

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. To separate repetitive DNA from bulk genomic DNA, which of the following method is used?

- | | |
|-------------------------------|-------------------------------------|
| (A) Elution | (B) Southern Blotting |
| (C) Polymerase Chain Reaction | (D) Density Gradient Centrifugation |

2. Select the correct option:

- | | |
|--|---------------------------------|
| (A) Tropics between 23.5° N - 23.5° S - Higher biodiversity than temperate areas | (B) Columbia - 105 bird species |
| (C) New York - 1400 bird species | (D) India - 2000 bird species |

3. In a dihybrid cross, 2400 individuals are produced in F₂ generation. Approximately how many will be phenotypically similar to parents?

- | | |
|----------|----------|
| (A) 2000 | (B) 1500 |
| (C) 580 | (D) 450 |

4. What could be the reason of extinction of Abingdon Tortoise from Galapagos Islands?

- | | |
|-------------------------------|-------------------------------|
| (A) Intraspecific Competition | (B) Predation |
| (C) Parasitism | (D) Interspecific Competition |

5. What conclusion can be drawn if the forelimbs of an aquatic animal and a terrestrial animal have similar anatomical structure?

- | | |
|--------------------------------------|-----------------------------|
| (A) Live in same habitat | (B) Share common ancestors |
| (C) Forelimbs perform same functions | (D) Forelimbs are analogous |

6. How many of the following features are related to Nirodh - a popular brand of condoms?

- (i) Prevention of sexually transmitted infections.
 (ii) Phagocytosis of sperms.
 (iii) Male contraceptive device.
 (iv) Acts as chemical barrier.
 (v) Physiological changes in cervical mucus.

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

7. A bacterium having radioactive thymidine in its DNA is allowed to multiply in a medium having non-radioactive thymidine for two generations. What percentage of bacteria will have radioactive thymidine in its DNA?

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

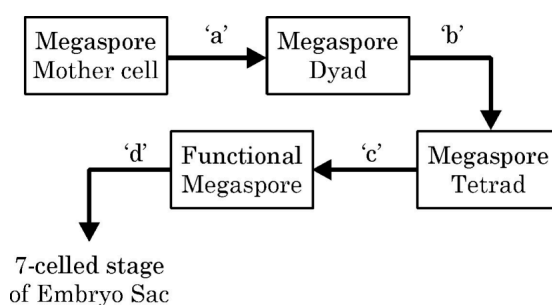
8. What is the role of histamine released by mast cells?

- | | |
|-----------------------------------|------------------------------|
| (A) Lowers blood pressure | (B) Causes allergic symptoms |
| (C) Stimulates antibody formation | (D) Destroys pathogens |

9. Which of the following is used to visualize DNA bands under UV light after gel electrophoresis?

- | | |
|----------------------|----------------------|
| (A) Acetocarmine | (B) Safranin |
| (C) Ethidium Bromide | (D) Potassium Iodide |

10. Given below are stages of embryo sac formation from megaspore mother cell. Identify the correct option for the cell division marked a, b, c and d.

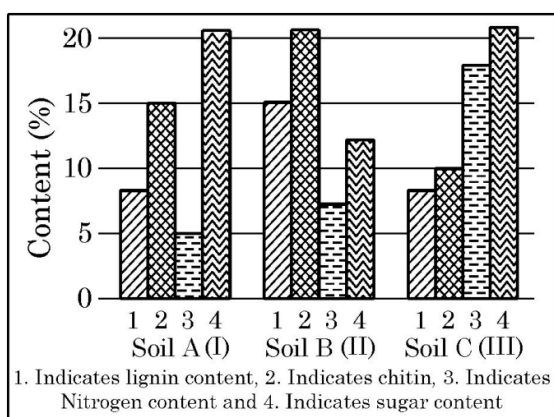


- | | |
|---|---|
| (A) a - Meiosis-I, b - No division, c - Mitosis, d - Meiosis-II | (B) a - Meiosis-I, b - Meiosis-II, c - No division, d - Mitosis |
| (C) a - Mitosis, b - Meiosis-I, c - Meiosis-II, d - No division | (D) a - No division, b - Mitosis, c - Meiosis-I, d - Meiosis-II |

11. Genetically modified tobacco plants were produced using *Agrobacterium* vectors. Which property of *Agrobacterium* helps in carrying nematode specific genes into the host plant?

- (A) Infectious for monocot plant; has Ti plasmid
 (B) Infectious for dicot plant; has Ti plasmid
 (C) Infectious for plants and animals; has Ti plasmids
 (D) Infectious for monocot and dicot plants; has cry gene

12. Observe the contents 1, 2, 3 and 4 of soil samples I, II and III shown in the graph. If the temperature and moisture of all soil samples are identical, which soil sample(s) will show faster decomposition?



1. Indicates lignin content, 2. Indicates chitin, 3. Indicates Nitrogen content and 4. Indicates sugar content

- (A) Soil Sample I
 (B) Soil Sample II
 (C) Soil Sample III
 (D) Both Soil Samples II and III

13. Assertion (A): Apomixis leads to production of genetically identical off-springs.

Reason (R): Apomixis involves fertilization between two genetically similar plants.

Select the correct option:

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

14. Assertion (A): Microbes are used for commercial production of alcohol and beverages.

Reason (R): Yeast converts glucose into ethanol and carbon dioxide during fermentation.

Select the correct option:

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

15. Assertion (A): IUCN Red List helps in identifying and protecting endangered species worldwide.

Reason (R): The list includes the species facing risk of extinction.

Select the correct option:

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

16. Assertion (A): DNA Ligase is used to join DNA fragments.

Reason (R): It catalyses the formation of glycosidic bonds between nucleotides.

Select the correct option:

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

Section B

17. (a) The diagram below shows the sequence of amino acids in part of haemoglobin molecule.

Val	His	Leu	Thr	Pro	Glu	Glu	haemoglobin chain
							mRNA
CAT	GTA	AAT	TGA	GGA	CTT	CTC	DNA
Key :	Val = valine		Thr = threonine				
	His = histidine		Pro = proline				
	Leu = leucine		Glu = glutamic acid				

Key: Val = valine, His = histidine, Leu = leucine, Thr = threonine, Pro = proline, Glu = glutamic acid

(i) If the base T is substituted with A, in CTT of DNA strand how would it affect the haemoglobin chain?

(ii) Name the condition and the effects associated with the above substitution.

OR

(b) DNA is considered a more stable genetic material than RNA. Justify this statement with suitable reasons.

18. How do scientists use microinjection and gene gun in biotechnology?

19. After significant reduction of BOD during secondary treatment of sewage, what further processes are carried out? Mention any one important outcome of these processes.

20. (a) In some cases, measuring population density by counting individuals may not be feasible. Mention two other parameters that can be used and justify their use with suitable examples.

OR

(b) What factors contribute to the Amazonian rain forests in South America being the most biodiverse regions on Earth?

21. (a) (i) Name the organ that forms a connection between foetus and the uterus of a pregnant human female.

(ii) How does it support both nutrition and hormonal regulation?

OR

(b) Give reasons for:

(i) All copulations do not lead to pregnancy.

(ii) Meiosis I in spermatogenesis and oogenesis are markedly different.

Section C

22. There are limitations of traditional breeding techniques that led to promotion of micro-propagation.

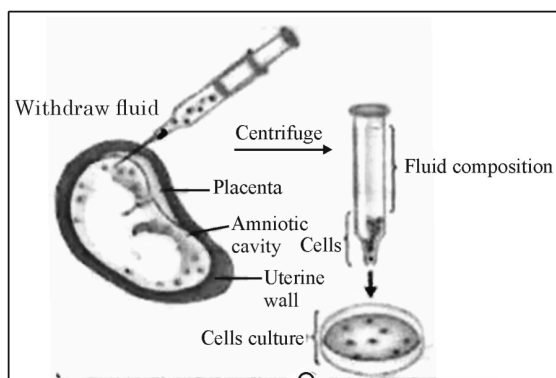
- (a) Mention two advantages of micropropagation.
- (b) Give two examples where it is commercially adopted.

23. (a) Give the scientific name of the organism used by Morgan to study sex-linked traits.

- (b) Write any four reasons why this organism made it an ideal experimental model.

24. Draw a neat diagram of enlarged view of one microsporangium of a young anther of an angiosperm. Label the different layers of the wall and write the functions of the outermost and innermost layer.

25. Study the diagram given below:



(a) Name and explain the procedure shown in the diagram. Mention one of its advantage and one disadvantage.

(b) How is 'Saheli' different from other oral pills in terms of its composition and advantage?

26. S.L. Miller conducted an experiment in 1953 to simulate the conditions of early earth in a laboratory setup. Answer the following questions based on the experiment:

- (a) What was the aim of his experiment?
- (b) Name the gases used and the source of energy.

27. (a) What is a genetic code?

(b) Why did scientists feel the need to propose a genetic code?

(c) Genetic code is said to be 'Universal'. Why?

28. (a) A person inhales dust and pathogens but does not always fall sick. Explain how the body protects against such infections.

(b) Name and describe any two barriers involved in this protection.

Section D

29. Gene manipulation is a fast emerging science. It started with the development of recombinant DNA molecules. This technology which mostly involves cutting and pasting of desired DNA fragments is based on two most important discoveries in bacteria - presence of plasmid and restriction endonucleases. The science of r-DNA technology took birth when Cohen and Boyer (1973) were able to produce a piece of gene containing foreign DNA introduced into plasmid of *E. coli*.

(a) Name one core technique of biotechnology that alters the genetic material.

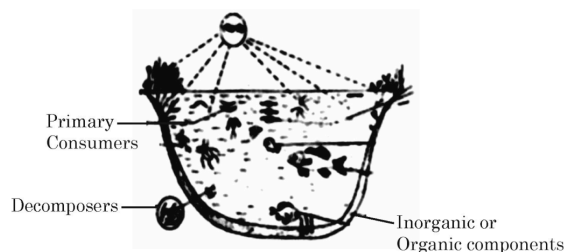
(b) What is a plasmid? Mention its importance in biotechnology.

(c) Which gene was isolated by Cohen and Boyer and from which bacteria?

OR

(c) How is the action of exonuclease different from that of endonuclease?

30. Below is shown a pond that represents a self-sustaining natural ecosystem with both biotic and abiotic components interacting in a balanced food web.



Based on the diagram, answer the questions:

(a) Mention two abiotic components of a pond ecosystem.

(b) Differentiate between the roles of producers and decomposers in such an ecosystem.

(c) Draw a simple food chain operating in such an ecosystem and label each trophic level.

OR

(c) Why is transfer of energy not 100% efficient between trophic levels?

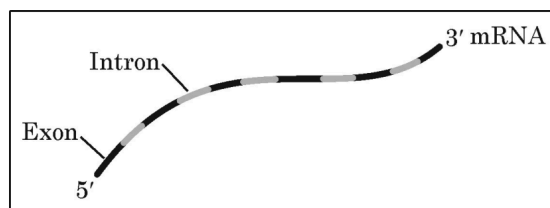
Section E

31. (a) (i) Explain the role of stigma in pollen pistil interaction.
- (ii) Describe the post pollination events leading to double fertilization in angiosperms starting with 2-celled pollen grain.

OR

- (b) (i) Explain menstrual phase in the menstrual cycle of human female.
- (ii) Why is follicular phase also called proliferative phase?
- (iii) Explain the events that occur in Graafian follicle at the time of ovulation and thereafter.
- (iv) Draw a Graafian follicle and label - Antrum and secondary oocyte.

32. (a) Observe the segment of mRNA given below and answer the questions given below:



- (i) Explain and illustrate the steps involved to make fully processed hn RNA.
- (ii) Gene encoding RNA polymerase I and RNA polymerase III have been affected by mutation. Explain its impact on the synthesis of polypeptide giving reasons.

OR

- (b) In a particular cattle, the coat colour red and white are controlled by single pair of alleles. A calf that receives allele for red coat from mother and allele for white coat from father shows equal number of red and white hairs on its coat.
- (i) Is this an example of Co-dominance or incomplete dominance. Give a reason for your answer.
- (ii) With the help of a genetic cross upto F_2 generation, explain what will be the consequent phenotype of calf when
- (1) Red is dominant over white,
 - (2) Red is incompletely dominant.

33. (a) A 30 year old man was admitted to a hospital with recurrent infections, weight loss, prolonged fever. His blood report showed a decline in count of T-Lymphocytes thus affecting immune system.

- (i) Identify the disease and its causative agent.
- (ii) How did the pathogen affect the immune system once it entered the body? Explain.
- (iii) Mention two major modes of its transmission.

OR

(b) (i) Why are microbes considered effective biocontrol agents in sustainable agriculture?

(ii) Explain the role of the following as biocontrol agents naming the pests or diseases they help to control:

- (1) A Bacterium
- (2) A Fungus
- (3) Virus

- End of Question Paper -