CBSE
Class XI Biology
Sample Paper – 2

Time: 3 hrs **Total marks: 70**

General instructions:

1. All questions are compulsory.
2. The question paper consists of four sections A, B, C and D.
3. Internal choice is given in all the sections. A student has to attempt only one of the alternatives in such questions.
4. Section A contains 5 questions of 1 mark each.
5. Section B has 7 questions of 2 marks each.
6. Section C is of 12 questions of 3 marks each.
7. Section D has 3 questions of 5 marks each.
8. Wherever necessary, the diagrams drawn should be neat and properly labelled.

SECTION A

1. Name two non-chordate phyla where animals are radially symmetrical. [1]

2. Which type of meristem is a cylindrical meristem? [1]

OR

Arrange the following in the sequence in which you would find them in a plant starting from the periphery:
Pericycle, Epidermis, Pith, Endodermis, Cortex

3. What is the function of GLUT-4? [1]

4. Which part of the human body should one use to demonstrate the stages of mitosis? [1]

5. What is the advantage of synovial fluid? [1]

OR

What is a neuromuscular junction?

SECTION B

6. Describe the phylogenetic classification system. [2]

7. What are inclusion bodies? Give three examples of inclusion bodies found in prokaryotes. [2]

OR

Differentiate between essential and non-essential amino acids.

8. Give two reasons as to why photosynthesis is important for sustaining life on the Earth.[2]

9. Describe the symport and antiport methods of transport. [2]

10. Plants and animals grow by mitotic cell divisions. What differences do they exhibit in their growth? [2]

OR

Where does mitosis take place in plants and animals? What is its significance in multicellular organisms?

11. What is a root cap? What is its function? [2]

12. Name the stage of the cell cycle at which each of the following events occurs: [2]
(a) Chromosomes are moved to the spindle equator.
(b) Centromere splits and chromatids separate.
(c) Pairing between homologous chromosomes.
(d) Crossing over between homologous chromosomes.

SECTION C

13. Draw a labelled diagram of a Funaria plant showing the sporophyte and gametophyte.[3]

14. Name the types of cells present in the epithelium of gastric glands. Mention their secretions. [3]

OR

Name the three enzymes secreted by the pancreas and their action on proteins, fats and starch.

15. Describe the process of fertilisation and development of an earthworm. [3]

16. [3]

i. Name the tissue which lines the trachea in humans. State any one advantage of this tissue being present there.

ii. Why is mosaic vision also known as nocturnal vision?

17. Who proposed the cell theory? List its main postulates. [3]

OR

What is a mesosome in a prokaryotic cell? Mention its functions.

18. [3]

i. What is the endomembrane system? List its components.

ii. Why are mitochondria called semiautonomous organelles?

19. Define cytokinesis. How is it accomplished in animal cells? [3]

20. How does oxidative phosphorylation differ from photophosphorylation? Explain. [3]

OR

List three internal plant factors which determine the rate of photosynthesis.

21. There are three phases in the growth of a plant. Name them and also mention what each of them corresponds to. [3]

22. How does the liver serve as a digestive as well as a secretory organ? [3]

OR

State the role of pancreatic juice in the digestion of proteins.

23. Describe the three disorders of the skeleton and joints. [3]

24. Give information about the following mineral nutrients in plants as asked against each:

(a) Sulphur: Any one amino acid in which it is present, effect of deficiency on flowering.

(b) Manganese: Chemical form in which it is absorbed from the soil, the best defined function in photosynthesis.

(c) Calcium: Two roles during cell division.

SECTION D

25. What are the steps involved in the formation of a root nodule? [5]

OR

Explain with examples: Macronutrients, micronutrients, beneficial nutrients, toxic elements and essential elements

26. [5]

i. Where is the pancreas located?
ii. Why is the pancreas considered an endocrine as well as an exocrine gland?
iii. Draw a diagram to show the duct system of the pancreas pouring into the duodenum.

OR

How many vertebrae do we have in all? Categorise them on the basis of their location and give the specific number in each category.

27. How is respiration regulated? [5]

OR

Explain the autoregulatory mechanism of GFR.

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Class XI Biology
Sample Paper – 2 Solution

SECTION A

1. Cnidaria and Echinodermata

2. Lateral meristem

OR

Epidermis – Cortex – Endodermis – Pericycle – Pith

3. It enables glucose transport into cells.

4. Bone marrow

5. It reduces friction between the articulating bones.

OR

The neuromuscular junction is the junction between the motor neuron and the sarcolemma of the muscle fibre.

SECTION B

6. Phylogenetic classification systems take into account the evolutionary or phylogenetic relationships among various organisms. They assume that organisms belonging to the same taxa have a common ancestor.

7. Inclusion bodies are non-membrane-bound structures lying in the cytoplasm which store reserve materials.
Examples: Phosphate granules, cyanophycean granules, glycogen granules

OR

Essential amino acids	Non-essential amino acids
(i) These amino acids cannot be synthesised in the body. (ii) Dietary proteins form the source of essential amino acids.	(i) These amino acids can be synthesised in the body. (ii) They need not be present in the diet.

8.

i. Oxygen is liberated in the atmosphere during photosynthesis.
ii. The process of photosynthesis manufactures food for all living organisms.

9. Some carrier proteins allow transport only if two types of molecules move together. This is called cotransport. It is of two types:

i. In the symport method, both molecules cross the membrane in the same direction at the same time.
ii. In the antiport method, both molecules move in the opposite direction.

10. Differences in the growth of plants and animals:

Growth in plants	Growth in animals
1. Growth occurs in certain regions called meristems.	1. Growth occurs throughout the body.
2. Growth occurs throughout life.	2. Growth occurs only for a limited time period after which it stops.

OR

Mitosis occurs in the somatic or body cells of plants and animals where growth is involved.

Significance of mitosis in multicellular organisms:

- Assists in growth
- Helps in the repair of injured tissues and replacement of worn-out cells

11. A root cap is the thimble-like structure which covers the root apex or tip in plants.

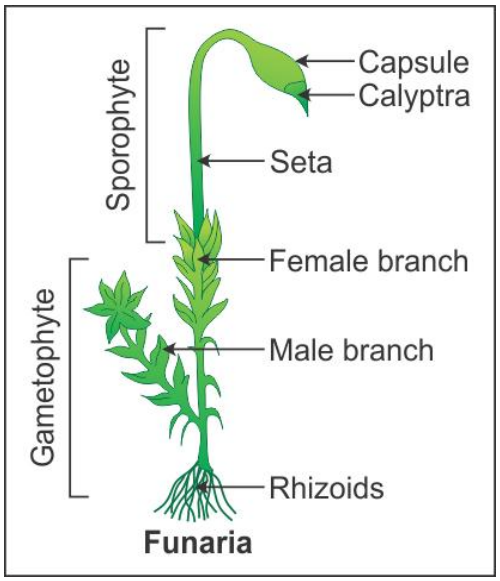
Functions of the root cap: To protect the tender apex of the root as it penetrates the soil.

12.

(a) Metaphase
(b) Anaphase
(c) Zygotene of Prophase I (Meiosis)
(d) Pachytene of Prophase I (Meiosis)

SECTION C

13.



14. The following types of cells are present in the epithelium of gastric glands:

i. Chief cells or peptic cells (zymogen cells) secrete gastric digestive enzymes as proenzymes or zymogens, pepsinogen and prorennin, small amount of gastric amylase and gastric lipase.

ii. Oxyntic cells (parietal cells) secrete hydrochloric acid and Castle intrinsic factor (factor essential for the absorption of vitamin B_{12}).

iii. Mucous cells (goblet cells) secrete mucus.

OR

Trypsin, lipase and amylase are the enzymes secreted by the pancreas.

- Trypsin acts in proteins, proteoses and peptones and converts them to shorter peptides.
- Lipase acts on triglycerides and converts them to diglycerides and monoglycerides along with the release of fatty acids.
- Amylase acts on starch and converts it to maltose.

15. A mutual exchange of sperm occurs between two worms during mating. During mating, the male genital papilla of one earthworm is inserted into the spermathecal pore of the other earthworm to transfer the sperms and prostatic fluid. Mature sperm and egg cells and nutritive fluid are deposited in cocoons produced by the gland cells of the clitellum. Fertilisation and development occur inside the cocoon which slips off the worm and is deposited in or on the soil. After about three weeks, each cocoon produces 2–20 baby worms; the development is direct and does not involve any larval stage.

16.

i. Pseudostratified columnar ciliated epithelium lines the trachea in humans.
Advantage: The movements of the cilia propel the mucus and foreign particles towards the larynx.

ii. Mosaic vision is also known as nocturnal vision because it more often occurs at night.

17. The cell theory was proposed by Schleiden and Schwann.
The main postulates of the cell theory are

i. All living organism are composed of cells and their products.
ii. New cells arise from pre-existing cells.

OR

A mesosome is the extension of the plasma membrane into the cell in the form of vesicles, tubules or lamellae in prokaryotic cells.
Mesosomes help in

- Increasing the surface area of the plasma membrane and enzymatic content
- Respiration and secretion
- Cell wall formation
- DNA replication and its distribution

18.

i. Many of the membranous organelles despite being distinct in terms of their structure and function are considered together as the endomembrane system because their functions are coordinated.
It includes
    1. Endoplasmic reticulum
    2. Golgi complex
    3. Vacuoles
    4. Lysosomes

ii. Because mitochondria possess a single circular DNA molecule, a few RNA molecules, 70 S ribosomes and other components needed for protein synthesis, they are called semiautonomous organelles.

19. Cytokinesis is the process by which the cytoplasm of a cell divides. It corresponds to the separation of the two daughter nuclei into two daughter cells.
In animal cells, a furrow appears in the cell membrane during late anaphase or early telophase. The furrow deepens and when they join in the centre, the cytoplasm is divided into two compartments. Each compartment with a daughter nucleus is known as a daughter cell.

20.

Oxidative phosphorylation	Photophosphorylation
1. It is the process by which synthesis of ATP takes place with the help of energy liberated during the oxidation of the reduced	1. It is the process of production of ATP by phosphorylation of ADP using light energy in photosynthesis.
2. It takes place in the mitochondrial electron transport system.	2. It occurs in the thylakoid membranes/electron transport in chloroplasts.
3. It occurs in all living cells.	3. It occurs in green photosynthetic tissues.
4. It takes place continuously in all living cells.	4. It takes place only in the presence of light.

OR

Plant factors which determine the rate of photosynthesis:

- Internal CO_2 concentration
- Amount of chlorophyll
- Number, size, age and orientation of leaves
- Number and size of mesophyll cells
- Number and size of chloroplasts

21.

i. Meristematic phase: It corresponds to the cell division phase.
ii. Elongation phase: It corresponds to the cell enlargement phase. During this phase, there is maximum growth of a plant.
iii. Maturation phase: It corresponds to cell differentiation. During this phase, there is not much of an increase in the weight or volume of plants.

22. The most important secretion of the liver is bile.

Although bile does not contain any enzymes, it has a very significant role in the digestion of lipids. Lipase converts emulsified fats to fatty acids, glycerol and monoglycerides.

Thus, the liver acts as a secretory as well as a digestive organ.

OR

Pancreatic juice contains the inactive enzymes trypsinogen, chymotrypsinogen and procarboxypeptidases. Trypsinogen is activated into trypsin by the enzyme enterokinase, which in turn activates the other enzymes in pancreatic juice.

Chymotrypsinogen and procarboxypeptidases get converted to chymotrypsin and carboxypeptidase. Chymotrypsin converts proteins to peptides, and carboxypeptidase further converts peptides to a smaller peptide chain and amino acids.

23.

i. Arthritis. It is caused by the inflammation of the joints. It is a common disease of old age which includes pain and stiffness in the joints.

ii. Sprain. It refers to an injury to a joint capsule which involves stretching or tearing of tendons or ligaments. This condition may often remain for a week or may take more time. Thus, it may become chronic.

iii. Osteoporosis. It results from excessive resorption of calcium and phosphorus from the bone which leads to more chances of fractures. The major causes of this disorder are imbalances of hormones such as calcitonin of thyroid, parathormone of parathyroids, sex hormones and deficiency of vitamin D.

24. Sulphur:

- Amino acid present: Cysteine
- Effect of deficiency on flowering: Delay in flowering

Manganese:

- Chemical form in which it is absorbed from the soil: Manganous (Mn^{2+} ions)
- Function in photosynthesis: Assists in the splitting of water during photolysis to liberate oxygen

Calcium:

- Roles during cell division: It is necessary for the formation of the middle lamella. It is also involved in the formation of the mitotic spindle.

SECTION D

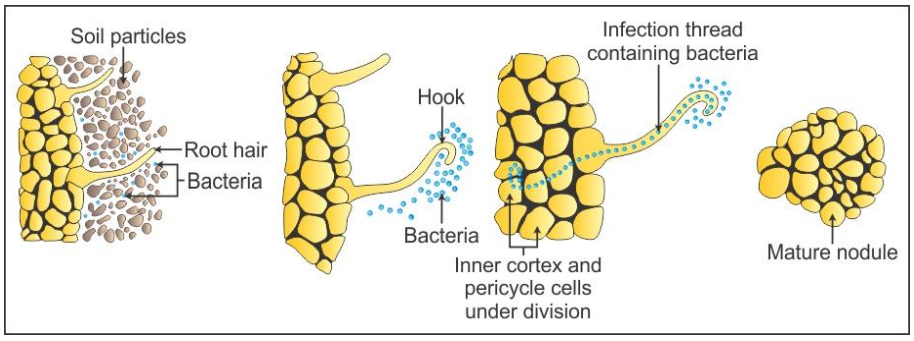
25. Steps in the development of root nodules:

(a) Roots of legumes secrete flavonoids and betaines which attract Rhizobium bacteria.

(b) These bacteria collect over the root hair and release Nod factors which cause curling of root hair.

(c) The enzymes from the bacteria degrade the parts of the root hair cell wall which produces a thread-like structure called an infection thread.

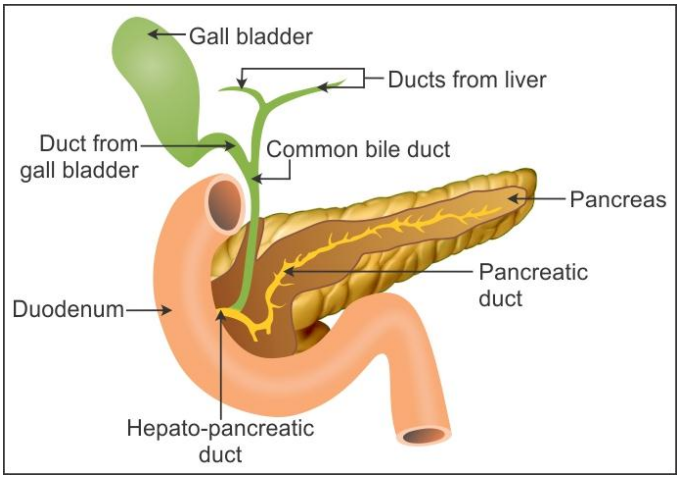
(d) The bacteria multiply and invade the infection thread and finally reach the inner cortex where they enter the cells and divide to form a knob-like protuberance called the root nodule.



i. Macronutrients: Macronutrients are the elements which are required in large amounts for plant growth. They are present in plant tissues in concentrations of 1 to 10 mg/L of dry matter. The macronutrients include carbon, hydrogen, oxygen, nitrogen, phosphorus, sulphur, potassium, calcium and magnesium. Of these, carbon, hydrogen and oxygen are mainly obtained from CO_2 and H_2O, while the others are absorbed from the soil as mineral nutrition.
ii. Micronutrients: Micronutrients or trace elements are the elements which are needed in very small amounts for plant growth (less than 0.1 mg/L of dry matter). These include iron, manganese, copper, molybdenum, zinc, boron, chlorine and nickel.
iii. Beneficial elements: There are some elements which are required by higher plants in addition to macro and micronutrients. Such elements are called beneficial elements. Examples: Sodium, silicon, cobalt, selenium
iv. Toxic elements: The elements which reduce the dry weight of tissues by about 10% are called toxic elements.
v. Essential elements: An essential element is an element which has specific structural or functional roles in plants and without which plants are unable to complete their life cycle. Examples: Carbon, hydrogen, oxygen, nitrogen, phosphorus, sulphur, potassium, calcium, iron, zinc, magnesium

26.

i. It is an elongated compound gland, i.e. it has both exocrine and endocrine parts, located between the loops of the duodenum.
ii. It is considered exocrine as well as exocrine as its exocrine portion secretes digestive enzymes, while the endocrine portion secretes two hormones, insulin and glucagon.
iii. The duct of the pancreas joins the common bile duct to form the hepatopancreatic duct which opens into the duodenum of the alimentary canal. Its opening is guarded by the sphincter of Oddi.



OR

There are 26 vertebrae in our body:

i. Cervical vertebrae (seven) are located in the neck region.
ii. Thoracic vertebrae (twelve) are present in the thoracic region of the trunk.
iii. Lumbar vertebrae (five) are present in the abdominal region of the trunk.
iv. Sacrum (one) is the largest triangular bone at the end of the vertebral column in the hip region.
v. Coccyx is the small bone at the end and is vestigial.

27. Regulation of respiration:

- The ability to maintain and moderate the respiratory rhythm according to the demand of the body tissues is due to neural control.
- The respiratory rhythm centre located in the medulla of the brain is primarily responsible for this regulation.
- The pneumotaxic centre present in the pons of the brain functions as the 'switch off' point for regulation; by altering the duration of inspiration, it can alter the respiratory rate.
- A chemosensitive area is situated adjacent to the rhythm centre; it is highly sensitive to carbon dioxide and hydrogen ions.
- An increase in the concentration of these substances activates this centre which in turn sends signals to the rhythm centre to make necessary adjustments in the respiratory process.
- Receptors associated with the aortic arch and carotid artery are also sensitive to carbon dioxide and hydrogen ions, and hence, they too send signals to the respiratory rhythm centre.
- Oxygen plays an insignificant role in the regulation of respiratory rhythm.

OR

Autoregulatory mechanism of GFR:

- Juxtaglomerular apparatus (JGA) is a specialised cellular structure located where the distal convoluted tubule passes close to the Bowman's capsule near the afferent arteriole, where the two come in contact with each other.
- A fall in the glomerular filtration rate (GFR) activates JGA to release renin.
- Renin acts through a complex series of reactions called the renin–angiotensin–aldosterone mechanism.
- This increases the blood volume and blood pressure and GFR is brought back to normal.