

**Class XI Session 2024-25**  
**Subject - Biology**  
**Sample Question Paper - 4**

**Time Allowed: 3 hours**

**Maximum Marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

**Section A**

1. Sometimes different authors give different names to one and the same species. In such a situation: [1]
  - A. The name under which the species was first described is a valid name.
  - B. The latest name under which the species was described is valid.
  - C. People can use any one of the names for the species.
  - D. All known names are discarded and a new name is given to the species.

a) (D) b) (B)  
c) (A) d) (C)
2. The epithelial cells of Bowman’s capsule are called: [1]
  - a) Calyces b) Filtration slits
  - c) Podocytes d) Slit pores
3. An important site for the formation of glycoproteins and glycolipids is: [1]
  - a) Vacuoles b) Lysosomes
  - c) Plastids d) Golgi apparatus
4. Monocotyledonous leaves are \_\_\_\_\_. [1]
  - a) Dorsiventral b) Round
  - c) Pinnate d) Isobilateral
5. How will you define the lungs? [1]
  - a) Respiratory Control Centre b) Pneumotoxic Centre



- a) Both A and R are true and R is the correct explanation of A.      b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.      d) A is false but R is true.

16. **Assertion (A):** Pneumotaxic centre present in the pons region of the brain. [1]

**Reason (R):** Neural signal from this centre can reduce the duration of inspiration and thereby alter the respiratory rate.

- a) Both A and R are true and R is the correct explanation of A.      b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.      d) A is false but R is true.

**Section B**

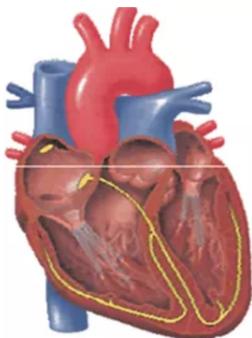
17. You are given two slides having T.S. of roots and stems. How will you identify which slide is of root and which is of stem? [2]
18. Where is the Bidder's canal located and how is it useful in frog? [2]
19. Write short note on the function of Thymosins [2]
20. Why is death considered as a regulatory process on the earth? [2]
21. What is the significance of splitting of water, during photosynthesis? [2]

OR

Differentiate between stroma and grana of chloroplasts.

**Section C**

22. Distinguish between Artificial System and Phylogenetic System. [3]
23. Which features make mammals as the most successful and dominant animals? [3]
24. Do amino acids exist as Zwitter ion. Give its structure. Why is it formed? [3]
25. A rubber band stretches and reverts back to its original position. Bubble gum stretches, but it would not return to its original position. [3]
- Is there any difference between the two processes? Discuss it with respect to plant growth (Hint: Elasticity (reversible) Plasticity (irreversible))
26. Describe the structure of the rib cage of the human. [3]
27. In the diagrammatic presentation of heart given below, mark and label, SAN, AVN, AV bundles, bundle of His and Purkinje fibres. [3]



OR

Differentiate between

- i. Myogenic heart and neurogenic heart.  
ii. Lymphatic capillaries and blood capillaries.

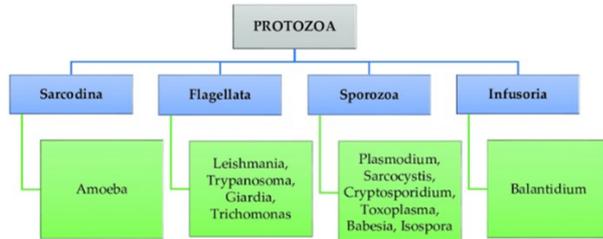
28. Give a description of the structure of neuron. [3]

**Section D**

29. **Read the following text carefully and answer the questions that follow:**

[4]

Sarcodines are unicellular/jelly-like protozoa found in fresh or sea water and in moist soil. Their body lacks a periplast. Therefore, they may be naked or covered by a calcareous shell. They usually lack flagella and have temporary protoplasmic outgrowths called pseudopodia. These pseudopodia or false feet help in movement and capturing prey. They include free-living forms such as Amoeba or parasitic forms such as Entamoeba. Zoo flagellates ciliates and I sporozoans are other groups of protozoan protists. They are all unicellular and heterotrophic. They may be holozoic, saprobic or parasitic.



- i. Write two lines about flagellated protozoans and also mention some flagellated protozoans. (1)
- ii. Observe the given protozoan classification and mention what is the basis of protozoan classification. (1)
- iii. Mention some locomotory organs of protozoa. (2)

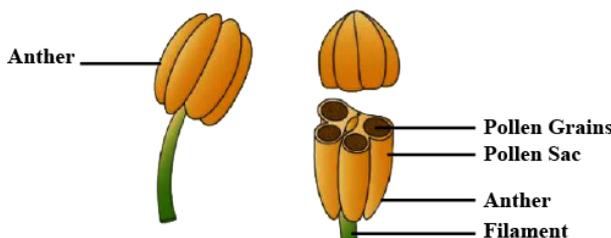
**OR**

Which protozoan group has two nuclei, macronucleus, and micronucleus? Mention characteristics of it. (2)

30. **Read the following text carefully and answer the questions that follow:**

[4]

The androecium is composed of stamens. Each stamen that represents the male reproductive organ consists of a stalk or a filament and an anther. Each anther is usually bilobed and each lobe has two chambers, the pollen-sacs. Stamens of flowers may be united with other members such as petals or among themselves. The stamens may be epipetalous or epiphyllous. A flower is a modified shoot wherein the shoot apical meristem changes to floral meristem. Internodes do not elongate and the axis gets condensed. The apex produces different kinds of floral appendages laterally at successive nodes instead of leaves. The arrangement of flowers on the floral axis is termed an inflorescence.



- i. Observe the figure and mention what is androecium composed of. (1)
- ii. The pollen grains are produced in pollen-sacs. What is a sterile stamen is called? (1)
- iii. Is salvia and mustard show variation in the length of filaments within a flower? (2)

**OR**

Mention statement justifies that the given figure is racemose inflorescence. (2)



**Section E**

31. Comment on the statement - Meiosis enables the conservation of specific chromosome number of each species [5]  
even though the process per se, results in reduction of chromosome number.

OR

Distinguish anaphase of mitosis from anaphase I of meiosis.

32. Give an account of Glycolysis. Where does it occur? What is the end product? Trace the fate of these products in [5]  
both aerobic and anaerobic respiration.

OR

Explain various steps involved in cellular respiration.

33. Describe the structure of the following with the help of labelled diagrams. [5]

i. Nucleus

ii. Centrosome

OR

Give the factors that govern the size of the cell.

# Solution

## Section A

1.  
**(c) (A)**  
**Explanation:** In *Mangifera indica* Linn, the word 'Linn' indicates that this species was first described by Linnaeus. Hence, the correct option is The name under which the species was first described is the valid name.
2.  
**(c) Podocytes**  
**Explanation:** Podocytes are cells in the Bowman's capsule in the kidneys that wrap around capillaries of the glomerulus. The Bowman's capsule filters the blood, retaining large molecules such as proteins while smaller molecules such as water, salts, and sugars are filtered as the first step in the formation of urine.
3.  
**(d) Golgi apparatus**  
**Explanation:** Synthesis of glycoproteins and glycolipids take place in Golgi apparatus inside the cell. Golgi apparatus is located near the nucleus of the cell.
4.  
**(d) Isobilateral**  
**Explanation:** Monocotyledonous leaves are isobilateral as both the lower and upper sides of the leaves are the same.
5.  
**(d) Respiratory Rhythm Centre**  
**Explanation:** The lung is a bag-like structure made up of bronchioles and alveoli. This is the place where the exchange of gases takes place.
6.  
**(d) NAD to NADH**  
**Explanation:** After absorbing light, electrons are excited and transferred through PS II and PS I and finally to NAD forming NADH.
7.  
**(a) Liver**  
**Explanation:** Urea cycles operate in the liver, where ammonia is converted into urea. Sometimes urea cycle also occurs in the kidney.
8.  
**(c) Blubber**  
**Explanation:** Whales can live in cold water as they have a thick coat of blubber. Blubber help in providing insulating coat beneath the skin that prevents loss of heat from the body.
9.  
**(b) Extra elongation**  
**Explanation:** GA3 is gibberellin that helps in the elongation of the stem of the plant. If the GA3 plant hormone is applied to the rice seedling the plant will show extra elongation of the plant body.
10.  
**(d) Haploid**  
**Explanation:** A dominant, independent, photosynthetic, thalloid, or erect phase of Bryophytes and pteridophytes is represented by a haploid gametophyte.
11.  
**(d) Protection**  
**Explanation:** The skin is one of the largest organs in the body in surface area and weight. The skin consists of two layers: the epidermis and the dermis. Beneath the dermis lies the hypodermis or subcutaneous fatty tissue. The skin has three main functions: protection, regulation, and sensation.

12. (a)  $pO_2$

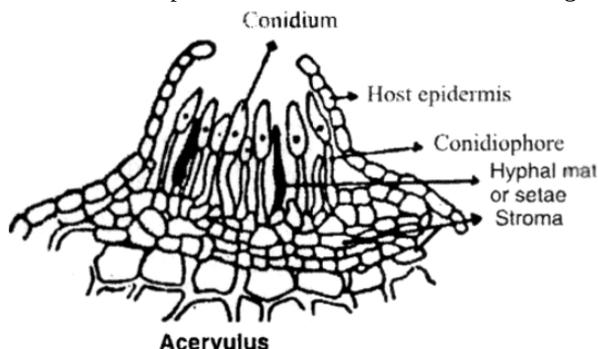
**Explanation:**  $CO_2$  is carried by haemoglobin as carbamino-haemoglobin. This binding is related to the partial pressure of  $CO_2$ .  $pO_2$  is a major factor that could affect this binding.

13.

(b) Both A and R are true but R is not the correct explanation of A.

**Explanation:**

Acervulus is a saucer-shaped structure consisting of stromate mass of hyphae and a fertile layer of conidiophores. Intermingled with the conidiophores are sometimes found dark, long, stiff bristles. These are called the setae.



14.

(b) Both A and R are true but R is not the correct explanation of A.

**Explanation:** Both A and R are true but R is not the correct explanation of A.

15.

(c) A is true but R is false.

**Explanation:** Polymerization or condensation is an energy-requiring anabolic process. A molecule of water is eliminated in the region of condensation of two macromolecular residues.

16. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:** Both A and R are true and R is the correct explanation of A.

#### Section B

17. Presence or absence of hair on the epidermis will give the clue. Those with hair are slides of root. Cuticles will be present on the slide of stem.
18. Bidder's canal is present in the kidney of a frog. It communicates with the ureter, which leaves the kidney near its end and opens into the cloaca.
19. **Functions of Thymosins.** Thymosins play a major role in the differentiation of T-lymphocytes, which provide cell mediated immunity. In addition, thymosins also promote production of antibodies to provide humoral immunity.
20. Every organism which is born on this earth has some role with respect to another organism, ecosystem and biospheres existing on earth. After performing its functional part in its life cycle it contributes to the cycle of nature and dies. This way natural control on all natural process is maintained. This is why the death of the organism is inevitable.
21. The photosystem I keeps on removing electrons from photosystem II. A continuous supply of electrons is required to further carry on the reaction. When water molecule is split, electrons are released. These electrons maintain the continuous supply from photosystem II to photosystem I. oxygen is also released after splitting of water, which helps in maintaining the balance of oxygen in the environment.

OR

Stroma	Grana
It is the jelly-like matrix of the chloroplast.	These are formed of stacks of thylakoids.
Dark reaction takes place here.	Light reaction takes place here.

#### Section C

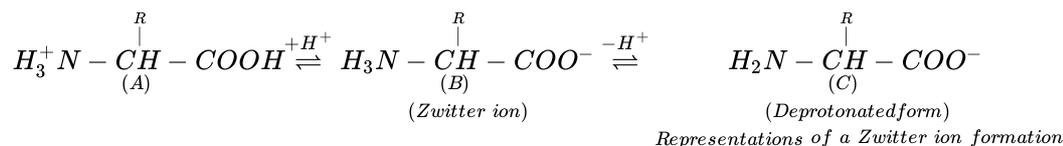
Artificial System	Phylogenetic System
The organisms are categorised on the basis of one/few superficial characters.	The organisms are categorised on the basis of relationship with their ancestors.

It was based on <b>Bauhin</b> and <b>Linnaeus's</b> work.	It was on <b>Eichler's</b> system of classification.
Suggested by <b>Theophrastus</b> in his book named Historia Plantarum.	Suggested by <b>Darwin</b> and <b>Wallace</b> ; as the evolutionary theory was its base.

23. Features which make mammals as dominant and successful animals are as follows:

- i. The presence of an insulating and protective hairy exoskeleton.
- ii. They are warm-blooded so have a high rate of metabolism.
- iii. They are viviparous animals and show placentation and intrauterine development which increases the chances for survival of young ones.
- iv. They show a high degree of parental care.
- v. They have more developed hearing efficiency due to the presence of pinna, three ear-ossicles and coiled cochlea in the ear.
- vi. They are able to speak through indicative/verbal language.
- vii. They have a good power of learning due to the presence of a more developed brain.

24. Yes, amino acids exist as Zwitter ion.



Zwitter ion formation is another particular property of amino acid. It is a neutral molecule (with positive and negative charge), having the ionisable nature of —NH<sub>2</sub> and —COOH groups. Hence, in solutions of different pHs, the structure of amino acid changes variably.

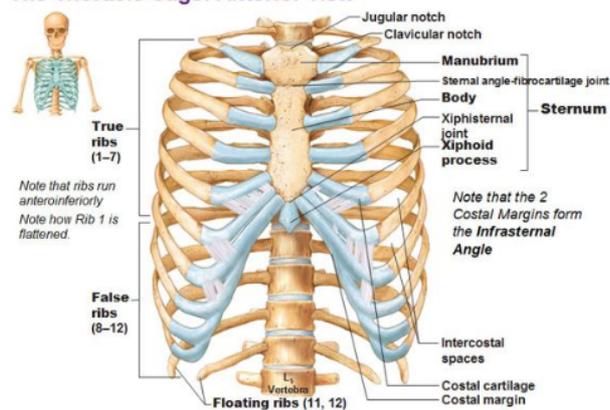
25. A rubber band stretches and reverts back to its original position due to elasticity. However, when bubble gum stretches, but would not return to its original position, it is plasticity.

The meristematic cells are rich in protoplasm, possess large conspicuous nuclei. Their cell walls are primary in nature, thin, cellulosic, and elastic with abundant plasmodesmatal connections.

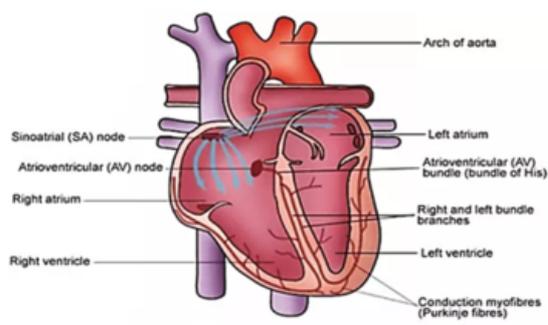
However, plants follow different pathways in response to the environment or phases of life to form different kinds of structures. This ability is called plasticity.

26. **Rib Cage:** There are 12 pairs of ribs. Each rib is a thin flat bone connected dorsally to the vertebral column and ventrally to the sternum. It has two articulation surfaces on its dorsal end and is hence called bicephalic. First, seven pairs of ribs are called true ribs. Dorsally, they are attached to the thoracic vertebrae and ventrally connected to the sternum with the help of hyaline cartilage. The 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> pairs of ribs do not articulate directly with the sternum but join the seventh rib with the help of hyaline cartilage. These are called vertebrochondral (false) ribs. Last 2 pairs (11<sup>th</sup> and 12<sup>th</sup>) of ribs are not connected ventrally and are, therefore, called floating ribs. Thoracic vertebrae, ribs and sternum together form the rib cage.

**The Thoracic Cage: Anterior view**



27. The labelled diagram of the human heart is given below:



OR

**i. Difference between Myogenic heart and Neurogenic heart:**

Myogenic heart	Neurogenic heart
In the myogenic heart, the initiation of the heartbeat is under muscular control.	Under nervous control. e.g. Insects, Crustacea and Annelida.
e.g. Molluscs and vertebrates.	Insects, crustacea, and Annelida.

**ii. Difference between Lymphatic capillaries and Blood capillaries:**

Lymphatic capillaries	Blood capillaries
They are colourless.	They are red.
They convey lymph,	They convey blood.
They are wider than blood capillaries.	They are narrower than the lymphatic capillaries

28. A neuron is a microscopic structure composed of three major parts, namely, cell body, dendrites and axon.

**Cell Body.** The cell body contains cytoplasm with typical cell organelles and certain granular bodies called Nissl's granules.

**Dendrites.** Short fibres which branch repeatedly and project out of the cell body also contain Nissl's granules and are called dendrites. These fibres transmit impulses towards the cell body.

**Axon.** The axon is a long fibre, the distal end of which is branched. Each branch terminates as a bulb-like structure called synaptic knob which possess synaptic vesicles containing chemicals called neurotransmitters. The axons transmit nerve impulses away from the cell body to a synapse or to a neuro-muscular junction.

**Section D**

29. i. Flagellated protozoans are either free-living or parasitic protozoans that have flagella. Sleeping sickness is caused by parasitic versions of the parasite. Trypanosoma is a good example.

- ii. • Locomotion  
• Protozoan are eukaryotic having different shapes and sizes. Some are ciliated flagellated or both may be absent.

- iii. a. Cilia  
b. Flagella  
c. Pseudopodia

**OR**

Ciliata has two nuclei, macronucleus, and micronucleus.

Ciliates are characterized as organisms propelled by rows of cilia and possessing two types of nuclei. They are a large macronucleus involved in vegetative functions of the organism, and a small micronucleus involved in sexuality.

30. i. An androecium is the male part of the flower which is composed of a long filament and an anther attached to its tip.

ii. Sterile stamen is called staminode.

iii. Yes, salvia and mustard show variation in the length of filaments within a flower.

**OR**

a. The main axis continues to grow.

b. The flowers are borne laterally in an acropetal succession.

**Section E**

31. Meiosis is called reduction division because the number of chromosomes in daughter cells becomes half of the number of chromosomes in mother cells. In spite of this, meiosis enables the conservation of specific chromosome number of each species. In fact, has there been no meiosis, organisms would not have been able to evolve to sexual mode of reproduction. We know that

fertilization involves fusion of male and female gametes. Thus, zygote gets the chromosome pool from two cells and the number of chromosomes in a zygote becomes double that of the gametes. To ensure conservation of specific chromosome number after fertilization, it is necessary that the gametes should have half the number of chromosomes compared to what it is in somatic cells.

OR

Anaphase of mitosis	Anaphase I of meiosis
The centromere of every chromosome divides.	The centromere does not divide.
Separation of sister chromatids takes place.	Homologous chromosomes are separated.
Only one chromatid of every chromosome moves to the pole. The number and types of chromosomes at each pole is the same as in the parent nucleus. Chromosomes are single-stranded	Each homologous pair of chromosomes moves to the pole with both the chromatids. chromosomes are double-stranded
The chromatids moving to one pole are genetically identical to those moving to the opposite pole.	The chromosomes moving to one pole are not genetically identical to those moving to the opposite pole.

32. Glycolysis occurs in the cytoplasm of the cell and is present in all living organisms. In this process, glucose undergoes partial oxidation to form two molecules of pyruvic acid. The following are the important step of glycolysis.

- Glucose undergoes phosphorylation to produce glucose- 6 -phosphate.
- Fructose-6-phosphate is then converted into PGAL. (Phosphoglyceraldehyde).
- Each molecule of PGAL then undergoes several steps to produce Pyruvic Acid.
- There is a net gain of two molecules of ATP during glycolysis of one molecule of glucose.

**Fate of Pyruvate:** Aerobic Respiration: Pyruvic acid is completely oxidized to produce carbon dioxide and energy.

**Anaerobic Respiration:** Depending upon the availability of oxygen in some organisms. pyruvic acid is converted into ethanol and carbon dioxide when there is a complete absence of oxygen. In some other organisms, pyruvic acid is converted into lactic acid when there is an incomplete oxygen supply.

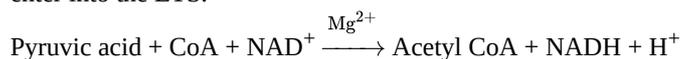
OR

**Steps of cellular respiration:**

i. Glycolysis: Glycolysis is the first step in cellular respiration. During glycolysis, glucose undergoes partial oxidation to form pyruvic acid. From 1 molecule of glucose, 2 molecules of pyruvic acid is formed.

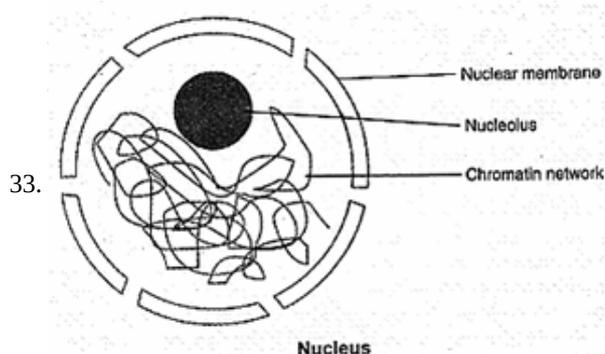
ii. Aerobic or Anaerobic respiration:

- In the absence of oxygen pyruvic acid is converted into lactic acid or ethanol.
- Citric Acid Cycle: Under aerobic conditions, the pyruvic acid enters citric acid cycle  $\text{NADH} + \text{H}^+$  and  $\text{FADH}_2$  which enter into the ETS.



iii. Electron Transport System (ETS) and Oxidative Phosphorylation

- Energy stored in  $\text{NADH} + \text{H}^+$  and  $\text{FADH}_2$  is utilised to form ATP. This is accomplished when they are oxidised through the electron transport system and the electrons are passed on to  $\text{O}_2$  resulting in the formation of  $\text{H}_2\text{O}$ .
- When the electrons pass from one carrier to another in the electron transport chain, they are coupled to ATP synthase for the production of ATP from ADP and inorganic phosphate.



i. **Nucleus:** Nucleus is a double membrane structure, with minute pores in the membrane. The pores work like channels for passage of substances. The fluid-filled in the nucleus is called nucleoplasm. There is usually one nucleolus inside the nucleus.

Sometimes many nucleoli can be found. There is a fine network of a thread like chromatins inside the nucleus. During the resting stage of a cell, structures inside the nucleus cannot be seen. They become visible only during cell division.

ii. **Centrosome:** In chromosome, there is one primary constriction, which contains two centromeres. These centromeres comprise the centrosome. Centrosome plays an important role during cell division.

OR

**Factor Governing Cell Size:** Like all other living things, cells have a definite age and a maximum size. This process of cell division goes on in the body all the time. It is on this account, the cells do not grow beyond a certain size and limit.

Surface	Volume ratio
A	6 : 1
B	3 : 1
C	2 : 1

Volume ratio decreases with the increase in size. The size of the cell is co-related to the functions it performs.

Surface: Volume ratio decreases with the increase in size. The size of the cell is co-related to the functions it performs. As cell increases in volume, its surface area is increased (not to some extent). The volume determines the chemical activity of the cells per unit of time. The surface area determines the amount of absorption as well as the amount of release of waste products by cells. As the living cell grows, its rate of waste product formation and the need for intake of substances from the outside increases at a faster rate than that of the surface area. The small size of the cells of the large/bigger organisms compensates the disproportionate increase in volume and surface area of the cells. The cells are tiny structures. They are small in volume to maintain a large surface area to volume ratio.