

CBSE
Class XI Biology
Sample Paper – 3

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.
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SECTION A

1. Why were bacteria, cyanobacteria and fungi included in the plant kingdom in the earliest classification systems? [1]

OR

What are storage bodies of green algae called? Where are they located in the cells?

2. Mention the functions of underground stems. [1]
3. Name the outermost and innermost layers of the cell envelope in a prokaryotic or bacterial cell. [1]
4. When is a mineral element considered toxic in plant nutrition? [1]

OR

Nitrogen fixation is shown by prokaryotes and not eukaryotes. Comment.

5. What is the name given to the bulb-like structure at the axon terminal? [1]

SECTION B

6. What do you mean by metagenesis? Give one example of an animal which shows metagenesis. [2]

7. What are plasmodesmata? What is their function? [2]

OR

What is crossing over? Name the enzyme responsible for it.

8. What is oxidative decarboxylation of pyruvic acid? When does it occur? [2]

9. Why does the colour of a leaf kept in dark frequently become yellow or pale green? Which pigment do you think is more stable? [2]

OR

Distinguish between glycolysis and fermentation.

10. Draw a labelled diagram showing binary fission in bacteria. [2]

11. Name the type of connective tissue which serves as a support framework for the epithelium. Mention its cell types. [2]

12. Mention two functions performed by the centriole. [2]

SECTION C

13. Name the type of fertilisation which is unique to angiosperms. Describe it. [3]

14. Describe the structures which constitute the mouth parts of a cockroach. [3]

OR

Answer in one word or one line.

(a) What is the position of the ovaries in a cockroach?

(b) How many segments are present in the abdomen of a cockroach?

(c) Where do you find Malpighian tubules?

15. Cork cambium forms tissues which form the cork. Do you agree with this statement? Explain. [3]

16. What is meant by modification of root? What type of modification of root is found in [3]

(a) Banyan tree

(b) Turnip

(c) Mangrove trees

OR

What is a perianth? What term is given to its constituent members? Give an example.

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

18. What is a mesosome in a prokaryotic cell? Mention the functions which it performs. [3]

19. Describe the important properties of enzymes. [3]

OR

List the four steps involved in the catalytic action of an enzyme.

20. A patient was complaining of frequent urination, excessive thirst, hunger and tiredness. His fasting blood level was found to be higher than 130 mg/dL on two occasions. [3]

- i. Name the disease
- ii. Give the root cause of this disease
- iii. Explain why the blood glucose level is higher than 130 mg/dL

21. How does carboxylation take place in the sugarcane plant? [3]

22. Why is it that deficiency symptoms appear first in the younger parts of certain plants, while they do so in mature organs in others? [3]

23. Draw a standard ECG and explain the different segments in it. [3]

OR

What is the significance of the juxtaglomerular apparatus (JGA) in kidney function?

24. Two groups (A and B) of bean plants of similar size and same leaf area were placed in identical conditions. Group A was exposed to light of wavelength 400–450 nm and Group B to light of wavelength 500–550 nm. Compare the photosynthetic rate of the two groups giving reasons. [3]

SECTION D

25. Name at least five different deficiency symptoms in plants. Describe them and correlate them with the concerned mineral deficiency. [5]

OR

- i. What are respiratory substrates? Name the most common respiratory substrate.
- ii. Give the schematic representation of an overall view of the Krebs cycle.

26.Name the hormone which regulates each of the following and mention its source. [5]

- i. Heart beat and blood pressure
- ii. Secretion of growth hormone
- iii. Maturation of Graafian follicles
- iv. Rise in calcium ion level in the blood
- v. Milk secretion

OR

Name the components of the formed elements in the blood and mention one major function of each.

27.How many vertebrae do we have in all? Categorise them on the basis of their location and give the specific number in each category. [5]

OR

Explain the conduction of a nerve impulse along a nerve fibre.

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Class XI Biology
Sample Paper – 3 Solution

SECTION A

1. Bacteria, cyanobacteria and fungi were included in the plant kingdom in the earliest classification systems because they all have a cell wall.

OR

The storage bodies of green algae are called pyrenoids. They are located in the chloroplasts.

2.

- i. They store food.
- ii. They take part in perennation.

3. Outermost layer: Glycocalyx

Innermost layer: Plasma membrane

4. A mineral element is said to be toxic when it is in concentrations which reduce the dry weight of tissues by about 10%.

OR

Prokaryotes have the enzyme nitrogenase for the reduction of nitrogen into ammonia. Hence, nitrogen fixation is shown only by prokaryotes and not by eukaryotes.

5. Synaptic knob

SECTION B

6. Certain cnidarians which exhibit both forms (polyp and medusa) exhibit alternation of generation. Polyps produce medusae asexually, while medusae form polyps sexually. This phenomenon is called metagenesis. Example: Obelia

7. Plasmodesmata are cytoplasmic bridges. They transverse the primary cell wall and middle lamella and connect the adjacent cells.

Function: They form transport channels between adjacent cells.

OR

Crossing over is defined as a phenomenon of exchange of equivalent segments between non-sister chromatids of homologous chromosomes during prophase I of meiosis. The enzyme recombinase is responsible for it.

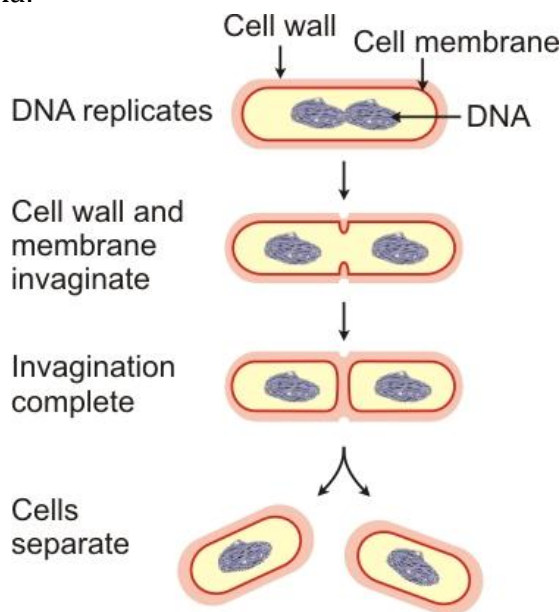
8. Oxidative decarboxylation is the process in which pyruvic acid is decarboxylated, i.e. one carbon atom is removed as carbon dioxide, and then oxidised to form acetyl CoA or activated acetate. It occurs when pyruvate enters the mitochondria through a specific transport protein.
9. The colour of a leaf kept in the dark frequently becomes yellow or pale green because chlorophyll is degraded, and there is no formation of chlorophyll. Carotenoid pigments are more stable.

OR

Differences between glycolysis and fermentation:

Glycolysis	Fermentation
It is the process in which one molecule of glucose is broken down into two molecules of pyruvic acid.	It is the process in which pyruvic acid is converted to alcohol or organic acid by certain microbes.
Oxygen does not influence its reaction.	It occurs only in the absence of oxygen.

10. Binary fission in bacteria:



11. Areolar connective tissue serves as a support framework for epithelium.
It contains mast cells, macrophages and fibroblasts.

12. Functions of the centrioles:

- They form spindle fibres which give rise to the spindle apparatus.
- They form the basal body of cilia or flagella.

SECTION C

13. Double fertilisation is unique to angiosperms.

In this phenomenon, two male gametes are discharged by a pollen tube into the embryo sac of an ovule. One male gamete fuses with the female gamete to form a zygote. This fusion is called syngamy. A second male gamete fuses with the secondary nucleus to form the primary endosperm nucleus. This is called triple fusion.

14. The mouth parts of a cockroach consist of the following:

A labrum (upper lip), a pair of mandibles each with two regions—the grinding region and incising region, a pair of maxillae, a labium (lower lip) and the hypopharynx within the cavity and enclosed by the other mouth parts.

OR

(a) The ovaries extend between the 4th and 6th abdominal segments.

(b) 10 segments

(c) Malpighian tubules are present at the junction between the midgut and hindgut of cockroaches or insects.

15. It is true that the cork cambium forms tissues which form the cork. The cork cambium produces new cells on both outer surface and inner surface. The cells formed on the outer side differentiate into cork, also called phellem. The cells become impervious to water because of deposition of suberin and become thick-walled.

16. Modification of the root is a change in the shape, size, structure and normal functioning of the root to perform some secondary functions or a particular adaptation.

(a) Banyan tree: In banyan trees, long roots develop from branches which go deep down to reach the ground to provide additional mechanical support to the banyan tree. This modification is called a prop root.

(b) Turnip: In turnip, the root is modified to store extra food. This modification is called napiform fleshy tap root.

(c) Mangrove trees: The roots of mangrove trees get modified into pneumatic structures to provide additional oxygen to the plant. This modification of roots is called respiratory roots or pneumatophores.

OR

The perianth is the accessory whorls of a flower where the calyx and corolla cannot be distinguished.

The constituent members of the perianth are called tepals.

Example: Lily

17. The cell theory was proposed by Schleiden and Schwann.

The main postulates of the cell theory are

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

18. A mesosome is a membrane complex formed by infolding of the plasma membrane in prokaryotic cells. If the mesosome is attached to a nucleoid, it is called a septal mesosome. A mesosome free from the nucleoid is called a lateral mesosome. A lateral mesosome is rich in respiratory enzymes and thus takes part in respiration. A septal mesosome takes part in the separation of daughter nucleoids, the formation of the plasma membrane for rapid elongation and the formation of the septum.

19.

- i. Chemical nature: Enzymes are generally complex macromolecules of globular proteins. They do not initiate a chemical reaction but increase the rate of a chemical reaction.
- ii. Molecular weight: Being proteinaceous in nature, the enzymes are giant molecules with a molecular weight of 6000 to 4,600,000 kDa.
- iii. Changeless form: Enzymes are not transformed in the chemical reaction. They combine temporarily with the substrate molecules but are neither consumed nor changed permanently in the reaction they catalyse.

OR

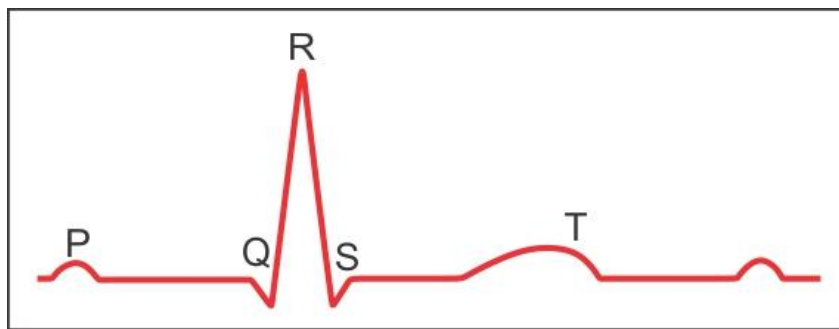
Steps involved in the catalytic action of an enzyme:

- The substrate binds to the active site of the enzyme.
- The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.
- The active site of the enzyme, which is now in proximity to the substrate, breaks the chemical bonds of the substrate and hence an enzyme-product complex is formed.
- The enzyme releases the products and is free to run through the catalytic cycle again.

20.

- i. The disease is diabetes mellitus.
- ii. The failure of the β -cells of the islets of Langerhans of pancreas to produce adequate amounts of insulin is the root cause of this disease.
- iii. Undersecretion of insulin impairs the following functions:
 - (a) Use and uptake of glucose by adipocytes and hepatocytes
 - (b) Conversion of glucose to glycogen by the above target cells

- 21.** In the mesophyll cells of sugarcane plant (a C_4 plant), phosphoenol pyruvate (PEP) is the primary acceptor of CO_2 which is carboxylated by the enzyme PEP-carboxylase to form a 4C-compound, oxaloacetic acid (OAA).
In the bundle sheath cells, RuBP is the primary acceptor of CO_2 . The reaction catalysed by RuBisCO results in the formation of a 6C compound which breaks into two molecules of a 3C-compound, 3-phosphoglyceric acid (3-PGA).
- 22.** Deficiency symptoms appear first in the young plants for elements which are relatively immobile inside the plant. Examples: Calcium and sulphur. They appear first in mature organs for those elements which are mobilised from senescing regions for supply to younger regions. Examples: Phosphorus, nitrogen and potassium. Thus, mobility of an element determines whether the deficiency symptoms appear in younger parts or in older parts.
- 23.** ECG is electrocardiograph. It is a graphical representation of the electrical activity of the heart during a cardiac cycle.



A human electrograph shows five waves or deflections—P, Q, R, S and T.

The P-wave represents depolarisation or the electrical excitation of the atria. This leads to the contraction of both atria.

The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.

The T-wave represents repolarisation, i.e. the return of the ventricles from the excited to the normal state. The end of the T-wave marks the end of the systole.

OR

The juxtaglomerular apparatus (JGA) secretes the enzyme renin into the blood stream which changes the plasma protein angiotensinogen into a peptide, angiotensin II. Angiotensin II increases the blood pressure by causing arterioles to constrict. It also increases the blood volume by inducing the proximal convoluted tubules to reabsorb more NaCl and water. It stimulates the adrenal glands to secrete a hormone called aldosterone which induces the distal convoluted tubule to absorb more Na^+ and water.

24. Group A will show more photosynthesis as compared to Group B.

- Chlorophyll absorbs maximum light in the blue region of the spectrum, i.e. 400–450 nm, and hence, the photosynthetic rate will also be high.
- Chlorophyll does not absorb any light in the green region, i.e. 500–550 nm. In fact, green light is reflected by the chlorophyll pigment.
- As a result, Group B will show negligible amount of photosynthesis or no photosynthesis.

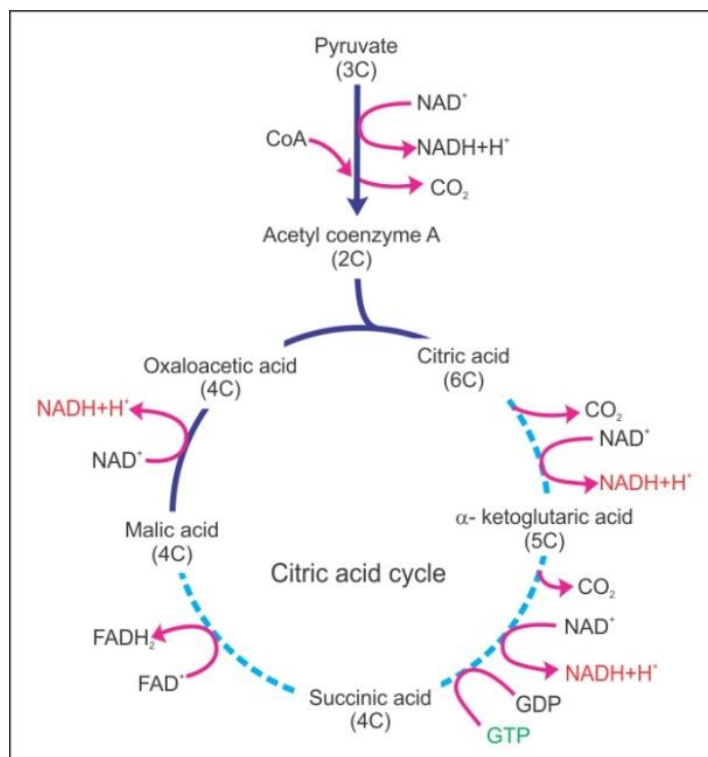
SECTION D

25.

- Chlorosis: It is the loss of chlorophyll leading to the yellowing of leaves. It is caused by the deficiency of N, K, Mg, S, Fe, Mn, Zn and Mo.
- Necrosis: It is the killing of cells and tissues and is usually expressed in the form of leaf spots, blights and rots. These are caused by the deficiency of Ca, Mg, Cu and K.
- Inhibition of cell division: Inhibition of cell division is expressed in stunted growth. This is caused by lack or low levels of N, K, S and Mo.
- Delay of flowering: Low concentration of N, S and Mo causes delay in flowering in certain plants.
- Deformation: Deficiency of boron causes deformation, discolouration and disorganisation of meristematic tissue and finally death of a growing plant.

OR

- Compounds which are oxidised during respiration to liberate energy inside the living cells are called respiratory substrates. Glucose is the most common respiratory substrate.
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26.

Hormone	Source
(i) Adrenaline and noradrenalin	They are secreted by the adrenal medulla.
(ii) Growth hormone-releasing hormone (GHRH)	It is secreted by the hypothalamus.
(iii) Follicle-stimulating hormone	It is secreted by the anterior pituitary.
(iv) Thyrocalcitonin	It is secreted by the parafollicular cells of the thyroid gland.
(v) Prolactin and progesterone	Prolactin is secreted by the anterior pituitary and progesterone is secreted by the corpus luteum of the ovary.

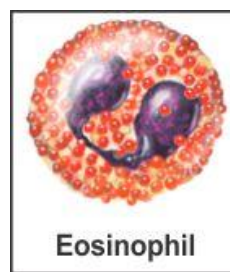
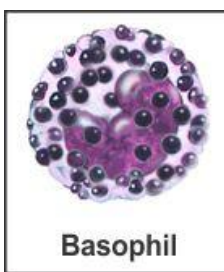
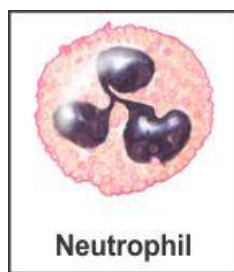
OR

Blood consists of a watery fluid called plasma in which floating bodies called formed elements are found. These formed elements are erythrocytes or red blood cells, leucocytes or white blood cells and platelets or thrombocytes.

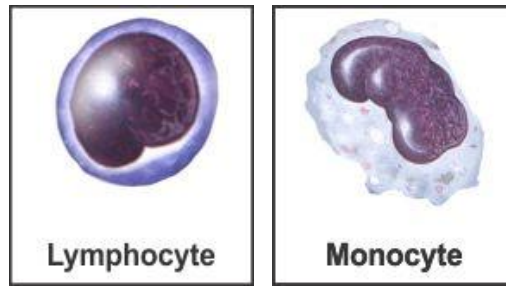
- i. Erythrocytes or red blood cells: These are the most abundant cells in the human body. These are biconcave and circular, enucleated and contain the pigment haemoglobin which imparts red colour to the blood. They help in the exchange of gases and maintain the pH of blood.



- ii. Leucocytes or white blood cells: They are round or irregular and do not have haemoglobin. They are of two types—granulocytes and agranulocytes. Granulocytes are further divided into three types—neutrophils, eosinophils and basophils.



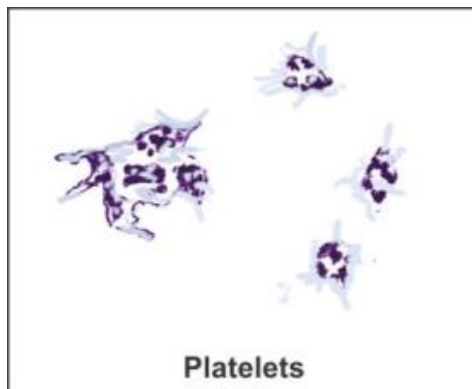
Agranulocytes are of two types—lymphocytes and monocytes.



Neutrophils and monocytes are phagocytic cells which destroy foreign organisms entering the body. Basophils are involved in inflammatory reactions and secrete histamine, serotonin and heparin. Eosinophils defend against infections. They are associated with allergic reactions.

Lymphocytes are of two major types—B and T forms. Both B and T lymphocytes are responsible for immune responses in the body.

Platelets or thrombocytes: Platelets are cell fragments and can be round or oval. They release certain chemicals called platelet factors which help in the coagulation or clotting of blood.



27. There are 26 vertebrae in our body.

Type of vertebrae	Number	Location in the body
Cervical vertebrae	7	Neck region
Thoracic vertebrae	12	Thoracic region of the trunk
Lumbar vertebrae	5	Abdominal region of the trunk
Sacrum	1	Large triangular bone at the end of the vertebral column
Coccyx	1	Vestigial tail bone

OR

Conduction of a nerve impulse along a nerve fibre:

- In a resting nerve fibre (i.e. at resting potential), the axoplasm is electronegative and the exterior (extracellular fluid) is electropositive.
- This state of the resting membrane is called the polarised state.
- When a threshold stimulus is applied, the resting membrane potential undergoes a change to become the action potential, where the interior or axoplasm becomes electropositive and the outside is electronegative, i.e. depolarisation.
- Consequent to depolarisation, cations diffuse through the cytoplasm from the electropositive depolarised part of the membrane to the electronegative depolarised part.
- Simultaneously, cations from the polarised region diffuse through the ECF to the electronegative region on the outer side.
- This flow of ions depolarises the next region of the membrane producing the action potential there.
- Repetition of this process makes the action potential flow onwards as depolarisation proceeds along the membrane.