

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) This question paper contains **27 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 5 carry 1 mark each.
- (iii) Section B: Questions 6 to 12 carry 2 marks each.
- (iv) Section C: Questions 13 to 24 carry 3 marks each.
- (v) Section D: Questions 25 to 27 carry 5 marks each.
- (vi) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vii) Draw neat, properly labelled diagrams wherever necessary.

Section A

1. Mention one example each from plants and animals exhibiting divergent evolution.

2. Give one reason to justify statutory ban on amniocentesis.

3. Name any two physiological barriers that provide innate immunity.

OR

3. Select two disease resistant crop varieties from the list of crop varieties given below:

Himgiri, Pusa Gaurav, Pusa Komal, Pusa A-4

4. Name a human genetic disorder due to the following:

(a) An additional X-chromosome in a male

(b) Deletion of one X-chromosome in a female

OR

4. State what does aneuploidy lead to.

5. Why is the rate of secondary succession much faster than that of primary succession?

Section B

6. State 'two' observations made by German naturalist, Alexander von Humboldt during his extensive explorations in South American jungles.

OR

6. If in a population of size 'N' the birth rate is represented as 'b' and the death rate as 'd', the increase or decrease in 'N' during a unit time period 't' will be:

$$dN/dt = (b - d) \times N$$

The equation given above can also be represented as:

$$dN/dt = r \times N, \text{ where } r = (b - d)$$

What does 'r' represent? Write any one significance of calculating 'r' for any population.

7. A segment of DNA molecule comprises of 546 nucleotides. How many cytosine nucleotides would be present in it if the number of adenine nucleotides is 96?

8. (a) You are given castor and bean seeds. Which one of the two would you select to observe the endosperm?

(b) The development of endosperm precedes that of embryo in plants. Justify.

9. Name a distinguishing structure seen in a mature black pepper seed and not in a pea seed. State how does it develop.

10. Why does the insecticidal protein produced by *Bacillus thuringiensis* not kill the bacterium, but kills the cotton bollworm? Explain.

11. Write the palindromic nucleotide sequence that EcoRI reads, and indicate the site of its action.

12. Mosses and frogs both need water as a medium for fertilisation. Where does syngamy occur and how is it ensured in both these organisms?

OR

12. Write the basis of categorising animals as oviparous or viviparous, giving one example of each.

Section C

13. Differentiate between an 'Expanding age pyramid' and a 'Stable age pyramid'. Substantiate your answer with diagrams.

14. A child is born with ADA-deficiency.

(a) Suggest and explain a procedure for possible life-long (permanent) cure.

(b) Name any other possible treatment for this disease.

15. Name the most commonly used bioreactor in biotechnology labs. Mention the most essential components this bioreactor must have so as to provide the optimum conditions to the culture medium, resulting in production of large volume of desired product.

16. A tall pea plant bearing violet flowers is crossed with a tall pea plant bearing white flowers. In the F₁ progeny, there were tall pea plants with white flowers, tall pea plants with violet flowers, dwarf pea plants with violet flowers and dwarf pea plants with white flowers. Work out the cross to show how it is possible.

17. (a) Differentiate between inbreeding and outbreeding.

(b) List any three advantages and one important disadvantage of inbreeding practice in animal husbandry.

18. Explain Hardy-Weinberg principle.

19. "Use of heavy isotope of nitrogen by Meselson and Stahl demonstrated semi-conservative mode of replication of a DNA molecule." Explain how did they arrive at this conclusion.

OR

19. Explain the mechanism of translation that occurs in the ribosomes in a prokaryote.

20. (a) Name the causative agents of pneumonia and common cold.

(b) How do these differ in their symptoms?

(c) Mention two symptoms common to both.

OR

20. (a) Write the scientific names of the causative agent and vector of malaria, and write its symptoms.

(b) Name any two diseases spread by *Aedes* sp.

21. Draw L.S. of an embryo of grass and label its parts.

OR

21. Draw a diagrammatic sectional view of a seminiferous tubule (enlarged) in humans and label its parts.

22. Construct a flow chart exhibiting sequential events of oogenesis.

23. When and where do tapetum and synergids develop in flowering plants? Mention their functions.

OR

23. Where are the following structures present in a male gametophyte of an angiosperm? Mention the function of each one of them.

(a) Germ pore

(b) Sporopollenin

(c) Generative cell

24. Describe the carbon cycle in nature. How does deforestation affect this cycle?

Section D

25. A normal couple has a colour-blind child, whereas a child suffering from thalassemia is born to normal parents.

Compare the pattern of inheritance of these two traits in the said cases. State the reasons how is it possible.

OR

25. (a) State the reasons for which Hershey and Chase carried out their experiments.

(b) Answer the following questions based on the experiments of Hershey and Chase:

(i) Name the different radioactive isotopes they used, and explain how they used them.

(ii) Why did they need to agitate and spin their culture?

(iii) Write their observations and the conclusions they arrived at.

26. A plastic sack manufacturer in Bengaluru, Ahmed Khan has managed to find an ideal solution to the problem of plastic waste. Explain in five steps the efforts of Ahmed Khan to meet the challenges of solid waste management.

OR

26. (a) What does an ecological pyramid represent? State any two limitations that these pyramids have.

(b) Describe an inverted pyramid of biomass with the help of an example.

27. (a) Differentiate between active and passive immunity.

(b) Comment on the role of vaccination and immunization in keeping human population healthy.

OR

27. Describe the process of secondary treatment given to municipal waste water (sewage) before it can be released into fresh waterbodies. Mention another benefit provided by this process.

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