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**QUESTION BANK (BIOLOGY)**

**CLASS XII**

**NOTE: DO ALL THESE QUE AND ANS 2-2 TIMES IN YOUR H.W. NOTEBOOK.**

**BIOTECHNOLOGY**

1. What does the organisation GEAC do? Check with reference to genetic engirneering.

Ans. GEAC is an organisation set-up by the Indian government to make decisions regarding the validity of GM research and the safety of introducing GM organisations for public services.

1. Name the cry gene that control cotton bollworm and corn borer respectively.

Ans. The cry genes that control cotton bollworm – crylAc and cryllAb and to control corn borer – crylAb,

1. How does silencing of specific mRNA in RNA interference prevent parasitic infection?

Ans. Parasitic infection can be prevented by using RNA interference (RNAi) process, as the nematode cannot live in the transgenic host that expresses the specific interfering RNA thus, making it double stranded and unable to translate the protein or product.

1. What are recombinant proteins? How do bioreactors help in their production?

Ans. Recombinant proteins are produced by the expression of recombinant DNA in the transgenic organism. Bioreactors help in producing these proteins on a large scale as

1. Large volumes of culture can be processed in bioreactors to produce desired quantity of product.
2. These provide optimum conditions of ph, oxygen, salts, substrates, etc., to get the desired product.
3. State how was Agrobacterium tumifaciens been made as a useful cloning vector to transfer DNA to plant cells.

Ans. The bacterium Agrobacterium tumifaciens is known to be natural vector capable of passing its DNA to plants and induce tumor by integrating its DNA with host genome. The tumor causing gene of interest and is now used as a cloning vector to transfer the DNA into plant cells.

1. Why do the toxic insecticidal proteins secreted by Bacillus thuringiensis kill the insect and not the bacteria itself?

Ans. Bt toxin does not kill bacteria because it exists as an inactive protoxin. When Bt toxin is ingested by an insect, it is converted into its active form due to the alkaline ph of the gut. The activated toxin binds to the surface of the epithelial cells of the midgut and create pores. Water entered causes swelling and lysis of cells in insect body.

1. What is biopiracy? state the initiative taken by the Indian parliament against it.

Ans. Biopiracy refers to the use of bioresources by multinational companies and authorisation from the concerned countries and people.

The Indian parliament has cleared a second Amendment of Indian Patents Bill as a initiative step against including patent terms, emergency provisions as well as research and development initiative.

1. How is *Rosie* considered different from a normal cow? Explain.

Ans. The transgenic cow, Rosie, produced human protein-enriched milk (2.4gm/l). it contained the human alpha lactalbumin and was nutritionally more balanced product for human babies than natural cow’s milk.

1. What are transgenic animals? Explain any four ways in which such animals can be beneficial for humans.

Ans. Animals that have had their DNA manipulated to possess and express an extra foreign gene are called transgenic animals. Transgenic rats, rabbits, pigs and cows have been produced.

Use of transgenic animals for human are:

1. To study gene regulation, their effect on the normal functions of the body and its development.
2. Study of genes, which are responsible for diseases in human and their treatment, e.g. cancer.
3. Useful biological products can be produced by introducing the portion of DNA, which codes for a particular product into transgenic animals.
4. Transgenic mice are developed to test the safety of vaccines before being used in humans.
5. Explain how Eli Lilly, an American company, produced insulin by recombinant DNA technology.

Ans. Insulin production by Eli Lilly company

1. DNA sequences corresponding to the two polypeptide, A and B- chains of insulin are synthesised in vitro.
2. They are introduced into plasmid DNA of E. coli.
3. This bacterium is cloned under suitable conditions.
4. The transgene is expressed in the form of polypeptides A and B, secreted into the medium.
5. They are extracted and combined by creating disulphide bridge to form human insulin.
6. Explain how a hereditary disease can be corrected. Give an example of the first successful attempt made towards correction of such disease?

Ans. Hereditary disease can be corrected by gene therapy. It is a collection of methods that allows correction of replacement of defective gene. The first gene therapy was given in 1990 to a 4 year old girl with Adenosine Deaminase (ADA) deficiency. It is caused due to the deletion of gene for adenosine deaminase.

The treatment involves following steps:

1. Lymphocytes from the blood of patient are grown on culture outside the body.
2. A functional ADA, c DNA (using a Retroviral vector) is then introduced into these lymphocytes.
3. Such genetically engineered lymphocytes are returned to the blood of patient.
4. Periodic infusion of such genetically engineered lymphocyte is required by the patient.
5. Plasmid is boon to biotechnology. Justify this statement quoting the production of human insulin as an example.

Ans. Plasmid is an autonomously replicating extra chromosomal cirucular DNA found in bacterialcells. Because it can replicate within a bacterial cell, it is used as a vector in r DNA technology.

Production of insulin polypeptide chains separately by plasmids of *E*. *coli* have enabled the artificial production of mature human insulin.

1. Insulin production by Eli Lilly company
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6. What is ADA deficiency? Describe three methods to cureit.

Ans. ADA deficiency is caused due to the deletion of gene for adenosine deaminase .

Methods to cure ADA deficiency are:

1. **First** **method**: in some cases, it can be cured by bone marrow transplantation and enzyme replacement therapy but it is not fully curative.
2. **Second** **method**: lymphocytes from patient’s blood were grown in a culture and functional ADA, c DNA was introduced in these lymphocytes using a retroviral vector. The lymphocytes were then transferred into the patient’s body. Periodic infusion of such genetically engineered lymphocytes is done because these cells are mortal.
3. **Third method**: this is a permanent method. Genes isolated from the bone marrow cells producing ADA is introduced into cells at early embryonic stage.
4. Explain the basis on which the gel electrophoresis technique works. Write any two ways the products obtained through this technique can be utilised.

Ans. Gel electrophoresis technique works on the principle of separation of DNA fragment on the basis of electric charge.

Since, DNA is negatively charged molecule so, they can be forced to separate out according to their size towards anode under an electric field through a medium or matrix (commonly used is agarose). Shorter molecule moves faster and migrate further than the longer one. The products obtained through this technique can be utilised as follows:

1. Construction of recombinant DNA by joining with cloning vectors.
2. Used in making multiple copies of same DNA by using PCR (Polymerase Chain Reaction).
3. Describe the process of gene amplification for r DNA technology experiments.

Ans. Amplification of gene is done using polymerase chain reaction (PCR). It is carried out in following steps:

1. **Denaturation**: the double stranded DNA is denatured by applying high temperature of 950C for 15 seconds. Each separated strand acts as a template.
2. **Annealing**: two sets of primers are added, which anneal to the 3’ end of each separated strand.
3. **Extension**: DNA polymerase extends the primers by adding nucleotides complementary to the template provided in the reaction. Taq polymerase is used in the reaction, which can tolerate heat. All these steps are repeated many times to get several copies of the desired DNA.

