

G.C.E. (A.L) Support Seminar - 2016
Biology - Paper I

Qu. No.	Answer	Qu. No.	Answer
(1)	3	(26)	3
(2)	2	(27)	3
(3)	3	(28)	3
(4)	5	(29)	2
(5)	3	(30)	4
(6)	3	(31)	1
(7)	2	(32)	5
(8)	4	(33)	4
(9)	1	(34)	5
(10)	4	(35)	3
(11)	5	(36)	1
(12)	1	(37)	4
(13)	2	(38)	2
(14)	5	(39)	4
(15)	4	(40)	2
(16)	5	(41)	2
(17)	3	(42)	4
(18)	4	(43)	4
(19)	5	(44)	1
(20)	1	(45)	2
(21)	3	(46)	3
(22)	2	(47)	5
(23)	1	(48)	2
(24)	4	(49)	4
(25)	5	(50)	1

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(01 mark each total marks 50)

Biology

Answer Guide

Part A - Structured Essay

1. (A) (i) **Name the main nucleotide which supplies energy for metabolic activities in living cells.**
ATP / Adenosine Tri Phosphate (1 × 2)
- (ii) **Name the major component molecules of the above mentioned nucleotide.**
Ribose sugar, Adenine base, Phosphate group (1 × 2)
- (iii) **State the main reason to consider the compound mentioned above in A (i) is suitable for its function.**
Presence of high energy Phosphate bond which can dissociate easily. (1 × 2)
- (iv) **What is the significance of self replication of DNA in cell division.**
Produce identical DNA molecules for daughter cells. (1 × 2)
- (v) **Name two major enzymes which are important in DNA self replication and state their specific functions.**

Enzyme	Function
• DNA Helicase	Separation of 2 strands of DNA by breaking H bonds.
• DNA Polymerase	Synthesis of new chains by joining nucleotides.

(4 × 2)

- (vi) **What is meant by a recombinant DNA molecule.**
A DNA molecule which can act as a single unit produced by joining of DNA obtained from different species.
- (vii) **State three applications of DNA recombination technology in Medicine.**
- Production of human Insulin / Growth hormone.
 - Production of Hepatitis B antigen.
 - Production of blood clotting factors.
 - Production of Interferon. (any 3 × 2)
- (viii) **Name an enzyme for each of the following functions in genetic recombinant technology.**

Function	Enzyme
Cutting DNA at specific sites	Restriction endonuclease
Joining of DNA fragments	DNA ligase (2 × 2)

- (B) (i) **Name the an enzyme for each of the following functions.**

Function	Structure
a. Synthesis of membrane phospholipids	Rough endoplasmic reticulum
b. Cytoplasmic Streaming	Cytoskeleton
c. Production of ribosome	Nucleus / Nucleolus
d. Prevent leakages through cells	Tight junctions

(4 × 2)

(ii) (a) What is 'sarcomere'?

It is a functional unit of a striated muscle, which is located between two adjoining Z lines of a myofibril of striated muscle fibre. (1 × 2)

(b) Name the types of muscles in which sarcomeres can be seen.

- cardiac muscle
- Skeletal muscle (2 × 2)

(iii) State two physiological differences between muscle types you mentioned in above (ii) (b).

- Cardiac muscles are myogenic while skeletal muscles are neurogenic.
- Cardiac muscle are involuntary while skeletal muscle are voluntary in action.
- Cardiac muscles show rhythmic contractions while skeletal muscles do not show rhythmic contractions.
- Cardiac muscles do not get fatigue while skeletal muscles get fatigue easily. (any2 × 2)

(iv) State four changes occur in a sarcomere during contraction of muscle according to the sliding filament theory.

- Length of I band / zone decreases.
- Length of the H band / zone decreases.
- Actin filaments slide over myosin filaments.
- Length between two Z lines decreases. / Z lines become closer. (4 × 2)

(v) Name the tissues which are important for mechanical support in plants and state how the each tissue is modified for function.

Tissue	Modification	
• Collenchyma	Walls of cell corners are thickened with extra cellulose.	
• Sclerenchyma	Bearing lignified cell walls.	
• Xylem tissue	Cell walls are lignified.	(3 + 3) × 2

(vi) What is the complex tissue type from the tissues you mentioned in B (v) above.

Xylem (1 × 2)

(vii) State two functions of the above mentioned (vi) tissue other than mechanical support.

- Transportation of water.
- Transportation of minerals.
- Transportation of some plant growth substances/ cytokinine / Absisic acid (any 2 × 2)

(C) (i) What are the main functions of human skeletal system?

- Support
- Protection.
- Movements.
- Production of blood cells.
- Storage and Release of Calcium
- Storage and Release of Phosphates (any 5 × 2)

(ii) Name the bones in human vertebral column which are formed by fusion of vertebrae and state the number of fused vertebrae in each.

Bone	Number of vertebrae	
• Sacrum	5	
• Coccyx	4	(4 × 2)

(iii) State two features seen in the human vertebral column that contribute to maintain erect posture.

Presence of 4 curvatures in vertebral column.

Thickening of intervertebral discs/ increased size of vertebral bodies Progressively in downward direction. (2 × 2)

(iv) State one major feature of following vertebrae which can be used to differentiate them from typical vertebrae.

- **Cervical vertebrae** : Presence of transverse foramen for vertebral artery. / Vertebral arterial foramen
- **Thoracic vertebrae** : Presence of facets for articulation with ribs / downward projected long neural spine.
- **Lumbar vertebrae** : Presence of rectangular shaped neural spine.

(3 × 2)

(any 50 × 2 = 100)

2. (A) (i) Name the Kingdoms belong to Domain Eukarya.

Protista

fungi

Plantae

Animalia

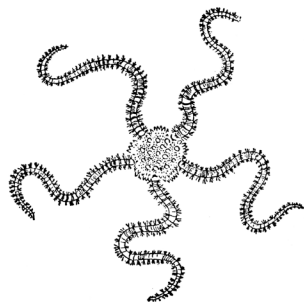
(4 × 2)

(ii) If the given character in the first column is present in the animal phyla given in the table, indicate with a (✓) in the appropriate cage.

character	Animal phyla				
	Coelenterata	Arthropoda	Annelida	Nematoda	Mollusca
Cephalization		✓	✓		✓
Exoskeleton	✓	✓			✓
Circulatory System is absent	✓			✓	

(8 × 2)

(iii) Following questions are based on animals A and B.



A



B

(a) State two major external features which can be used to distinguish animals A and B from each other.

- Arms are distinctly separated from central disc in A, but not in B.
- A possesses an anus, but B does not possess an anus.
- Suckers are absent on tube feet in A, suckers are present on tube feet in B. (any 2 × 2)

(b) Name the animal phylum into which above animals A and B belong to.

Echinodermata (1 × 2)

(c) State two external characteristic features which help to categorize animals A and B into the above mentioned phylum.

- Penta radial symmetry
- Presence of tube feet
- Presence of ambulacral grooves
- Presence of madreporite. (any 2 × 2)

(B) (i) State four reasons to consider that plants of phylum Anthophyta are evolutionary more advanced than that of the plants of phylum Cycadophyta.

- Seeds are enclosed within in the fruit.
- Presence of a flower as the reproductive organ.
- Presence of vessel elements in xylem and sieve tubes and companion cells in phloem.
- Presence non motile male gametes / development of pollen tube to a transport make gametes
External water is not needed for fertilization of gametes.
- Formation of triploid endosperm due to double fertilization. (any 4 × 2)

(ii) What is meant by the terms given below regarding morphological features of flowers.

- (a) Hypogynous flower : A flower in which the ovary is located above the level of other floral parts.
- (b) Epipetaly : Presence of stamens attached to petals.
- (c) Perianth : The outer sterile part of the flower which is not differentiated into corolla and calyx.

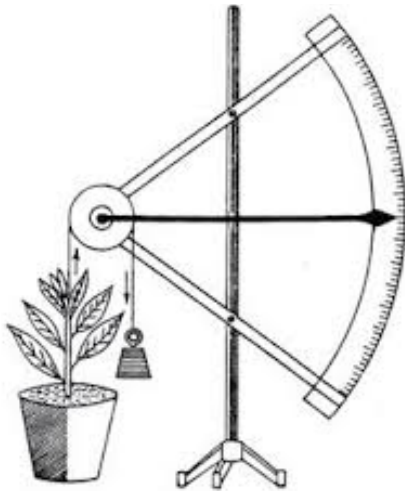
(3 × 2)

(iii) *Pogonatum, Selaginella, Nephrolepis, Cycas, Mangifera*

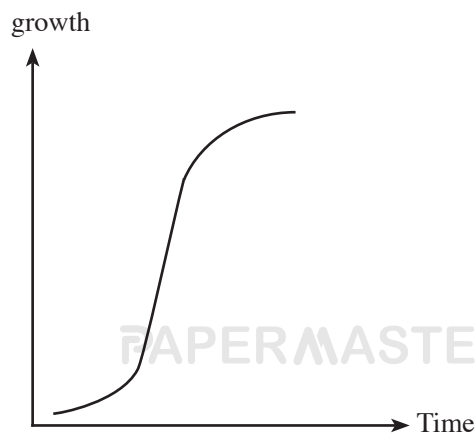
Select and write the relevant genus / genera of plants from the above list compatible to the following features.

- | | |
|--|-------------------------------|
| (a) Presence of biflagellated male gametes | <i>Pogonatum, Selaginella</i> |
| (b) Gametophytes are enclosed by sporophytic tissues. | <i>Cycas, Mangifera,</i> |
| (c) Presence of monoecious photoautotrophic gametophytes. | <i>Nephrolepis</i> |
| (d) Development of pollen tube to conduct male gametes. | <i>Mangifera</i> |
| (e) Sporophyte and gametophytes are independent from each other and autotropic | <i>Nephrolepis</i> |
| (f) Homospory is present | <i>Pogonatum, Nephrolepis</i> |
- (10 × 2)**

(C) (i) Given below is an equipment used in the laboratory.



- (a) Identify the above equipment. (1 × 2)
(Lever) Auxanometer.
- (b) What is the objective of using the above equipment. (1 × 2)
To detect the growth of plant by measuring the increase of height / length of shoot.
- (c) Plot a graph in the given space using the data obtained from above equipment.



Naming 2 axis } (2 × 2)
Shape of the graph }

(ii) State the parameters used to measure the growth of following plant organs.

- (a) A fruit : Increase of volume.
- (b) A leaf : Increase of surface area. (2 × 2)

(iii) State two differences of plant growth substances from animal hormones.

- Plant growth substances are not secreted by specific glands. Animal hormones are secreted by endocrine glands.
- Plant growth substances are transported through xylem, phloem or parenchyma while animal hormones are transported through blood. (2 × 2)

(iv) State a plant growth substance which perform following functions.

Function	Plant growth substances
(a) Inhibit apical dominance	Cytokinin
(b) Promote the elongation of stem	Gibberelin/ Ethylene
(c) Inhibit cambial activity	Abscisic acid (3 × 2)

(v) State three artificial plant growth substances used in agriculture and horticulture and their applications.

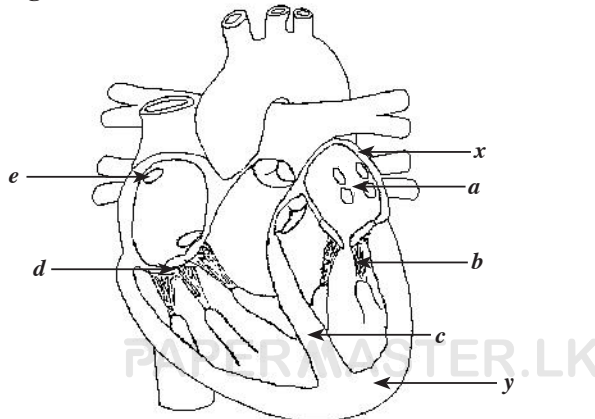
Plant growth substance	Applications
IBA	To induce rooting in stem cuttings. / Induce parthenocarpy
2 4 D / MCPA	As weedicides.
Gibberellin	Induce seed germination/ induction of stem elongation.
Ethylene	Induce ripening of fruit.

any (3 + 3) × 2
(any 50 × 2 = 100)

3. (A) (i) Name the parts labelled as (a) to (e) in the above diagram.

- A pumping device / Heart.
- (Blood) vesseles.
- Circulating fluid. (3 × 2)

(ii) Diagram given below is a Longitudinal section of a human heart.



(a) Name the parts (a) to (e) in the diagram.

(a) - Opening for pulmonary veins.

(b) - Chordae tendinae

(c) - Interventricular septum.

(d) - Tricuspid valve / right atrio ventricular valve.

(e) - Opening of superior Vena cava. (5 × 2)

(b) Why the wall of “Y” is thicker than that of “X”.

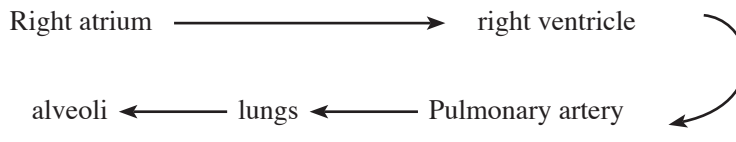
Y has to generate force to pump blood out of the heart throughout the body while X has to generate force to pump blood only to the ventricles which needs relatively low force. (1 × 2)

(c) State the functions of “b” and “d”.

b - Prevent the eversion of atrioventricular valves during ventricular contraction.

d - Prevent back flow of right ventricular blood to right auricle. (2 × 2)

(iii) State the correct order of structures passed by a CO₂ molecule being entered into the heart through vena cava upto respiratory surface of man.



(1 × 2)

(iv) State two structural differences between blood circulatory system and Lymphatic System of man.

- Blood circulatory system possesses a heart but a heart is absent in lymphatic system.
- Blood capillaries are opened at either ends but lymph capillaries originate blindly.
- Blood circulatory system possess arteries and veins but lymphatic system does not possess arteries and veins. (any 2 × 2)

(v) Name the two major vessels of lymphatic System of man.

- Right Lymphatic duct.
- Thoracic duct. (2 × 2)

(vi) What is the origin of lymph ?

- Tissue fluid (1 × 2)

(B) (i) What is meant by internal environment of the body?

The immediate surrounding of cells which provide the medium, in which they have to live (1 × 2)

(ii) State the major factors in the internal environment that must be controlled in human body.

- Concentration of chemical constituents /eg glucose, ions.
- Maintenance of relative amount of water and solutes.
- Body temperature. (3 × 2)

(iii) Name the hormones which increase blood glucose level of man.

Glucagon, Thyroxin, Cortisol, Adrenaline (4 × 2)

(iv) State the major factors which are controlled in osmoregulation in man.

- Controlling the amount of water.
- Controlling the amount of salt gained and lost by the body. (2 × 2)

(v) Name the major osmoregulatory organ in human body.

- Kidney (1 × 2)

(vi) Name the two hormones which are directly involved in osmoregulation in humans.

- ADH
- Aldosterone (2 × 2)

(vii)(a) State the secretory site and target / structure of the hormones you mentioned in above 3 B (vi).

Hormones	Secretory site	Target	
• ADH	Posterior pituitary	Distal convoluted tubules and collecting duct.	
• Aldosterone	Adrenal Cortex	Distal convoluted tubules	(4 × 2)

(b) How the secretion of above hormones are stimulated ?

- ADH - Increased osmotic pressure in blood
- Aldosterone - Decreased blood pressure or blood volume/
reduced Na⁺ concentration of blood (2 × 2)

(C) (i) State two organic components and two inorganic components translocated in phloem tissue in plants.

Organic Components	Inorganic Components	
• Sucrose	• Water	
• Plant growth substances.		
• Amino acids	• K ⁺ , PO ₄ ⁻³	
• Vitamins		(2 + 2) × 2

(ii) State four special features of phloem translocation.

- Bidirectional.
- Transport take place under hydrostatic pressure.
- large amount of substances are transported
- Distance and rate of transport is high. any (3 × 2)

(iii) Name the nutrients that are obtained in gaseous form by plants.

- Carbon dioxide
- Oxygen (2 × 2)

(iv) State three natural processes which increase the available form of nitrogen in soil.

- Nitrogen fixation.
- Nitrification.
- Lightning. (3 × 2)

- (v) Name a species of chemo autotrophic organism which reduce nitrates to gaseous nitrogen in soil.

Thiobacillus denitrificans (1 × 2)

Total marks 50 × 2 = 100

4. (A) (i) Name the layers of cross section of the Earth from outer to inner in order.

Crust, mantle, core (1 × 2)

- (ii) (a) Name the major layers of atmosphere from bottom to upper according to the temperature.

Troposphere, Stratosphere, Mesosphere, Thermosphere (1 × 2)

- (b) Name the layer out of the above mentioned layers in 4 (ii) (a) in which that ozone layer is located.

Stratosphere (1 × 2)

- (iii) State two sources of pollutants that could pollute each of the following resources.

(a) Ocean : Industrial effluent/oil spills/ Garbage (2 × 2)

(b) Air : Buring of fossil fuel / Emissions from automobiles/ Refrigerators/ air conditioners/ aerosol. (2 × 2)

(c) Soil : Fertilizer/ agro chemicals/ Solid wastes/ radio active wastes/ Industrial wastes (2 × 2)

- (iv) State the impact of excessive use of fertilizers in water bodies.

- NO_3^- and PO_4^{3-} of levels of water increases, creating to
- Increased growth of cyanobacteria and Algae / leads to Algal blooms.
- O_2 Concentration of the water body decreases at night / increasing BOD value.
- Death of fish occur / death of aquatic organisms.
- Growth of bacteria on dead bodies and anaerobic decomposition.
- Releasing bad smelling gases/ leading to bad odour/ H_2S , ammonia are released.(6 × 2)

- (v) What is meant by 'Air Pollution'?

Deterioration of the quality of air by releasing substance or energy in such quantities which prevent smooth/ balanced functioning of natural processes and produce undesirable environmental and health effects. (1 × 2)

- (vi) Name an air pollutant which is responsible for the following undesirable impacts.

- (a) Cause photochemical smog.

Oxides of nitrogen / Hydrocarbons. (1 × 2)

- (b) Decrease in O_2 carrying capacity of blood.

Carbon monoxide / Oxides of nitrogen (1 × 2)

- (c) Bronchitis and emphysema.

SO_2 (1 × 2)

(B) (i) (a) What is meant by Bio diversity?

Variability among organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part of. **(1 × 2)**

(b) Name the three basic components of Bio diversity.

- Genetic diversity.
- Species diversity.
- Eco-system diversity. **(3 × 2)**

(c) What is the importance of conserving Bio diversity?

- Ensure of long term survival of many species as possible.
- Protection of species that are in danger of extinction. **(2 × 2)**

(ii) Name the major types of Bio diversity conservation method applied in each of the following instances.

- (a) Reintroduction of species : In - situ conservation.
- (b) Maintain field gene banks : Ex - situ conservation.
- (c) Traditional home gardens : In - situ conservation. **(3 × 2)**

(iii) Name the International conventions which contribute to conservation of bio diversity and state the specific objective of each.

Convention	Objective
RAMSAR	Conservation of internationally important wetlands
CITES	to Ensure that international trade in specimens of wild animals and plants does not threaten their survival
Bio diversity convention	Protection of bio diversity, Sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources.

(any 2 + 2) × 2

(C) (i) What is meant by microbial food spoilage?

Making food unfit for human consumption due to the growth of micro organisms in food that changes physical, chemical & biological structure. **(1 × 2)**

(ii) State the reasons for spoiling fish by micro organisms easily.

- Fish contain suitable optimum pH for bacterial growth.
- high moisture content of fish which favour bacteria growth.
- It is a good nutrient source for growth of micro organisms.
- Absence of natural covering to prevent entrance of microbes. **(4 × 2)**

(iii) What is the group of micro organisms which spoil fish.

Bacteria (1 × 2)

(iv) Briefly explain the chemical reaction occur during spoilage of fish.

- Putrefaction.
- Protein food. $\xrightarrow[\text{Micro organisms}]{\text{Proteolytic}}$ Amino acids + Amines + Ammonia + H₂S (7 × 2)

(v) Name three common method used to preserve fish and state the principle / principles applied in each method.

Method	The way of control
Canning	prevent entering of micro organisms/ prevent growth and activity of micro organisms. Destroying all forms of micro organisms.
Drying/ Sun drying/ Smoking/ salt and drying	prevent growth & activity of micro organisms.
Low temperature preservation (Freezing)	Prevent the growth and activity of micro organisms.

(3 + 3) × 2

any 50 × 2 = 100

* *

5. Describe the role of chloroplast in photosynthesis.

1. Photosynthesis occurs within a chloroplast in two steps.
2. Light reaction
3. Dark reaction / Calvin cycle
4. Light reaction - occurs at thylakoid membranes/ grana and lamella when light is present.
5. Dark reaction - occurs in the chloroplast stroma independently from light.

In the light reaction;

6. Photosystem I and photosystem II are located on thylakoid membranes,
7. photosynthetic pigments at antennal complexes,
8. absorb light rays of wavelength of blue and red range of visible spectrum
9. is transmitted to the reaction centers (by resonance)
10. Special chlorophyll molecules of reaction centers become excited.
11. and electrons are boosted to high energy levels / electrons become excited
12. These high energy electrons are captured by primary electron acceptors located at thylakoid membranes.
13. and transmit through the series of electron carrier molecule on thylakoid membranes.
14. Energy is emitted when high energy electrons transmit in downhill direction
15. And ATP is produced using this energy / photophosphorylation takes place
16. Electrons emitted from PS II replace the electrons of Photosystem I
17. Photolysis of water takes place at Photosystem II
18. O_2 is liberated
19. H^+ are supplied to the Photosystem I
20. Electrons produced by photolysis of water are used to replace the electron deficiency of Photosystem II
21. Electrons boosted to high energy levels in Photosystem I, are received by primary electron acceptors
22. and transmitted to $NADP^+$ through a series of electron carriers.
23. $NADP^+$ is reduced here by using H^+ provided by photolysis of water from PS II.
24. Enzymes located on thylakoid membranes involve in this reduction of $NADP^+$
25. $NADPH$ and ATP produced in light reaction participate to produce carbohydrates in the Calvin cycle.

Dark reaction

26. RUBP and RUBP carboxylase required for this, are located in the stroma of chloroplast.

This occurs in three steps.

27. carboxylation

28. reduction of PGA

29. regeneration of RUBP

30. RUBP Captures CO₂ and produce a 6C unstable compound

31. This step is catalysed by RUBP carboxylase

32. 6C unstable compound soon breaks into two molecules of 3C PGA.

33. PGA is reduced to PGAL by all NADPH and

34. a part of ATP produced in light reaction

35. a part of this PGAL produce hexoses/ carbohydrates through a series of reactions.

36. remaining PGAL regenerate RUBP through RUMP by a series of reacton

37. using the rest of the ATP

38. Simple sugars produced, are converted to starch and get stored temporary in the stroma of choroplast.

39. raw materials and bi-products are transported across membranes of the chloroplasts to carry out an efficient photosynthesis

(any 38 × 4 = 152)

(Maximum 150)

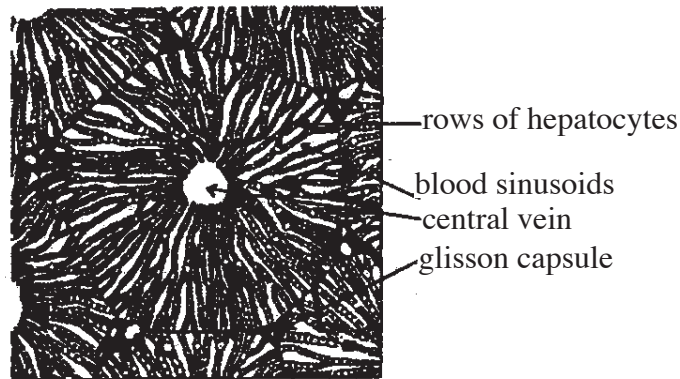
6. (a) State the location of human liver.

1. below the diaphragm
2. In abdominal cavity
3. In upper right region.

(b) Describe the gross and tissue structure of human liver.

4. upper and anterior surfaces of liver are smooth :
5. Consists of four lobes.
6. right lobe.
7. left lobe.
8. caudate lobe.
9. quadrate lobe.
10. all lobes are enclosed in fibrous capsule
11. lobes are made up of tiny lobules.

12. lobules are hexagonal in shape.
13. are formed by pairs of hepatocytes rows.
14. hepatocytes rows radiate as pairs from the central vein in each lobule
15. in between pairs of hepatocytes rows liver sinusoids are located
16. Sinusoids are dilated blood capillaries with incomplete walls.
17. Kuffer cells which is a type of macrophages are found in the lining of sinusoids..
18. Within a pair of liver cells bile canaliculi are located.
19. Glisson's capsules are located in the connective tissue in between of each liver lobules.
20. Each Glisson's capsule mainly contains a branch of Hepatic portal vein.
21. a branch of hepatic artery.
22. and a branch of bile duct.



(c) Describe the contribution of human liver for regulation of physical nature and chemical composition of internal environment.

23. Regulation of blood glucose level
when blood glucose level rises than normal level
24. Glucose is converted in Glycogen and fat with the help of insulin and stored in liver cells.
25. Excessive glucose is oxidized within liver cells
when blood glucose level is decreased than normal level
26. Stored glycogen in the liver is converted into glucose by glucagon and released to blood.
27. liver regulates lipid content in the body by accelerating oxidizing of stored fat in it.
28. liver synthesizes non essential amino acid.
29. Detoxification of alcohol, microbial toxins and some drugs.
30. Production of heat to regulate body temperature/ Heat produces in the liver due to high metabolic rate distribute heat through blood.

31. Inactivation and removal of hormones.
32. Breakdown of hemoglobin.
33. Breakdown of red blood cells which have completed their life cycles
34. Storage of blood.
35. Storage of fat soluble vitamins A, D, E and K
36. Storage of iron and copper.
37. Synthesis of plasma proteins such as of Albumin. Globulin and blood clotting factors.
38. Synthesis of cholesterol.
39. Production of urea / excess amino acids are deaminated to produce urea.

(any 37 × 4 = 148)

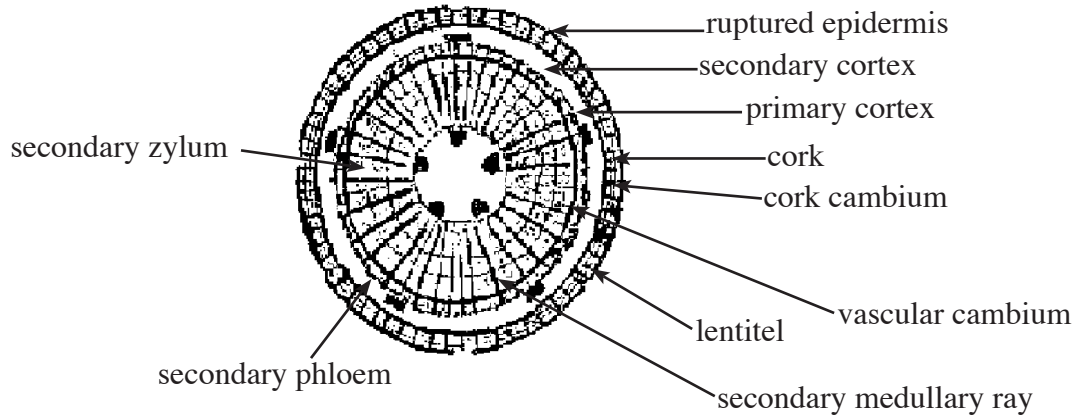
(diagram = 04)

(maximum 150)

7. (a) State the types of meristems according to the localization in plant body and describe the locations and the functions of each.

1. Apical meristems.
2. are called root apices when located at root apex.
3. root apices involve growing of root.
4. When located at stem apex are called stem apices.
5. stem apices/ shoots involve in growth of stems / shoots.
6. intercalary meristems are located at
7. Leaf bases of grass,
8. nodes of the stems.
9. increase the length of stems / internodes.
10. lateral meristems are
11. vascular cambium.
12. the cork cambium
13. in-between xylem and phloem of vascular cambium of dicot stem
14. the increases the diameter of stem and root / girth / involves in secondary growth.
15. the cork cambium is located in the cortex of stem and root pericycle area of
16. cork cambium increases the diameter of stem and root.

(b) Describe the role of secondary meristems of a dicot stem.



(any 8 × 1 = 8)

17. In primary stem, intrafascicular cambium become activated in between xylem and phloem.
18. a parenchyma cell layer of primary medullary rays gain meristematic ability.
19. and differentiate into interfascicular cambium.
20. vascular cambium /cambial ring is formed by the fusion of intra fascicular and interfascicular cambium.
21. Due to action of vascular cambium, new cells are produced in inward and outward directions of the stem.
22. Secondary xylem is formed by the cells produced in inward direction.
23. Secondary phloem is formed by the cells produced in outward direction.
24. Secondary xylem and secondary column are arranged circularly in the stem
25. Parenchyma cells are produced in both inward and outward directions.
26. Secondary medullary rays are formed by such parenchymatous strands.
27. The diameter of the stem increases due to formation of secondary xylem and secondary phloem.
28. Stem cortex is pushed outward / due to new tissues added to interior
29. Therefore, a cell layer in cortex gets meristematic ability and becomes cork cambium.
30. secondary cortex is produced by cells produced towards interior
31. cells produce outward from the cork.
32. lenticels contain complementary cells.
33. secondary xylem become wood when matured.
34. all tissues outer to vascular cambium become bark.
35. Cork cambium and secondary cortex together form periderm
36. Annual rings form in wood due to seasonal changes.

(any 36 × 4 = 144)

(labeled diagram 8)

(Total = 152)

(Maximum = 150)

8. (a) Describe the contribution of mitosis and meiosis for continuity of life and evolution process.

1. Sexually reproducing
2. diploid animals
3. by meiosis
4. Produce haploid gametes
5. Plants produce haploid spores.
6. In plants, gametes are produced by mitosis in gametophytes.
7. Gametes fertilize and produce diploid sporophyte generation.
8. and maintain the chromosome number within the species from generation to generation
9. Genetically Identical daughter cells are produced during mitosis.
10. Therefore, multicellular organisms maintain the genetic constituent of their cell during growth,
11. during their embryonic development,
12. Replacement of tissues.
13. And regeneration of some animals, mitosis is important.
14. During asexual reproduction of some animals
15. increase their number of organisms by mitosis
16. eg :- *Hydra/ Paramecium*
17. During prophase I of meiosis
18. Due to exchange of parts of chromatids of homologous pairs/crossing over
19. genetic variation in offsprings takes place by production of new allele combination between homologous chromosomes
20. In meta phase I of meiosis
21. due to the random orientation of homologous chromosomes on the equator.
22. cause random combination of parental chromosomes
23. result new genetic variations among offspring.
24. these type of variations contribute for evolution.

(b) Explain how the natural selection is important for evolution of life.

25. there are morphological,
26. behavioral and
27. structural differences among organisms of a species.
28. These are variations
29. some variations are favourable, some are unfavourable,

30. some favourable variations are heritable, some are non – heritable
31. There is a competition between organisms of a species for food, shelter or for reproductive partners.
32. In this competition, organisms with favourable variations establish in the population.
33. They pass their favourable variation to the next generation by reproduction
34. These organisms are more adapted to the environment with the time
35. Organisms with favourable character increase in number with the time.
36. Therefore, most fitted organisms are selected by the nature./ natural selection occur
37. Organisms having unfavourable characters remove from the population with the time.
38. Due to not getting chances for reproduction
39. as they get failed in the competition.

(any 38 × 4 = 152)

(Maximum = 150)

9. Describe the role of micro organisms in the following processes.

(a) Production of vinegar

1. phloem sap of coconut tree is used.
2. sucrose in sweet toddy is hydrolyzed into glucose.
3. by *Saccharomyces cerevisiae*.
4. from sucrase / invertase enzyme.
5. this sucrose is converted to ethanol and CO₂
6. by alcoholic fermentation / anaerobic oxidating
7. *Saccharomyces cerevisiae* participate to
8. Ethyl alcohol is converted into acetic acid
$$(C_2H_5OH + O_2 \longrightarrow CH_3COOH + H_2O)$$
9. by aerobic oxidation
10. by *Acetobacter aceti* and
11. *Gluconobacter*.

(b) production of compost.

12. decomposing fertilizer / compost is produced
13. by using natural decomposing ability of microorganisms
14. heterotrophic fungi and
15. bacterial activity are used here
16. compost production is done under warm.
17. moist

18. aerobic conditions
19. by a mixed population of microorganisms
20. by decomposing organic mater.

(c) Extraction of Metal extraction by microbial leaching..

21. to extract copper from low grade ores containing iron and sulphur/ (calcoprytes)
22. *Thiobacillus ferroxidans* and
23. *Thiobacillus thiooxidans*
24. like chemoautotropic bacteria are used.
25. In their metabolism or chemosynthesis, bacteria produce,
26. H_2SO_4 and
27. Fe^{+3} .
28. by those ores are oxidized
29. and copper in it is converted to $CuSO_4$
30. this $CuSO_4$ is electrolyzed to extract copper.

(d) Coir production

31. to obtain coir by coir retting
32. aerobic as well as anaerobic
33. heterogeneous population of microbes are used.
34. specifically bacteria are used.
35. this process is called retting
36. this loosening of fibres in plant sources
37. pectinase enzyme secreted by micro organisms is used here.
38. plant parts are immersed under water for varying lengths of time for retting.

(any 38 × 4 = 152)

(maximum 150)

10. Write short notes on the following.

(a) Human brain stem.

The parts belong to brain stem are,

1. Pons varoli
2. Medulla oblongata
3. Mid brain

Pons varoli

4. located in front of the cerebellum, below the mid brain and above the medulla oblongata
5. Consists of peripheral white matter and inner gray matter
6. It consists of solid mass of neuron and fibers.
7. It joins two hemispheres of cerebellum
8. Intergrates information transmit in upward and downward directions.
9. Regulate lung ventilation.

Medulla oblongata

10. Located below pons varoli and above the spinal cord
11. Consists of peripheral white matter and central gray matter
12. Respiratory centre and cardio vascular centers are located in the medulla oblongata.

Functions

13. regulate the rate and force of heart beat / control the blood pressure
14. affect the heart beat and respiratory rate
15. control the involuntary reflexes such as sneezing, coughing, swallowing. vomiting

Mid brain

16. located between upper cerebrum lower pons varoli
17. consists of group of nerve cells and nerve fibers

Functions

18. control the reflexes of eye muscles
19. control the reflexes of head, neck and trunk as responses to visual and auditory stimuli.
20. Change the sizes of pupil and size and shape of the eye lens.

(b) Concept of water potential

21. Any system containing water has a water potential
22. Water potential of a system is affected by factors such as pressure,
23. dissolved solutes
24. Hydrophilic substances and temperature
25. Water potential is related to kinetic energy of water molecules
26. Water potential is denoted by Ψ
27. And is measured by the units of pressure Mpa / Pa/ atm
28. Pure water possesses the highest water potential

29. Arbitrarily, the water potential of pure water at atmospheric pressure is considered as zero
30. When solutes dissolve in water, the water potential is decreased and it become negative
31. Therefore the water potential of most naturally occurring aqueous systems is negative
32. When solutes dissolve in water, water potential is decreased and become negative /
Therefore the water potential is inversely proportional to solute concentration of the system
33. When pressure is increased the kinetic energy of water potential are also increased, thereby increasing the water potential of the system /
Therefore water potential is directly proportional to the system
34. Water potential of a cell is collection of solute potential and pressure potential /
 $\Psi_w = \Psi_s + \Psi_p$

(c) Chromosomal mutations.

35. Changes that occur in DNA/ genetic material is referred as mutation.
36. Which is transmitted into next generation.
37. Changes in number of chromosomes or
38. Structure of chromosomes can cause chromosomal mutation .
39. Errors that occur during segregation of chromosomes during cell division / meiosis may lead to chromosome mutation.
40. Mutation that occur in structure of chromosomes can be due to changes in number of nucleotides.
41. Examples
 - Deletion of part of chromosome/
 - Substitution of part of chromosome.

Two types of mutation due to changes in number of chromosome.

42. Aneuploidy
43. Polyploidy
44. Aneuploidy occur due to non disjunction of chromosome during meiosis

Three types of aneuploidy

45. Down's syndrome
46. Occurs due to additional somatic chromosomes /
47. Turners syndrome
48. Occurs due to having single sex chromosomes / one sex chromosome is lacking

49. Klinefelter syndrome
50. Occur due to an extra X chromosome
51. Polyploidy occurs due to the multiplication of chromosome sets. / Example $3n, 4n$
any $50 \times 3 = 150$
