



Blue Print (As per PU Board)

Topic	1 mark questions	2 marks questions	3 marks questions	5 marks questions	Total Marks
Biotechnology and its Applications	1	1	1	1	11

One mark questions

1. Name the technique which is used to detect HIV in suspected AIDS patient?

Answer: PCR (Polymerase Chain Reaction)

2. Name the disease that can be cured through gene therapy?

Answer: SCID (Several Combined Immuno deficiency) due to absence of ADA.

3. Define RNA interference (RNAI)

Answer: It is a method of silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA.

Two marks questions

4. What do you mean by "Bio piracy" give an Eg?

Answer: Bio piracy refers to the use of bio- resources lay multinational companies and other organizations without proper authorization from the countries and people concerned.

Eg Basmati rice grown in India is distinct for its unique flavour and aroma but an American company got patent rights on Basmati through US patent.

5. Give any two example of products, how transgenic animals can be used to produce biological compounds.

Answer:

(i) Alpha-1-antitrypsin a protein that is used to treat emphysema.

(ii) Alpha - lactalbumin - protein - rich milk that is more nutritionally balanced product for human babies

6. Mention any four applications of Biotechnology in the field of agriculture?

Answer: (Half mark for each)

(1) To make crops tolerant to abiotic stresses

Eg cold, drought, salt, heat.

(2) To reduce reliance on chemical pesticide by producing pest- resistant crops.

(3) Increased efficiency of mineral usage by plants.

(4) Enhanced nutritional value of food

Eg Vit-A rich golden rice

Three marks questions

7. Give an account of applications of biotechnology in agriculture.

Answer: (any 6 points -3 marks)

(1) To develop genetically modified crops to increase agricultural productivity.

(2) To develop high yielding and disease resistance varieties of plants.

(3) To make plants resistant to pests and pathogens

(4) To increase their tolerance to abiotic stresses like heat, frost and drought.

(5) To increase nutritional quality of the food

(6) To increase their efficiency in mineral usage.

(7) To develop natural pest resistant plants to reduce the use of chemical fertilizers and pesticides.

8. Describe with example, why transgenic animals are produced?

Answer: Transgenic animals are produced for following purpose:

(3 marks)

(i) To allow the study of how genes are regulated and how they affect normal function of body and its development

Eg: Information obtained about biological role of insulin like growth factors.



- (ii) To increase our understanding on how genes contribute to development of diseases.
- (iii) To produce useful biological compounds by introducing a portion of DNA that codes for that product - 1 antitrypsin, a protein used to treat emphysema - other organisms etc.
- (iv) For testing the safety of vaccine.
Eg: Polio vaccine in transgenic mice.
- (v) To test the toxicity of drugs.

9. What is RNA silencing? How is this strategy used to create pest resistant plants.

Answer: It is a technique which involves silencing or disabling of specific mRNA due to complementary ds RNA molecule that binds to and prevents the translation of mRNA. This strategy is used to prevent infection of roots of tobacco plants lay nematode meloidegnye incognita. In this strategy complementary ds RNA is produced against specific mRNA. The source of this complementary RNA could be from an infection by viruses having RNA genomes.

Using Agrobacterium vector nematode specific genes were introduced into host plant. The introduction of DNA was such that it produced both sense and antisense RNA in the host cell. These two RNA's being complementary each other formed a ds RNA that initiated RNAi and thus silenced specific mRNA of the nematode. The consequence was that parasite could not survive in transgenic host.

10. What are GMO's? Name three major steps of process of GMO's

Answer: (any 6 points -3 marks)

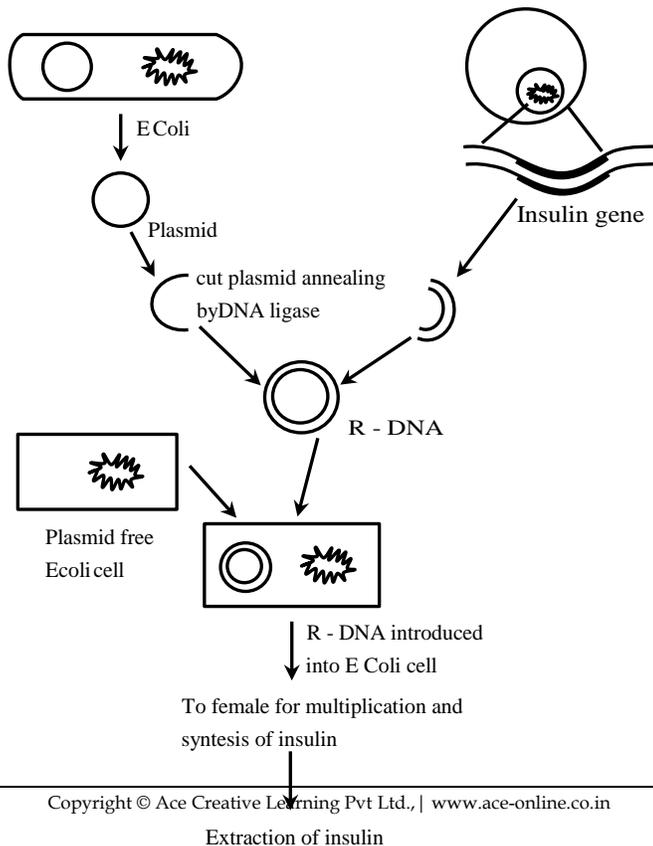
Genetically Modified Organisms

- (1) Isolation of DNA.
- (2) Fragmentation of DNA by restriction endonucleases.
- (3) Isolation of desired DNA fragment by gel electrophoresis.
- (4) Ligation of DNA fragments with a vector by DNA ligase.
- (5) Transferring the recombinant DNA into the host
- (6) Culturing the host cells in a medium at large scale in a bioreactor
- (7) Extraction of desired product by downstream processing.

Five marks questions

11. Describe the steps of synthesis of human insulin through genetic engineering.

Answer:



(2 marks)



Pro insulin has A chain with 21 amino acids, B chain with 30 amino acids and C chain with 33 amino acids. Pro insulin gene is extracted from human cells by cDNA method. It is inserted into the plasmid DNA adjacent to the lac Z gene with help of RE_N's and ligases. The r-RNA obtained incorporated into the host (E, coli). The transformed cells with pro insulin gene are grown in the bio reactors to get proinsulin and β -galactosidase.

It is removed from the β -galactosidase by CNBr. This pro insulin is converted into insulin by the removal 'C' chain with the help of proteolytic enzymes and by forming disulphide cross links between chain A and chain B thus forming functional insulin. (3 marks)

12. What is gene therapy - Illustrate using example of adenosine deaminase deficiency?

Answer: Gene therapy is a collection of methods that allows correction of a gene defect. In this method genes are inserted into the cells and tissues of an individual to correct certain hereditary disease. It involves delivery of a normal gene into the individual or embryo to replace the defective mutant allele of the gene. Viruses which attack the host cell and introduce genetic material into host are used as vectors. (2 marks)

For Eg: Adenosine deaminase (ADA) deficiency can be cured by bone marrow transplantation in some children but is not culture fore gene therapy, lymphocytes are grown in a culture and functional ADA, cDNA is introduced into these lymphocytes. These lymphocytes are then transferred into body of patient, the patient requires infusion of such genetically engineered lymphocytes.