

## CHAPTER 12

# BIOTECHNOLOGY AND ITS APPLICATIONS

### MULTIPLE-CHOICE QUESTIONS

1. Bt cotton is not:
  - a. A GM plant
  - b. Insect resistant
  - c. A bacterial gene expressing system
  - d. Resistant to all pesticides
2. C-peptide of human insulin is:
  - a. A part of mature insulin molecule
  - b. Responsible for formation of disulphide bridges
  - c. Removed during maturation of pro-insulin to insulin
  - d. Responsible for its biological activity.
3. GEAC stands for:
  - a. Genome Engineering Action Committee
  - b. Ground Environment Action Committee
  - c. Genetic Engineering Approval Committee
  - d. Genetic and Environment Approval committee
4.  $\alpha$ -1 antitrypsin is:
  - a. An antacid
  - b. An enzyme
  - c. Used to treat arthritis
  - d. Used to treat emphysema

5. A probe which is a molecule used to locate specific sequences in a mixture of DNA or RNA molecules could be:
  - a. A single stranded RNA
  - b. A single stranded DNA
  - c. Either RNA or DNA
  - d. Can be ss DNA but not ss RNA
  
6. Choose the correct option regarding Retrovirus:
  - a. An RNA virus that can synthesise DNA during infection
  - b. A DNA virus that can synthesise RNA during infection
  - c. A ssDNA virus
  - d. A dsRNA virus
  
7. The site of production of ADA in the body is:
  - a. Bone marrow
  - b. Lymphocytes
  - c. Blood plasma
  - d. Monocytes
  
8. A protoxin is:
  - a. A primitive toxin
  - b. A denatured toxin
  - c. Toxin produced by protozoa
  - d. Inactive toxin
  
9. Pathophysiology is the:
  - a. Study of physiology of pathogen
  - b. Study of normal physiology of host
  - c. Study of altered physiology of host
  - d. None of the above
  
10. The trigger for activation of toxin of *Bacillus thuringiensis* is:
  - a. Acidic pH of stomach
  - b. High temperature
  - c. Alkaline pH of gut
  - d. Mechanical action in the insect gut

11. Golden rice is:
  - a. A variety of rice grown along the yellow river in China
  - b. Long stored rice having yellow colour tint
  - c. A transgenic rice having gene for  $\beta$ -carotene
  - d. Wild variety of rice with yellow coloured grains
  
12. In RNAi, genes are silenced using:
  - a. ss DNA
  - b. ds DNA
  - c. ds RNA
  - d. ss RNA
  
13. The first clinical gene therapy was done for the treatment of:
  - a. AIDS
  - b. Cancer
  - c. Cystic fibrosis
  - d. SCID (Severe Combined Immuno Deficiency resulting from deficiency of ADA)
  
14. ADA is an enzyme which is deficient in a genetic disorder SCID. What is the full form of ADA?
  - a. Adenosine deoxy aminase
  - b. Adenosine deaminase
  - c. Aspartate deaminase
  - d. Arginine deaminase
  
15. Silencing of a gene could be achieved through the use of:
  - a. short interfering RNA (RNAi)
  - b. antisense RNA
  - c. by both
  - d. none of the above

#### VERY SHORT ANSWER TYPE QUESTIONS

1. In view of the current food crisis, it is said, that we need another green revolution. Highlight the major limitations of the earlier green revolution.
2. Expand GMO. How is it different from a hybrid?
3. Differentiate between diagnostics and therapeutics. Give one example and for each category.

4. Give the full form of ELISA. Which disease can be detected using it? Discuss the principle underlying the test.
5. Can a disease be detected before its symptoms appear? Explain the principle involved.
6. Write a short note on Biopiracy highlighting the exploitation of developing countries by the developed countries.
7. Many proteins are secreted in their inactive form. This is also true of many toxic proteins produced by micro organisms. Explain how the mechanism is useful for the organism producing the toxin?
8. While creating genetically modified organisms, genetic barriers are not respected. How can this be dangerous in the long run?
9. Why has the Indian Parliament cleared the second amendment of the country's patents bill?
10. Give any two reasons why the patent on *Basmati* should not have gone to an American Company.
11. How was Insulin obtained before the advent of rDNA technology? What were the problems encountered?
12. With respect to understanding diseases, discuss the importance of transgenic animal models.
13. Name the first transgenic cow. Which gene was introduced in this cow?
14. PCR is a useful tool for early diagnosis of an infectious disease. Elaborate.
15. What is GEAC and what are its objectives?
16. For which variety of Indian rice, the patent was filed by a USA Company?
17. Discuss the advantages of GMO.

#### SHORT ANSWER TYPE QUESTIONS

1. Gene expression can be controlled with the help of RNA. Explain the method with an example.
2. Ignoring our traditional knowledge can we prove costly in the area of biological patenting. Justify.
3. Highlight any four areas where genetic modification of plants has been useful.

4. What is a recombinant DNA vaccine? Give two examples.
5. Why is it that the line of treatment for a genetic disease is different from infectious diseases?
6. Discuss briefly how a probe is used in molecular diagnostics.
7. Who was the first patient who was given gene therapy? Why was the given treatment recurrent in nature?
8. Taking examples under each category, discuss upstream and downstream processing.
9. Define Antigen and Antibody. Name any two diagnostic kits based upon them.
10. ELISA technique is based on the principles of antigen-antibody interaction. Can this technique be used in the molecular diagnosis of a genetic disorder, such as phenylketonuria?
11. How is a mature, functional insulin hormone different from its prohormone form?
12. Gene therapy is an attempt to correct a genetic defect by providing a normal gene into the individual. By this the normal function can be restored. An alternate method would be to provide the gene product (protein/enzyme) known as enzyme replacement therapy, which would also restore the function. Which in your opinion is a better option? Give reason for your answer.
13. Transgenic animals are the animals in which a foreign gene is expressed. Such animals can be used to study the fundamental biological process, phenomenon as well as for producing products useful for mankind. Give one example for each type.
14. When a foreign DNA is introduced into an organism, how is it maintained in the host and how is it transferred to the progeny of the organism?
15. Bt cotton is resistant to pest, such as lepidopteron, dipterans and coleopterans. Is Bt cotton also resistant to other pests as well?

### LONG ANSWER QUESTIONS

1. A patient is suffering from ADA deficiency. Can he be cured? How?
2. Define transgenic animals. Explain in detail any four areas where they can be utilised.

3. You have identified a useful gene in bacteria. Make a flow chart of the steps that you would follow to transfer this gene to a plant.
4. Highlight five areas where biotechnology has influenced our lives.
5. What are the various advantages of using genetically modified plants to increase the overall yield of the crop?
6. Explain with the help of one example how genetically modified plants can:
  - (a) Reduce usage of chemical pesticides
  - (b) Enhance nutritional value of food crops
7. List the disadvantages of insulin obtained from the pancreas of slaughtered cows and pigs:
8. List the advantages of recombinant insulin.
9. What is meant by the term bio-pesticide? Name and explain the mode of action of a popular bio-pesticide.
10. Name the five key tools for accomplishing the tasks of recombinant DNA technology. Also mention the functions of each tool.