

**SAMPLE QUESTION PAPER**  
**SESSION 2014 - 15**  
**CLASS – XII**

**SUB: BIOTECHNOLOGY**

**TIME: 3 Hrs.**  
**M.M.: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 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 6 are very short answer questions, carrying 1 mark each.
- (iv) Question numbers 7 to 14 are short answer questions, carrying 2 marks each.
- (v) Question numbers 15 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. "Golden rice is nutritionally superior to normal rice". Justify. 1
- 2. Write the complementary sequence of the following sequence 5' ATMKGCSWNB 3' 1
- 3. What is the specific role of baffles in large scale fermentation process? 1
- 4. A,B and C are type I, type II and type III enzymes respectively. Which of these is mostly used in recombinant DNA technology and why? 1
- 5. Curd is used as a pro-biotic. Give reason 1
- 6. Give the commercial importance of flavr savr variety of tomatoes. 1

**SECTION B**

- 7. Both Hind III and Pvu I are unique restriction sites in insert and host DNA. Why is Hind III still a preferred restriction enzyme? 2
- 8. Detergent manufacturers supplement their products with a protease. Indicate why the enzyme is inactivated by bleach and how can this problem be overcome? 2

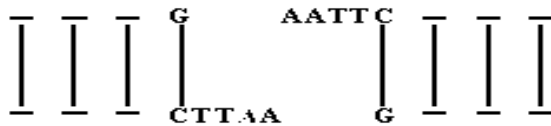
**OR**

American scientists have developed a formulation based on whey proteins for reducing the viral load in Hepatitis patients. What could be the possible scientific explanation for this therapeutic effect?

9. Indicate two techniques which can be used for amplifying DNA. 2
10. An interesting property of restriction enzymes is to precisely cut DNA. Restriction enzymes typically recognize a symmetrical sequence of DNA. 2



Notice that the top strand reads the same sequence 5' to 3' as the bottom strand. When the enzyme cuts the strand between G and A, it leaves overhanging chains:



- A. What is this symmetrical sequence of DNA known as?  
 B. What is the advantage of these overhanging chains?
11. What are data retrieval tools? Which tool would be useful for obtaining comprehensive information on a biological question? 2
12. How can microbes producing novel products be identified using metagenomics?. 2
13. *E.coli* is not the preferred host for the expression of a protein produced in papaya. Justify. 2
14. (i) Mention the number of primers required in each cycle of polymerase chain reaction (PCR). 2  
 (ii) Give the characteristic feature and source organism of the DNA polymerase used in PCR.

### SECTION C

15. Protoplasts from two different sources are isolated and allowed to randomly fuse with each other. Name this process and indicate how this fusion can be done and give its agricultural importance? 3
16. Discuss two important medical applications of tissue engineering. 3
17. Study the following enzyme purification table and answer the questions that follow:

Step	Procedure	Total protein (mg)	Activity (units)
1.	Crude extract	10,000	20,00,000
2.	Precipitation (salt)	2,500	15,00,000
3.	Precipitation (pH)	2,000	5,00,000
4.	Ion exchange chromatography	100	4,00,000
5.	Affinity chromatography	25	3,75,000
6.	Size exclusion chromatography	22.5	3,37,500

- (a) What is the yield of active protein from crude extract?  
 (b) Which step in the purification is most effective, and why ?  
 (c) Which of the procedures is least effective and why ?
18. What do you understand by 'SNPs'? Suggest any two applications. 3
19. 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 also provide an example of a therapeutic use of monoclonal antibodies. 3
20. How can you obtain virus-free sugarcane plants from virus-infected plants ? Are these plants virus-resistant? State yes /no giving reason. 3
21. (i)What kind of animal culture set up will you use to scale up a given animal cell line?  
 (ii)Patients who are administered OKT3 do not suffer from an acute renal allograft rejection, why? 3
22. Name an organism that is used to produce pencyllin and depict the steps in downstream processing. 3
23. If a culture of *E.coli* contains  $10^4$  cells/ml at 4:00 pm and  $10^8$  cells/ml at 8:00 pm, calculate its specific growth rate and doubling time. Which growth phase in this bacterial culture will show maximum value of specific growth rate? 3
24. Differentiate between  
 (a) Normal and cancer cells.  
 (b) Defined and serum supplemented medium  
 (c) Finite and continuous cell lines 3
25. (a) *Agrobacterium tumefaciens* is regarded as nature's genetic Engineer. Comment  
 (b) Enlist the major steps to introduce novel genes into plants using *Agrobacterium*. 3

## SECTION D

Q26 Expand NCBI. Classify the resources available from the NCBI into seven heads. Why was it necessary to create bioinformatics databases? 5

**OR**

(a) Margaret Dayhoff observed that protein sequences undergo variations during evolution. Indicate three patterns observed by her.

(b) Describe the importance of EST approach in generating databases of nucleotide sequences and mapping of human genome.

Q27. Explain the role of insertional inactivation in rDNA technology. 5

Q28. The functional properties of a protein are dependent on its 3D structure.

Name the non-covalent interactions involved in making a folded protein and explain how proteins are volatilized as well as analyzed by the mass spectrometer. Why has this technique become so important for biotechnology? 5

**OR**

Given below is a polypeptide:

AGTRCWPMKGLYCAFAEPGILKYCRQALTWERAGLAFANG

How many polypeptides will be formed upon the action of chymotrypsin and trypsin?