

**CBSE Test Paper 01**  
**Ch-12 Biotechnology and its Applications**

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1. Which technique is routinely used in HIV detection
  - a. DNA sequencing
  - b. PCR
  - c. GEAC
  - d. Gel electrophoresis
2. Fruit softening is promoted by polygalacturonase which degrades
  - a. lipid
  - b. Pectin
  - c. cellulose
  - d. protein
3. The cutting out of separated bands of DNA from the agars gel is called
  - a. Elution
  - b. Polymerisation
  - c. Electrophoresis
  - d. Annealing
4. For the production of FlavrSavr tomato the sense and antisense RNA hybridize, the technique used is called as
  - a. plyadenylation
  - b. RNA splicing
  - c. Intron splicing
  - d. RNAi
5. Cry genes can be transferred as they are present in a bacteria in
  - a. plasmid
  - b. nucleoid material
  - c. membrane
  - d. mitochondria
6. Seeds of golden rice are yellow in colour because
  - a. It has vitamin E encoding gene
  - b. It has vitamin B encoding gene
  - c. Provitamin A is produced in the entire grain

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- d. It is a biproduct of 3 genes
7. Bio-weapons are conventionally used by terrorists as they are
    - a. Invisible and extremely difficult to detect
    - b. Are expensive
    - c. Can cause causality
    - d. Easily available
  8. Name a molecular diagnostic technique to detect the presence of a pathogen in its early stage of infection.
  9. A multinational company outside India tried to sell new varieties of turmeric without proper patent rights. What is such an act referred to?
  10. What are genetically modified organisms (GMO)?
  11. Explain why Bt cotton flowers undergo pollination by butterflies and bees inspite of being insect pest resistant?
  12. What are transgenic plants? Give some example.
  13. How is a transgenic tobacco plant made resistant to nematode using biotechnology?
  14. What are transgenic bacteria? Illustrate using any one example
  15. find out how to make orally active protein pharmaceutical. What is the major problem to be encountered?

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**Answer**

1. b. PCR, **Explanation:** Polymerase chain reaction (PCR) tests are used to detect HIV's genetic material, called RNA. These tests can be used to screen the donated blood supply and to detect very early infections before antibodies have been developed. This test may be performed just days or weeks after exposure to HIV.  
Although these tests are the most accurate, they are not performed as often as the other HIV tests because they are expensive and also time- and labor-intensive
2. b. Pectin, **Explanation:** Pectin present in cell wall of plant cell is responsible for hardness of fruit coat. Polygalacturonase is induced into the fruit that degrade the pectin and soften the fruit.
3. a. Elution, **Explanation:** In gel-electrophoresis, the separated bands of DNA are cut out from the agarose gel and extracted from the gel piece. This step is called elution.
4. d. RNAi, **Explanation:** FlavrSavr tomato is produced to increase its durability. For production of this tomato by genetic engineering the sense and antisense RNA hybridize. This technique is called as RNA interference that inhibit gene expression.
5. a. plasmid, **Explanation:** Cry gene is present in plasmid of bacterium. This gene can be easily separated from plasmid and included into another crops to provide resistance against pests and insects.
6. c. Provitamin A is produced in the entire grain, **Explanation:** The seeds of golden rice are yellow in colour due to presence of provitamin A in entire gene. This rice is natural source of vitamin A along with starch and proteins.
7. a. Invisible and extremely difficult to detect, **Explanation:** Bio-weapons are conventionally used by terrorists as they are invisible and extremely difficult to detect. It includes addition of microbes in water, food etc. that can cause disease

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in large number of people.

8. Polymerase chain reaction (PCR) is a technique used in molecular biology to amplify a single copy or a few copies of a segment of DNA across several orders of magnitude, generating thousands to millions of copies of a particular DNA sequence.
9. Biopiracy is the practice of commercially exploiting naturally occurring biochemical or genetic material, especially by obtaining patents that restrict its future use, while failing to pay fair compensation to the community from which it originates.
10. When a gene from one organism is purposely moved to improve or change another organism in a laboratory, the result is a genetically modified organism (GMO). It is also sometimes called "transgenic" for transfer of genes.

There are different ways of moving genes to produce desirable traits. For both plants and animals, one of the more traditional ways is through selective breeding. For example, a plant with a desired trait is chosen and bred to produce more plants with the desirable trait

11. Bt cotton is genetically engineered to produce a toxin which kills pests which eat the plant and cause damage. Bees and butterflies only forage for nectar in flowers and do not eat any part of the plant. So, they do not die.
12. Transgenic plants are plants that have been genetically engineered, a breeding approach that uses recombinant DNA techniques to create plants with new characteristics. They are identified as a class of genetically modified organism (GMO). Examples - Bt Cotton, Golden Rice, Flavr Savr tomato.
13. RNAi takes place in all eukaryotic organisms as a method of cellular defence. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that builds to and prevents translation of the mRNA.

Using *Agrobacterium* vectors, nematode-specific genes were introduced into the host plant. The introduction of DNA was such that it produces both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other formed a double-stranded RNA that initiated RNAi and thus silences the specific mRNA of the nematode. As a consequence the parasite could not survive in a transgenic host

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expressing specific interfering RNA.

14. Transgenic bacteria contain foreign gene that is intentionally introduced into its genome. They are manipulated to express the desirable gene for the production of various commercially important products.

An example of transgenic bacteria is E.coli. In the plasmid of E.coli, the two DNA sequences corresponding to A and B chain of human insulin are inserted, so as to produce the respective human insulin chains.

Hence, after the insertion of insulin gene into the bacterium, it becomes transgenic and starts producing chains of human insulin. Later on, these chains are extracted from E.coli and combined to form human insulin.

15. Orally active protein pharmaceuticals contain biologically active materials such as peptides or proteins, antibodies, and polymeric beads. It is administered orally into the body through various formulations. It involves the encapsulation of protein or peptide in liposomes or formulations using penetration enhancers. These proteins or peptides are used for treatment of various diseases and are also used as vaccines. However, the oral administration of these peptides or proteins has some problems related to it. Once these proteins are ingested, the proteases present in the stomach juices denature the protein. As a result, their effect will be nullified. Hence, it is necessary to protect the therapeutic protein from digestive enzymes, if taken orally. This is the reason for the proteins to be injected directly into the target site.

**How to make:**

- i. By putting the proteins (eg--insulin) in a tablet whose coating is made of a material that does not get digested in stomach's acidic medium but dissolves in the intestines thus proteins get absorbed in intestine by villi.
- ii. The way around this is to protect the therapeutic protein with a covering that will dissolve after it has passed through the stomach.