection
C) Retro-virus mediated gene transfer
D) Virus vectors

2016

Q.33 Restriction endonucleases cleave the _____ of duplex DNA.
A) Nitrogenous base
B) Pentose sugar
C) Phosphodiester bond
D) Hydrogen bond

Q.34 The enzyme which is responsible for the formation of bond between two double stranded DNA fragments is:
A) Endonuclease
B) Lipase
C) Ligase
D) Helicase

Q.35 _____ acts as an ideal expression system in recombinant DNA technology.
A) Retrovirus
B) Rotavirus
C) Algae
D) Bacteria

Q.36 The modified plasmid or phage DNA is called:
A) Clone DNA
B) Recombinant DNA
C) cDNA
D) rDNA

Q.37 _____ enzyme is very stable and active even at very high temperature.
A) RNA polymerase
B) DNA polymerase II
C) Helicase
D) *Taq* polymerase

2017

Q.38 Restriction enzyme EcoR1 cuts DNA to produce:
A) Blunt ends
B) Non-palindromic ends
C) Sticky ends
D) Split ends

Q.39 Restriction endonucleases are produced by:
A) Fungi
B) Algae
C) Bacteria
D) Viruses

Q.40 _____ is the first heat stable component used in PCR.
A) *Taq* isomerase
B) *Taq* helicase
C) *Taq* polymerase
D) *Taq* SSBP

Q.41 DNA segments of different lengths can be separated by a process of:
A) Western blotting
B) Northern blotting
C) Autoradiography
D) Gel electrophoresis

Q.42 Patients of Cystic Fibrosis (CF) produce thick mucus due to faulty:
A) Trans-membrane carrier
B) Cl^- ions
C) Na^+ ions
D) Mucous membrane

2017-Retake

Q.43 Commonly used restriction enzyme is:
A) EcoR1
B) pSC 101
C) pBR 322
D) BamH1

Q.44 Gene can be from mRNA using:
A) Reverse transcriptase
B) DNA polymerase
C) DNA ligase
D) Helicase

Q.45 Collection of bacterial or bacteriophage clones is called:
A) Gene pole
B) Genome
C) Genomic library
D) Bean bag

Q.46 Formation of new strand of DNA from template strand is the function of:
A) DNA polymerase
B) RNA Polymerase
C) DNA ligase
D) Helicase

2018

Q.47 Enzymes used by the bacteria to cut the DNA of the invading virus for its protection is:
A) Restriction exonuclease
B) Restriction ligase
C) Restriction endonuclease
D) DNA polymerase

Q.48 DNA made by joining pieces from two or more different sources:
A) Mutated DNA
B) Restriction endonuclease
C) Probes
D) Recombinant DNA

Q.49 PCR means:
A) Polymerase cross reaction
B) Polymerase chain reaction
C) Polymerase copy reaction
D) Polymerase chronic reaction

Q.50 Chemical nature of primer used in PCR process is _____.
A) Protein
B) Carbohydrate
C) RNA
D) DNA

Q.51 Deficiency of enzyme _____ causes combined immunodeficiency syndrome.
A) Adenosine transaminase
B) Adenosine deaminase
C) Adenosine polymerase
D) Adenosine transcriptase

2019

Q.52 Complementary DNA molecule is:
A) An artificial DNA
B) Single stranded DNA
C) DNA from mRNA
D) A small segment of chromosomal DNA

Q.53 The plasmid pBR322 has antibiotic resistance genes for:
A) Tetracycline and Doxycycline
B) Streptomycin
C) Doxycycline and Ampicillin
D) Ampicillin and Tetracycline

Q.54 DNA polymerase enzyme for PCR is isolated from bacteria *Thermus aquaticus* because:
A) It can withstand high denaturation temperature
B) It can withstand low denaturation temperature
C) It can work at high speed
D) It can be used again and again

Q.55 Which enzyme is administered to the patients of Severe Combined Immunodeficiency Disease (SCID)?
A) Pancreatic Enzyme
B) Adenosine Deaminase (ADA)
C) β – galactosidase
D) β – lactamase

Q.56 Transgenic mice have been used to produce:
A) Protein rich milk
B) A growth hormone
C) Protein rich meat
D) Extra hair

2020

Q.57 The DNA that has been altered and which now contains a length of nucleotides from two different organisms is called a:
A) Plasmid
B) Combined DNA
C) Vector
D) Recombinant DNA

Q.58 It is a method for rapid production of a very large number of copies of a particular fragment of DNA:
A) Gel electrophoresis
B) Polymerase chain reaction
C) DNA extraction
D) Recombination

Q.59 What is the effect of enzyme DNA ligase?
A) DNA is broken up at a specific site
B) DNA fragments are jointed together
C) DNA replication occurs
D) DNA transcriptions occurs

Q.60 Which of the following are the components/tools of recombinant DNA technology?
A) Gene of interest
B) Molecular scissors
C) Molecular glue and expression system
D) All of the above

Q.61 Gel electrophoresis is a technique:
A) Employed by forensic scientist to assist in the identification of the individuals by their respective type of DNA
B) Collect all the genes found in one complete set of chromosomes
C) To separate different sized fragment of charge bearing polymers
D) Grow single cell or a group of cells in a glass ware on artificial medium under aseptic conditions

Q.62 Transgenic organisms:
A) Have a foreign gene inserted into them
B) Have an important role in the large-scale production of medical products
C) Are considered beneficial to humans
D) All of the above

Q.63 Which of the following is not necessary for PCR to occur?
A) d - ATP
B) Primer
C) DNA fragments
D) Ribo-nucleotides

ANSWER KEY

TOPIC-WISE MCQs

1	B	11	B	21	C	31	B	41	C	51	A
2	A	12	A	22	C	32	D	42	B	52	A
3	C	13	C	23	B	33	C	43	B	53	B
4	B	14	B	24	D	34	D	44	D	54	D
5	D	15	B	25	B	35	A	45	D	55	B
6	A	16	A	26	C	36	D	46	B	56	D
7	B	17	D	27	B	37	B	47	D	57	A
8	B	18	B	28	C	38	D	48	A	58	D
9	A	19	B	29	B	39	D	49	C	59	A
10	B	20	C	30	C	40	C	50	D	60	A

PAST PAPERS MCQs

1	B	11	C	21	C	31	A	41	D	51	D	61	C
2	D	12	A	22	C	32	B	42	A	52	C	62	D
3	D	13	D	23	B	33	C	43	A	53	D	63	D
4	C	14	C	24	C	34	C	44	A	54	A		
5	C	15	D	25	A	35	D	45	C	55	B		
6	C	16	B	26	A	36	B	46	A	56	B		
7	B	17	A	27	B	37	D	47	C	57	D		
8	C	18	C	28	D	38	C	48	D	58	B		
9	B	19	B	29	C	39	C	49	B	59	B		
10	C	20	B	30	A	40	C	50	D	60	D		

EXPLANATORY NOTES

TOPIC-WISE MCQs

1. Four requirements of recombinant DNA technology are:
   i. Gene of interest which is to be cloned
   ii. Molecular scissors to cut out gene of interest
   iii. Molecular carrier or vector
   iv. Expression system
2. Restriction enzymes are the natural enzymes of bacteria, which they use for their own protection against viruses.
3. All enzymes are proteins but all proteins are not enzymes. EcoRI is restriction enzyme.
4. Vectors are the means by which recombinant DNA is introduced into a host cell.
5. A ligase is an enzyme that can catalyze the joining of two large molecules by forming a new chemical bond.
6. 400 restriction enzymes are discovered, 20 are commonly used.
7. Palindromic sequences are sequences of four or six nucleotides arranged symmetrically in the reverse order produced by restriction enzymes, which cut the DNA at specific sites.
8. A restriction enzyme, restriction endonuclease, is an enzyme that cleaves DNA into fragments at or near specific recognition sites within molecules known as restriction sites.
9. Genetically identical copies of DNA molecules produced through replication process.
10. Gene can be synthesized in the lab from mRNA using reverse transcriptase. Such DNA molecule produced from mRNA is called complementary DNA (cDNA).
11. Vectors are the means by which recombinant DNA is introduced into a host cell.
12. Plasmids and Lambda phage (DNA of bacterial viruses) can also be used as a vector.
13. These are the natural enzymes of bacteria, which they use for their own protection against viruses. The restriction enzyme cuts down the viral DNA but does not harm to bacterial chromosome. Thus, they restrict viral growth.
14. Plasmids are natural extra chromosomal circular DNA molecules which carry genes for antibiotic resistance and fertility. These were first discovered in intestinal bacterium *Escherichia coli* while studying their sex life.
15. ***pSC 101*** has antibiotic resistance gene for tetracycline.
    pBR 322 has antibiotic resistance gene for tetracycline as well as ampicillin.
16. ***Palindromic sequences*** are sequences of four or six nucleotides arranged symmetrically in the reverse order produced by restriction enzymes, which cut the DNA at specific sites.

7. Restriction enzymes are the natural enzymes of bacteria, which they use for their own protection against viruses.

3. Bacterial cells take up recombinant plasmid if they are treated with calcium chloride to make them more permeable.

. Plasmids and Lambda phage (DNA of bacterial viruses) can also be used as a vector.

. PCR is very specific; the targeted DNA sequence can be less than one part in a million of the total DNA sample.

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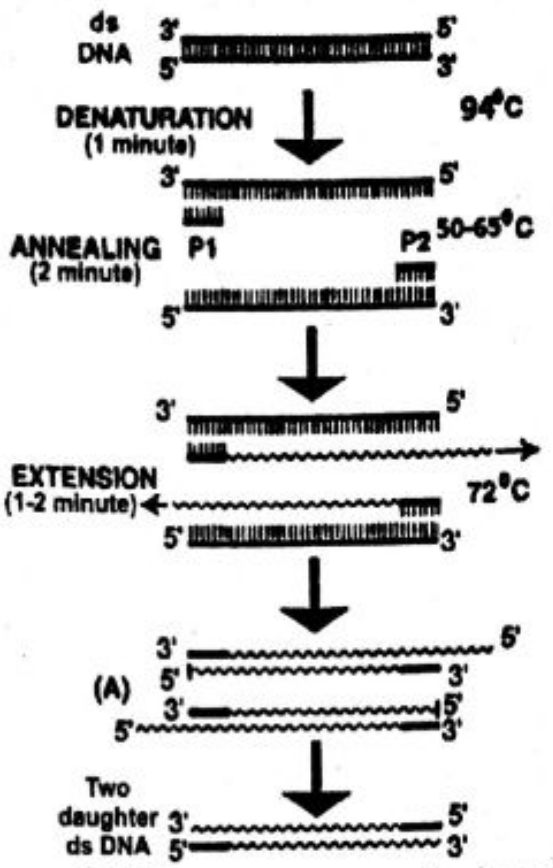
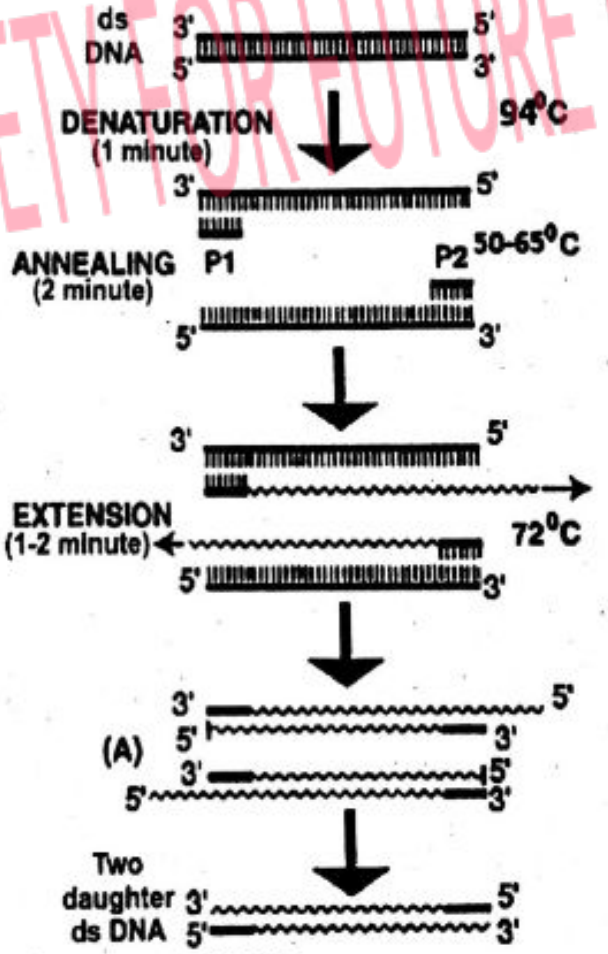
22.



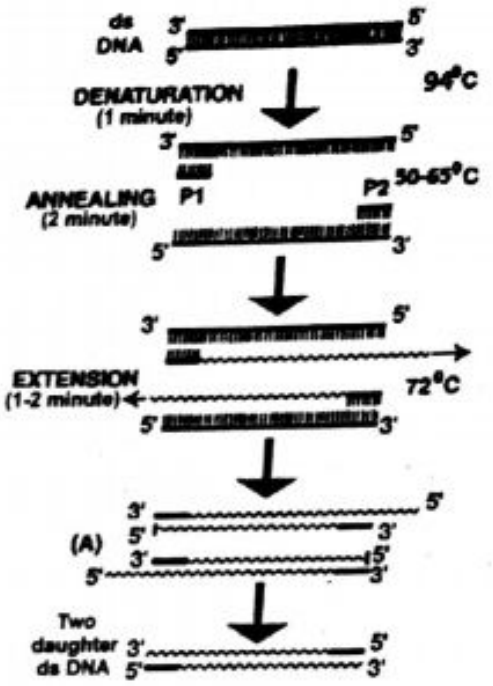
23. PCR is very specific; the targeted DNA sequence can be less than one part in a million of the total DNA sample. It does not concern with protein synthesis.

24.



25. Following are the basic requirements of PCR
   i. Template DNA
   ii. Primers
   iii. Taq. polymerase
   iv. dNTPs (four types of DNA nucleotides)

26. ***Primers*** are the sequences of about 20 bases that are complementary to the bases on either side of the target DNA.
27. ***PCR*** is done in automatic PCR machine or thermocycler.
28. DNA polymerase used is ***temperature–insensitive*** (thermostable) enzyme extracted from the bacterium ***Thermus aquaticus***. This enzyme is also known as ***Taq polymerase***.
29.



30. ***Attachment*** of primers with already single stranded DNA molecules during PCR is known as annealing.
31. Probe is highly specific short oligonucleotide sequence which is radioactively or fluorescently labeled. It is used to screen genomic library for a particular DNA sequence.
32. Probe is either ssDNA or RNA molecule that is used as selection marker.
33. Single stranded
    Radioactively or Fluorescently labeled
    Short sequence of oligonucleotides
    Complementary to the target region.
34. During DNA fingerprinting, fragments of DNA are formed by using restriction endonucleases. Then these fragments are separated on the basis of their size on gel electrophoresis. Finally these are identified by using probes. A ligase is an enzyme that can catalyze the joining of two large molecules by forming a new chemical bond.
. The introduction of normal genes into cells in place of missing or defective ones in order to correct genetic disorders.

During DNA fingerprinting, fragments of DNA are formed by using restriction endonucleases. Then these fragments are separated on the basis of their size on gel electrophoresis. Finally these are identified by using probes.

RBCs are without nuclei so DNA fingerprinting is not applied on RBCs.

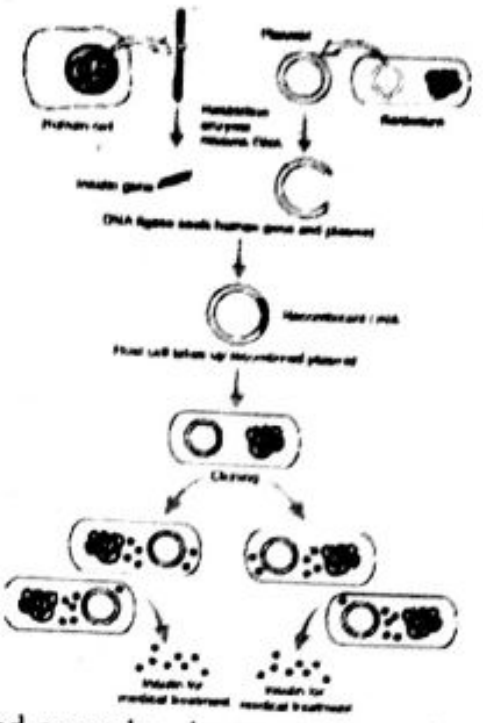
Gel electrophoresis is a technique used for the separation and analysis of macromolecules (DNA, RNA and proteins) and their fragments, based on their size and charge.

The genome is treated with restriction enzymes, which results in a unique collection of different sized fragments. These fragments vary in length and restriction enzyme separates according to this length, which is different in different individuals. This process of existing in different lengths is called restriction fragment length polymorphism (RFLPs). Fragments of genome can be separated according to their lengths through a process called gel electrophoresis.

40. Because of the absence of 3'OH- group it doesn't allow the DNA polymerase to add further nucleotides.

41. Nucleases are used to cut DNA into small pieces/fragments.

42.



43. A weed called mouse-eared cress has been engineered to produce a ***biodegradable plastic (polyhydroxy butyrate)*** in cell granules.

44. In order to get transgenic animals, ***two methods*** are used i.e. ***microinjection*** (by hand) and ***vortex mixing method,*** by inserting gene into egg.

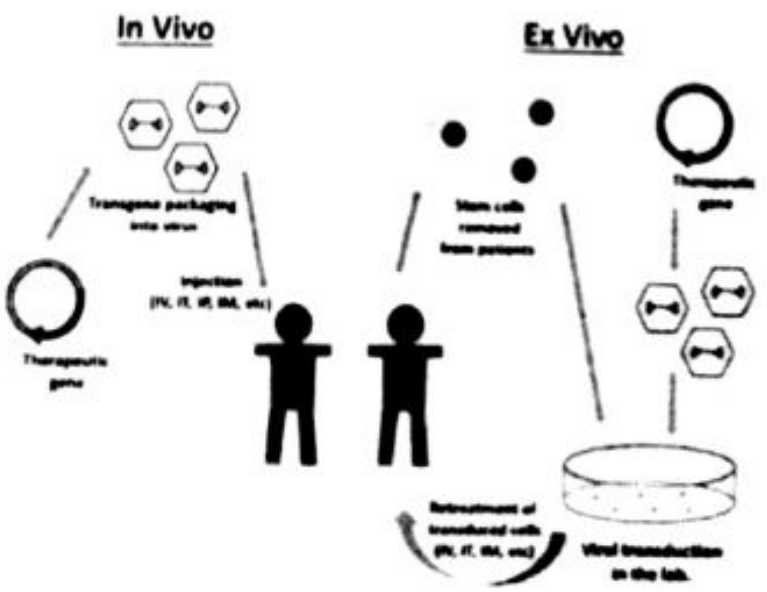
45. Anti-thrombin III prevents blood clot formation during surgery

46. A foreign gene isolated from any type of organism is placed in the tissue culture medium. This tissue culture contains protoplasts. High voltage electric pulses are used to create pores in the plasma membrane so that DNA can enters.

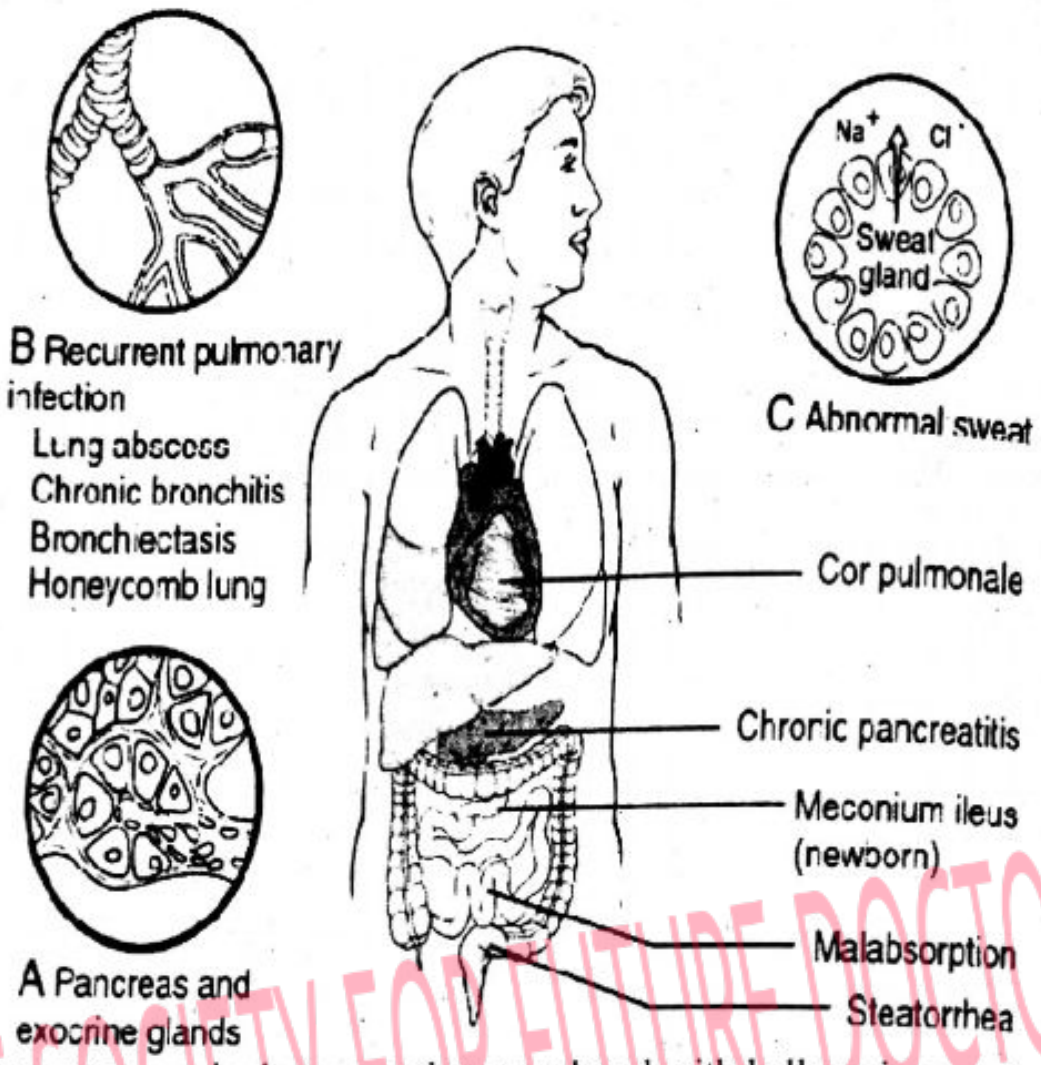
47. Cell culture is the process by which cells are grown under controlled conditions, generally outside their natural environment. After the cells of interest have been isolated from living tissue, they can subsequently be maintained under carefully controlled conditions.

48. Many somatic plant cells, including some fully differentiated types (leaf mesophyll), contain intact nuclear, plastid and mitochondrial genomes and have the capacity to regenerate into whole plants. This phenomenon is called Totipotency.

49.



50.



51. In coronary artery angioplasty, a catheter enclosed with balloon is coated with a plasmid containing gene for vascular endothelial growth factor, is placed in arteries

52. B and T cells are the most important component of cell mediated and humoral immunity.

53. Hypercholesterolemia is a condition in which liver cells lack the receptors for removing blood cholesterol. Therefore, liver part is excised end infected with retroviruses containing normal gene for cholesterol receptors.

54. Ex vivo gene therapy is a type of gene therapy which involves exterior modification of a patient's cell and reintroduction of it to the patient.

55. Blood of human is the source of bone marrow stem cells.

56. Plasmid DNA product containing vascular endothelial growth factor 2 used in clinical trials for coronary artery diseases (CAD).

57. Liposome-microscopic vesicles (lipoproteins coated with gene) are used as gene carrier for the treatment of cystic fibrosis.

58. Lack of receptor on liver cells for cholesterol leads to hypercholesterolemia.

59. To treat hemophilia, patients could get regular doses of cells that contain normal clotting factor genes or such cells could be placed in ***organoids***, artificial organs that can be implanted in the abdominal cavity.

60. Angiogenesis is the physiological process through which new blood vessels form from pre-existing vessels by introducing plasmid containing genes for vascular endothelial growth factors.

PAST PAPER MCQs

1. Plasmids and Lambda phage (DNA of bacterial viruses) can also be used as a vector. But plasmids are most commonly used vectors in genetic engineering.
2. DNA polymerase used is ***temperature–insensitive*** (thermostable) enzyme extracted from the bacterium ***Thermus aquaticus***. This enzyme is also known as ***Taq polymerase***.
3. Gene can be synthesized in the lab from mRNA using reverse transcriptase. Such DNA molecule produced from mRNA is called complementary DNA (cDNA).
4. ***pSC 101*** has antibiotic resistance gene for tetracycline.
5. ***pBR 322*** has antibiotic resistance gene for tetracycline as well as ampicillin.
6. Plasmids and Lambda phage (DNA of bacterial viruses) can be used as a vector. But plasmids are most commonly used vectors in genetic engineering.
7. A restriction enzyme, restriction endonuclease, is an enzyme that cleaves DNA into fragments at or near specific recognition sites within molecules known as restriction sites.
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9. Liposome-microscopic vesicles (lipoproteins coated with gene) are used as gene carrier for the treatment of cystic fibrosis.
10. For the treatment of SCIDS ex-vivo gene therapy method is used in which bone marrow stem cells are taken outside of the body and gene of interest is inserted into the target cells.
11. Plasmids and Lambda phage (DNA of bacterial viruses) can be used as a vector. But plasmids are most commonly used vectors in genetic engineering.
12. Genetic engineering became possible with the discovery of mainly two types of enzymes: the cutting enzymes called restriction endonucleases and the joining enzymes called ligases.
13. PCR is very specific; the targeted DNA sequence can be less than one part in a million of the total DNA sample.
14. Use of probes for genetic markers produces a distinctive pattern that can be recorded on X-ray film.
15. SCID is caused by adenosine deaminase (ADA) deficiency, in which infants lack the ADA enzyme necessary for the maturation of T and B cells.
16. Plasmids and Lambda phage (DNA of bacterial viruses) can be used as a vector. But plasmids are most commonly used vectors in genetic engineering.
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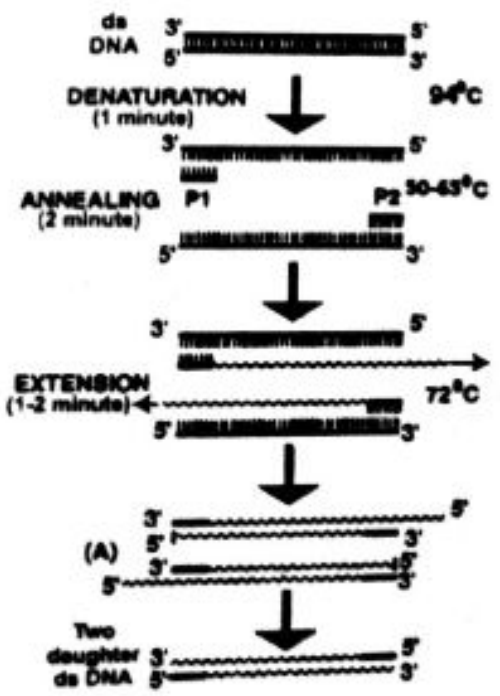
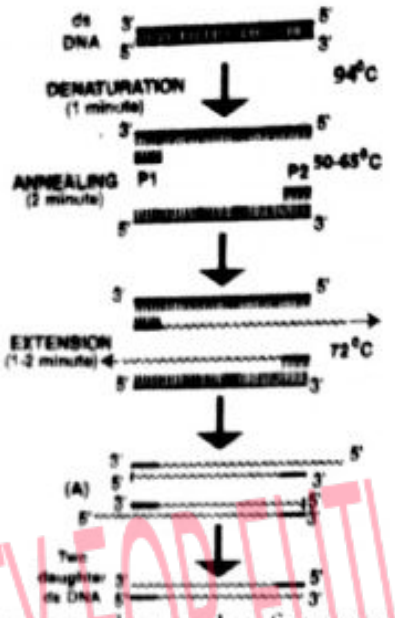


19. Cystic fibrosis patients lack a gene that codes for trans-membrane carrier of chloride ions.
20. Plants having any foreign gene are called transgenic plants.
21. ***pSC 101*** has antibiotic resistance gene for tetracycline. ***pBR 322*** has antibiotic resistance gene for tetracycline as well as ampicillin.
22. A restriction enzyme, restriction endonuclease, is an enzyme that cleaves DNA into fragments at or near specific recognition sites within molecules known as restriction sites.
23. ***Recombinant DNA*** contains DNA from two different sources. It is also called as chimeric DNA.
24. The exploitation of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc. is known is biotechnology.
25.



26. Cystic fibrosis patients lack a gene that codes for trans-membrane carrier of chloride ions which are located in epithelial cells.
27. Plants having any foreign gene are called transgenic plants.
28. Gene probes are small, single-stranded fragments of DNA that are complementary to a gene of interest. This means they are a perfect match, and when applied to a sample, a gene probe can help to find out a gene from the mixture.
29. Gene can be synthesized in the lab from mRNA using reverse transcriptase. Such DNA molecule produced from mRNA is called complementary DNA (cDNA).
30. Bacterial cells take up recombinant plasmid if they are treated with calcium chloride to make them more permeable.
31. Liposome-microscopic vesicles (lipoproteins coated with gene) are used as gene carrier for the treatment of cystic fibrosis.
32. Transgenic animals have been developed by inserting genes into the eggs of animals. In order to get transgenic animals, ***two methods*** are used i.e. ***microinjection*** (by hand) and ***vortex mixing method,*** by inserting gene into egg.
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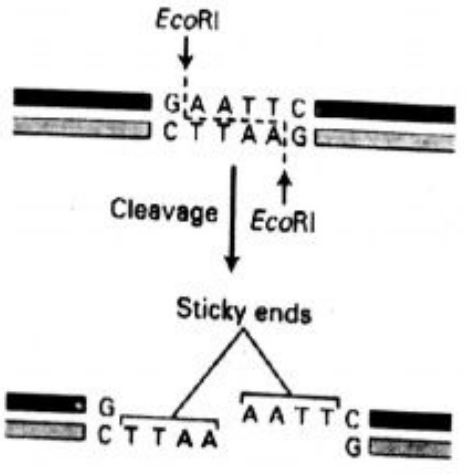

34. A ligase is an enzyme that can catalyze the joining of two large molecules by forming a new chemical bond.
35. Bacteria are used as ideal expression system because of their less doubling time. Products can be easily collected.
36. ***Recombinant DNA*** contains DNA from two different sources. It is also called as chimeric DNA. When gene of interest is incorporated into plasmid, plasmid is termed as recombinant DNA.
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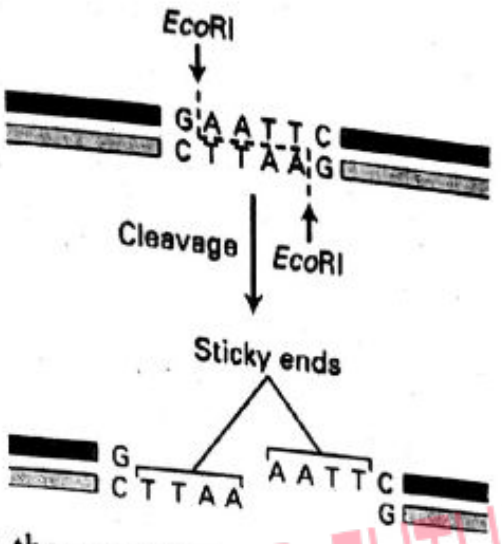

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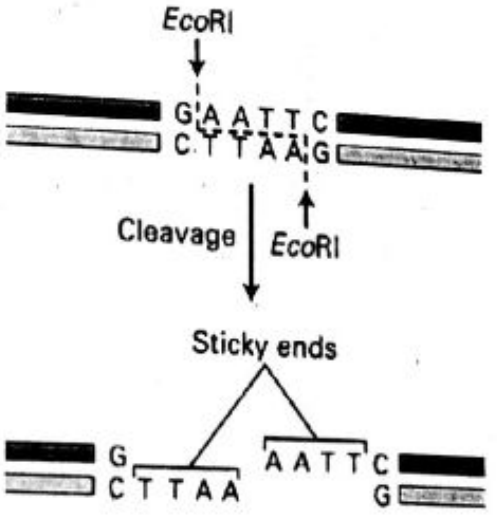

44. Gene can be synthesized in the lab from mRNA using reverse transcriptase. Such DNA molecule produced from mRNA is called complementary DNA (cDNA).
45. Genomic library represents an entire genome of an individual animal, bacteria, plant or virus under study. or It is the collection of cloned segments of DNA containing at least one copy of every gene from a particular organism.

46. DNA Polymerase is a naturally occurring complex of proteins whose function is to copy a cell's DNA before it divides in two. Taq polymerase is DNA polymerase used in PCR for DNA amplification.
47. Restriction enzymes are the natural enzymes of bacteria, which they use for their own protection against viruses.
48. ***Recombinant DNA*** contains DNA from two different sources. It is also called as chimeric DNA. When gene of interest is incorporated into plasmid, plasmid is termed as recombinant DNA.
49. ***PCR*** takes its name from DNA polymerase, the enzyme that carries out DNA replication process in cell.
50. ***Primers*** are the sequences of about 20 NDA bases that are complementary to the bases on either side of the target DNA.
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56. Transgenic mice have been genetically engineered to produce growth hormone.
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58. Polymerase chain reaction (PCR) is a method widely used to rapidly make millions to billions of copies of a specific DNA sample, allowing scientists to take a very small sample of DNA and amplify it to a large enough amount to study in detail.
59. DNA ligase is an enzyme which can connect two strands of DNA together by forming a bond between the phosphate group of one strand and the deoxyribose group on another. It is used in cells to join together the Okazaki fragments which are formed on the lagging strand during DNA replication.
60. Recombinant DNA is the method of joining two or more DNA molecules to create a hybrid. The technology is made possible by two types of enzymes, restriction endonucleases and ligase. A restriction endonuclease recognizes a specific sequence of DNA and cuts within, or close to, that sequence.
61. Electrophoresis is a technique that enables separation and analysis of charged molecules in an electric field. Gel electrophoresis is most commonly used for separation and purification of proteins and nucleic acids that differ in size, charge, or conformation. The gel is composed of polyacrylamide or agarose.
62. A transgenic, or genetically modified, organism is one that has been altered through recombinant DNA technology, which involves either the combining of DNA from different genomes or the insertion of foreign DNA into a genome.
63. PCR uses DNA template, d-ATP and DNA polymerase which recognizes the junction of double stranded DNA and single stranded DNA. It recognizes DNA but not RNA so cannot work with an RNA template

19 TOPIC MAN & HIS ENVIRONMENT / ECOSYSTEM

PRACTICE EXERCISE

TOPIC-WISE MCQs

FOOD CHAIN, FOOD WEB, ENERGY FLOW

Q.1 Total amount of organic matter present in a dynamic ecosystem is called:
A) Biomass
B) Litter
C) Biome
D) Food

Q.2 A food chain is a group of:
A) Organisms of same species
B) Parasites and hosts
C) Organisms feeding on one another
D) Producers and decomposers

Q.3 In a simple ecosystem, the food chain always starts with:
A) Consumers
B) Producers
C) Decomposers
D) Detritivores

Q.4 Each successive trophic level has:
A) Less total energy
B) Same total energy
C) More total energy
D) Zero total energy

Q.5 99% of solar energy is used:
A) By plants
B) To develop new ecosystem
C) By organisms
D) To evaporate water and reflect back to atmosphere

Q.6 Process which fixes energy at T_1 level is:
A) Solarization
B) Photosynthesis
C) Grazing
D) Forests

Q.7 Out of the total energy which is absorbed by the plants, primary consumer uses _____ % of that.
A) 100
B) 50
C) 10
D) 20

SUCCESSION

Q.8 Crust on the substratum. This is related with:
A) Crustose lichen
B) Foliose lichen
C) Fruticose lichen
D) Foliage lichen

Q.9 The _____enzyme provided by heather host to its fungal partner in mycorrhizal association is.
A) Carbohydrate digesting
B) Fat digesting
C) Protein digesting
D) Lipids digesting

Q.10 Succession is a series of changes in:
A) Physical structure of an area
B) Community structure
C) Biotic communities on a bare area
D) Community structure and physical environment in an area

Q.11 Process which transforms the environment into a fertile ecosystem:
A) Grazing
B) Photosynthesis
C) Succession
D) Seral community

Q.12 Crumpled leaves like structures are found in_____ stage.
A) Crustose
B) Foliage
C) Moss
D) Herbaceous

Q.13 Permellia is an example of:
A) Crustose lichen
B) Foliage lichen
C) Moss stage
D) Herbaceous stage

Q.14 Formation of fertile soil over a relatively short time after a farm land is abandoned:
A) Primary succession
B) Secondary succession
C) Rehabilitation
D) Vegetation

SYMBIOSIS, MUTULASIM, PARSITISM, PREDATION

Q.15 Any species cannot survive if it _____ is lost.
A) Predator
B) Habitat
C) Parasite
D) Family

Q.16 A group of several species living together with mutual tolerance or adjustment and beneficial interactions in a natural area is known as:
A) Species
B) Community
C) Populations
D) Family

Q.17 Interaction between the two organisms in which one organism kills and feeds on the second organism is known as:
A) Scavenging
B) Parasitism
C) Predation
D) Mutualism

Q.18 Which of the following is beneficial in maintenance of ecosystem?
A) Predation
B) Decomposition
C) Mutualism
D) All A, B, C

Q.19 What is true of commensalisms?
A) One organism is harmed while the other is unaffected
B) Both are harmed
C) One organism is benefited while the other is unaffected
D) Both are benefited

Q.20 Mycorrhiza is a symbiotic association between:
A) Fungi and roots of plants
B) Algae and fungi
C) Algae and roots of plants
D) Bacteria and roots of plants

Q.21 *Rhizobium* and root nodules of pea have an association called:
A) Predation
B) Symbiosis
C) Parasitism
D) Commensalisms

Q.22 Which of the following is always a harmful symbiotic association for one organism?
A) Parasitism
B) Commensalisms
C) Symbiosis
D) Predation

Q.23 Competition is more severe among the organisms which have:
A) Same habitat
B) Different habitat
C) Same environment
D) Same ecosystem

Q.24 Which of the following is not an example of predation-prey relationship?
A) Fox/Rabbit
B) Seal/Fish
C) Shark/Remoras
D) Cat/Mouse

Q.25 Tape worm in small intestine is an example of:
A) Symbiosis
B) Mutualism
C) Mycorrhiza
D) Parasite

BIOGEOCHEMICAL CYCLES (N_2 CYCLE)

Q.26 Which of the following is not recycled within an ecosystem?
A) Water
B) Nitrogen
C) Energy
D) Carbon

Q.27 In an ecosystem, homeostasis is maintained through:
A) Checking the balance
B) Flow of energy
C) Cycling of materials
D) Gaseous exchange

Q.28 The conversion of nitrogen to ammonia or nitrogenous compounds is called as:
A) Nitrogen assimilation
B) Nitrification
C) Nitrogen depletion
D) Nitrogen fixation

HUMAN IMPACTS ON ENVIRONMENT

Q.29 Incomplete burning of carbonate and carbon compounds are source of:
A) Chlorofluorocarbons
B) Sulfur dioxide
C) Lead compounds
D) Carbon monoxide

Q.30 Organisms of same species inhabiting in space and time form a:
A) Population
B) Species
C) Community
D) Food web

Q.31 A community of grasses was found growing in already burnt forest area. This represents:
A) Primary succession
B) Secondary succession
C) Reforestation
D) Desertification

ACID RAIN

Q.32 What is the main source of acid rain?
A) Antarctica
B) Magnesium oxide
C) Calcium oxide
D) Oxides of nitrogen and sulfur

GREEN HOUSE EFFECT

Q.33 If more UV rays reach the earth's surface, they will directly affect life on earth by:
A) Increasing pH of oceans
B) Decreasing salinity of water
C) Changes in DNA
D) Destroying habitat

Q.34 All of the following are causes of greenhouse effect, except:
A) Afforestation
B) Over urbanization
C) Industrialization
D) Population explosion

Q.35 Most of the solar energy that reaches to earth is involved in:
A) Photosynthesis
B) Biomass production
C) Heating environment
D) Gross productivity

Q.36 Which one the following is not a greenhouse gas?
A) CO_2
B) O_2
C) CO
D) CFCs

OZONE DEPELTION

Q.37 A hole in earth's protective shield is:
A) Ozone layer depletion
B) Greenhouse effect
C) Global warming
D) Eutrophication

Q.38 The problems caused by thinning and breach of ozone layer:
A) Skin cancers
B) Decreased immunity
C) Cataract
D) All A, B, C

Q.39 Chief air pollutant which is likely to deplete ozone layer is:
A) Sulfur dioxide
B) Carbon monoxide
C) Carbon dioxide
D) Chlorofluorocarbons

Q.40 Ozone layer is present above the earth from:
A) 10-20 km
B) 10-30 km
C) 10-40 km
D) 10-50 km

Q.41 The main strategy against the air pollution is:
A) Biological control
B) Bioremediation
C) Forestation
D) Desertification

ALGAL BLOOMS

Q.42 Ultimate survivors after eutrophication of an aquatic habitat are:
A) Fishes
B) Aerobic bacteria
C) Anaerobic bacteria
D) Fungi

Q.43 Algal blooms are result in:
A) Global warming
B) Salination
C) Eutrophication
D) Bio-magnification

PAST PAPER MCQs

2008

Q.1 Pick the biotic component from the following.
A) Soil
B) Water
C) Atmosphere
D) Animals

Q.2 Name the nutrition resulted by feeding on dead and decaying matter.
A) Saprophytic
B) Parasitic
C) Symbiotic
D) Both B and C.

2009

Q.3 Succession in previously existing ecosystem is called:
A) Primary succession
B) Secondary succession
C) Tertiary succession
D) Quaternary succession

Q.4 The nutrient cycles are also called:
A) Biogeochemical cycles
B) Biochemical cycles
C) Bio element cycles
D) Geochemical cycles

Q.5 What is the drawback of nuclear energy?
A) It causes radiation pollution
B) It is not long lasting
C) It is very expensive
D) It pollutes the air

Q.6 _____ are bio indicators of air pollution.
A) Cyanobacteria
B) Fungi
C) Mycorrhiza
D) Lichens

2010

Q.7 Which of the following is the lowest level of biological organization with respect to others?
A) Multicellular organisms
B) Biosphere
C) Species
D) Population

Q.8 Ozone filters ultraviolet radiations from the sun in the upper:
A) Biosphere
B) Atmosphere
C) Lithosphere
D) Hydrosphere

Q.9 The natural heat energy trapped underground is:
A) Geothermal energy
B) Thermal energy
C) Electric energy
D) Solar energy

Q.10 An association between two organisms benefiting both is called:
A) Commensalism
B) Parasitism
C) Predation
D) Symbiosis

Q.11 A parasite living inside body of the host is called:
A) Ectoparasite
B) Obligate parasite
C) Facultative parasite
D) Endoparasite

Q.12 In aquatic ecosystem, human activities may accelerate the process of:
A) Eutrophication
B) Photosynthesis
C) Decomposition
D) Recycling

2011

Q.13 The typical environment of a particular organism population community is called:
A) Niche
B) Ecosystem
C) Habitat
D) Biosphere

Q.14 In an ecosystem, mycorrhizae are an example of:
A) Symbiosis
B) Predation
C) Commensalism
D) Parasitism

Q.15 Excessive enrichment of water with nutrients by human activity by which large amount of living organic matter grows is called:
A) Archeotrophication
B) Eutrophication
C) Enrichment
D) Low Trophication

Q.16 Successive stages of eating and being eaten by which recycling of materials and flow of energy takes place is called:
A) Food Chain
B) Food Web
C) Trophic Level
D) Food Link

2012

Q.17 Population of different species (plants and animals) living in the same habitat form a:
A) Community
B) Ecosystem
C) Biosphere
D) Microhabitat

Q.18 What is the niche of an organism in an ecosystem?
A) Role played by many organisms in an ecosystem
B) Role played by community of microorganisms in their ecosystem
C) Role played by a dead organism in an ecosystem
D) Role played by an organism in its ecosystem.

Q.19 The cause of acid rain is:
A) Oxides of carbon
B) Oxides of nitrogen and Sulphur
C) Oxides of Sulphur
D) Oxides of nitrogen

Q.20 The distinct levels or links of food chain are called:
A) Trophic level
B) Food web
C) Energy pyramid
D) Food chain

2013

Q.21 Living part of ecosystem is:
A) Lithosphere
B) Hydrosphere
C) Community
D) Biosphere

Q.22 As a result of destruction of ozone layer there is significant increase in:
A) Ultra-violet radiations
B) Greenhouse gases
C) Nitrogen oxide
D) Sulphur oxide

Q.23 In an ecosystem, mycorrhizae are an example of:
A) Predation
B) Symbiosis
C) Mutualism
D) Parasitism

Q.24 A living association between two living organisms of different species which is beneficial to both the partners is called:
A) Commensalism
B) Parasitism
C) Mutualism
D) Predation

Q.25 Higher rate of a biological activity in a nutrient rich pond water is called:
A) Water pollution
B) Air pollution
C) Eutrophication
D) Industrial effects

2014

Q.26 Which one of the following is the ultimate distributional unit within which a species is restrained by the limitations of its physical structure and physiology?
A) Niche
B) Ecosystem
C) Biome
D) Habitat

Q.27 The relationship in which one organism gets benefit and the other is not affected is called:
A) Mutualism
B) Commensalism
C) Predation
D) Parasitism

Q.28 All herbivores belong to which trophic level in the food chain?

A) T1
B) T2
C) T3
D) T4

Q.29 How many food chains are present in following food web?

A) 5
B) 6
C) 3
D) 4

Q.30 Individual successions are known as:

A) Primary successions
B) Secondary successions
C) Seres
D) Xeroses

2015

Q.31 Ozone is a layer of atmosphere extending from _____ km above earth and absorbs ultraviolent radiations.

A) 10-50
B) 50-60
C) 5-30
D) 10-80

Q.32 Light rays from the sun are absorbed by CO2 and re-radiate as _____ radiations.

A) Ultraviolent
B) Indigo
C) Infra-Red
D) Green

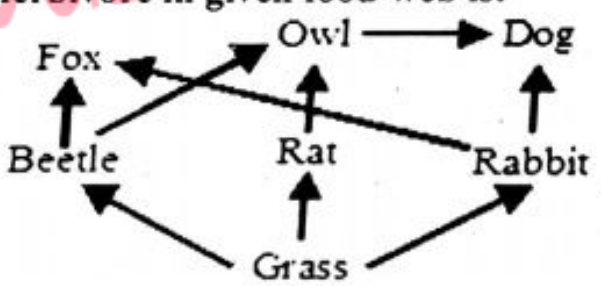
Q.33 The gases which are produced by burning of fossils fuels and are responsible for acid rain is:

A) CFCs
B) CO2 and CO
C) HCl and Oxides of Nitrogen
D) SO2 and Oxides of Nitrogen

Q.34 During successions, the first organisms that develop on bare rock are:

A) Lichens
B) Shrubs
C) Moss
D) Herbs

Q.35 Trophic level of an herbivore in given food-web is:



A) 1
B) 3
C) 4
D) 2

2016

Q.36 The ultimate source of energy in an ecosystem is:

A) Photosynthesis
B) Sun
C) Plants
D) Water

Q.37 The decline in the thickness of ozone layer is caused by:

A) Increasing level of nitrogen oxide
B) Decreasing level of O_2
C) Decreasing level of CFCs
D) Increasing level of CFCs

Q.38 _____ is the branch of Biology used for the identification and interpretation of fossils.

A) Evolution
B) Paleontology
C) Zoogeography
D) Biodiversity

Q.39 The organisms of third trophic level are:
A) Primary consumer
B) Primary producer
C) Tertiary consumer
D) Secondary consumer

Q.40 The change from bare rock or open area is rapid, especially in the initial stages and follows a series of recognizable and hence predictable stages. This process is called:
A) Pioneers
B) Xerosere
C) Succession
D) Secondary succession

Q.41 All the food chains and food webs begin with:
A) Detritus
B) Herbivores
C) Green plants
D) Omnivores

2017
Q.42 Chemicals used for destroying agricultural competitors are known as:
A) Antibiotics
B) Pesticides
C) Disinfectants
D) Chemotherpeutic agents

Q.43 How denitrification does occur in soils:
A) Bacterial reduction of NO_3^{-1} ions to N_2 gas
B) Active uptake of Nitrate ions by plant roots
C) Drainage of manure from fields
D) Leaching of nitrate ions

2017-Retake
Q.44 Pick the weed killers:
A) Insecticide
B) Fungicide
C) Herbicide
D) Fertilizer

Q.45 CO is highly toxic due to:
A) Stability
B) C and O bond
C) Color
D) Smell

2018
Q.46 An area previously supporting life is made barren, the subsequent recolonization is called _____.
A) Pioneer succession
B) Primary succession
C) Climax community
D) Secondary succession

ANSWER KEY

TOPIC-WISE MCQs

1	A	11	C	21	B	31	C	41	B
2	C	12	B	22	A	32	D	42	C
3	A	13	B	23	A	33	C	43	C
4	A	14	B	24	C	34	D		
5	D	15	B	25	D	35	C		
6	B	16	B	26	C	36	B		
7	C	17	C	27	C	37	A		
8	A	18	D	28	D	38	D		
9	A	19	C	29	D	39	D		
10	D	20	A	30	A	40	D		

PAST PAPERS MCQs

1	D	11	D	21	D	31	A	41	C
2	A	12	A	22	A	32	C	42	B
3	D	13	C	23	B	33	D	43	A
4	A	14	A	24	C	34	A	44	C
5	A	15	B	25	C	35	D	45	A
6	D	16	A	26	A	36	B	46	D
7	A	17	A	27	B	37	D		
8	B	18	D	28	B	38	B		
9	A	19	B	29	D	39	D		
10	D	20	A	30	C	40	C		

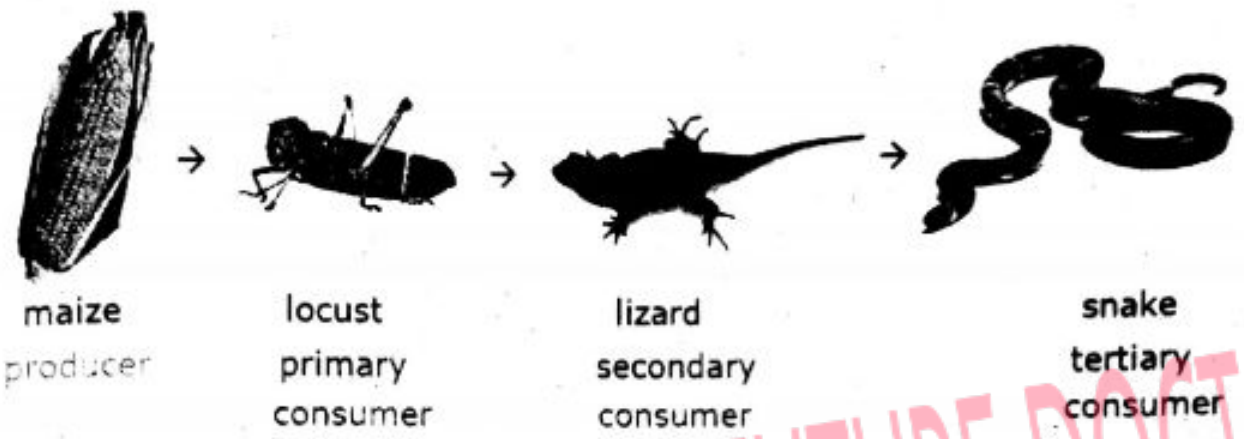
EXPLANATORY NOTES

TOPIC-WISE MCQs

1. **Biomass:** Biomass is plant or animal material used as fuel to produce electricity or heat.
Biome: A large naturally occurring community of flora and fauna occupying a major habitat, e.g. forest or tundra.
Litter: Rubbish such as paper, cans, and bottles left lying in an open or public place.
Food: Any nutritious substance that people or animals eat or drink or that plants absorb in order to maintain life and growth.

2. A series of organisms each dependent on the next as a source of food.

3.

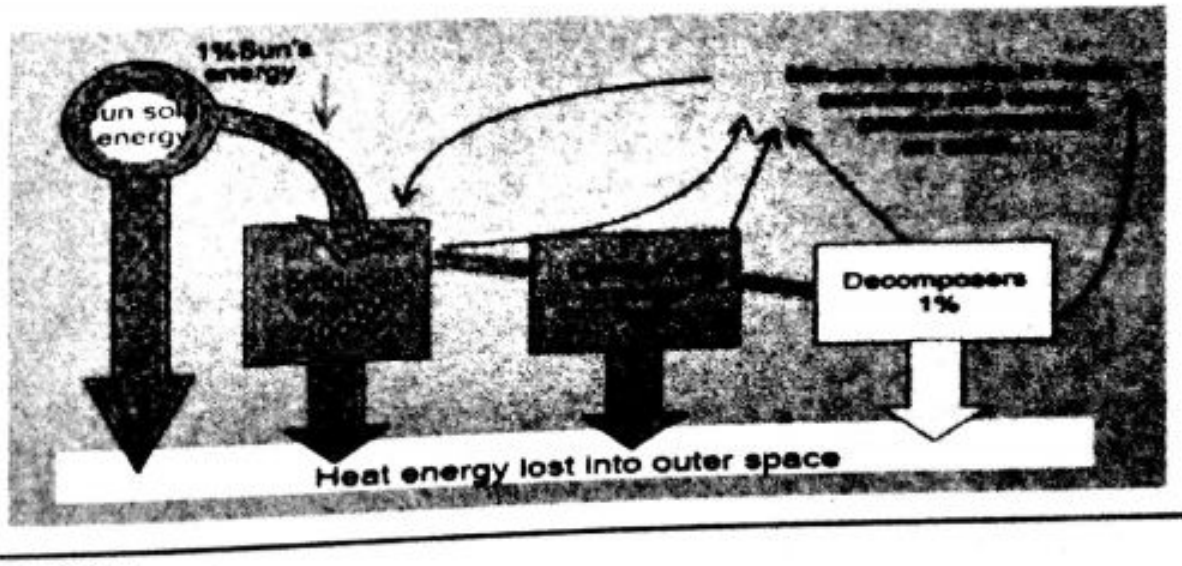


4.

Energy at each Trophic Level frome 1,000,000 Kcal of sunlight per m^2 per yr

5. 1% of the total energy from the sun is trapped by the producers while, the remaining **99%** of solar energy is used to evaporate water, heat up soil and is then lost to the outer space.

6.



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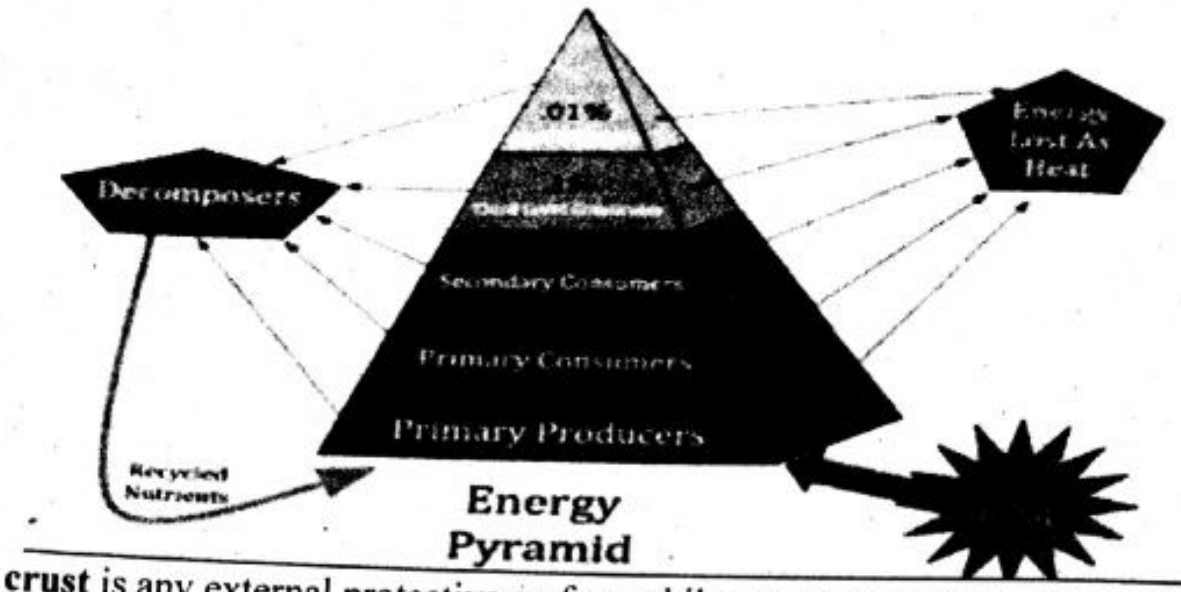

Energy Pyramid

8. A **crust** is any external protective surface while, **crustose** means crusts on the substratum. Special types of lichens get impregnated in the form of crust. Foliose and Fruticose lichens are attached by the substratum at one point only.

9. **Mycorrhiza** is an association between the roots of **plants** growing in acid soil and certain **fungi.** The host heather provides the fungus with an enzyme to digest carbohydrates in leaf litter. In return, the fungus symbiont passes mineral ions from the soil to the host.

10. **Succession** is a sequence of changes in the community structure of an ecosystem over a period of time. Community changes alter the ecosystem in ways that favors the competitors and species to replace their predecessors.

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12. In **Foliage stage** the lichens are just like crumpled leaves attached at one point. It produces shade to the crustose lichens as a result of which their growth is reduced or decreased.

13. In **Foliage stage** the lichens are just like crumpled leaves attached at one point.
Foliage Lichen Stage Examples: Dermatocarpon, Parmellia.

14. **Primary succession:**
Ecosystem is forged from bare rock, sand or clear glacial pool where there was no trace of previous life.
Secondary succession:
New ecosystem develops after an existing ecosystem is disturbed as in case of forced ire or an abandoned farm field.
Secondary succession happens much more **rapidly** than primary succession.

15. **Habitat**: Place where an organism makes its home.
Parasite: Organism that lives in or on an organism of another species and benefits by deriving nutrients at the other's expense.
Predator: An animal that preys on other animals

16. **Species:** Largest group of organisms in which any two individuals of the appropriate sexes or mating types can produce fertile offspring.
Populations: Number of all the organisms of the same group or species who live in a particular geographical area.
Community: A group of several species living together with mutual tolerance or adjustment and beneficial interactions in a natural area.

17. **Predation**: Interaction between the two organisms in which one organism kills and feeds on the second organism.
Parasitism: Association between a host and a parasite, which involves providing the parasite with food, protection and conditions for its survival.
Mutualism: Relationship between two organisms in which both the organisms benefit from each other.

18. **Predation**: Interaction between the two organisms in which one organism kills and feeds on the second organism.
Mutualism: Relationship between two organisms in which both the organisms benefit from each other.
Decomposition: Process by which dead organic substances are broken down into simpler organic or inorganic matter.

19. **Commensalisms**: In this type of relationship only one organism benefits from the relationship e.g. Shark & Remoras relationship.

20. **Mycorrhiza** is an association between the roots of **plants** growing in acid soil and certain **fungi.** The host provides the fungus with an enzyme to digest carbohydrates in leaf litter. In return, the fungus symbiont passes mineral ions from the soil to the host.

21. **Symbiosis:** Association between two organisms, which brings benefit to both the organisms' e.g. Root Nodules and Mycorrhiza.
Predation: Interaction between the two organisms in which one organism kills and feeds on the second organism e.g. cat/mouse and Fox/rabbit
Parasitism: Association between a host and a parasite, which involves providing the parasite with food, protection and conditions for its survival e.g. tape worm in intestine of man
Mutualism: Relationship between two organisms in which both the organisms benefit from each other e.g. Lichens

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23. A **habitat** is a place where an organism lives. A **habitat** meets all the environmental conditions an organism needs to survive.

24. **Fox/Rabbit:** Predation
Shark/Remoras: Commensalism
Seal/Fish: Predation
Cat/Mouse: Predation

25. **Parasitism:** Association between a host and a parasite, which involves providing the parasite with food, protection and conditions for its survival e.g. tape worm (Parasite) in the intestine of man

26. Renewable Resources: Water, Nitrogen, Carbon,
Non-Renewable Resources: Metals, Oils, Gas, Energy

27. The three main **cycles** of an **ecosystem** are the water **cycle**, the carbon **cycle** and the nitrogen **cycle**. These three **cycles** working in balance are responsible for carrying away waste **materials** and replenishing the **ecosystem** with the nutrients necessary to sustain life.

28. Nitrogen fixation: The conversion of nitrogen to ammonia or nitrogenous compounds.
Nitrogen assimilation: The formation of organic nitrogen compounds like amino acids from inorganic nitrogen compounds.
Nitrification: Oxidation of ammonia or ammonium ions with the help of bacteria.
29. Carbon monoxide is produced by incomplete combustion of carbon compounds.
30. Species: Largest group of organisms in which any two individuals of the appropriate sexes or mating types can produce fertile offspring.
Populations: Number of all the organisms of the same group or species who live in a particular geographical area.
Community: A group of several species living together with mutual tolerance or adjustment and beneficial interactions in a natural area.
Food web: Combination of many food chains.
31. Primary succession: Ecosystem is forged from bare rock, sand or clear glacial pool where there was no trace of previous life.
Secondary succession: New ecosystem develops after an existing ecosystem is disturbed as in case of forced ire or an abandoned farm field
Reforestation: A community of grasses was found growing in already burnt forest area.
Desertification: The process by which fertile land becomes desert .
32. Acid rain occurs when water in the air reacts with sulphur oxides and nitrogen oxides that result from the combustion of fossil fuels.
33. UV rays directly hit the structure of DNA and cause mutations in it.
34. Over urbanization, Industrialization and deforestation are the causes of greenhouse, which is gradually increasing temperature on the earth.
35. 1% of the total energy from the sun is trapped by the producers while, the remaining 99% of solar energy is used to evaporate water, heat up soil and is then lost to the outer space.
36. Greenhouse gas: Any gas that has the property of absorbing infrared radiation emitted from Earth's surface e.g. CO, CO_2 CFC,
37. Ozone layer depletion is a hole in earth's protective shield.
38. With depletion of Ozone layer, UV radiation reaches on earth surface, UV radiations are linked with human problems e.g. Skin cancers, Cataract, Decreased immunity etc.
39. The decline in the thickness of the ozone layer is caused by increasing level of chlorofluorocarbons (CFCs), which contains chlorine, fluorine, and carbon. UV rays release chlorine from chlorofluorocarbons which destroy ozone layer.
40. Ozone layer is present above the earth from 10-50km in the region called stratosphere.
41. Bioremediation employs the use of living organisms, like microbes and bacteria, in the removal of contaminants, pollutants, and toxins from soil, water, and other environments.
42. Dead algae of aquatic life are decomposed by aerobic bacteria, which deplete the water oxygen content, causing death of aquatic animals through lack of oxygen. So only anaerobic bacteria can survive in this environment.
43. Eutrophication is a natural process of excessive enrichment of water with nutrients by which large amount of living organic matter grows in the water. Human activities accelerate eutrophication by adding mineral and organic nutrients in larger quantities than nature would provide as excreta and fertilizer

PAST PAPERS MCQs

1. Biotic component: All living organisms (Plants and Animals).
A-Biotic component: Non-living components (air, water, and soil).

2. Saprophytic: Feeding on dead and decaying matter.
Symbiotic: Association between two organisms, which brings benefit to both the organisms'.
Parasitic: Association between a host and a parasite, which involves providing the parasite with food, protection and conditions for its survival.

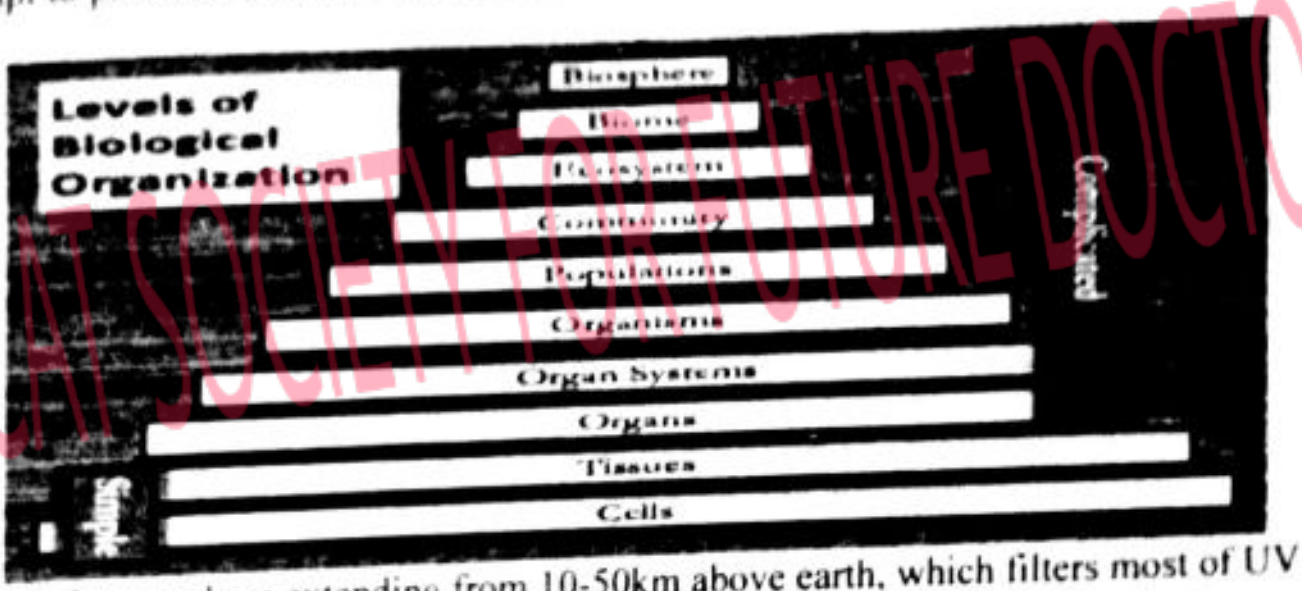
3. Primary succession: Ecosystem is forged from bare rock, sand or clear glacial pool where there was no trace of previous life.
Secondary succession: New ecosystem develops after an existing ecosystem is disturbed as in case of forced ire or an abandoned farm field.

4. The nutrient cycles are also called biogeochemical cycles as the nutrients move from living to nonliving to living portions of ecosystem in a cyclic manner.

5. Nuclear energy is obtained by the fission of radioactive atom. Radioactive wastes as a result of nuclear energy cause radiation pollution.

6. Lichens (Fungi & Algae) indicate the presence of the pollutant and can also be used in an attempt to provide additional information about the amount and intensity of the exposure

7.



8. A layer of atmosphere extending from 10-50km above earth, which filters most of UV radiation and protects us from these harmful rays of sun, is known as ozone layer.

9. The natural energy trapped underground is called geothermal energy. Hot water and streams carrying geothermal energy comes up to the surface in some parts of the world. This type of energy is free and can lasts for a long time

10. Symbiosis: Association between two organisms, which brings benefit to both the organisms' e.g. Root Nodules and Mycorrhiza.
Predation: Interaction between the two organisms in which one organism kills and feeds on the second organism e.g. cat/mouse and Fox/rabbit
Parasitism: Association between a host and a parasite, which involves providing the parasite with food, protection and conditions for its survival e.g. tape worm in intestine of man.
Commensalisms: In this type of relationship only one organism benefits from the relationship e.g. Shark & Remoras relationship

11. Ectoparasites: Outside the body of the host e.g. fungi causing dandruff in hair
Endoparasite: Living inside the body of the host e.g. tape worm in intestine of man
Obligate parasite: Organism that cannot complete its life-cycle without exploiting a suitable host.
Facultative parasite: Organism which can act as a parasite but does not rely on its host to continue its life-cycle.

12. Human activities accelerate natural process of eutrophication by adding mineral and organic nutrients in larger quantities than nature would provide as excreta and fertilizer etc.

13. Ecosystem: Community of living organisms in conjunction with the nonliving components of their environment.
Habitat: Environment of a particular organism population community.
Niche: Role a species plays in a community including behavior and influence.
Biosphere: Thin layer of earth in which all living organisms exist.

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15. Eutrophication is a natural process of excessive enrichment of water with nutrients by which large amount of living organic matter grows in the water. Human activities accelerate eutrophication by adding mineral and organic nutrients in larger quantities than nature would provide as excreta and fertilizer

16. Food Chain is a process of eating and being eaten by which recycling of materials and flow of energy takes place. Food web is the combination of many food chains.

17. Community: Population of different species living in the same habitat.
Ecosystem: Community of living organisms in conjunction with the nonliving components of their environment.
Biosphere: Thin layer of earth in which all living organisms exist.

18. Niche is a role played by species in a community including behavior and influence.

19. Acid rain occurs when water in the air reacts with sulphur oxides and nitrogen oxides that result from the combustion of fossil fuels

20. A trophic level is the group of organisms within an ecosystem which occupy the same level in a food chain.
T_1: First trophic producer level
T_2: Primary consumer
T_3: Secondary Consumer
T_4: Tertiary Consumer

21. Biosphere: Thin layer of earth in which all living organisms exist.
Community: Population of different species living in the same habitat.
Lithosphere: The rigid outer part of the earth, consisting of the crust.
Hydrosphere: Combined mass of water found on, under, and above the surface of a planet.

22. Ozone layer is extending from 10-50km above earth, which filters most of UV radiation and protects us from these harmful rays. So, as a result of destruction of ozone layer there is increase of UV radiation.

23. Symbiosis: Association between two organisms, which brings benefit to both the organisms' e.g. Root Nodules and Mycorrhiza.
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25. Eutrophication is a natural process of excessive enrichment of water with nutrients by which large amount of living organic matter grows in the water. Human activities accelerate eutrophication by adding mineral and organic nutrients in larger quantities than nature would provide as excreta and fertilizer.

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Commensalisms: In this type of relationship only one organism benefits from the relationship e.g Shark & Remoras relationship

28. T1: First trophic producer level (Plants)
T2: Primary consumer (Herbivores)
T3: Secondary Consumer (Carnivores or omnivores)
T4: Tertiary Consumer (Predator of carnivores)

29. 4 food chains are present in food web
T1: First trophic producer level (Plants)
T2: Primary consumer (Herbivores)
T3: Secondary Consumer (Carnivores or omnivores)
T4: Tertiary Consumer (Predator of carnivores

30. Primary succession: Ecosystem is forged from bare rock, sand or clear glacial pool where there was no trace of previous life.
Secondary succession: New ecosystem develops after an existing ecosystem is disturbed as in case of forced ire or an abandoned farm field.
Seres: Individual succession.
Xeroses: Changes in community structure during xerarch succession.

31. A layer of atmosphere extending from 10-50km above earth, which filters most of UV radiation and protects us from these harmful rays of sun, is known as ozone layer.

32. Light rays from the sun are absorbed by CO_2 and re-radiate as Infra-Red radiations.

33. SO_2 and Oxides of Nitrogen are produced by burning of fossils fuels and are responsible for acid rain. These oxides combine with water vapors and produce Nitric acids and sulphuric acids etc.

34. Ozone layer is present above the earth from 10-50km in the region called stratosphere.

35. T1: First trophic producer level (Plants)
T2: Primary consumer (Herbivores)
T3: Secondary Consumer (Carnivores or omnivores)
T4: Tertiary Consumer (Predator of carnivores)

36. Energy in the form of radiant heat and light from the sun flows through an ecosystem passing through the different trophic levels and radiates again back into outer space.
37. The decline in the thickness of the ozone layer is caused by increasing level of chlorofluorocarbons (CFC_s), which contains chlorine, fluorine, and carbon.
38. Evolution: Change in the characteristics of a species over several generations.
Zoogeography: Geographical distribution of animals.
Paleontology: Identification and interpretation of fossils.
Biodiversity: Variability among living organisms.
39. T1: First trophic producer level (Plants)
T2: Primary consumer (Herbivores)
T3: Secondary Consumer (Carnivores or omnivores)
T4: Tertiary Consumer (Predator of carnivores)
40. The change from bare rock or open area is rapid, especially in the initial stages and follows a series of recognizable and hence predictable stages. This process is called succession.
41. All the food chains and food webs begin with First trophic producer level that is green plants.
42. Pesticides: Chemicals used for destroying agricultural competitors.
Antibiotics: Destroy or slow down the growth of bacteria.
Disinfectants: Chemical agents designed to inactivate or destroy microorganisms on inert surfaces.
Chemotherpeutic agents: Directly or indirectly inhibit the uncontrolled growth and proliferation of cancer cells
43. Denitrification is the conversion of nitrates into nitrogen gas and nitrous oxide gas by the denitrifying
44. Insecticide: Insects Killers
Fungicide: Fungi Killers
Herbicide: Weed killers
45. CO is more toxic due to the property of stability.
46. Primary succession: Ecosystem is forged from bare rock, sand or clear glacial pool where there was no trace of previous life.
Secondary succession: New ecosystem develops after an existing ecosystem is disturbed as in case of forced ire or an abandoned farm field.
In each case succession is initiated by a few hardy invaders called pioneers and it ends with a diverse and relatively stable climax community.