CBSE Test Paper 03

Ch-12 Biotechnology and its Applications

1. Maximum application of animal cell culture technology today is in the production of
   a. Vaccines
   b. Edible proteins
   c. Interferons
   d. Insulin
2. In 1997, an American company got patent rights on
   a. Turmeric
   b. Soybean
   c. Basmati rice
   d. Maize
3. The site in the vector which helps in identifying and eliminating non transformation:
   a. Ori
   b. Cloning site
   c. Selectable marker
   d. Rop
4. RNAi helps in producing pest resistant plants as there is the formation of
   a. dsDNA
   b. dsRNA
   c. ssRNA
   d. ssDNA
5. In tissue culture medium, the embryoids formed from pollen grains is due to
   a. Organogenesis
   b. Cellular totipotency
   c. Double fertilization
   d. Test tube culture
6. The main challenge for production of insulin using rDNA technique was
   a. Getting insulin assembled into a mature form
   b. Removing C peptide chain
   c. Joining chain A with peptide chain
   d. Separating chain A and chain B

7. Name the first transgenic cow.
8. Name the vector used for introducing the nematode specific gene in tobacco plant.
9. Name the nematode that infests and damages tobacco roots.
10. How has recombinant technology helped in large scale production of vaccines? Explain giving one example.
11. What happens when Meloidegyne incognitia consumes cells with RNAi gene?
12. How is 'Rosie' considered different from a normal cow? Explain.
13. Explain the steps involved in the production of genetically engineered insulin.
14. Compare and contrast the advantages and disadvantages of production of genetically modified crops.
15. Tarun was one of the best boys in the class. In spite of his efforts he was not doing well in class XI. His father wanted him to qualify for medical sciences. He got frustrated with his results and resorted to drugs. He started misbehaving with parents and friends in school. His friends started neglecting him. The school authorities counselled Tarun but to no effect. His parents were upset and took him to a rehabilitation centre. After a few months he came back recovered.
    a. What values did the Principal reflect through his initiative?
    b. What is drug abuse?
    c. Name some commonly abused drugs and their source.
    d. What should be the attitude of his parents after his return?

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Answer

1. a. Vaccines, **Explanation:** The most important application of animal cell cultures is the production of a wide range of commercial compounds for medical and pharmaceutical use.
   Monkey kidney or chick embryo cells or recently human diploid cells are in use for the production of vaccines. The vaccine manufacture in animal cell cultures is rather complex with risk of contamination, and safety aspect. For these reasons, production of vaccines by recombinant DNA technology employing bacteria or yeasts is preferred.
2. c. Basmati rice, **Explanation:** In September 1997 Texas, USA company RiceTec was granted U.S. Patent No. 5,663,484 on "basmati rice lines and grains." The patent secures lines of basmati and basmati-like rice and ways of analyzing that rice. RiceTec, owned by Prince Hans-Adam of Liechtenstein, faced international outrage over allegations of biopiracy.
3. c. Selectable marker, **Explanation:** A selectable marker is a gene introduced into a cell, especially a bacterium or to cells in culture, that confers a trait suitable for artificial selection.
4. b. dsRNA, **Explanation:** RNA interference (RNAi) is present in all eukaryotic organisms. It involves silencing of a specific mRNA due to complementary dsRNA molecules that binds and prevents translation of the mRNA.
5. b. Cellular totipotency, **Explanation:** Cellular Totipotency is the ability of a single cell to produce all cell types and to organise them into an entire organism when cultured in a suitable culture medium at appropriate temperature and aeration conditions. Spores and Zygote are examples of totipotent cells.
6. a. Getting insulin assembled into a mature form, **Explanation:** The C peptide is not present in the mature insulin and is removed during maturation into insulin. The main challenge for production of insulin using rDNA technique was getting insulin assembled into a mature form.

In 1983, Eli Lilly an American company, first prepared two DNA sequences corresponding to A and B chains of human insulin and introduced them in plasmids of Escherichia coli to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin

7. The first transgenic cow Rosie produced human protein enriched milk (2.4 grams per litre). The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow milk.
8. Nematode-specific genes are introduced into the tobacco plants using Agrobacterium vectors to develop resistance in tobacco plants against nematodes.
9. A nematode Meloidogyne incognita infect the roots of tobacco plants and causes a great reduction is yield.

10. Recombinant vector vaccines make use of recombinant DNA technology. These vaccines make use of an attenuated virus or bacterium to introduce microbial DNA to cells of the body.

    Recombinant technology has allowed the production of antigenic polypeptides of the pathogen in other microbes like yeast and bacteria.

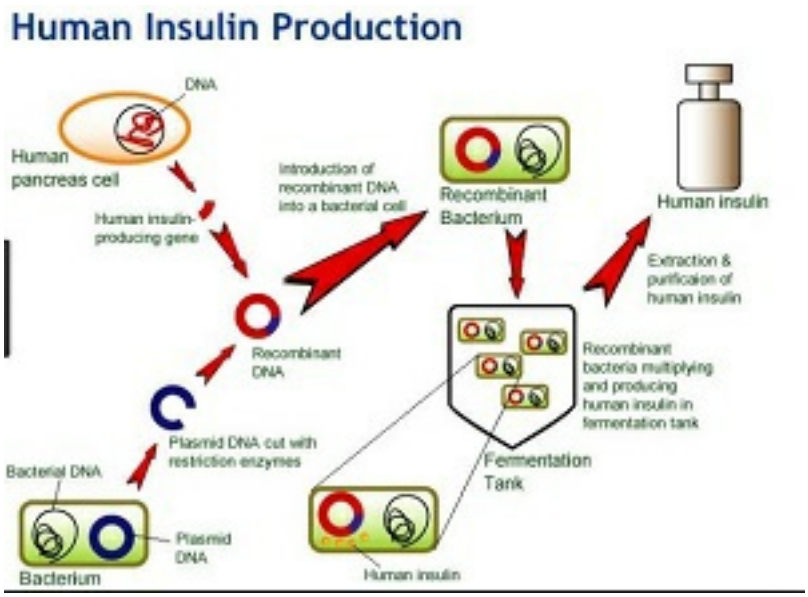
    For example, Heptitis B vaccine is produced using yeast cell.

11. When Meloidogyne incognita (parasite) consumes cells with RNAi gene, parasite cannot survive and this prevents infestation. The introduced RNAi gene DNA forms both sense and anti-sense RNA. Two strands being complementary to each other bend and form ds RNA, leading to RNAi. Thus, the mRNA of nematode is silenced and the parasite cannot survive there.

12. Rosie is the first transgenic cow produced In 1997. It produced human protein-enriched milk at 2.4 grams per litre. This transgenic milk is a more nutritionally balanced product than natural bovine milk and could be given to babies or the elderly with special nutritional or digestive needs. Rosie's milk contains the human gene alpha-lactalbumin.

13. **The genetic engineering process** :

- A small piece of circular DNA called a plasmid is extracted from the bacteria or yeast cell.
- A small section is then cut out of the circular plasmid by restriction enzymes, ‘molecular scissors’.
- The gene for human insulin is inserted into the gap in the plasmid. This plasmid is now genetically modified.
- The genetically modified plasmid is introduced into a new bacteria or yeast cell.
- This cell then divides rapidly and starts making insulin.
- To create large amounts of the cells, the genetically modified bacteria or yeast are grown in large fermentation vessels that contain all the nutrients they need. The more the cells divide, the more insulin is produced.
- When fermentation is complete, the mixture is filtered to release the insulin.
- The insulin is then purified and packaged into bottles and insulin pens for distribution to patients with diabetes.



14. **Advantages of GM crops:**

i. Genetic modification has made crops more tolerant to abiotic stresses (cold, drought, heat, salt)

ii. Viral resistance can be introduced.

iii. Over ripening losses can be reduced e.g. Flavr Savr tomato

iv. Enhanced nutritional value of food e.g. Golden Rice

v. Reduced reliance on chemical pesticides.

Disadvantages of GM crops:

i. Transgenes in crop plants can endanger native species. For example, the gene for Bt toxin expressed in pollen might end natural pollinators like honey bees

ii. Weeds also become resistant

iii. Products of transgene may be allergic or toxic.

iv. They cause damage to the natural environment.

15. **Ans-a)** The Principal showed his social liability and responsibility.

Ans-b) Intake of drugs for a non- medical purpose in the dose, strength, frequency and the way of taking which impairs mental and physical functions of human being is drug abuse.

Ans-c) i) Opium: from plant Papaver somniferum- its derivatives includes morphine, codeine, heroin, smack i.e brown sugar etc.

ii) Cocaine: from Erythroxylon coca, crack - a cocaine derivative, caffeine from Thea sinensis, Coffea Arabica, Theobroma cacao

iii) LSD: from fungus Claviceps purpurea

iv) Any other may be included

Ans-d) Parents should be compassionate and more caring towards the child and behave normally