Sample Paper – 03
Class-XI
Biology (Theory)

Time: 3 Hrs **MM: 70**

General Instructions

1. The question paper comprises of five Sections A, B, C, D and E.
2. All questions are compulsory.
3. There is no overall choice however; internal choice has been provided in one question of 2 marks, one question of 3 marks and all the two questions of five marks category. Only one option in such question is to be attempted.
4. Questions1 to 5 in section A are very short questions of one mark each. These are to be answered in one word or one sentence each.
5. Questions 6 to 9 in section B are short questions of two marks each. These are to be answered in approximately 20-30 words each.
6. Questions 10 to 20 in section C are questions of three marks each. These are to be answered in approximately 30-50 words each. Question 21 is of 4 marks.
7. Questions 22 to 23 in section D are questions of five marks each. These are to be answered in approximately 80-120 words each.
8. Questions 24 to26 in section E is based on OTBA of 10 marks.

Section – A

1. What is corpora quadrigemina?
2. What is tetany?
3. What are hormones?
4. What is meant by equational division?
5. Define hydroponics.

Section – B

6. What are cell junctions? Name the different types of them.
7. Draw a labelled diagram of a bacteriophage.

   Or

   Draw a labelled diagram of a Funaria plant.
8. What is diatomaceous earth? Mention two uses of it.
9. What is meant by taxon and herbarium?

Section – C

10. Describe PSI and PSII

11. What is systemic circulation? Describe its importance. Why are the walls of the ventricle more muscular than the walls of atria?
12. Explain the initiation of muscle contraction. What is the role of sacroplasmic reticulum, myosin head and F-actin during contraction in striated muscles?
13. Why do plants of the legume family usually contain more protein than other plants?
14. Define: a) IRV and b) ERV
15. Enumerate the peculiar features that you find in phylum chordata.
16. What are the muscle tissues? What are the three types of muscles found in human beings?
17. List various functions of epithelial tissue.
18. Describe the process of crossing over. What is its significance?
19. Describe the structure of chloroplast.

Or

Draw a labelled diagram of female reproductive system of a cockroach.

20. Differentiate hyperglycemia and hypoglycemia.
21. A teenage girl accidently became pregnant. She stopped coming to college and also preferred to remain isolated. She was scared to inform her parents. One of her friends Sweta met her and came to know about the problem. She took her to a doctor and got her aborted. She convinced the parents and kept the matter concealed.
    (a) Did Sweta take the correct decision? What values did she show?
    (b) What is the medical term for abortion? What is the period which is considered safe for abortion?
    (c) What prevention may be taken to avoid pregnancy?

Section – D

22. Explain mass flow hypothesis with neat sketch.

Or

Explain Hatch –Slack pathway.

23. Explain the fore brain of human with neat sketch

Or

How the function of kidney regulated?

Section-E (OTBA) Questions

24. OTBA Question — 2 mark
25. OTBA Question — 3 mark
26. OTBA Question — 5 mark

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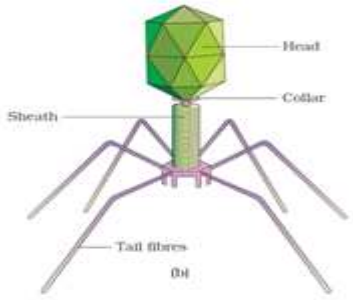
Answers

Section-A

1. The dorsal portion of the midbrain consists mainly of four round swellings (lobes) called corporaquadrigemina.
2. It is a rapid spasm (wild contractions) in muscles due to low Ca++ in body fluid.
3. Hormones are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts.
4. The M- phase is the most dramatic period of the cell cycle, involving a major reorganisation of virtually all components of the cell. Since the number of chromosomes in the parent and progeny cells is the same, it is also called as equational division.
5. The method of growing plants in a defined nutrient solution in complete absence of soil is called hydroponics.

Section-B

6. These are the structures which hold the cells of a tissue together, when they are not widely separated by extracellular material. The three types of cell junctions are:
   Tight junctions, Adhering junctions and Gap junctions.
7. 

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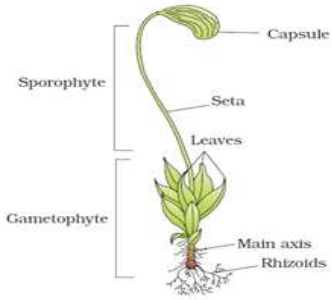


8. It refers to the deposits of the indestructible siliceous cell wall of diatoms in the ocean floor.
   Uses:
   (a) As an absorbent for liquid nitroglycerine to make explosives.
   (b) For filtering the liquids in sugar factories.

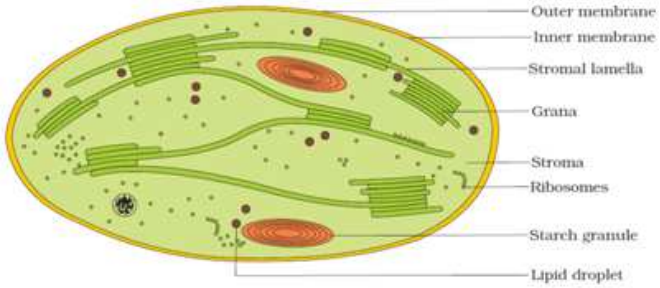
9. Taxon is unit of classification that represents a rank. It is the basic unit of classification of plants and animals.
   Herbarium is a collection of plants that have been dried, pressed and preserved on sheets for future reference and classification.

Section-C

10. The pigments are organized into two discrete photochemical light harvesting complexes (LHC) within the PS I and PS II. These are named in the sequence of their discovery, and not in the sequence in which they function during the light reaction. The LHC are made up of hundreds of pigment molecules bound to proteins. Each photosystem has all the pigments (except one molecule of chlorophyll *a*) forming a light harvesting system also called antennae. These pigments help to make photosynthesis more efficient by absorbing different wavelengths of light. The single chlorophyll *a* molecule forms the reaction centre. The reaction centre is different in both the photosystems. In PS I the reaction centre chlorophyll *a* have an absorption peak at 700 nm, hence is called P700, while in PS II it has absorption maxima at 680 nm, and is called P680.
11. Systemic circulation refers to the flow of oxygenated blood from the left ventricle to all parts of the body and the flow of deoxygenated blood from all parts except lungs of the body to the right atrium.
    The importance of circulation are:-
    (a) To supply oxygen and nutrients to all parts of the body.
    (b) To remove carbon dioxide and other metabolic wastes from the body tissues.
    Ventricles are the pumping chambers and they have to exert more pressure for pumping the blood to various parts and so are more muscular. The atria are the receiving chambers and they have to pump the blood only the respective ventricles and so have less muscular wall.
12. A nerve impulse arriving at the neuromuscular junction initiates the contractile response. A neurotransmitter released at the neuromuscular junction enters the sacromere through its membrane channel. The opening of the channel results in the inflow of sodium ions inside the sacromere and generates a component of the thin filament. As a result of conformational changes in the troponin, the active sites on the F-actin are exposed. These are the active sites specific to myosin head, which show myosin-dependent ATPase activity. The myosin head acts as hooks and attach to F-actin to form bridges.
13. Plants of legume family have root nodules in which the symbiotic bacteria Rhizobium fix atmospheric nitrogen into ammonia which helps to synthesize amino acids, proteins, vitamins and nucleic acids.
14. (a) Inspiratory Reserve Volume - The additional volume of air a person can inspire by a forcible inspiration. This averages 2500 – 3000 mL.
    (b) Expiratory Reserve Volume - The additional volume of air a person can expire by a forcible expiration. This averages 1000 – 1100 mL.
15. The peculiar characteristics of the phylum Chordata are:
    (i) The notochord is stiff and flexible rod of tissues lying ventral to nerve cord.
    (ii) All the chordates are triploblastic, coelomate and bilaterally symmetrical.
    (iii) They possess a post anal tail and closed blood vascular system.
    (iv) Presence of a dorsal hollow nerve cord and paired pharyngeal gill slits.
16. Each muscle is made of many long, cylindrical fibres arranged in parallel arrays. These fibres are composed of numerous fine fibrils, called myofibrils. Muscle fibres contract

(shorten) in response to stimulation, then relax (lengthen) and return to their uncontracted state in a coordinated fashion. Their action moves the body to adjust to the changes in the environment and to maintain the positions of the various parts of the body. In general, muscles play an active role in all the movements of the body. Muscles are of three types, skeletal, smooth, and cardiac.

17. The various functions of epithelial tissues are:
    (a) Protection – The epithelial tissue protects the underlying tissue from injury, chemicals, bacteria etc.
    (b) Sensation – The specialized epithelial tissue consisting of sensory nerve endings are found in the skin, eyes, nose, ears and the tongue.
    (c) Secretion – The epithelial tissue secretes definite chemical substances such as enzymes, hormones and lubricating fluids.
    (d) Absorption – The epithelial tissue lining the small intestine absorb nutrients from the digestion of food.
18. In pachytene stage of prophase I in Meiosis I, the bivalent chromosomes clearly appear as tetrads. This stage is characterized by the appearance of recombination nodules, the sites at which crossing over occurs between non-sister chromatids of the homologous chromosomes. Crossing over is the exchange of genetic material between two homologous chromosomes. Crossing over is also an enzyme-mediated process and the enzyme involved is called recombinase. Crossing over leads to recombination of genetic material on the two chromosomes. Recombination between homologous chromosomes is completed by the end of pachytene, leaving the chromosomes linked at the sites of crossing over.
19. The chloroplasts of the green plants are found in the mesophyll cells of the leaves. These are lens-shaped, oval, spherical, discoid or even ribbon-like organelles having variable length (5-10mm) and width (2-4mm). The chloroplasts are double membrane bound. Of the two, the inner chloroplast membrane is relatively less permeable. The space limited by the inner membrane of the chloroplast is called the stroma. A number of organized flattened membranous sacs called the thylakoids are present in the stroma (Figure 8.8). Thylakoids are arranged in stacks like the piles of coins called grana (singular: granum) or the intergranal thylakoids. In addition, there are flat membranous tubules called the stroma lamellae connecting the thylakoids of the different grana. The membrane of the thylakoids encloses a space called a lumen. The stroma of the chloroplast contains enzymes required for the synthesis of carbohydrates and proteins. It also contains small, double-stranded circular DNA molecules and ribosomes. Chlorophyll pigments are present in the thylakoids. The ribosomes of the chloroplasts are smaller (70S) than the cytoplasmic ribosomes (80S).



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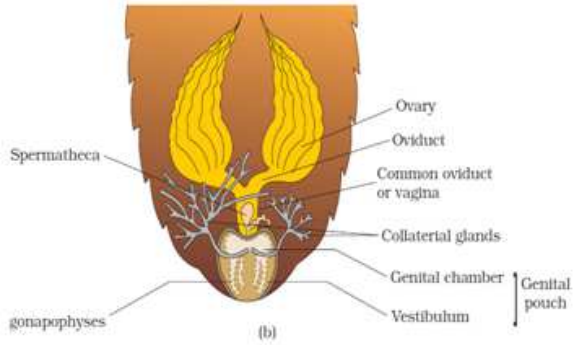


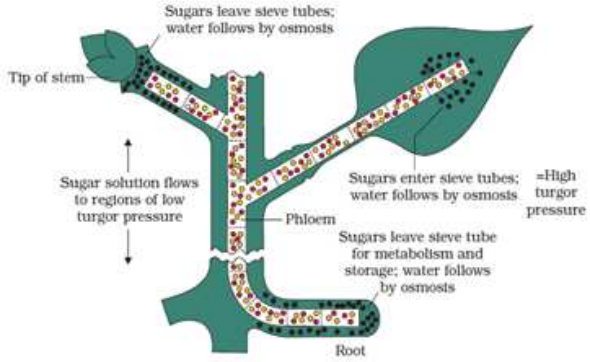
20.

Hyperglycemia	Hypoglycemia
It results from hyposecretion of insulin	It results from hypersecretion of insulin
It symptoms show high blood glucose level, breakdown of muscle tissue, loss of weight and tiredness.	It symptoms show low blood glucose level, hunger, sweating, irritability and double vision.

21. (a) Yes. Sweta expressed her helpful attitude and true friendship. She had social commitment and sensitivity to act as per the situation.
    (b) Medical termination of pregnancy (MTP) or Induced abortion. It is safe up to the first trimester of pregnancy (12 weeks).
    (c) (i) Abstinence
    (ii) Contraceptive methods.

Section-D

22. The accepted mechanism used for the translocation of sugars from source to sink is called the pressure flow hypothesis. As glucose is prepared at the source by photosynthesis, it is converted to sucrose, a disaccharide. The sugar is then moved in the form of sucrose into the companion cells and then into the living phloem sieve tube cells by active transport. This process of loading at the source produces a hypertonic condition in the phloem. Water in the adjacent xylem moves into the phloem by osmosis. As osmotic pressure builds up the phloem sap will move to areas of lower pressure. At the sink osmotic pressure must be reduced. Again active transport is necessary to move the sucrose out of the phloem sap and into the cells which will use the sugar – converting it into energy, starch, or cellulose. As sugars are removed, the osmotic pressure decreases and water moves out of the phloem.



Thus the movement of sugars in the phloem begins at the source, where sugars are loaded (actively transported) into a sieve tube. Loading of the phloem sets up a water potential

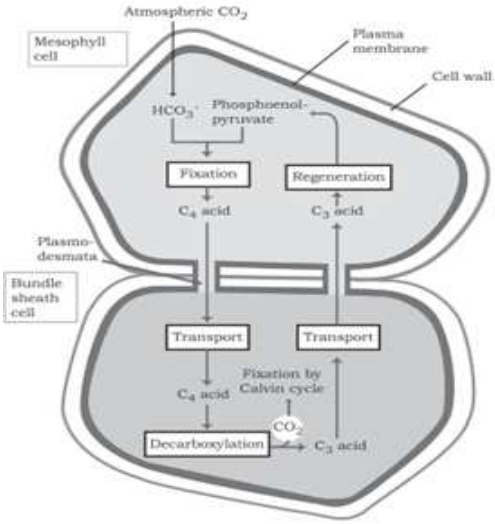
gradient that facilitates the mass movement in the phloem. Phloem tissue is composed of sieve tube cells, which form long columns with holes in their end walls called sieve plates. Cytoplasmic strands pass through the holes in the sieve plates, so forming continuous filaments. As hydrostatic pressure in the phloem sieve tube increases, pressure flow begins, and the sap moves through the phloem. Meanwhile, at the sink, incoming sugars are actively transported out of the phloem and removed as complex carbohydrates. The loss of solute produces a high water potential in the phloem, and water passes out, returning eventually to xylem.

Or

The primary CO_2 acceptor is a 3-carbon molecule phosphoenolpyruvate **(**PEP**)** and is present in the mesophyll cells. The enzyme responsible for this fixation is PEPcarboxylaseor PEPcase. It is important to register that the mesophyll cells lack RuBisCO enzyme. The C4 acid OAA is formed in the mesophyll cells.

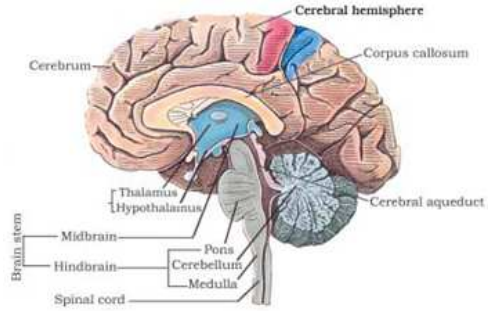
It then forms other 4-carbon compounds like malic acid or aspartic acid in the mesophyll cells itself, which are transported to the bundle sheath cells. In the bundle sheath cells these C4 acids are broken down to release CO2 and a 3-carbon molecule.

The 3-carbon molecule is transported back to the mesophyll where it is converted to PEP again, thus, completing the cycle. The CO2 released in the bundle sheath cells enters the C3 or the Calvin pathway, a pathway common to all plants. The bundle sheath cells are rich in an enzyme Ribulosebisphosphate carboxylase-oxygenase**(**RuBisCO**)**, but lack PEPcase. Thus, the basic pathway that results in the formation of the sugars, the Calvin pathway, is common to the C3 and C4 plants.



23. The forebrain consists of cerebrum, thalamus and hypothalamus. Cerebrum forms the major part of the human brain. A deep cleft divides the cerebrum longitudinally into two halves, which are termed as the left and right cerebral hemispheres. The hemispheres are connected by a tract of nerve fibres called corpus callosum. The layer of cells which covers the cerebral hemisphere is called cerebral cortex and is thrown into prominent folds. The cerebral cortex is referred to as the grey matter due to its greyish appearance. The neuron cell bodies are concentrated here giving the colour. The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory nor motor in function. These regions called as the association areas are responsible for complex functions like inter-sensory associations, memory and communication. Fibres of the tracts are

covered with the myelin sheath, which constitute the inner part of cerebral hemisphere. They give an opaque white appearance to the layer and, hence it is called the white matter.



The cerebrum wraps around a structure called thalamus, which is a major coordinating centre for sensory and motor signaling. Another very important part of the brain called hypothalamus lies at the base of the thalamus. The hypothalamus contains a number of centres which control body temperature, urge for eating and drinking. It also contains several groups of neurosecretory cells, which secrete hormones called hypothalamic hormones. The inner parts of cerebral hemispheres and a group of associated deep structures like amygdala, hippocampus, etc., form a complex structure called the limbic lobe or limbic system. Along with the hypothalamus, it is involved in the regulation of sexual behaviour, expression of emotional reactions (e.g., excitement, pleasure, rage and fear), and motivation.

Or

The functioning of the kidneys is efficiently monitored and regulated by hormonal feedback mechanisms involving the hypothalamus, JGA and to a certain extent, the heart. Osmoreceptors in the body are activated by changes in blood volume, body fluid volume and ionic concentration. An excessive loss of fluid from the body can activate these receptors which stimulate the hypothalamus to release antidiuretic hormone (ADH) or vasopressin from the neurohypophysis. ADH facilitates water reabsorption from latter parts of the tubule, thereby preventing diuresis. An increase in body fluid volume can switch off the osmoreceptors and suppress the ADH release to complete the feedback. ADH can also affect the kidney function by its constrictor effects on blood vessels. This causes an increase in blood pressure. An increase in blood pressure can increase the glomerular blood flow and thereby the GFR.

The JGA plays a complex regulatory role. A fall in glomerular blood flow/glomerular blood pressure/GFR can activate the JG cells to release reninwhich converts angiotensinogen in blood to angiotensin I and further to angiotensin II. Angiotensin II, being a powerful vasoconstrictor, increases the glomerular blood pressure and thereby GFR. Angiotensin II also activates the adrenal cortex to release Aldosterone. Aldosterone causes reabsorption of Na+ and water from the distal parts of the tubule. This also leads to an increase in blood pressure and GFR. This complex mechanism is generally known as the Renin-Angiotensinmechanism.

An increase in blood flow to the atria of the heart can cause the release of Atrial Natriuretic Factor(ANF). ANF can cause vasodilation (dilation of blood vessels) and thereby decrease the blood pressure. ANF mechanism, therefore, acts as a check on the renin-angiotensin mechanism.