CBSE Class 12 Biotechnology 2007 - Set 99/1

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. An internal choice is provided in one two-mark question and two five-mark questions. Attempt only one of the choices in such questions.

(iii) The question paper contains four sections: A, B, C and D.

(iv) Questions 1–5 are very short answer questions, carrying 1 mark each.

(v) Questions 6–15 are short answer questions, carrying 2 marks each.

(vi) Questions 16–25 are short answer questions, carrying 3 marks each.

(vii) Questions 26–28 are long answer questions, carrying 5 marks each.

(viii) Calculators are not permitted. Log tables may be used if necessary.

Section A

1. Give the sequence of the 2 primers (5-nucleotides long) required to amplify the following DNA sequence by PCR :
5' ATGCCTAGGATCATGC 3'

2. Why is the nutrient medium autoclaved before using it for culturing microbes ?

3. Which future vaccine holds promise of bypassing the need to visit the doctor regularly for childhood immunisations ?

4. A soil microorganism produces a novel metabolite in nanomolar concentration (nM). Suggest a way to increase its production in quantities that are economically viable.

5. Why is 'Golden rice' nutritionally superior to normal rice ?

Section B

6. Ovalbumin is the major protein of egg white. The chicken ovalbumin gene contains 8 exohs separated by 7 introns. Should one use ovalbumin cDNA or genomies DNA to express the protein in *E. coli* and why ?

7. How can SNPs be used to predict susceptibility to diseases ?

8. What is the mode of action of tissue plasminogen activator (t-PA) ? Name one medical application of t-PA.

9. Which one of the following proteins would be expected to migrate fastest through SDS-PAGE gel and why ?

Protein	MW (daltons)
α-macroglobulin	820,000
Lysozyme	15,000
Serum albumin	69,000
Retinol binding protein	21,000
α-antitrypsin	45,000

10. Why are type II restriction endonucleases (RE) extensively used in recombinant DNA technology ? Why do bacteria make RE ?

11. What is the IUPAC code for T or C ? Write the complementary sequence of the following sequence :
5'-ATGAYCGBT-3'

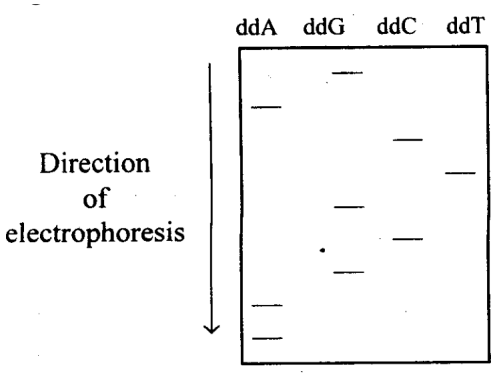
12. Why is foaming caused in microbiological processes ? Name a commonly used anti-foaming agent.

13. Erythropoietin (EPO) is included in the list of banned substances for sportsmen. What is this substance ? How does it act ?

OR

13. Embryonic cells during development not only commit along different lineages but also retain a population of cells that are present only at strategic locations in the adult organism. Name these specialized cells and why they are maintained in undifferentiated state ?

14. An autoradiogram of a sequencing gel containing 4 lanes of DNA fragments is shown in the figure below :



(i) Read the DNA sequence from the autoradiogram.
(ii) What purpose do ddNTPs serve in Sanger's method of DNA sequencing ?

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

Step	Procedure	Total protein (mg)	Activity (units)
1.	Crude extract	20,000	4,000,000
2.	Precipitation (salt)	5,000	3,000,000
3.	Precipitation (pH)	4,000	1,000,000
4.	Ion exchange chromatography	200	800,000

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

Section C

16. Why is the technique for the production of monoclonal antibodies called hybridoma technology. ? Why are monoclonal antibodies preferred over serum antibodies in diagnostics and therapeutics ? Give an example of a therapeutic use of monoclonal antibody.

17. What is 'Molecular Pharming' ? Suggest any four advantages of expressing transgenic proteins in milk.

18. Suggest any four reasons why complete genome sequencing projects should be undertaken ? Describe the advantage of using bacterial artificial chromosomes (BAC) in such sequencing programmes.

19. What is downstream processing ? What strategy would you use to purify a recombinant protein that is secreted into the growth medium ?

20. What are the basic steps of a polymerase chain reaction (PCR) ? Give two applications of PCR.

21. How can you obtain virus-free sugarcane plants from virus-infected plants ? Are these plants virus resistant ? Why or why not ?

22. Why is it difficult to culture animal cells as compared to microbial cells ? How is the pH and osmolality of the medium monitored and maintained in animal cell culturing ?

23. Name any four physical and/or chemical properties of enzymes which might be useful to change by site-directed mutagenesis. Support your answer by taking an example of an engineered protein/enzyme.

24. Explain how DNA “microarray” technique can be used to study cellular response to environment. Also depict major steps diagrammatically.

25. What are microbial culture collection centres ? Suggest any two benefits. Name any one culture collection centre and its location.

Section D

26. (a) What is the principle of protein finger printing ? Illustrate major steps.
(b) Who developed this technique ?
(c) Name a human disease caused by the absence of a protein /enzyme.

27. (a) Enlist the four major steps in a recombinant DNA experiment.
(b) What is the advantage of having a poly linker in a cloning vector ?
(c) Name a cloning vector that can be used to clone large DNA fragments (> 1 MB)

OR

27. (a) What is the principle of blue-white selection for the identification of recombinants ?
(b) Name any three methods of introducing recombinant DNA into host cells.

28. (a) Enlist the six major steps in plant tissue culture.
(b) Name a medium commonly used for culturing plant parts and what factors dictate the choice of media ?

OR

28. (a) Describe vector-mediated and vector-less gene transfer in plants.
(b) Why is *Agmbacterium tumefaciens* regarded as nature's genetic engineer ?

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