

CBSE Class 12 Biotechnology 2025 - Set 99/S - Compartment



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) Question paper is divided into five sections – Section A, B, C, D and E.
- (iii) Section A : Questions number 1 to 16 are Multiple Choice Type Questions (MCQs). Each question carries 1 mark.
- (iv) Section B : Questions number 17 to 21 are Very Short Answer (VSA) Type Questions. Each question carries 2 marks.
- (v) Section C : Questions number 22 to 28 are Short Answer (SA) Type Questions. Each question carries 3 marks.
- (vi) Section D : Questions number 29 and 30 are Case Study-based Questions, carrying 4 marks each. Each question has sub-parts with internal choice in one sub-part.
- (vii) Section E : Questions number 31 to 33 are Long Answer (LA) Type Questions. Each question carries 5 marks.
- (viii) There is no overall choice given in the question paper. However, an internal choice has been provided in few questions in all the Sections except Section – A.

Section A

1. In microbial culture, shakers and baffled flasks help to achieve :

- | | |
|---|------------------------------|
| (A) Sterilization of the culture medium | (B) Purification of products |
| (C) Aeration and mixing | (D) Optimum pressure |

2. Sodium bicarbonate buffer system is used in animal cell culture medium to maintain appropriate :

- | | |
|--|------------------------|
| (A) pH, osmolality and also serves as a carbonate source | (B) Temperature |
| (C) Sterility | (D) Purity of products |

3. Information on annotated protein sequence is available in which of the following database ?

- | | |
|---------------|----------|
| (A) UniProtKB | (B) EMBL |
| (C) PDB | (D) PALI |

4. Tissue hardening of regenerated plants by plant tissue culture method is known as :

- | | |
|----------------------------|---------------------|
| (A) Vegetative propagation | (B) Acclimatization |
| (C) Plant tissue culture | (D) Explant culture |

5. Out of the following, the trace elements required for microbial culture works are :

- | | |
|-------------------------|--------------------------|
| (A) Carbon and Hydrogen | (B) Copper and Cobalt |
| (C) Hydrogen and Oxygen | (D) Nitrogen and Sulphur |

6. BAC vectors can accommodate inserts up to :

- | | |
|-------------|------------|
| (A) 350 kb | (B) 250 kb |
| (C) 1000 kb | (D) 500 kb |

7. The characterization of protein-protein interactions is a part of :

- | | |
|---------------------------|---|
| (A) Structural proteomics | (B) Functional proteomics |
| (C) Expression proteomics | (D) Both functional and expression proteomics |

8. Which of the following tools is used for the identification of paralogs ?

- | | |
|----------------------|----------------|
| (A) BLAST | (B) ENTREZ |
| (C) Taxonomy Browser | (D) Locus Link |

9. Prions are :

- | | |
|--------------------------|------------------------|
| (A) Infectious proteins | (B) Catalytic proteins |
| (C) Therapeutic proteins | (D) Enzymes |

10. The monoclonal antibody approved for therapy of early stage breast cancer in humans is :

- | | |
|-----------------|---------------|
| (A) OKT3 | (B) Herceptin |
| (C) Factor VIII | (D) tPA |

11. Counting of genes is difficult due to the existence of :

- | | |
|---|---------------------------------|
| (A) Large genome sizes | (B) Complexity of organisms |
| (C) Overlapping genes and splice variants | (D) Large number of chromosomes |

12. Recombinant vaccines :

- | | |
|---|---|
| (A) are based on specific epitope on an antigen | (B) provide limited supply |
| (C) provide no scope for micromanipulation | (D) utilise heat-inactivated bacteria/viruses |
-

13. Assertion (A): Embryonic stem cells are isolated from the inner cell mass of blastocysts.

Reason (R): Embryonic stem cells are multipotent.

- | | |
|--|--|
| (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): Microbial population remains almost constant in the lag phase of growth.

Reason (R): Bacterial cells show intense metabolic activity in this period to adapt to the culture conditions.

- | | |
|--|--|
| (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. |
-

15. Assertion (A): In blue-white screening technique, the transformed bacterial cells appear white in colour.

Reason (R): Functionally active LacZ gene is present on pUC19 vector in such transformed cells.

- | | |
|--|--|
| (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. |
-

16. Assertion (A): Callus refers to an unorganised mass of plant cells.

Reason (R): Auxins are added to culture medium containing an explant for callus induction.

- | | |
|--|--|
| (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. |
-

Section B

17. (a) Name the source of DNA ligase enzyme used in RDT. (b) Why does alkaline phosphatase enzyme prevent self-ligation of vector ?

18. Write the functions of erythropoietin. Which conditions stimulate the production of erythropoietin in human body ?

19(a). Which microscope is used to view animal cells in culture vessels ? Why ?

OR

19(b). Briefly explain how sterile environment is maintained in Laminar Air Flow hoods for performing animal cell culture works.

20. (a) Which enzyme activates chymotrypsinogen ? (b) How can you confirm that a serine residue is involved in catalysis by chymotrypsin ?

21. How is a Philadelphia chromosome formed ? Write its consequence in a human being.

Section C

22. (a) What is the cause of sickle cell anaemia ? Briefly explain the process of sickling of RBCs in this disease. (b) Why is sickle cell anaemia called a “molecular disease” ?

23. What are the problems associated with the expression of eukaryotic genes in prokaryotic cells ? How are such problems tackled ?

24. Draw a diagrammatic representation of an artificial seed. Write the significance of these seeds.

24-VI. What are artificial seeds ? How are artificial seeds produced in a laboratory ?

25. Since ancient times, whey has been administered to the sick for treatment of numerous ailments. Briefly explain the therapeutic use of whey.

26. Many of the vectors used in RDT are constructed such that they can exist in both eukaryotic cells and *E. coli*. What are such vectors called ? Write the important features incorporated in them. Give an example of one such vector.

27. What is the significance of using serum and antibiotics as important components of animal cell culture medium ?

28(a). (i) What does the capital letter 'R' refers to in the name of the restriction enzyme EcoRI ? (ii) Suggest the name of the first restriction enzyme that was isolated from the bacterium *Arthrobacter luteus*. Write its recognition sequence.

OR

28(b). Draw a well labelled schematic representation showing the basic steps of RDT.

28(b)-VI. Write the basic steps of recombinant DNA Technology.

Section D

29. Single nucleotide polymorphisms (SNPs) are DNA sequence variations, which occur when a single base (A, C, G or T) is altered so that different individuals may have different bases at these positions. The 0.2% difference in DNA sequence is enough to make each individual unique. On an average, one in a thousand nucleotides are different in genomes of two different individuals.

29(a). What is SNP map ?

29(b). Why are SNPs useful in forensic sciences ?

29(c)(i). Suggest any two applications of SNPs.

OR

29(c)(ii). How are genes linked to diseases ? Give two examples.

30. Continuous culture is an 'open' culture system for growing microbial cells in which fresh sterilized medium is introduced steadily. This system depends on the fact that the concentration of an essential nutrient within the culture medium controls the growth rate of cells. In a continuous culture, fermentation occurs at periodic intervals while feeding nutrients and extracting products.

30(a). How is the nutrient medium designed for culturing microbes in a continuous culture system ?

30(b). What is the major advantage of growing microbes in a continuous culture system ?

30(c)(i). Write the functions of a chemostat and a turbidostat.

OR

30(c)(ii). Diagrammatically depict the characteristic features of a continuous culture at a steady state.

30(c)(ii)-VI. State the function of overflow device in continuous culture.

Section E

31(a). Enlist any five protein-based products with an example of each.

OR

31(b). What are the principles behind Iso Electric Focusing (IEF) and SDS-PAGE technique ? How are the two techniques combined in 2D-gel electrophoresis ? What are the advantages of such two-dimensional analysis ?

32(a). What is the purpose of production of secondary metabolites by some plants ? Give two examples of such naturally occurring plant secondary metabolites. Why are such compounds expensive ?

OR

32(b). Mention any two types of environmental stresses which usually affect plants. How are abiotic-stress-tolerant plants produced ?

33(a). (i) Briefly explain the principle of Sanger's method of DNA sequencing. (ii) What is the difference between deoxy and dideoxy nucleotides ?

OR

33(b). What is the purpose of a Polymerase Chain Reaction (PCR) ? Briefly explain the basic steps of PCR technique and write one application.

- End of Question Paper -