

CBSE
Class XI Biology

Time: 3 hrs

Total marks: 60

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. Name an alga which is used in laboratory culture media. [1]
2. Why is a leaf of silk cotton called palmately compound? [1]
3. Which stage of cell division will you select to study the morphology of chromosomes and why? [1]
4. What does the variegated leaf experiment of photosynthesis prove? [1]
5. What is serum? [1]

SECTION B

6. What is meant by haemocoel? Name the phylum which shows this feature. [2]
7. Differentiate between saturated and unsaturated fats. [2]

OR

What are nucleic acids? Name the two types of nucleic acids.

8. Differentiate between tidal volume and residual volume. [2]

9. [2]
(a) What is hypertension?
(b) Name two vital organs affected by high blood pressure or hypertension.

SECTION C

10. Describe the three common steps in the sexual reproduction of fungi. [3]
11. Enumerate three points to show the interaction of cockroach with mankind. [3]
12. Describe any three modified forms of tap root for storage with one example of each. [3]
13. [3]
(a) What are spermathecal pores? Mention their location and function in earthworm.
(b) How many times do nymphs moult to reach the adult form of cockroach?
14. What is the significance of mitosis? [3]
15. [3]
(a) Differentiate between the primary and secondary wall.
(b) What is the significance of a vacuole in a plant cell?
16. [3]
(a) What is chromatin? Describe its chemical composition.
(b) What does 'S' refer to in a 70S and 80S ribosome?
17. [3]
(a) What are the chemical changes in a pyruvic acid molecule before it enters the mitochondria?
(b) What is the function of phosphofructokinase in glycolysis?
(c) Photorespiration is a wasteful process. Give two reasons.
18. [3]
(a) What is imbibition pressure?
(b) What is the usefulness of imbibition pressure to seed germination?
(c) How is nitrate assimilated by plants?

OR

- (a) What is complex III in ETS of mitochondria? Describe its function.
(b) Draw a diagram of the light harvesting complex.
19. Give the location and function of the following in the human eye: [3]
(a) Cornea
(b) Iris

20. Draw a well-labelled diagram of the human respiratory system.

[3]

SECTION D

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

Harish's mother always insisted on including pulses in the daily diet as they are rich in proteins, but Harish does not like eating pulses. He asked his science teacher how legumes are rich in proteins. The teacher explained that legumes have a symbiotic association with some bacteria which fix nitrogen from the atmosphere. [4]

- i. What is nitrogen fixation?
- ii. Name two organisms involved in nitrogen fixation.
- iii. What is the role of nitrogen in plants?
- iv. Harish should learn which important point about food from his mother?

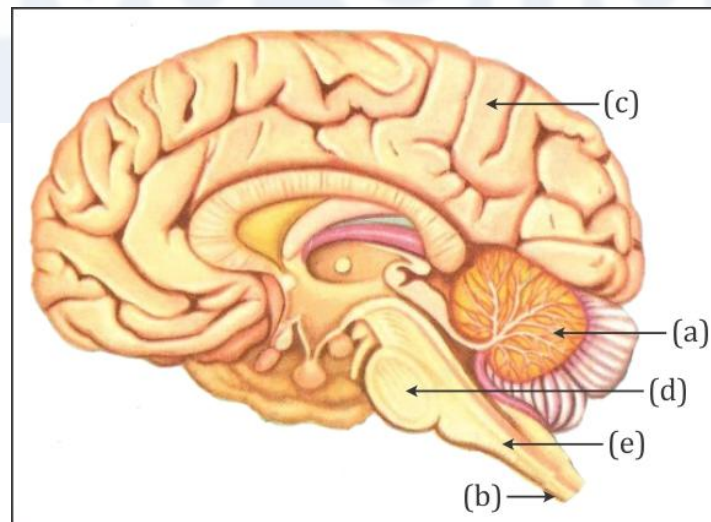
SECTION E

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

OR

What are the conditions necessary for fixation of atmospheric nitrogen by *Rhizobium*?
What is its role in N_2 fixation?

23. Study the given figure carefully and answer the following questions: [5]

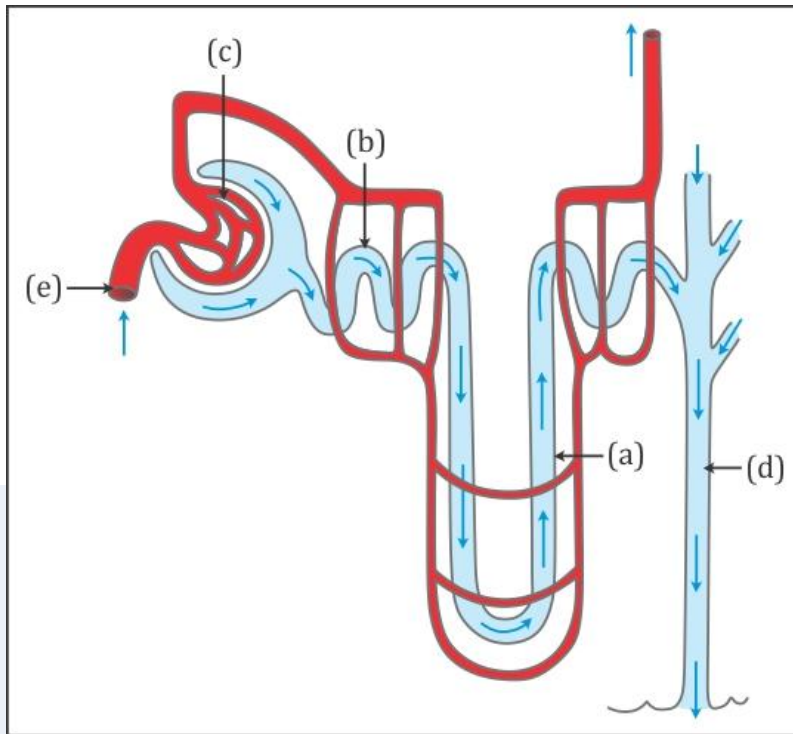


(a) Label the parts marked as (a), (b), (c), (d) and (e).

(b) Give one major function of each.

OR

- (a) Study the given figure carefully and label the parts (a), (b), (c), (d) and (e).
(b) Give one major function of each of these.



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CBSE
Class XI Biology
Solution

SECTION A

1. *Gelidium* - Agar
2. A leaf of silk cotton is palmately compound because the petiole bears leaflets at the tip of the petiole like the fingers of the palm.
3. Metaphase is the best stage to study the morphology of chromosomes because the chromosomes are the shortest and thickest at this stage.
4. It proves that chlorophyll is necessary for photosynthesis.
5. Plasma without the clotting factors is called serum.

SECTION B

6. Haemocoel is a body cavity or pseudocoel filled with blood. It is found in Arthropods and Molluscs.
- 7.

Saturated Fats	Unsaturated Fats
<ol style="list-style-type: none">i. They do not possess any double bonds in their fatty acids.ii. All carbon atoms are fully saturated.iii. They are solid at ordinary temperature.iv. Animal fats are mostly saturated fats.	<ol style="list-style-type: none">i. They contain one or more double bonds in their fatty acids.ii. Carbon atoms are unsaturated in the region of double bonds.iii. They are liquid at ordinary temperature.iv. Plant fats are generally unsaturated fats.

OR

Nucleic acids are long chain macromolecules which are formed by end to end polymerisation of a large number of repeated units called nucleotides. The two types of nucleic acids are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

8.

Tidal volume	Residual volume
i. It is the volume of air inspired or expired with each normal breath.	i. It is the volume of air which remains still in the lungs after the most forceful expiration.
ii. This is about 500 ml in an adult person.	ii. It is about 100 ml to 1200 ml of air.

9.

- (a) If repeated checks of blood pressure of an individual are 140/90 mm Hg or higher, it is called hypertension.
- (b) Brain and kidney

SECTION C

10. Sexual reproduction in fungi involves:

- i. Plasmogamy: Fusion of the protoplasm of the two fusing gametes/cells is called plasmogamy.
- ii. Karyogamy: It involves mixing of two nuclei of the fusing gametes/cells. It follows plasmogamy.
- iii. Meiosis: The diploid nucleus formed by karyogamy undergoes meiosis to produce haploid spores.

11.

- i. Cockroaches cause damage to household materials such as clothes, purses, shoes etc. They also eat and destroy human food such as bread, fruits, cheese etc.
- ii. They carry harmful germs of diseases such as diarrhoea, cholera, typhoid, tuberculosis etc.
- iii. Many animals such as amphibians (e.g. frogs, toads), lizards and birds eat cockroaches. Thus, they are part of the food chain.

12. Modifications of tap root for storage:

- i. Conical: The base of the root is broad and gradually tapers towards the apex. Example: Carrot
- ii. Fusiform: The fusiform fleshy root is like a spindle, i.e. thickest in the middle and narrow towards both base and apex. Example: Radish
- iii. Napiform: The fleshy root is very thick at the base and is almost spherical. It suddenly thins out towards the apex. Example: Turnip

13.

- i. Spermathecal pores are four pairs of small openings situated ventro-laterally in the intersegmental grooves of the segments 5/6, 6/7, 7/8 and 8/9 on each side. Each opening leads into a spermatheca, in which the sperms of the other earthworm are stored.
- ii. Thirteen times

14. Significance of mitosis:

- i. Mitosis is essential for growth and development of a multicellular organism.
- ii. An efficient cell has a high nucleocytoplasmic ratio. An increase in size lowers the ratio. It is brought back to the efficient level through division.
- iii. Mitosis involves replication and equitable distribution of all the chromosomes so that all the cells of a multicellular organism have the same number and type of chromosomes.

15.

i.

Primary Wall	Secondary Wall
<ol style="list-style-type: none">i. The primary wall is laid inner to the middle lamella.ii. It is formed in growing cells.iii. It occurs in all plant cells.iv. It is comparatively thin (0.1–3 μm).	<ol style="list-style-type: none">i. The secondary wall is laid inner to the primary wall.ii. It is formed when the cell has stopped growing.iii. It is found in some cells.iv. It is quite thick 3–10 μm.

- ii. It contains cell sap and helps to maintain the osmotic pressure of the cell.

16.

- i. The highly extended and indistinct network of nucleoprotein fibres present in the nucleoplasm is called chromatin.
The chromatin contains DNA and some basic proteins called histones, some non-histone proteins and RNA.
- ii. S refers to sedimentation (or Svedberg) coefficient.

17.

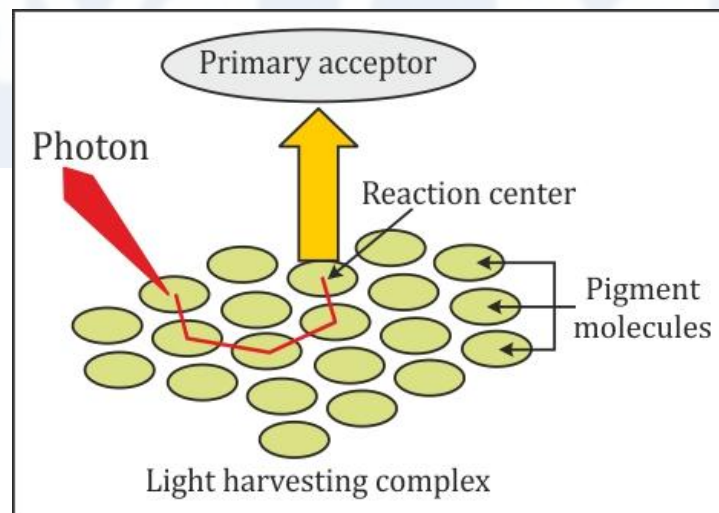
- i. Pyruvic acid undergoes oxidative decarboxylation in which pyruvic acid first loses one carbon dioxide molecule and then undergoes oxidation in the presence of enzyme pyruvic dehydrogenase to form acetyl CoA.
- ii. Phosphofructokinase catalyses the phosphorylation of fructose 6-phosphate by ATP to form fructose 1, 6-bisphosphate.
- iii. It is a wasteful process because
 - (a) There is no synthesis of sugars or other energy-rich compounds such as ATP.
 - (b) It consumes ATP and liberates the photosynthetically fixed carbon dioxide.

18.

- i. The pressure developed in the adsorbent or imbibant due to diffusion of water in it is known as imbibition pressure.
- ii. This pressure makes the seedlings to emerge from the soil during seed germination.
- iii. The nitrate formed by the process of nitrification is absorbed by plants and transported to the leaves where it is reduced to form ammonia. The reduced ammonia finally forms the amino group of amino acids.

OR

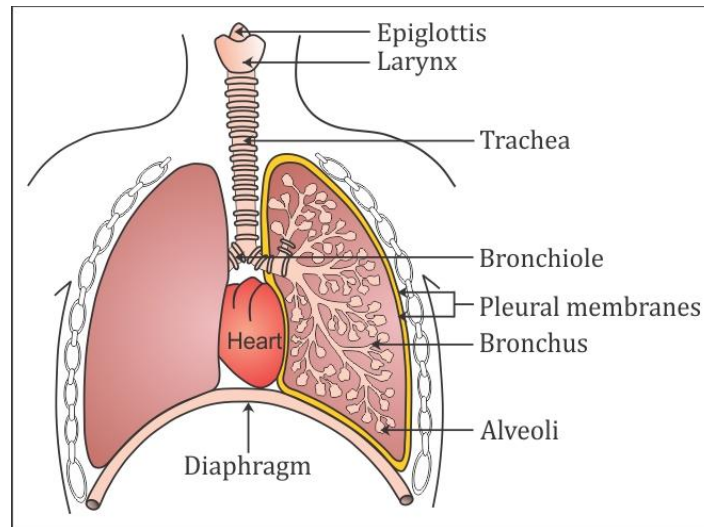
- i. Complex III consists of cytochrome bc complex. It passes the electrons from ubiquinol to cytochrome c, which in turn, passes it to complex IV.
- ii.



19.

- i. The cornea is the transparent portion which forms the anterior one-sixth of the eyeball. The cornea admits and helps to focus light waves as they enter the eye.
- ii. It extends from the ciliary body across the eyeball in front of the lens and has an opening in the centre called the pupil. It contains two types of smooth radial muscles which controls the amount of light entering the eye.

20.



SECTION D

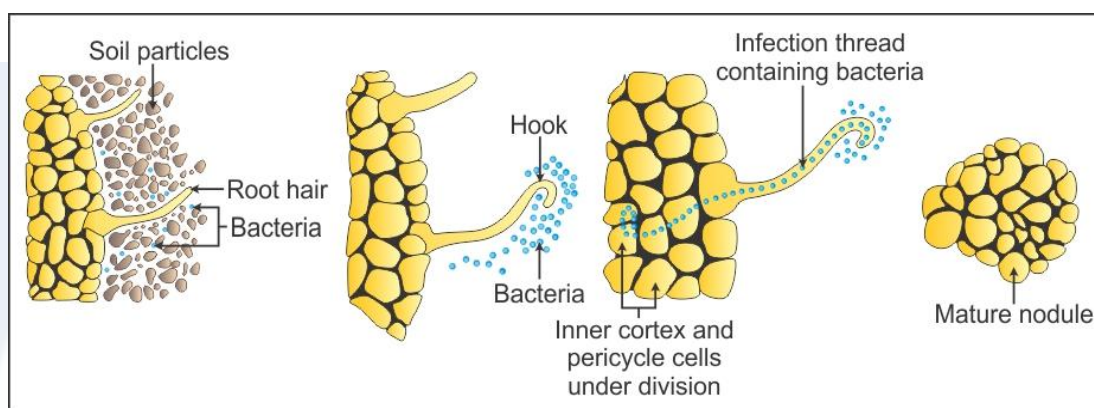
21.

- i. It is the process of converting atmospheric nitrogen into ammonia by the bacterium, such as *Rhizobium*, living in the root nodules of legumes.
- ii. *Rhizobium* (symbiotic), *Azotobacter* (free living)
- iii. Nitrogen is a component of macromolecules such as proteins and nucleic acids, and it is important for various metabolic activities.
- iv. Harish should learn that in a balanced diet, proteins are also very important.

SECTION E

22. Steps in the development of root nodules:

- The roots of legumes secrete flavonoids and betaines which attract Rhizobium bacteria.
- The bacteria collect over the root hair and release Nod factors which cause curling of root hair.
- The enzymes from the bacteria degrade the parts of root hair cell wall which produces a thread-like structure called the infection thread.
- The bacteria multiply and invade the infection thread and finally reach up to the inner cortex where they enter the cells and divide to form a knob-like protuberance called root nodule.



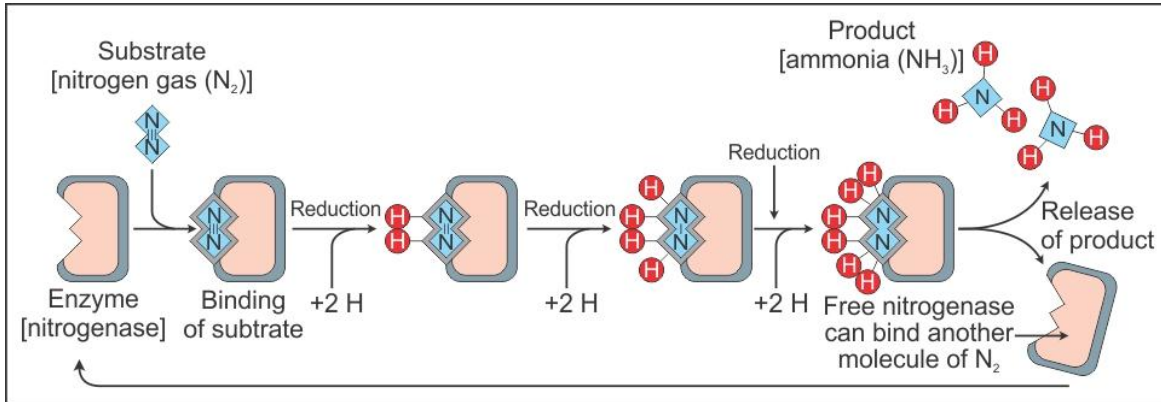
OR

The following conditions are necessary for fixation of atmospheric nitrogen by Rhizobium:

- Reducing environment
- Presence of enzyme nitrogenase
- Source of energy as ATP
- Source of reducing power, NAD(P) H₂ or FMNH₂
- Ferredoxin as electron donor
- Keto acids for picking up the amino group
- Reduced availability of nitrate in the substrate

Role of Rhizobium in N₂ fixation:

Rhizobium fixes nitrogen from the atmosphere into a plant usable form, ammonium, using the enzyme nitrogenase. In return, the plant supplies the bacteria with carbohydrates, proteins and sufficient oxygen so as not to interfere with the fixation process. Leghaemoglobin, a plant protein, helps to provide oxygen for respiration while keeping the free oxygen concentration low enough not to inhibit the nitrogenase activity.



23.

i.

- (a) Cerebellum
- (b) Spinal cord
- (c) Cerebrum
- (d) Pons varolii
- (e) Medulla oblongata

ii. Functions of parts:

- (a) It maintains posture, equilibrium and muscle tone.
- (b) It acts as a centre for spinal reflexes.
- (c) It perceives the sensory impulses coming from the sense organs.
- (d) It controls some aspects of respiration.
- (e) It has a cardiac centre to control the rate of heartbeat and a respiratory centre to control breathing movements.

OR

i.

- (a) Thin ascending limb of loop of Henle
- (b) Proximal convoluted tubule
- (c) Glomerulus
- (d) Collecting duct
- (e) Afferent arteriole

ii. Functions of parts from (a) to (e):

- (a) Reabsorption of electrolytes
- (b) Selective reabsorption of useful substances
- (c) Ultrafiltration of blood
- (d) Reabsorption of water to form hypertonic urine
- (e) To carry blood to glomerulus for ultrafiltration