**Question Paper 2007**
**CBSE Class 12 Biotechnology**

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**General Instructions:**

(i) All questions are compulsory.
(ii) There is no overall choice. However, an internal choice has been provided in one question of two 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

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**SECTION A**

1. Give the sequence of the two primers (5 nucleotides long) required to amplify the following DNA sequence by PCR: 1
5' GCACCTAGATCGATCC 3’

2. What is lyophilization?

3. What treatment will you recommend to a fruit-seller for ripening a consignment of ’Flavr Savr’ tomatoes, and why?

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

5. Suppose you are planning a large scale hybridisation programme in maize, how can this task be made less labour intensive?

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**SECTION B**

6. You wish to introduce the human insulin gene into a bacterial host in the hope of

producing large amounts of human insulin. Should you use genomic DNA or cDNA? Explain.

7. What are ESTs? How are they useful in genome analysis?

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

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

| Protein | MW (daltons) |
|---|---|
| Transferrin | 90,000 |
| Cytochrome c | 13,400 |
| $\alpha$ -antitrypsin | 45,000 |
| Myoglobin | 17,000 |
| Serum albumin | 69,000 |

**10.** Give two distinguishing features of pBR322 and pUC19 vectors.

11. What is the IUPAC code for A or C? Write the complementary sequence of the following sequence :
5'-ASGYTWCAG-3'

12. Why is aeration important for microbial growth? How can proper aeration be achieved in microbial cultures grown under laboratory conditions?

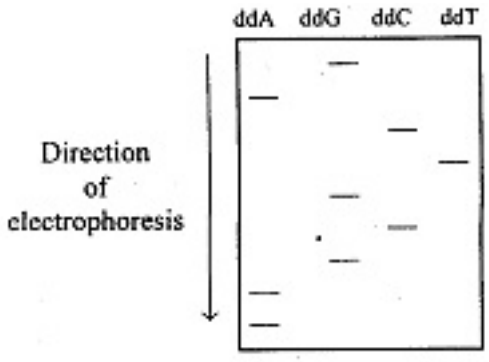
13. The long distance runners are disqualified if they test positive for erythropoietin (EPO). What is this substance and how does it act?

**OR**

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. What are these specialized cells known as? Why are they maintained in

undifferentiated state?

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




(a) Read the DNA sequence from the autoradiogram.
(b) Explain why the sequence read from the autoradiogram is complementary to the original sequence.

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

| Step | Procedure | Total protein (mg) | Activity (units) |
|---|---|---|---|
| 1. | Crude extract | 15,000 | 1,50,000 |
| 2. | Salt fractionation | 4,000 | 1,38,000 |
| 3. | Ion exchange chromatography | 1,500 | 1,15,500 |
| 4. | Molecular exclusion chromatography | 688 | 75,000 |
| 5. | Affinity chromatography | 1-75 | 52,000 |

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

## SECTION C

16. What is OKT-3? Why is it administered to patients undergoing organ transplantation? What is the relevance of fusing an antibody producing B-cell with myeloma cells in hybridoma technology?

17. What is ‘Molecular Pharming’? Suggest any four advantages of expressing transgenic

proteins in milk?

18. Name any three resources available from the NCBI and their uses.

19. What is fed-batch culture and what are its benefits in microbial technology? How is it different from a batch culture?

20. Name the special DNA polymerase used in PCR reactions. What are the three basic steps of a PCR cycle? Using a single template molecule, how many DNA molecules are generated after 10 cycles of amplification?

21. What are edible vaccines? Give 3 advantages of developing edible vaccines. Which plant part(s) will be best suited for expressing antigenic transgene?

22. Why is it difficult to culture animal cells as compared to plant or microbial cells? How is the pH and osmolality of the medium monitored arid 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. A Chronic Myelogenous Leukaemia (CML) patient has been put on a combination drug therapy for the past 2 months. How can the FISH technique be used to monitor the effect of chemotherapy?

25. What are the microbial culture collection centres? Suggest any two benefits. Name a microbial culture centre from India and its location.

## SECTION D

**26.** (a) What is the principle of protein fingerprinting? Illustrate major steps.

(b) Who developed this technique?

(c) What are prions?

**27.** (a) How will you select bacterial cells carrying a recombinant plasmid?

(b) Explain briefly a technique for visual screening of transformed bacteria.

(c) How can E. coli cells be made competent and who developed this method?

**OR**

(a) Enlist the four major steps in a recombinant DNA experiment.

(b) What is the advantage of having a polylinker in a cloning vector?

(c) Name a cloning vector that can be used to clone large DNA fragments (> 1 MB).

28. (a) Describe vector-mediated and vector-less gene transfer in plants.

(b) Why is Agrobacterium tumefaciens regarded as nature's genetic engineer?

**OR**

(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.