Class XII
Biotechnology (045)
Sample Question Paper 2018-19

Time allowed: 3 Hours **Max. Marks: 70**

General Instructions:
(i) Question paper contains four sections-A, B, C and D.
(ii) All questions are compulsory.
(iii) There is internal choice in all sections. You have to attempt only one of the choices in such questions.
(iv) Question numbers 1 to 6 are very short answer questions, carrying 1 mark each.
(v) Question numbers 7 to 14 are short answer questions, carrying 2 marks each.
(vi) 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. 4 copies of ds DNA are subjected to polymerase chain reaction. How many copies would be obtained after 20 cycles?

OR

How can we use LEU 2 gene as a selectable marker?

2. Specify the role of alkaline phosphatase in cloning. **1**

3. Specific activity increases during subsequent steps of a protein purification scheme. How can you relate it with the purity of protein? **1**

4. Animal cells in a culture medium were placed in a regular incubator used for growing bacterial cells. Do you expect the animal cells to grow or not? **1**

5. What is Gene Knock out? **1**

6. What will be the consequence if a protein is having an altered structure? **1**

OR

Expand and define PER?

SECTION-B

7. What are inverted microscopes and why are they useful in animal cell culture lab? **2**

OR

Enlist the advantages and limitations of animal cell culture (two each).

8. Explain a visual method of screening the transformed host cells. **2**

9. Interspecific cross leads to formation of sterile seeds. What could be the reasons for the same and how can normal development be achieved? **2**

10. A protein from cell A and cell B is compared to find the whole protein pattern by a technique developed by O'Farrel. Name the technique. State its principle. **2**

11. C.elegans is a eukaryotic organism with a genome of 97 Mb and about 20,000 genes. What organizational features of this genome are unusual when compared to the genomes of other eukaryotes, such as yeast and Drosophila? **2**

OR

Annotation of human genome sequence reveals that our genome contains 30000- 33000 genes. Proteomic analysis indicates that human cells are capable of synthesizing more than 30,000 different proteins. How can this discrepancy be reconciled?

12. Foot and Mouth Disease Virus(FMDV) vaccine is made by growing the virus in animal cells, harvesting the virus and inactivating it for vaccine formulations. Given the following data, calculate the weight and volume of the harvested virus from a bioreactor- **2**

(a) Total bioreactor capacity= 1000 l(atleast 20% space must be kept for oxygen and CO_2)
(b) Number of animal cells= 10^5/ml
(c) Number of virus particles/animal cell=50

Assume the virus to be a sphere with a gram molecular weight of 10^6 Daltons (1 million) and radius = 1nm.

OR

Recombinant insulin is produced at 100 mg/L by E. coli at a cell concentration of 1 g/L.
Calculate the volume of reactor (size of the fermentor) needed to produce 1 Kilogram of insulin in the following conditions:

(a) When the cell concentration is 1 g/L and insulin production is 100 mg /L.
(b) When the cell concentration is 50 g/L and insulin production is 100 mg /L.

13. Name the plant variations developed by long term callus and suspension culture in plants. How can such variations be used in crop improvement? **2**

14. Foaming is a problem in most microbiological processes. Mention any two possible causes of this problem? How can it be controlled? **2**

SECTION-C

15. What is Molecular Pharming? State its advantages (any 4) **3**

16. Outline the process of creation of chimeric mouse by embryonic stem cell culture. **3**

17. A specific DNA sequence is identified from a heterogeneous population of DNA molecules on the basis of DNA-DNA hybridization. **3**

a) Identify the technique.

b) Schematically depict the steps of DNA separation technique.

18. Based on Genomic studies, why do people say that different species and organisms had a common ancestor 100 million years ago. **3**

OR

The publication of 'Atlas of Protein Sequences and Structure' under the editorship of Margaret O' Dayhoff was a pioneering effort. Why?

19. Describe the important parts of a mass spectrometer with diagram. Why has this technique become so important in studying proteins? **3**

OR

Give reasons for the following:

(i) Kappa casein is involved in micelle stabilization of milk proteins.

(ii)Whey protein detoxifies xenobiotics.

(iii) Curd is used as pro-biotic.

20. What is meant by tissue engineering? Explain any two important medical applications of tissue engineering. **3**

OR

How do we analyse the growth characteristics of a particular cell line.

21. Enlist any six good laboratory practices, which need to be followed while working with microbes. **3**

22. With an example illustrate- **3**

(a) a blunt end cutter restriction enzyme

(b) a sticky end cutter restriction enzyme.

Which types of ends are better and why?

23. There are several concerns being raised in accepting transgenic crops. List any three of them. **3**

24. How does the metagenomics approach help to identify novel genes present in the environment? Explain the process. **3**

25. What are somatic hybrids? How are they produced? **3**

OR

Though a genetically engineered crop is herbicide and pesticide resistant, it still requires use of agro chemicals. Mention at least three facts to justify the statement.

SECTION-D

26. Why do ddNTP's cause chain termination during Sanger's DNA sequencing method? Write the DNA fragments formed by chain termination for the given original DNA strand-3' ATGCTAGC 5'. **5**

OR

Distinguish between:
(i) BAC and YAC
(ii) pBR322 & pUC19
(iii) M-13 & lambda phage
(iv) Cosmid & plasmid
(v) Transformation and transfection

27. What is the hierarchical organization of protein structure? Indicate the nature of covalent and non-covalent forces which determine the protein structure. **5**

OR

How can one use the method of aqueous-two phase partitioning for the separation of proteins? Also suggest various efforts which may be taken to maximize protein stability during such separation.

28. Indicate the inheritance pattern, genomic location and mutation in any two diseases caused by single gene mutations which follow mendelian inheritance. Also, specify the genomic location in any two diseases resulting from gene polymorphisms with complex inheritance. **5**