

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. According to the Hardy-Weinberg principle, the allele frequency of a population remains constant. How do you interpret the change of frequency of alleles in a population?

OR

1. Coelacanth was caught in South Africa. State the significance of discovery of Coelacanth in the evolutionary history of vertebrates.

2. State the functions of mast cells in allergy response.

OR

2. State the function of interferons.

3. Name the pattern of inheritance where F_1 phenotype

(a) resembles only one of the two parents.

(b) does not resemble either of the two parents and is in between the two.

4. State from where do the signals for parturition originate in human females.

5. Write the two specific 'cry' genes that encode the proteins which control cotton bollworms.

Section B

6. Write the genotypes of the parents of a child suffering from thalassemia. State the cause of this disease.

7. Justify the need for signing of 'Montreal Protocol' by the participating nations in 1987.

OR

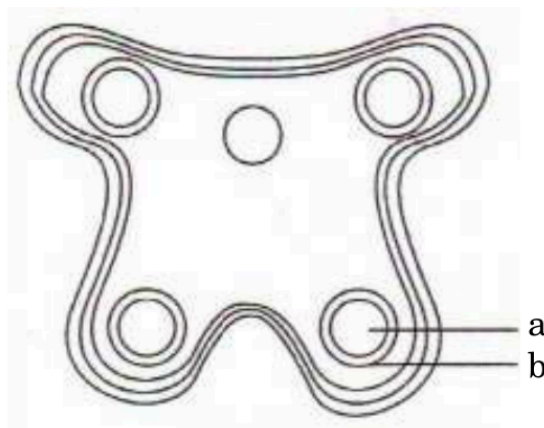
7. Write the effective remedy found by Ahmed Khan of Bengaluru for the efficient use of the plastic waste generated by big cities.

8. List any four common approaches for treatment of cancer.

9. Write the relationship between productivity, gross primary productivity, net primary productivity and secondary productivity.

10. State Gause's 'Competitive Exclusion Principle'. How have the recent studies modified this principle?

11. In the T.S. of a mature anther given below, identify "a" and "b" and mention their functions.



OR

11. What is cleistogamy? Write one advantage and one disadvantage of it, to the plant.

12. "Artificial insemination helps overcome several problems of normal mating in cattle". Do you agree? Support your answer with any three reasons.

Section C

13. State the medicinal value and the bioactive molecules produced by *Penicillium notatum*, *Monascus purpureus* and *Trichoderma polysporum*.

14. Describe the roles of (a) high temperature, (b) primers, and (c) bacterium *Thermus aquaticus* in carrying the process of polymerase chain reaction.

OR

14. How does β -galactosidase coding sequence act as a selectable marker? Why is it a preferred selectable marker to antibiotic resistance genes? Explain.

15. Answer the following questions based on Meselson and Stahl's experiment on *E. coli*:

(a) Write the name of the chemical substance used as the only source of nitrogen in the experiment.

(b) Why did they allow the synthesis of the light and the heavy DNA molecules in the organism?

(c) How did they distinguish the heavy DNA molecules from the light DNA molecules? Explain.

(d) Write the conclusion the scientists arrived at, at the end of the experiment.

16. Emasculation and bagging are the two important steps carried during artificial hybridisation to obtain superior varieties of desired plants. Explain giving reasons, in which types of flowers and at what stages are the two processes carried out.

OR

16. State what is apomixis. Write its significance. How can it be commercially used?

17. (a) Draw a sectional view of human ovary. Label the following parts:

(i) Primary follicle

(ii) Secondary oocyte

(iii) Graafian follicle

(iv) Corpus luteum

(b) Name the hormones influencing follicular development of corpus luteum.

OR

17. (a) Draw an L.S. of pistil showing pollen tube entering into the embryo sac. Label the following:

(i) Nucellus

(ii) Antipodals

(iii) Synergids

(iv) Micropyle

(b) Write the functions of the following:

(i) Synergids

(ii) Micropyle

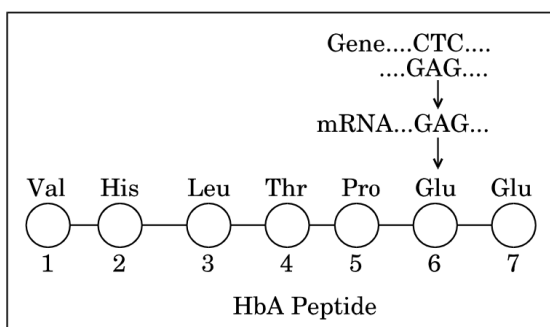
18. Name the technique and the property of plant cells that can help to grow somaclones of certain desired variety of apple. Explain how somaclones of apple can be obtained in the lab so as to get the desired variety on a large scale.

19. Explain the phenomenon of evolution by natural selection as supported by the variations observed in white winged and dark winged moth populations in England between 1850 - 1920.

20. Explain 'mutation breeding' as a method of developing disease resistant crop plants. Give an example of a pulse crop where this technique has helped.

21. Explain how 'sticky ends' are obtained in a DNA segment. Write their importance in DNA technology.

22. Given below is the representation of a relevant part of amino acid composition of the β -chain of haemoglobin, related to the shape of human red blood cells.



(a) Is this representation of the sequence of amino acids indicating a normal human or a sufferer from a certain blood related genetic disease? Give reason in support of your answer.

(b) Why is the disease referred to as a Mendelian disorder? Explain.

OR

22. Name the kind of diseases/disorders and any two symptoms that are likely to occur in humans if

(a) Mutation in the gene that codes for an enzyme phenylalanine hydroxylase occurs.

(b) The karyotype is XXY.

23. Study the graph given below and answer the questions that follow:

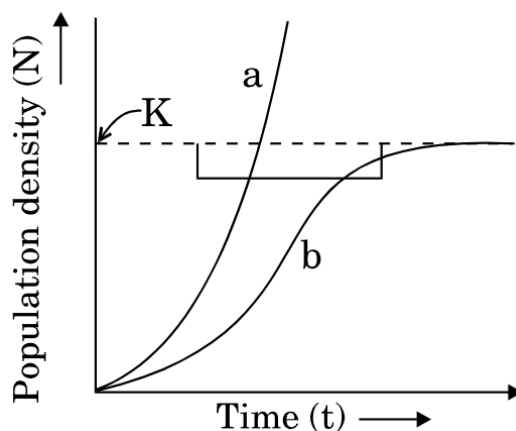
(i) The curve 'b' is described by the following equation:

$$dN/dt = rN ((K - N) / K)$$

What does 'K' stand for in this equation? Mention its significance.

(ii) Which one of the two curves is considered a more realistic one for most of the animal populations?

(iii) Which curve would depict the population of a species of deer if there are no predators in the habitat? Why is it so?



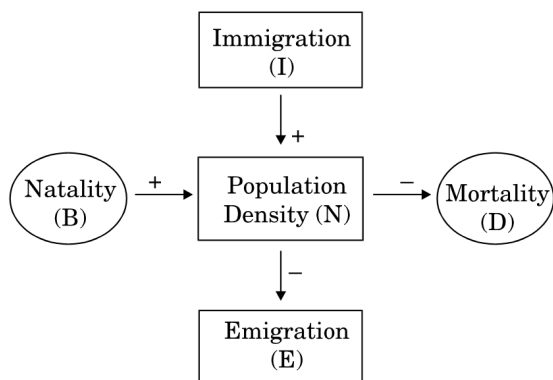
24. "A very small sample of tissue or even a drop of blood can help determine paternity." Provide a scientific explanation to substantiate how it is possible.

Section D

25. (a) Study the flow chart given below and complete the equation that follows by identifying 1, 2, 3 and 4.

$$N(t+1) = N(t) + ((1 + 2) - (3 + 4))$$

(b) Mention the different ways by which the population density of different species can be measured.



OR

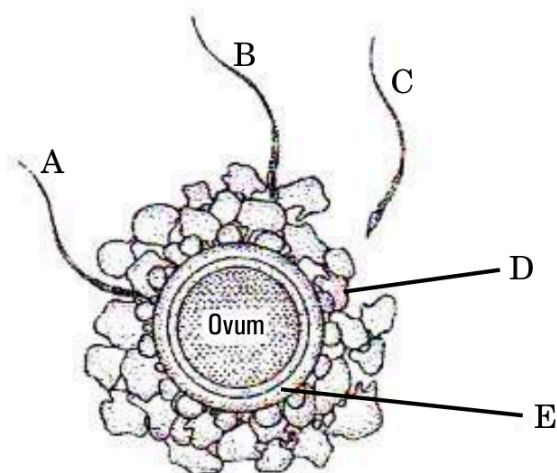
25. (a) 'The pyramid of energy is always upright.' Explain.

(b) Explain with the help of labelled diagrams, the difference between an upright pyramid of biomass and an inverted pyramid of biomass.

26. Describe the process of megasporogenesis upto fully developed embryo sac formation in an angiosperm.

OR

26. Given below is the diagram of a human ovum surrounded by a few sperms. Study the diagram and answer the following questions:



- (a) Which one of the sperms would reach that ovum earlier?
- (b) Identify 'D' and 'E'. Mention the role of 'E'.
- (c) Mention what helps the entry of sperm into the ovum and write the changes occurring in the ovum during the process.
- (d) Name the specific region in the female reproductive system where the event represented in the diagram takes place.

27. (a) Work out the crosses so as to obtain the phenotypic ratios given below:

(i) 1 : 2 : 1 (in F₂ generation)

(ii) 3 : 1 (in F₂ generation)

(iii) 1 : 1 (in F₁ generation)

(b) Differentiate between pleiotropy and polygenic inheritance patterns.

OR

27. (a) Describe the process of amino acylation.

(b) "Process of transcription and translation are coupled in prokaryotes, but not in eukaryotes." Explain.

- End of Question Paper -