

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 **33 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 16 carry 1 mark each.
- (iii) Section B: Questions 17 to 21 carry 2 marks each.
- (iv) Section C: Questions 22 to 28 carry 3 marks each.
- (v) Section D: Questions 29 to 30 carry 4 marks each.
- (vi) Section E: Questions 31 to 33 carry 5 marks each.
- (vii) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (viii) Draw neat, properly labelled diagrams wherever necessary.

Section A

1. The foetal ejection reflex in human triggers the release of _____ hormone from _____. Fill in the blanks by choosing right option.

- | | |
|--|----------------------------------|
| (A) oxytocin, foetal pituitary | (B) oxytocin, maternal pituitary |
| (C) human chorionic gonadotropin, placenta | (D) progesterone, corpus luteum |

2. Match the IUDs in Column I with suitable example in Column II.

Column I

- a. Non-medicated
- b. Copper releasing
- c. Hormone releasing

Column II

- i. Lippes loop
- ii. LNG-20
- iii. Multiload 375

Options:

- | | |
|----------------------|----------------------|
| (A) a-iii, b-ii, c-i | (B) a-i, b-ii, c-iii |
| (C) a-i, b-iii, c-ii | (D) a-ii, b-i, c-iii |

3. In *Pisum sativum*, the flower colour may be violet (V) or white (v). What proportion of the offspring in a cross of 'VV' x 'vv' would be expected to be violet?

- | | |
|---------|----------|
| (A) 25% | (B) 50% |
| (C) 75% | (D) 100% |

4. Arrange the following in the correct sequence of their evolution and select the correct option:

- (i) Seaweed
- (ii) Invertebrates
- (iii) Jawless fish

- | | |
|----------------------|----------------------|
| (A) (i), (ii), (iii) | (B) (i), (iii), (ii) |
| (C) (ii), (iii), (i) | (D) (ii), (i), (iii) |

5. If a genetic disease is transferred from a phenotypically normal but carrier female to only some of the male progeny, the disease is:

- | | |
|-------------------------|--------------------------|
| (A) autosomal dominant | (B) autosomal recessive |
| (C) sex-linked dominant | (D) sex-linked recessive |

6. A DNA molecule is 160 base pairs long. It has 30% Guanine. How many Adenine bases are present in this DNA molecule?

- | | |
|--------|---------|
| (A) 48 | (B) 64 |
| (C) 96 | (D) 192 |

7. A doctor identifies symptoms of nasal congestion, headache, sore throat, hoarseness and cough in a patient. The conclusion is that the patient is infected by a pathogen:

- | | |
|----------------|----------------|
| (A) Plasmodium | (B) Adenovirus |
| (C) Salmonella | (D) Rhinovirus |

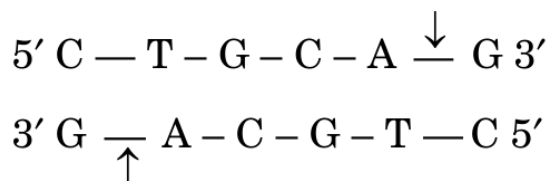
8. Which type of selection is industrial melanism observed in moth, *Biston betularia*?

- | | |
|-----------------|-----------------|
| (A) Stabilising | (B) Directional |
| (C) Disruptive | (D) Artificial |

9. C-peptide of human insulin is:

- (A) a part of mature insulin molecule. (B) responsible for formation of disulphide bridges.
(C) removed during maturation of pro-insulin to insulin. (D) responsible for its biological activity.

10. Given below is the restriction site of a restriction endonuclease Pst I and the cleavage sites on a DNA molecule.



Choose the option that gives the correct resultant fragments.

- (A) $\begin{array}{cc} 5' \text{ C — T — G} & \text{C — A — G } 3' \\ 3' \text{ G — A — C — G — T} & \text{C } 5' \end{array}$
(B) $\begin{array}{cc} 5' \text{ C — T} & \text{G — C — A — G } 3' \\ 3' \text{ G — A — C — G} & \text{T — C } 5' \end{array}$
(C) $\begin{array}{cc} 5' \text{ C — T — G — C} & \text{A — G } 3' \\ 3' \text{ G — A — C — G} & \text{T — C } 5' \end{array}$
(D) $\begin{array}{cc} 5' \text{ C — T — G — C — A} & \text{G } 3' \\ 3' \text{ G} & \text{A — C — G — T — C } 5' \end{array}$

11. Which of the following fish led to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in Lake Victoria of East Africa?

- (A) Catla Catla (B) Dogfish
(C) Nile Perch (D) African Catfish

12. Cattle or goats are never seen browsing on the weed, Calotropis. Select the correct option for the reason.

- (A) The plant produces highly poisonous tannins. (B) The plant produces quinine, which is bitter in taste.
(C) The plant produces the poisonous chemical, cardiac glycoside. (D) The plant bears prickles.

13. Assertion (A): Repetitive sequences make up a very large portion of human genome.

Reason (R): Repetitive sequences do not have direct coding functions in the genome.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.

14. Assertion (A): The embryo with 8 to 16 blastomeres is called a morula.

Reason (R): The morula continues to divide and transform into trophoblast.

- | | |
|--|---|
| (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). |
| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
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15. Assertion (A): The use of chitinase enzyme is necessary for the separation of DNA from yeast cells but not in the case of Spirogyra.

Reason (R): Fungal cell wall is made up of fungal chitin.

- | | |
|--|---|
| (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). |
| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
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16. Assertion (A): Besides curdling of milk, LAB also improves its nutritional quality by increasing Vitamin B12.

Reason (R): LAB, when present in the stomach checks disease-causing microbes.

- | | |
|--|---|
| (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). |
| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
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Section B

17. State the role of thymus as a lymphoid organ. Name the cells that are released from it and mention their functions.

18(a). Explain the mutually rewarding relationship between Yucca plant and species of moth.

OR

18(b). Pollination success will be reduced unless the orchid flower co-evolves with the pollinator. Explain.

19(a). Differentiate between grazing food chain and detritus food chain.

OR

19(b). Ecological pyramids are widely accepted but they still have some limitations. Write any two limitations.

20. How do 'implants' act as an effective method of contraception in human females? Mention one advantage of implants over contraceptive pills.

21(a). Explain any two methods of vectorless gene transfer.

OR

21(b). Name the most commonly used bioreactor. List the advantages of the bioreactor. Also write the importance of sampling ports.

Section C

22. Draw a labelled diagram of a 'replicating fork' showing the polarity. Why does DNA replication occur within such 'fork'?

23. List any three outbreeding devices that flowering plants have developed for cross-pollination and explain how they help to encourage cross-pollination.

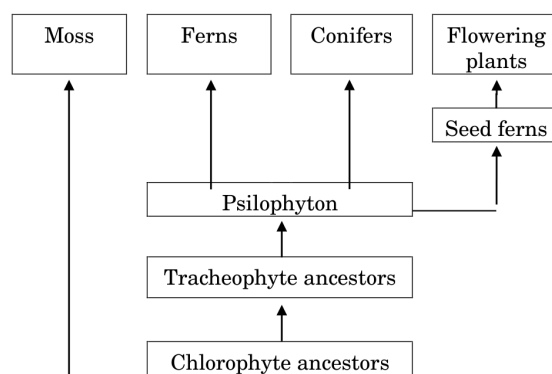
24. Explain how the following microbes act as biocontrol agents:

- (a) *Bacillus thuringiensis*
- (b) Nucleopolyhedrovirus

25. Transgenic animals are produced by man. Explain any three ways in which such animals can be beneficial to humans.

26. Explain the level of biodiversity at genetic, species and ecological levels with the help of one example each.

27. Study the given chart showing evolution of plants. Answer the following questions:



(a) Identify the plant which acts as an immediate ancestor of both ferns and conifers.

(b) Name the nearest ancestors of flowering plants.

(c) Name the most primitive group of plants.

(d) Psilophyton provides common ancestry to which classes?

(e) Name the common ancestor of psilophyton and seed ferns.

(f) Name the common ancestor of mosses and tracheophytes.

28. Given below is an equation describing the growth pattern of a population:

$$dN/dt = rN$$

(a) Mention the type of growth model or growth pattern of the population described by the given equation.

(b) What does 'r' in the equation signify?

(c) Mention the type of growth curve that will be obtained if the population density (N) is plotted against time (t).

(d) According to you, will the resource availability be limited or unlimited for this type of growth in the given population?

Section D

29(a). Read the following passage and answer the questions that follow:

The process of copying genetic information from template strand of DNA into RNA is called transcription. It is mediated by RNA polymerase. Transcription takes place in the nucleus of eukaryotic cells. In transcription, only a segment of DNA and only one of the strands is copied into RNA.

Why is the strand of DNA with 3' → 5' polarity transcribed and not the other strand of 5' → 3' polarity?

29(b)(i). Read the following passage and answer the questions that follow:

The process of copying genetic information from template strand of DNA into RNA is called transcription. It is mediated by RNA polymerase. Transcription takes place in the nucleus of eukaryotic cells. In transcription, only a segment of DNA and only one of the strands is copied into RNA.

Why is hnRNA required to undergo splicing?

OR

29(b)(ii). Read the following passage and answer the questions that follow:

The process of copying genetic information from template strand of DNA into RNA is called transcription. It is mediated by RNA polymerase. Transcription takes place in the nucleus of eukaryotic cells. In transcription, only a segment of DNA and only one of the strands is copied into RNA.

Mention the two additional processes which hnRNA needs to undergo after splicing to become functional.

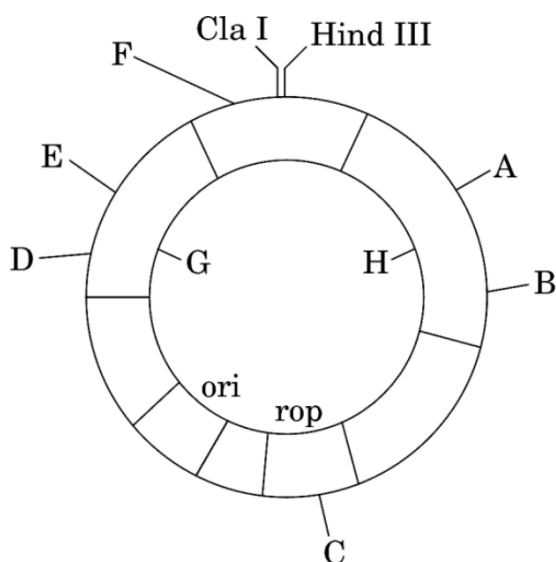
29(c). Read the following passage and answer the questions that follow:

The process of copying genetic information from template strand of DNA into RNA is called transcription. It is mediated by RNA polymerase. Transcription takes place in the nucleus of eukaryotic cells. In transcription, only a segment of DNA and only one of the strands is copied into RNA.

Why is only one strand of the DNA transcribed? Give two reasons.

30(a). Read the following passage and answer the questions that follow:

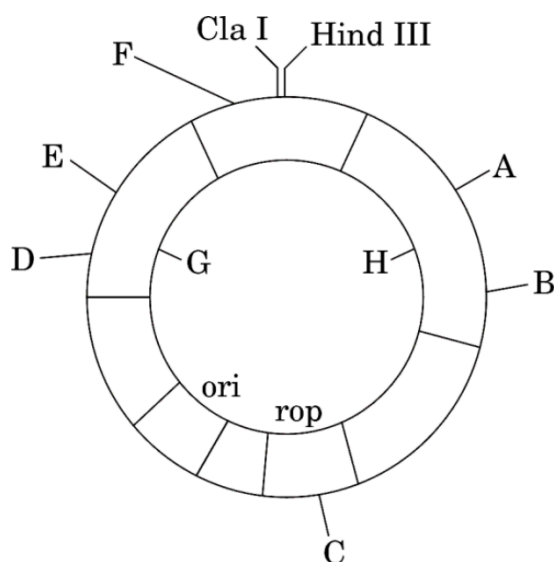
We know that plasmids and bacteriophages are the most commonly used vectors in biotechnology experiments. If we can link an alien piece of DNA to the plasmid DNA, the alien DNA can be multiplied equal to the copy number of the plasmid. Engineered vectors are used these days. Study the diagram of the *E. coli* cloning vector pBR322 and answer the questions that follow:



Why are plasmids and bacteriophages used as cloning vectors?

30(b)(i). Read the following passage and answer the questions that follow:

We know that plasmids and bacteriophages are the most commonly used vectors in biotechnology experiments. If we can link an alien piece of DNA to the plasmid DNA, the alien DNA can be multiplied equal to the copy number of the plasmid. Engineered vectors are used these days. Study the diagram of the *E. coli* cloning vector pBR322 and answer the questions that follow:



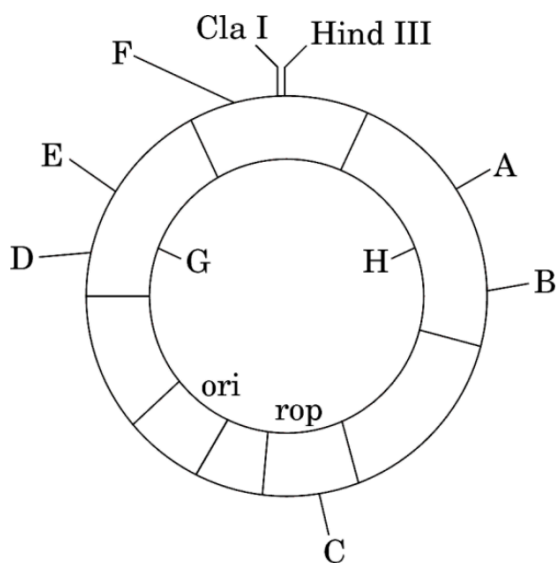
Identify:

- (I) The gene in the cloning vector that controls the copy number of the vector.
 - (II) The restriction site - C in the 'rop' gene.
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OR

30(b)(ii). Read the following passage and answer the questions that follow:

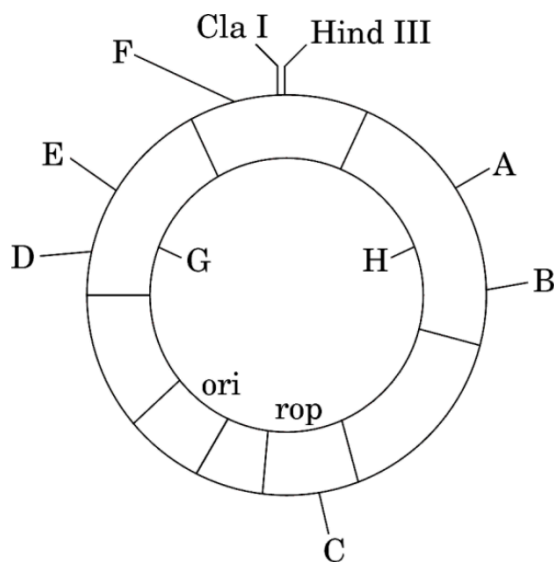
We know that plasmids and bacteriophages are the most commonly used vectors in biotechnology experiments. If we can link an alien piece of DNA to the plasmid DNA, the alien DNA can be multiplied equal to the copy number of the plasmid. Engineered vectors are used these days. Study the diagram of the *E. coli* cloning vector pBR322 and answer the questions that follow:



Identify and name two selectable markers shown in the diagram.

30(c). Read the following passage and answer the questions that follow:

We know that plasmids and bacteriophages are the most commonly used vectors in biotechnology experiments. If we can link an alien piece of DNA to the plasmid DNA, the alien DNA can be multiplied equal to the copy number of the plasmid. Engineered vectors are used these days. Study the diagram of the *E. coli* cloning vector pBR322 and answer the questions that follow:



Name the two restriction sites each in the two genes you have identified as selectable markers.

Section E

31(a). Work out separate monohybrid crosses up to F_2 generation between two pea plants and two *Antirrhinum* plants, both having contrasting traits with respect to the colour of the flower. Comment on the patterns of inheritance in the crosses carried out in such two cases.

OR

31(b)(i). Answer the following questions:

How does a chromosomal disorder differ from a Mendelian disorder? Write one example for each.

OR

31(b)(ii). Answer the following questions:

Name the phenomenon that leads to situations like 'XO' abnormality in humans. Also name this genetic disorder. How are individuals with an XO chromosomal abnormality affected? Write its symptoms as well as karyotype.

32(a)(i). Draw the structure of an antibody molecule and label any four of its parts.

32(a)(ii). Differentiate between active and passive immunity. Write any three differences.

OR

32(b)(i). (I) Write the scientific names of the two species of filarial worms causing filariasis. (II) How do they affect the body of infected persons? (III) How does the disease spread?

OR

32(b)(ii). Mention the source and the role of the following in providing defence against infection in the human body:

- (I) Histamine
- (II) Interferons

33(a). Briefly explain the events of fertilisation and implantation in an adult human female.

OR

33(b)(i). Arrange the following hormones in sequence of their secretion in a pregnant woman: hCG; LH; FSH; Relaxin.

OR

33(b)(ii). Mention the source and the functions of the above mentioned hormones.

- End of Question Paper -