

**CBSE**  
**Class XI Biology**

**Time: 3 hrs**

**Total marks: 60**

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**General instructions:**

1. All questions are compulsory.
  2. This question paper consists of five sections A, B, C, D and E. Section **A** contains **5** questions of **one** mark each, Section **B** is of **4** questions of **two** marks each, Section **C** is of **11** questions of **three** marks each, Section **D** is of **1** question of **four** marks and Section **E** is of **2** questions of **five** marks each.
  3. There is no overall choice. However, an internal choice has been provided in **one** question of **2** marks, **one** question of **3** marks and two questions of **5** marks weightage. A student has to attempt only one of the alternatives in such questions.
  4. 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]
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]
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]

### SECTION C

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

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

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

13. 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

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

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

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

17. A patient was complaining of frequent urination, excessive thirst, hunger and tiredness.  
His fasting blood level was found 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

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

19. 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]

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

**OR**

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

## SECTION D

21. Read the passage and answer the questions which follow:

Shyam's father was a habitual smoker. One day, he complained of breathing problem and his condition became serious. He was taken to hospital. Shyam asked the doctor about the cause of the problem. The doctor explained that it is due to smoking. [4]

- i. What is the term used to describe difficulty in breathing due to smoking?
- ii. What is the effect of smoking on our respiratory system?
- iii. What is the lesson learnt from the condition of Shyam's father?
- iv. Define emphysema.

## SECTION E

22. 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 Krebs's cycle.

23. Name the hormone which regulates each of the following and mention the source of it. [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.

**CBSE**  
**Class XI Biology**  
**Solution**

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**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.
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%.
5. Synaptic knob

**SECTION B**

6. Certain cnidarians which exhibit both forms (polyp and medusa) exhibit alternation of generation. The polyps produce medusae asexually, while medusae form the 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 mitochondria through a specific transport protein.
  9. The colour of a leaf kept in the dark frequently becomes yellow or pale green because the chlorophyll is degraded, and there is no formation of chlorophyll. Carotenoid pigments are more stable.

## SECTION C

**10.** 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.

**11.** 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.

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

**13.** 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.

**14.** 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.

**15.** 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 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, formation of the plasma membrane for rapid elongation and the formation of the septum.

**16.**

- 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.
- iii. Changeless form: Enzymes are not transformed in the chemical reaction. They combine temporarily with the substrate molecules but are not consumed or changed permanently in the reaction they catalyse.

**17.**

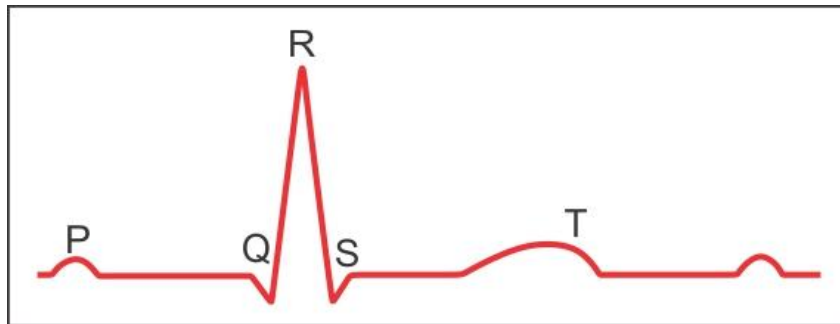
- i. The disease is diabetes mellitus.
- ii. The failure of the  $\beta$ -cells of the islets of Langerhans of pancreas to produce adequate amounts of insulin is the root cause of this disease.
- iii. Undersecretion of insulin impairs the following functions:
  - (a) Use and uptake of glucose by adipocytes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

**18.** 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 6C compound which breaks into two molecules of a 3C-compound, 3-phosphoglyceric acid (3-PGA).

**19.** 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.

20. 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 the 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 systole.

**OR**

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<sup>+</sup> and water.

#### **SECTION D**

21.

- i. Emphysema.
- ii. Smoking results in the inflation or abnormal distension of the bronchioles or alveolar sacs resulting in the loss of their elasticity.
- iii. Smoking is injurious to health.
- iv. Emphysema is a respiratory disorder caused by inflation or abnormal distension of the bronchiole or alveolar sac resulting in the loss of their elasticity.

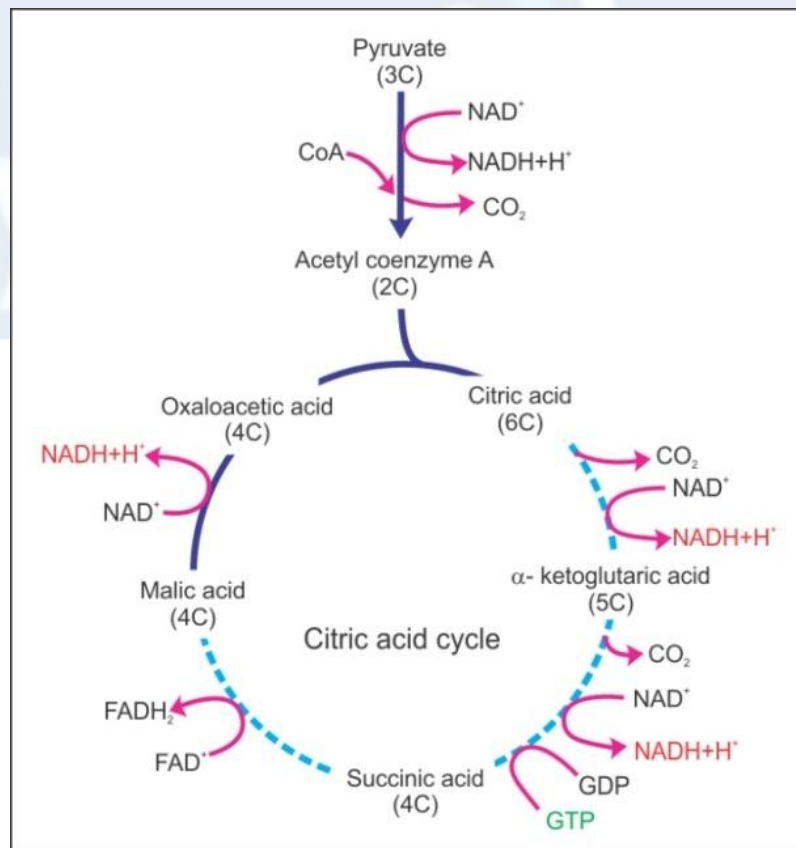
## SECTION E

22.

- i. 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.
- ii. 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.
- iii. 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.
- iv. Delay of flowering: Low concentration of N, S and Mo causes delay in flowering in certain plants.
- v. Deformation: Deficiency of boron causes deformation, discolouration and disorganisation of meristematic tissue and finally death of a growing plant.

OR

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





23.

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.

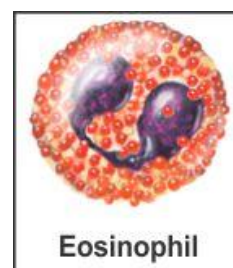
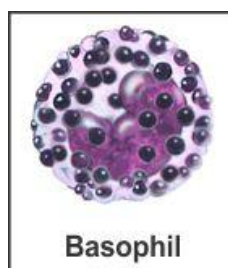
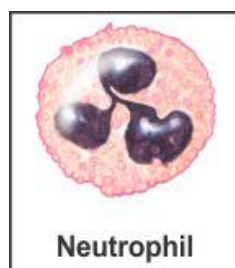
OR

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.

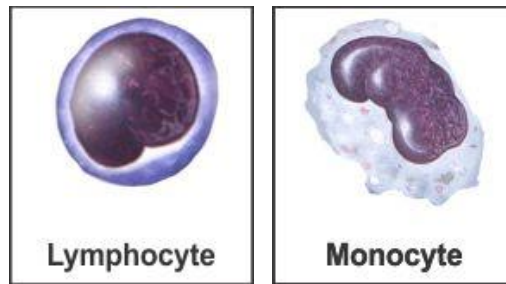
- i. Erythrocytes or red blood cells: These are the most abundant cells in the human body. These are biconcave and circular, enucleated and contain the pigment called haemoglobin which imparts red colour to the blood. They help in the exchange of gases and maintain the pH of blood.



- 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.

