

BIOTECHNOLOGY AND ITS APPLICATIONS

1. Biotechnology mainly deals with
 - (A) biochemistry
 - (B) molecular biology
 - (C) biotechnology
 - (D) microbiology
2. Applications like bioremediation, processed food, therapeutics and diagnostics are related to
 - (A) biochemistry
 - (B) microbiology
 - (C) biotechnology
 - (D) medical science
3. Organic agriculture is a technique of raising crops for
 - (A) increased food production
 - (B) reduction in required labour
 - (C) increasing the use of agrochemicals
 - (D) None of the above
4. Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called
 - (A) genetically modified organisms
 - (B) hybrid organisms
 - (C) pest resistant organisms
 - (D) insect resistant organisms
5. The bacterium, *Bacillus thuringiensis* is widely used in contemporary biology as an alternative of
 - (A) insecticides
 - (B) agent for the production of dairy products
 - (C) source of industrial enzyme
 - (D) indicator of water pollution
6. Which bacterium was the first to be used as biopesticide on the commercial scale in the world?
 - (A) *Bacillus thuringiensis*

- (B) *Escherichia coli*
 - (C) *Pseudomonas aeruginosa*
 - (D) *Agrobacterium tumefaciens*
7. GM crops are designed to develop natural resistance from insects and pests. Which of the following crops are modified using *Bacillus thuringiensis*?
- (A) Corn and cotton
 - (B) Tomato and rice
 - (C) Potato and soybean
 - (D) All of the above
8. Bt toxin is
- (A) intracellular crystalline protein
 - (B) extracellular crystalline protein
 - (C) intracellular monosaccharide
 - (D) extracellular polysaccharide
9. Bt toxin protein crystals present in bacterium *Bacillus thuringiensis*, do not kill the bacteria because
- (A) bacteria are resistant to the toxin
 - (B) bacteria enclose toxins in a special sac
 - (C) toxins occur as inactive protoxins in bacteria
 - (D) None of the above
10. Which of the following nematodes infects the root of the tobacco plants which reduces the production of tobacco?
- (A) *Wuchereria*
 - (B) *Ascaris*
 - (C) *Meloidogyne incognita*
 - (D) *Enterobius*
11. RNAi stands for
- (A) RNA interference
 - (B) RNA interferon
 - (C) RNA inactivation
 - (D) RNA initiation
12. What is the demerit of using bovine insulin(from cow) and porcine insulin(from pig) in diabetic patients?
- (A) It leads to hypercalcemia

- (B) It is expensive
 - (C) It may cause allergic reactions
 - (D) It may lead to mutations in human genome
13. Which polypeptide chain is removed during the maturation of proinsulin into insulin?
- (A) A-chain(21 amino acids)
 - (B) B-chain(30 amino acids)
 - (C) C-chain(33 amino acids)
 - (D) A and B-chains
14. Which step was proved to be the main challenge in the production of human insulin by recombinant DNA technology?
- (A) Splitting A and B-peptide chain
 - (B) Addition of C-peptide to proinsulin
 - (C) Getting insulin assembled into mature form
 - (D) Removal of C-peptide from active insulin
15. Second generation vaccines are prepared by recombinant DNA technology. Which of the following is/are examples of such vaccines?
- (A) Herpes virus vaccine
 - (B) Hepatitis-B virus vaccine
 - (C) Solk's polio vaccine
 - (D) Both(A) and (B)
16. For the first time, gene therapy was tried on a 4 year old girl in 1990 to treat which of the following enzyme deficiency?
- (A) Cytosine Deaminase(CDA)
 - (B) Adenosine Deaminase(ADA)
 - (C) Tyrosine oxidase
 - (D) Glutamate trihydrogenase
17. A patient has a defective gene for the enzyme Adenosine Deaminase(ADA). He/She lacks functional cells and therefore, fails to fight the infecting pathogens. The cells are
- (A) B-lymphocytes
 - (B) Phagocytes
 - (C) T-lymphocytes
 - (D) Both(A) and (C)

18. Adenosine Deaminase(ADA) deficiency can be cured by ...A... and ...B... but it is not fully curative. Here, A and B can be
- (A) A–gene therapy, B–radiation therapy
 - (B) A–bone marrow transplantation, B–enzyme replacement therapy
 - (C) A–organ transplantation, B–hormone replacement therapy
 - (D) A–radiation therapy, B–enzyme replacement therapy
19. Which one of the following molecular diagnostic techniques is used to detect the presence of a pathogen in its early stage of infection?
- (A) Angiography
 - (B) Radiography
 - (C) Enzyme replacement technique
 - (D) Polymerase Chain Reaction(PCR)
20. In which of the following methods, a probe is allowed to hybridise to its complementary DNA in the clone of cells?
- (A) Gene therapy
 - (B) Autoradiography
 - (C) Polymerase chain reaction
 - (D) Enzyme-Linked Immuno Sorbent Assay(ELISA)
21. Technique used to detect mutated genes is called
- (A) gel electrophoresis
 - (B) polymerase chain reaction
 - (C) gene therapy
 - (D) autoradiography
22. Animals whose DNA is manipulated to possess and express an extra(foreign) gene are known as
- (A) transgenic animals
 - (B) hybrid animals
 - (C) transversion animals
 - (D) All of the above
23. Transgenic animals are those which have foreign
- (A) DNA in all of their cells
 - (B) Proteins in all of their cells
 - (C) RNA in all of their cells
 - (D) RNA in some of their cells

24. Transgenic animals that serve as model to study many human diseases such as
- (A) Alzheimer's disease
 - (B) cancer
 - (C) night blindness
 - (D) Both(A) and (B)
25. Which of the following transgenic animals are used in testing safety of polio vaccine before they are used on human?
- (A) Transgenic cow
 - (B) Transgenic monkey
 - (C) Transgenic mice
 - (D) Transgenic sheep
26. What is the term used for animals that made to carry genes, which make them more sensitive to the toxic substances than other normal animals?
- (A) Transgenic
 - (B) Transversion
 - (C) Transition
 - (D) Transformant
27. A monopoly granted to a person who has either invented a new and useful article, made improvement in an existing article or invented a new process of making an article is called
- (A) bioethics
 - (B) patent
 - (C) biopiracy
 - (D) genetic recombination
28. Biopatent means
- (A) right to use an invention
 - (B) right to use biological resources
 - (C) right to use applications are processes
 - (D) All of the above
29. Basmati is unique for its aroma and flavour, whose A... documented varieties are cultivated in B... . Here, A and B refer to
- (A) A-27, B-America
 - (B) A-30, B-America
 - (C) A-27, B-India
 - (D) A-30, B-India

30. Which of the following option is related to bioethics?
- (A) Process of discovery and commercialisation of new products
 - (B) Use of bioresources without proper authorization
 - (C) Both(A) and (B)
 - (D) Standards used to regulate human activities in relation to the biological world
31. Biopiracy is related to which of the following?
- (A) Traditional knowledge exploitation
 - (B) Biomolecules and regarding bioresources exploitation
 - (C) Stealing of bioresources
 - (D) All of the above
32. Which step has been taken by Indian Parliament to meet and fulfil the requirements of patent terms and other emergency provisions in this regard?
- (A) Biopiracy act
 - (B) Indian Patents Bill
 - (C) Biowar act
 - (D) Bioethics act

Answer Key

1	(C)	2	(C)	3	(D)	4	(A)	5	(A)
6	(A)	7	(D)	8	(A)	9	(C)	10	(C)
11	(A)	12	(C)	13	(C)	14	(C)	15	(D)
16	(B)	17	(D)	18	(B)	19	(D)	20	(B)
21	(D)	22	(A)	23	(A)	24	(D)	25	(C)
26	(A)	27	(B)	28	(D)	29	(C)	30	(D)
31	(D)	32	(B)						

HINTS & EXPLANATIONS

- 4(A) Genes of plants, bacteria, fungi and animals have been altered by genetic manipulations. Therefore, these organisms are called Genetically Modified Organisms(GMOs). These are used in research, medicine, food production, etc.
- 5(A) *Bacillus thuringiensis* forms protein crystals during a particular phase of their growth. These crystals contain a toxic insecticidal protein called Bt toxin. Due to this, it is widely used as an alternative of insecticides.
- 6(A) *Bacillus thuringiensis*, spores were first used as biopesticides on a commercial scale in the world. Bt toxin gene has been cloned from the bacteria and has been expressed in plants to provide resistance to insects without the need of insecticides.
- 9(C) Bt toxin protein crystals present in bacterium, *Bacillus thuringiensis*, do not kill the bacterium itself. This is because the toxin occurs as inactive protoxin in bacterium.
- 13(C) Insulin contains two short polypeptide chains, chain-A and chain-B, linked by disulphide bridges. In mammals, insulin is synthesised as prohormone(that needs to be processed to become mature and functional hormone). It contains an extra stretch called C-peptide. This C-peptide is absent in mature insulin and as such is removed during the maturation of proinsulin into insulin.
- 14(C) The main challenge for the production of insulin using rDNA technique was getting insulin assembled into a mature form, which does not contain any extra stretch called C-peptide.
- 15(D) The second generation vaccines are produced with the help of genetic engineering techniques. Two examples of such vaccines are hepatitis-B vaccine and herpes virus vaccine. These are more uniform in quality and produce less side effects as compared to first generation vaccines produced by conventional methods.
- 16(B) For the first time in 1990, M Blease and WF Andresco of National Institute of Health, attempted gene therapy on a 4 year old girl with Adenosine Deaminase(ADA) deficiency. ADA deficiency is caused due to the deletion of gene for adenosine deaminase.
- 17(D) The patient has a defective gene for the enzyme Adenosine Deaminase(ADA). This enzyme is involved in maturation of B and T-lymphocytes and is crucial for the functioning of immune system due to this, he/she lacks functional lymphocytes and therefore, fails to fight the infecting pathogens.

- 19(D) PCR helps in early detection of pathogens by amplification of their nucleic acids. Thus, very low concentration of bacteria or virus can be detected by this technique.
- 24(D) Transgenic animals are specially made to serve as models for human diseases, so that investigation of new treatment for diseases can be conducted. Currently transgenic models exist for many human diseases such as Alzheimer's, cancer, cystic fibrosis, rheumatoid, arthritis.
- 27(B) A monopoly granted to a person who has either invented a new and useful article, made improvement in an existing article or invented a new process of making an article is called patent.
- 28(D) Abiopatent is a government protection granted for biological entities and their products. It gives protection to inventions, processes or products obtained along with the right to the inventor to make and sell or use the product or processes for limited period of time. Thus, it is the right to use an invention, biological resources, applications and processes of the product.