

CBSE Class 12 Biotechnology 2013 - Set 99/1 - Compartment



Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) All questions are compulsory.
- (ii) There is no overall choice. However, an internal choice has been provided in one question of three marks and two questions of five marks. You have to attempt only one of the choices in such questions. Question paper contains four sections – A, B, C and D.
- (iii) Question numbers 1 to 5 are very short answer questions, carrying 1 mark each.
- (iv) Question numbers 6 to 15 are short answer questions, carrying 2 marks each.
- (v) Question numbers 16 to 25 are also short answer questions, carrying 3 marks each.
- (vi) Question numbers 26 to 28 are long answer questions, carrying 5 marks each.
- (vii) Use of calculators is not permitted. However, you may use log tables, if necessary.

Section A

1. *E. coli* cells take up foreign DNA only after a heat shock followed by cold CaCl_2 treatment.

Why ?

2. What do you understand by the term GRAS ?
Give an example of a micro-organism under GRAS.

3. Weeds compete with crop plants for nutrients, water, etc and are responsible for significant reduction in crop yields. As a biotechnologist, suggest a way to overcome this problem.

4. How will you go about studying the genomes of microbes that are uncultivable ?

5. Children eating golden rice are unlikely to suffer from night blindness. Why ?

Section B

6. Compared to a conventional plasmid, what additional sequences are required in a YAC vector so that it behaves as an artificial chromosome ?

7. What is a prion ? Explain how a prion relies on normal cellular proteins to cause disease.

8. What are DNA chips (or microarray) and how are they used in functional genomics ?

9. In a culture of *E. coli*, the cell population increases from 2.0×10^6 cells/ml to 16×10^6 cells/ml in 30 min. What is the generation time of the given culture ?

10. Why is the technique for the production of monoclonal antibodies called hybridoma technology ? Give an example of a therapeutic monoclonal antibody for breast cancer patients.

11. (i) Why are type II restriction endonucleases extensively used in recombinant DNA technology ? (ii) Restriction endonucleases are naturally found in bacteria. What purpose do they serve ?

12. You have been provided with a mixture of proteins (A, B, C & D) in a buffer of pH 6.5. Protein A has a pI of 5.0 and all other proteins have a pI > 7.0. Based on this information, how will you separate protein A from the mixture and indicate the principle involved.

13. (i) Human populations vary greatly in their susceptibility to diseases. Why ? (ii) Which present day approach can assist physicians in predicting with confidence the risk of developing a disease ?

14. What is OKT-3 ? Why is it administered during kidney transplantation ?

15. Suppose you are interested in exploring the functional importance of a particular glutamic acid residue in a protein. By site directed mutagenesis you make mutant proteins in which glutamic acid has been replaced by other amino acids. The results are as follows :

Protein	Functionality (%)
Normal protein	100
Mutant containing Tyrosine	5
Mutant containing Aspartic acid	94
Mutant containing Phenylalanine	3
Mutant containing Glycine	4

From these results what would you conclude about the functional significance of glutamic acid ?

Section C

16. What are the three basic steps of a PCR cycle ? At what temperatures are they performed ? How can one selectively amplify a DNA fragment from total genomic DNA ?

17. What is the effect of SDS on protein structure ? How does it facilitate the determination of molecular mass ?

18. Enlist any three database retrieval tools available at NCBI. Does similarity between two sequences always indicate their homology ? Explain.

19. Differentiate between a fed batch and a continuous culture.

20. What are the three potential risks and three benefits of GM crops ?

21. Based on microscopic observation, how can an oncologist differentiate between cancerous and normal cells ?

22. Study the following enzyme purification table and answer the questions that follow :

Procedure	Total protein (mg)	Activity (units)
Step 1: Crude extract	16,000	1,60,000
Step 2: Salt fractionation	3,600	1,35,000
Step 3: Ion exchange chromatography	1,500	1,16,500
Step 4: Molecular exclusion chromatography	71	77,000
Step 5: Affinity chromatography	1.75	52,000

(a) Which step in the purification table is the most effective and why ? (b) Which of the procedures is the least effective and why ?

23. Name the two methodologies used for genome sequencing. Present a comparative account.

24. What parameters must be monitored and controlled in an optimised fermentation process ? Why do we need to control them ?

25. Why do all multicellular organisms retain adequate number of stem cells at strategic positions ? What is the difference between ES cells and adult stem cells ?

OR

25. Indicate the differences between finite and continuous cell lines. How can we obtain continuous cell lines ?

Section D

26. (i) What is the principle of blue-white selection for screening transformed cells ? (ii) Name any two methods of introducing DNA into host cells.

OR

26. Explain the principle and steps involved in Sanger's method of DNA sequencing.

27. (a) Why is sickle cell anemia called a molecular disease ? (b) Who developed the technique of protein finger printing ? (c) Indicate two ways by which sickle cell anemia can be diagnosed.

OR

27. Explain how the "charge relay system" operates in chymotrypsin. Name two other enzymes that use a similar theme. Why is the broad specificity of chymotrypsin advantageous ?

28. What are secondary metabolites ? What role(s) do they play in the host ? Name any three secondary metabolites produced by cell and tissue culture and their application in medicine.

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