Question Paper Delhi 2017 set 1

CBSE Class 12 Bio-technology

General Instructions:

- All questions are compulsory.
- There is no overall choice. However, an internal choice has been provided in questions of three marks and five marks each. You have to attempt only one of the choices in such questions. Question paper contains four sections A, B, C and D.
- Questions number 1 to 6 are very short answer questions, carrying 1 mark each.
- Questions number 7 to 14 are short answer questions, carrying 2 marks each.
- Questions number 15 to 25 are also short answer questions, carrying 3 marks each.
- Questions number 26 to 28 are long answer questions, carrying 5 marks each.
- Use of calculators is not permitted. However, you may use log tables, if necessary.

SECTION – A

1. Natural form of subtilisin enzyme is inactivated by bleach in detergents. How?

Ans. Oxidation of methionine at position 222.

2. In which particular phase of growth of animal cell culture, the cell number begins to increase exponentially?

Ans. Log phase/exponential phase.

3. Pattern of growth in bacteria is different from viruses. How?

Ans. Bacteria grow by binary fission; viruses do not follow a defined growth pattern.

4. Why is strain preservation important in microbial cell culture?

Ans. To ensure availability for future research/viability/to retain metabolite production.

5. In rDNA technology, what is the advantage of using vectors with polylinkers or multiple cloning sites?

Ans. To provide flexibility in use of different restriction enzymes.

6. Protein chemists prefer measuring absorbance of samples at 280 nm to estimate protein concentration. Why?

Ans. Nondestructive method.

SECTION – B

7. What are expression vectors ? What kind of promoter should be used in such vectors?

Ans. Vectors incorporating suitable signals for expressing foreign proteins in the particular host.

8. Germplasm conservation through the conventional methods has many limitations. Name any four.

Ans. Seed dormancy, seed borne diseases, short lived, high cost.

9. Generally, eukaryotic hosts are preferred to express eukaryotic proteins. Why?

Ans. Removal of introns/posttranscriptional modifications/ posttranslational modifications/ correct 3-D folding. (any 2)

10. Differentiate between structural and functional genomics. (any 2 points)

Ans.

Structural genomics	**Functional genomics**
Involves high throughput DNA sequencing	Determination of function of genes
High resolution genetic, physical and transcript map	Studying interactions between genes

11. How are Hydrogen bonds created in proteins and when are they strongest?

Ans. Sharing of a hydrogen between two electronegative atoms; strongest when the atoms

are in a linear array.

12. Properties of proteins decide its purification scheme. Enlist any two such properties.

Ans. Source material/ cellular location/physical, chemical and biological property of the protein. (Any two).

13. Give below is a table of number of genes and chromosomes, and size of genome of two different organism:

Organism	No. of Chromosomes	Genome Size	Predicted
Arabidopsis	5	15,70,00,000	25,498
Homosapiens	23	3,00,00,00,000	25,000

The two inferences from the above table.

Ans. No. of genes is not related to the number of chromosomes; Genome size is not related to number of genes.

14. Among the biomolecules, why do proteins have the maximum diversity in functions?

Ans. Proteins are made of 20 different amino acids and hence show diversity in size and sequence and therefore function.

SECTION – C

15. What is a metagenome ? How is metagenomics used to screen for novel microbial products?

Ans. Genome of both cultivable and non cultivable microbes from a given environmental area/niche.

16. Enlist three main concerns for safety aspects, specific to Biotechnology.

Ans.

17. (a) How branched chain amino acids are useful for athletes?

(b) What are essential amino acids?

Ans. (a) Branched chain amino acids are required for muscle growth. During exercise BCAAs are released from skeletal muscle and are used as fuel. Hence BCAAs are taken by athletes to protect muscle mass.

(b) Essential amino acids have to be obtained from diet and cannot be synthesized in the body.

18. Describe how Agrobacterium tumefaciens can be used to introduce desired gene into plants.

Ans. Collect leaf disc and infect Agrobacterium tumefaciens carrying a disarmed It plasmid vector. The infected tissue is cultured on shoot regeneration medium for 2-3 days during which time the transfer of T-DNA along with foreign genes takes place. Subsequently the transformed tissue is transferred on selection medium supplemented with lethal doses of kanamycin to eliminate non transformed tissue. After 2-3 weeks transfer to root inducing media and another 3-4 weeks for plant hardening.

19. Explain the principle and major steps of a DNA microarray experiment.

OR

What are DNA chips ? How are they useful in functional genomics?

Ans. mRNA from cells are taken and reverse transcribed to c DNA using reverse transcriptase. The c DNA is labeled with red and green flours that serve as probes. They are placed on microarray. Two cDNA probes are tested by hybridizing them to DNA microarray. Observation of colored spots tells about genes expressed in different conditions.

OR

DNA chips are used in microarray technologies. It is a glass slide onto which DNA molecules are spotted as an array and can be hybridized to specific probes. This helps researchers to analyse interactions among thousands of genes simultaneously/ It helps to study tissue specific genes/ cell cycle variations etc.

20. Animal cell cultures are grown in CO2 incubators rather than regular ones. Why?

Ans. It provides buffering / sterility of chamber / constant temperature / high relative humidity / maintains osmolarity.

21. (a) What is 'Insertional Inactivation'?

(b) Describe a visual method of screening transformed bacterial cells.

Ans. (a) A gene is made inactive by inserting a foreign DNA eg. Blue-white selection.

(b) Expression of LacZ in form of blue colonies, expression of GFP as fluorescent colonies or any other.

22. Describe the important parts of a mass spectrometer with diagram. Describe its use in study of proteins.

Ans. Mass spectrometer consisting of an ionization chamber in which vaporized sample of a protein is introduced. The sample is ionized and charged molecules are then propelled into mass analyzer that separates ions according to m/z ratio.

It is used to obtain protein mass and sequence/ to identify type and location of amino acid modifications, etc.

23. With the help of suitable diagram, describe major steps in making of a 'recombinant plasmid.

Ans. Steps to be included

- Isolate vector and DNA fragment to be cloned.
- Separately digest them with the same restriction enzyme.
- The digested DNA fragment and vector are mixed in a suitable buffer and ligated.

24. Differentiate between batch and continuous culture.

Ans.

S. No.	**Batch culture**	**Continuous culture**
1.	Closed system	Open system
2.	All nutrients are in limited quantity.	One of the nutrients is in limited c added before it is exhausted.

3.	Cell number decreases after a while due to depletion of nutrients & accumulation of toxic metabolites.	Cells can be grown at constant rat extended period.
4.	Used for isolating intracellular metabolites.	For biomass and metabolite prod

25. Justify the statements, giving reasons:

(a) Golden rice is nutritionally superior to normal rice.

(b) Edible vaccines are better than conventional vaccines.

(c) Plants are cheap chemical factories to produce thousands of chemical molecules.

Ans. (a) Golden rice is enriched with pro vitamin A . It is transgenic for three genes for β-carotene synthesis that are expressed in the endosperm.

(b) Low cost / alleviation of storage problems / easy delivery system (oral).

(c) They require minimal inputs such as water, minerals, light and CO2 for their growth.

SECTION – D

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

Ans.

27. (a) Why is sickle cell anaemia called a molecular disease?

(b) Describe the technique used to identify this disease in the laboratory.

(c) Who developed this technique?

Ans. (a) Sickle cell anemia is called a molecular disease because it is due to a single amino acid substitution (valine for glutamic acid) in the 6th position of the β-chain of hemoglobin molecule.

(b) Peptide mapping/protein fingerprinting as on pg. 36-37, fig.6

(c) V.M. Ingram

28. (a) What is the importance of maintaining pH while culturing animal cells?

(b) How does even transient change in pH can lead to cell death?

(c) How is the pH maintained in a culture media?

OR

(a) What are epitopes?

(b) Describe how hybridoma technology is used for producing monoclonal antibody.

(c) Enlist two therapeutic mAb, with their application.

Ans. (a) To maintain optimal function of cellular enzymes / optimal binding of hormones and growth factors.

(b) Most biological processes are pH sensitive and therefore transient pH changes lead to cell death.

(c) Using buffering system: bicarbonate – CO_2. The CO_2 derived from cells reacts with water to form carbonic acid that leads to a drop in pH. Bicarbonate in the medium neutralizes the effect of CO_2.

OR

(a). Domains/specific sequence within proteins that are recognized by specific antibodies.

(b) mAb are produced by antigen activated B-cells that have been immortalized by hybridizing with myeloma cells, using PEG. The hybrid cell retains the ability of B-cells to secrete antibodies and of the myeloma cell to divide indefinitely. The hybrid cell when grown in culture produces epitope specific antibodies.

(c) Herceptin, OKT-3,