CBSE Class 12 Biotechnology Question Paper 2017 Solved

1. Proteome of a given cell is dynamic. Why?
Ans: Proteome of a given cell is dynamic because in response to internal & external changes, the biochemical machinery of the cell can be changed.

2. What is lyophilization?
Ans: Freezing of a culture followed by drying under vacuum.

3. Why is a pan of water always kept in an incubator chamber, used for animal cell culture?
Ans: Cells will otherwise shrink or swell, and cell growth/function will be affected.

4. While growing animal cells in a laboratory, the osmality of medium is always maintained around 300 mOsm. WHy?
Osmolality within a cell is 300 mOsm and therefore has to be maintained for high humidity, preventing desiccation of culture medium, and maintenance of correct osmolarity

5. Why is a DNA sequence always listed in the direction 5' to 3'?
Ans: DNA is biologically synthesized in the 5'- 3' direction.

6. Name the scientist who established the first human cell line from cervix cancer cells.
Ans: George Gay.

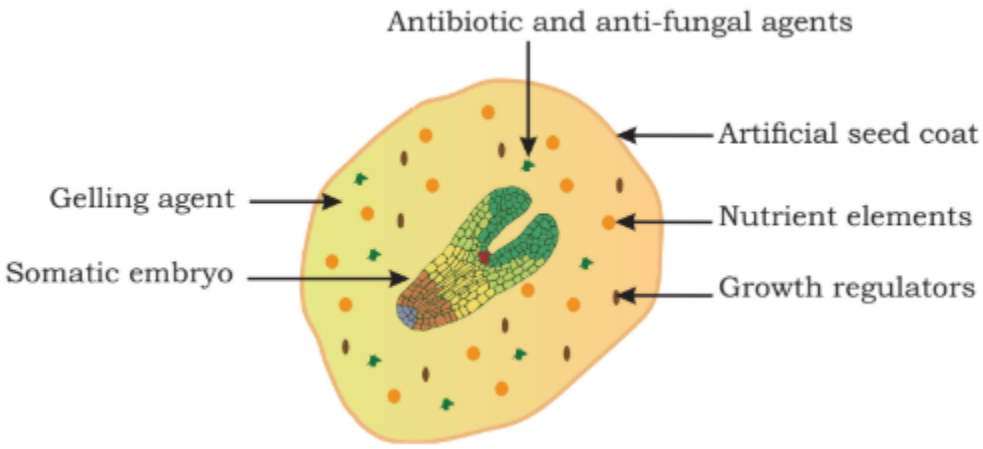
7 Choice of vector is crucial for an r-DNA experiment. Give two reasons for the same.
Ans: (i) Depending on the insert size.
(ii) Nature of the host.

8. Why is r-HUEPO preferred over blood transfusion in a person with blood loss due to accident?
Ans: No donor is required for transfusion, no transfusion facilities, no risk of transfusion-related infection (any two).

9. (a) How do bacteria protect themselves from infection by bacteriophages?
(b) Why are only type-II restriction enzymes used in r-DNA technology?
Ans:

- (a) Using restriction enzymes; Restriction enzymes will not cut their own chromosomal DNA.
- (b) Type II restriction enzymes cut within the recognition sequence.

10. Draw a labelled diagram of a synthetic seed.
Ans:



11. Curd and whey are categorised as nutraceutical proteins. Why?
Ans: Curd and whey are rich sources of nutrients- essential amino acids, etc., and have pharmaceutical compounds which elevate glutathione, which detoxify xenobiotics.

12. The number of genes predicted by computational biology is different from the number of genes identified by experimental methods in a genome. Justity.
Ans:

- (a) Existence of overlapping genes and spliced variants.
- (b) Incorrect prediction due to the use of experimentally identified genes.

13. How can Expression Proteomics be useful in the identification of disease-specific proteins?
Ans: Protein expression between different samples can be compared for differential protein expression using 2-D gel electrophoresis, mass spectrometry, etc.

14. Why is it essential to supplement animal cell culture media with serum?
Ans: Serum provides growth factors, nutrients, lipids, and other factors to support cell proliferation and attachment to the culture vessel.

15. How can microbial cultures be exploited for commercial purposes?
Ans: Production of food, vaccines/ Production of primary metabolites, acids, alcohol/ Production of secondary metabolites: Antibiotics/ Biotransformation reactions: Enzymatic, steroids,

16. Differentiate between primary and secondary metabolites. Name any two secondary metabolites obtained by plant tissue culture.

Ans: Primary metabolites are chemicals used for basic metabolic processes in plants, such as sugars, lipids, and amino acids. Secondary metabolites are additional products with useful properties. Eg., Digoxin, Capsaicin, etc.

17. It is difficult to raise hybrids which are interspecific and intergeneric. Why? How can these types of hybrids be obtained?

Ans: Because of the abnormal development of the endosperm, which can cause premature death of the hybrid embryo. Embryo rescue technique/Embryos are excised at the appropriate time and cultured on a suitable nutrient medium.

18. Differentiate between genomic and cDNA library. Mention three major points.

Ans: Differences between genomic and cDNA library:

Genomic Library	cDNA Library
All possible DNA sequences included.	mRNA is the starting material.
The DNA library is large	The cDNA library is small.
Both coding and non-coding DNA are included.	Only the coding part of DNA is used.

19. What are the three main features that a vector should possess? Describe the role of each.

Ans:

- It must have 'ori' for independent replication in the host.
- Selectable markers to identify host cells transformed by the vector.
- Small in size for easy transfer into the host.
- Multiple restriction sites.

20. Give a schematic representation about generation of RF LPs. What is the principle behind the generation of RFLPs?

Ans: 20. Fig.3/ pg 7. DNA isolated from an individual organism has a unique sequence and even members within a species differ in some part of their sequence, providing fragments of different sizes when digested with a given enzyme.

21. Enlist three reasons to support the statement "Edible vaccines have advantages over recombinant vaccines.

Ans: Edible vaccines are better because-

- Easy delivery through the oral route
- Low cost

- No storage problem

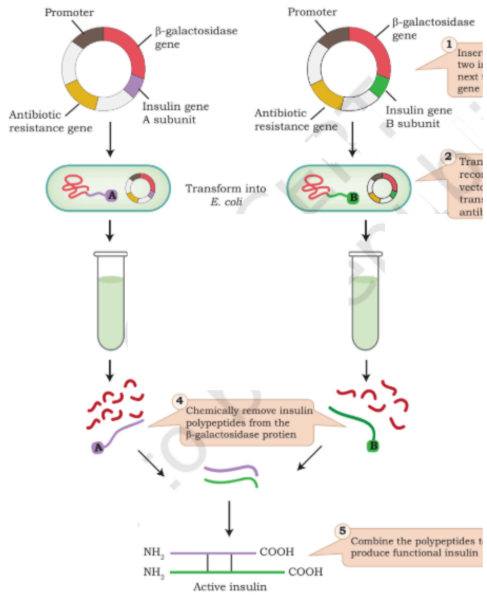
22. Describe any three non-covalent interactions involved in organising the structure of proteins.

Ans:

- (a) Ionic bond: Interactions between oppositely charged groups of a molecule. Ionic interactions are also known as salt bridges.
- (b) Hydrogen bond: formed by the sharing of hydrogen atoms between two electronegative atoms, such as nitrogen and oxygen.
- (c) Van der Waals forces: forces of weak attraction which occur between atoms at close range.
- (d) Hydrophobic interactions: the tendency of hydrophobic (water-hating) molecules to come together to repel water.

23. Draw a flow chart for isolation of an intracellular microbial metabolite, using an example.

Ans:



24. What kind of analysis can be done using Bioinformatics tools for DNA and proteins?

Ans:

- Processing raw information.
- Gene prediction.
- Protein sequence inference.
- Regulatory sequences – identification.
- Making phylogenetic relationships
- Making gene discovery

OR

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

Ans: Macromolecular Sequences were first compiled in this atlas, which helped develop computer methods for protein sequence comparison. Detection of various features from sequences, such as duplications, evolutionary histories, and alignments.

25. Describe the use of the following in an animal cell culture laboratory :

(a) LAF hood

(b) Inverted-microscope

(c) Microcarrier beads

Ans:

- (a) LAF: Work area to be free of contamination.
- (b) Inverted microscope: Allows cells at the bottom of the culture vessel to be visualized.
- (c) Micro carrier beads: Increase surface area in scaling up of adherent cultures.

26. What is in-situ activation of chymotrypsinogen? Explain how the correct folding of the enzyme chymotrypsin leads to its function as a proteolytic enzyme.

Ans: Activation at the site of function.

Chymotrypsinogen is acted upon by the trypsin enzyme, which results in activation of the enzyme and interaction with substrate.

Mechanism of action:

- Nucleophilic attack of serine O-H, ie, O- on the carbonyl group of the peptide bond to form a tetrahedral complex.
- Breakage of the peptide bond by water and release of one product.
- The addition of water, the second substrate.
- Acyl enzy,e complex breaks giving rise to the second product.

27. Expand 'BLAST'. Discuss the steps involved in comparison of DNA sequences using this tool. Differentiate between paralogs and homologs.

Ans:

- Basic Local Alignment Search tool.

- A given sequence is compared with sequences in the database using substitution matrices that specify a score to either reward or penalize. Top-scoring matches are ranked according to set criteria that serve to distinguish between similarity due to ancestral relationship or due to random chance. True matches are further examined thoroughly with other details accessible through Entrez and other tools available at NCBI.
- Paralogs: Duplicated genes within genomes that have similarities but differ in function.
- Homologs: Descended from a common ancestor and have the same function.

28. (a) Calculate the generation time of a_ bacterial population in which the number of bacteria increases from 10/ml to 10//ml during four hours of exponential growth.
(b) Explain any two methods of measuring microbial growth.
(c) In which phase of growth is the specific growth rate of microbial cells calculated? On what factors does the specific growth rate depend?
Ans:
(a) n=3.3 (log107 –log 104)
= 3.3 (3) =10
t= 240/ 10= 24 min
(b) ATP measurement; measure number of viable cells; dry weight; turbidity measurement.
(c) log phase: specific growth rate depends on temperature, pH, medium composition, and levels of dissolved oxygen.

OR
Suggest a genetic engineering strategy for each of the following traits in transgenic crops :
(a) Herbicide tolerance
(b) Insect resistance
(c) Abiotic stress tolerance
(d) Virus resistance
(e) Delayed ripening
Ans:

- (a) Overproduction of herbicide target enzymes/ introduction of a modified gene that encodes for a resistant form of herbicide target enzyme into crop plants.
- (b) Cry genes from Bacillus thuringiensis, which are specific to a particular group of insect pests, are introduced into plants.
- (c) Developing transgenic plants that overexpress the genes for one or more stress-related osmolites like mannitol, amino acids, anti-freeze proteins, etc.
- (d) Genes from viral coat proteins are introduced into plants to make them virus-resistant.
- (e) Hormone ethylene causes fruit ripening. By blocking or reducing ethylene production/antisense
- RNA ripening is delayed. When ripening is required, then ethylene can be applied. (pg 124-128)