

## MCQs

1. Polyhydroxy butyrate is called:  
 (A) Antithrombin III  (B) Nutra sweet  (C) Luciferine  (D) Biodegradable plastic
2. Antibodies made by soybean are used to cure:  
 (A) Tumor cells  (B) Mumps  (C) Cystic fibrosis  (D) Genital herpes
3. An enzyme - galactosidase that can be used to treat a human lysosome storage, is harvested from:  
 (A) Soybeans  (B) Corn plants  (C) Tobacco plants  (D) Sugarcane
4. Antithrombin III is a biotechnological product produced by:  
 (A) Goat  (B) Sheep  (C) Mice  (D) Cow
5. The use of transgenic farm animals to produce pharmaceutical is termed as:  
 (A) Gene therapy  (B) Genetic drift  (C) Gene farming  (D) Gene pharming
6. Urine is preferable vehicle for a biotechnology product than:  
 (A) Tissue fluid  (B) Plasma  (C) Blood  (D) Milk
7. Cystic fibrosis patients lack a gene that codes for transmembrane carriers of:  
 (A) Chloride ions  (B) Sulphate ions  (C) Carbonate ions  (D) Bromide ions
8. Persons with Huntington's disease have a unique site where a restriction enzyme cuts:  
 (A) Proteins  (B) Lipids  (C) DNA  (D) RNA
9. Patients of cystic fibrosis often die due to numerous infections of the:  
 (A) Digestive tract  (B) Excretory tract  (C) Respiratory tract  (D) Reproductive tract
10. The cells which cling to an egg after ovulation are called:  
 (A) Cumulus  (B) Ovary cells  (C) Heap  (D) Plethora
11. Adult transgenic tobacco plants glow when sprayed with the substrate:  
 (A) Luciferon  (B) Luciferol  (C) Luciferin  (D) Luciferase
12. Arabidopsis is:  
 (A) Heat resistant  (B) Water absorbent  (C) Totipotent  (D) Salt tolerant
13. The enzyme luciferase is produced in an insect called:  
 (A) Firefly  (B) Housefly  (C) Butterfly  (D) Tsetsefly
14. Which enzyme acts as molecular scissors?  
 (A) Restriction endonuclease  (B) RNA polymerase  
 (C) DNA polymerase  (D) DNA gyrase
15. The organisms used as biofilters are:  
 (A) Transgenic bacteria  (B) Transgenic animal

- (C) Transgenic plant (D) Transgenic virus
16. An antibody made by soybeans can be used for treatment of:  
(A) AIDS (B) **Genital herpes**  
(C) Hepatitis (D) Herpes simplex
17. DNA Polymerase Enzyme was isolated from:  
(A) Viruses (B) Protozoa (C) Fungi (D) **Bacteria**
18. Which of these would you expect to be a biotechnology product?  
(A) DNA probe (B) **Vaccine** (C) Protein (D) Steroid
19. A team of Japanese scientists attempted to introduce the C4 Cycle into the:  
(A) Wheat (B) Cotton (C) Corn (D) **Rice**
20. An antibody made by soybean can be used as treatment for:  
(A) Malaria (B) **Herpes simplex** (C) AIDS (D) Gonorrhoea
21. Transgenic bacteria are produced in large vats called:  
(A) Transducer (B) Biomultiplier (C) **Bioreactor** (D) Culture media
22. The phenomena in which transfer of genetic material from one cell to another and can alter the genetic makeup of the recipient cell is:  
(A) Translocation (B) Translation (C) Transduction (D) **Transformation**
23. Which of these is a benefit to having insulin produced by biotechnology?  
(A) It is just as effective (B) **It is non-allergenic**  
(C) It can be mass produced (D) It is less expensive
24. Which of these would you not expect to be a biotechnology product:  
(A) Vaccine (B) Modified enzyme (C) Protein hormones (D) **DNA probes**
25. Taq polymerase is an enzyme present in:  
(A) Fungi (B) Algae (C) **Bacteria** (D) Virus
26. *Thermusaquaticus* is a/an:  
(A) **Bacterium** (B) Fungus (C) Alga (D) Protozoan
27. Kary B. Mullis developed the polymerase chain reaction in:  
(A) 1963 (B) 1973 (C) 1993 (D) **1983**
28. The Polymerase Chain Reaction (PCR) was developed in 1983 by:  
(A) Theodore M. Klein (B) **Kary B. Mullis**  
(C) Gottlieb Haberlandt (D) Craig Venter
29. A full set of genes of an individual is called:  
(A) Dominance (B) Genotype (C) Karyotype (D) **Genome**
30. A probe is a single stranded nucleotide sequence that will hybridize in to certain piece of  
(A) RNA (B) **DNA** (C) Carbohydrate (D) Amino Acids
31. PCR takes its name from ..... the enzyme that carries out DNA replication in a cell:

- A** DNA Polymerase  
 **C** DNA Ligase
- B** DNA Polymerase I  
 **D** Restriction enzyme
32. Primer for PCR contains about:  
 **A** 10-20 bases       **B** 5 bases       **C** 30 bases       **D** 40 bases
33. Recombinant DNA is introduced into the host cell by means of:  
 **A** Fungus       **B** Bacterium       **C** Phage       **D** Vector
34. In which year Hamilton O. Smith, at John Hopkins University, isolated the first restriction Enzymes?  
 **A** 1965       **B** 1970       **C** 1975       **D** 1985
35. Gene of interest is joined to the open ends of plasmid by:  
 **A** Helicase       **B** DNA polymerase       **C** RNA polymerase       **D** DNA ligase
36. Commonly used restriction enzyme is:  
 **A** Plasmid       **B** Eco R1       **C** PBR 322       **D** PSC 101
37. Aspartame is a:  
 **A** Monopeptide       **B** Polypeptide       **C** Tripeptide       **D** Dipeptide
38. P<sup>sc</sup><sub>101</sub> has antibiotic resistance gene for:  
 **A** Ampicillin       **B** Tetracycline       **C** Neomycin       **D** Ergotine
39. It makes the bacterial cell more permeable to take up recombinant plasmids:  
 **A** Calcium chloride       **B** Potassium chloride  
 **C** Sodium chloride       **D** Cesium chloride
40. The two different pieces of DNA joined together is called as:  
 **A** Chimeric DNA       **B** Trimeric DNA  
 **C** Dimeric DNA       **D** Tetrameric DNA
41. Plasmid PBR<sub>322</sub> has antibiotic resistance gene for:  
 **A** Tetracycline       **B** Tetracycline and ampicillin  
 **C** Ampicillin       **D** Penicillin
42. Eco R1, is a commonly used:  
 **A** Gene       **B** Restriction enzyme  
 **C** Bacteriophage       **D** Bacteria
43. The enzymes which are used to cut the gene of interest are known as:  
 **A** DNA polymerase       **B** Restriction endonucleases  
 **C** DNA ligase       **D** RNA polymerase
44. First restriction enzyme was isolated by:  
 **A** Kary Mullis       **B** Mendel       **C** Sanger       **D** Hamilton
45. DNA polymerase enzyme was isolated from:  
 **A** Protozoa       **B** Fungi       **C** Viruses       **D** Bacteria
46. Taq polymerase is obtained from:

(A) Fungus

**(B) Bacterium**

(C) Algae

(D) Virus

**Fill in the blanks.**

- The use of polymerase chain reaction (PCR) creates a ..... of copies in a laboratory test tube.
- ..... free living organisms in the environment that have had a foreign gene inserted into them.
- ..... known sequences of DNA that are used to find complementary DNA strands; can be used diagnostically to determine the presence of particular gene.
- ..... production of many identical copies of a gene.
- ..... self duplicating ring of accessory DNA in the cytoplasm of bacteria

**Answers**

|    |            |    |                      |    |                  |
|----|------------|----|----------------------|----|------------------|
| 1. | Millions   | 2. | Transgenic organisms | 3. | Particular probe |
| 4. | Cloning is | 5. | Plasmids             |    |                  |

Chapter : 23

**Biotechnology**

pakcity.org

**Short Questions Answers**

1. **What is the use of genetically engineered bacteria?**

Ans: Genetically engineered bacteria have been used to clean up environmental pollutants, increase the fertility of soil and kill insect pests.

2. **What are the restriction enzymes?**

Ans: There are natural enzymes of bacteria, which they use for their own protection against viruses. They are **called** restriction enzymes because they restrict the growth of enzyme.

3. **Why transgenic animals are cloned?**

Ans: Transgenic animals are cloned in order to obtain the product in large quantity.

4. **Which enzyme is Taq polymerase?**

Ans: **DNA** polymerase used is temperature - insensitive (thermostable) extracted from the bacterium *Thermus aquaticus*, which lives in hot springs. Commonly, this enzyme is **known** as Taq polymerase.

5. **How transgenic animals are developed?**

Ans: Techniques have been developed to insert genes into the eggs of animals. It is possible to micro inject foreign genes into eggs by hand, but another method uses vortex mixing. The eggs are placed in an agitator with **DNA** and silicon - carbide needles, and the needles make tiny holes through which the **DNA** can enter. When these eggs are fertilized, the resulting offsprings are transgenic animals.

6. **From which animal, antithrombin III is produced?**

Ans: Antithrombin III, for preventing blood clot during surgery, is currently being produced by a herd of goats, and clinical trials have begun.

7. **How many methods are used for gene therapy? Name Them?**

Ans: There are two main methods used for gene therapy:

- ❖ Ex-vivo.
- ❖ In-vivo.

8. **How transgenic animals that secrete a product are often cloned?**

Ans: After enucleated eggs have been injected with 2n nuclei of adult cells, they can be coaxed (persuaded or induced gradually) to begin development. The offspring have the genotype and phenotype of the adult that donated the nuclei; therefore, the adult has been cloned.

9. **What is Dolly?**

Ans: In 1997, scientists at the Roslin Institute in Scotland produced a cloned sheep **called** Dolly.

10. **When recombinant DNA technology is used and when PCR?**

Ans: Recombinant DNA technology is used when a very large quantity of a gene is required. The polymerase chain reaction (PCR) is used to create a lesser number of copies within a laboratory test tube.

11. **How genes can be isolated from chromosomes?**

Ans: Genes can be isolated from the chromosomes by cutting the chromosomes on the flanking sites of the gene using special enzymes **known** as restriction endonucleases.

12. **What is complementary DNA?**

Ans: The gene of choice can also be synthesized in the laboratory from messenger RNA, using reverse transcriptase. This DNA molecule is **called** complementary DNA (cDNA).

13. **What are Palindromic sequences?**

Ans: Bacteria produces a variety of such restriction enzymes, which cut the DNA at very specific sites characterized by specific sequence of four to six nucleotides arranged symmetrically in the reverse order. such sequences are **known** as palindromic sequences.

14. **What are Sticky ends?**

Ans: The single stranded but complementary ends of the two DNA molecules are **called** "**sticky ends**" because they can bind by complementary base pairing.

15. **What is vector?**

Ans: A vector is the means by which recombinant DNA is introduced into a host cell. One common type of vector is a plasmid.

16. **What are plasmids?**

Ans: Plasmids are natural extra chromosomal circular DNA molecules which carry genes for antibiotic resistance and fertility etc. One of the plasmids discovered earlier **PSC** 101 has antibiotic resistance gene for tetracycline, whereas **PSR** 322 has antibiotic resistance genes for tetracycline as well as ampicillin.

17. **What is the use of DNA ligase?**

Ans: The gene of interest (insulin) is the joined with the sticky ends produced after cutting the plasmid with the help of another special enzyme **known** as DNA ligase. This enzymes seals the foreign piece of DNA into the vector.

18. **What is recombinant DNA or chimaeric DNA?**

Ans: When the two different pieces of DNA have been jointed together, it is **known** as

recombinant DNA or chimaeric DNA.

19. **What is clone?**

**Ans:** A clone can be a large number of molecules (i.e. cloned genes) or cell (i.e. cloned bacteria) or organisms that are identical to an original specimen.

20. **What is a genome and genomic library?**

**Ans:** A genome is a full set of genes of an individual. A genomic library is a collection of bacterial or bacteriophage clones, each clone containing a particular segment of DNA from the source cell.

21. **What is probe?**

**Ans:** A probe is a single stranded nucleotide sequence that will hybridize (pair) into a certain piece of DNA.

22. **What is the polymerase chain reaction or PCR?**

**Ans:** The **PCR** is used to create millions of copies of a single gene or any specific piece of DNA quickly in a test tube. Kary B. Mullis developed the polymerase chain reaction (PCR) in **1983**.

23. **Where from PCR took its name? Why is called chain reaction?**

**Ans:** **PCR** takes its name from DNA polymerase, the enzyme that carries out **DNA** replication in a cell. It is considered a chain reaction because **DNA** polymerase will carry out replication over and over again, until there are millions of copies of the desired **DNA**.

24. **What is DNA Finger printing?**

**Ans:** **DNA** Finger printing is a method of identification that compares fragments of deoxyribonucleic acid (DNA).

25. **What is gel-electrophoresis?**

**Ans:** It is the process by which the fragments of DNA can be separated according to their lengths, and the result is a number of bands that are so close together that they appear as a smear.

However, the use of probes for genetic markers produces a distinctive pattern that can be recorded on x-ray film.

26. **What is gene sequencing?**

**Ans:** In DNA or gene sequencing, scientists create many copies of a single-stranded DNA fragment that will be used to synthesize a new DNA strand. Then these will be used to determine sequence of nucleotides.

27. **What are various methods of gene or DNA sequencing?**

**Ans:** ❖ Sanger's method.  
❖ Maxam-Gilbert method.

 pakcity.org

28. **What is Sanger's method?**

**Ans:** In this method dideoxy ribonucleoside triphosphates are used to terminate DNA synthesis at different sites.

29. **What is Maxam-Gilbert method?**

**Ans:** In this method DNA threads are chemically cut into pieces of different sizes.

30. **What is the use of dideoxy method?**

Ans: In order to separate DNA pieces of different sizes on gel, dideoxy method is used.

31. **Name different organisms and organelles whose genomes have been sequenced?**

Ans: It includes plant chloroplasts and animal mitochondria, large numbers of bacteria, many of the yeasts, a nematode worm, Drosophila, the model plant Arabidopsis, the mouse and human.

32. **What is the purpose of primary goal of Human Genome Project?**

Ans: The Human Genome Project is massive effort to map the human chromosomes. The genes along the length of each type of chromosome are sequenced and then base pairs are found.

33. **What are biotechnology?**

Ans: The products produced by genetically engineered organisms are **called** biotechnology products. Today bacteria, plants and animals are genetically engineered to produce biotechnology products.

34. **What are transgenic organisms?**

Ans: Organisms that have had a foreign gene inserted into them are **called** transgenic organisms.

35. **What are bioreactors?**

Ans: Bioreactors are large vats in which bacteria reproduce when recombinant DNA technology is used to produce them.

36. **Name some biotechnology product produced by bacteria?**

Ans: Biotechnology products produced by bacteria, such as insulin, human growth hormone, produced by bacteria, such as insulin, human growth hormone, tissue plasminogen activator, haemophilia factor **VIII**, and hepatitis are now in the market.

37. **What are Biofilters?**

Ans: The transgenic organisms used to prevent airborne chemical pollutants from being released into the air are said to be biofilters.  
For **example** use of such bacteria in industry.

38. **What are protoplasts?**

Ans: The plant cells that have had the cell wall removed are **called** protoplasts.

39. **Give two advantages of transgenic plants?**

Ans: **Advantages :**

- ❖ Resistant to pests and herbicides.
- ❖ Improvement of dietary contents.



40. **Give two advantages of transgenic plants?**

Ans: **Advantages :**

- ❖ Bovine growth hormone.
- ❖ Producing larger animals.

41. **Define gene therapy?**

Ans: Gene therapy is the insertion of genetic material into human cells for the treatment of a disorder.

42. **What is Ex-vivo gene therapy?**

Ans: In **ex-vivo** gene therapy, normal gene is given to certain cells of the patient, outside the body of the patient and then these cells are returned to the patient.

43. **What is the method of ex-vivo gene therapy?**

Ans: Bone marrow stem cells are removed from the blood and infected with retrovirus (RNA virus) that carries a normal gene for the enzyme then the cells are returned to the patient.

44. **What is in-vivo gene therapy?**

Ans: In in-vivo gene therapy, patients are directly given normal genes in one way or the other.

45. **What is familial hypercholesterolemia?**

Ans: It is a condition that develops when liver cells lack a receptor for removing cholesterol from the blood. The high levels of blood cholesterol make the patient subject to fatal heart attack at a young age.

46. **What is Cystic fibrosis?**

Ans: Cystic fibrosis patients lack a gene that codes for trans-membrane carrier of the chloride ion. Patients often die due to numerous infections of the respiratory tract.

47. **How gene therapy has been used for the treatment of cancer?**

Ans: In clinical trials researchers have given genes to cancer patient that either make healthy cells more tolerant of chemotherapy or make tumours more vulnerable to it. Once the bone marrow stem cells were protected it was possible to increase the level of chemotherapy to kill the cancer cells.

48. **How gene therapy has been used for the treatment of coronary artery angioplasty?**

Ans: The balloon catheter is coated with a plasmid that contains a gene for vascular endothelial growth factor. The expression of the gene. Which promotes the proliferation of blood vessels to bypass the obstructed area, has been observed in at least one patient.

49. **What is tissue culture?**

Ans: Tissue culture is the growth of a tissue in an artificial liquid culture medium.

50. **Plant cells are said to be totipotent. What do you mean by this?**

Ans: Plant cells are totipotent which means that each cell has the full genetic potential of the organism and therefore a single cell could become a complete plant.

51. **What is Micro-propagation?**

Ans: Tissue culture techniques have by now led to micro-propagation, a commercial method of producing thousands, even millions of identical seedlings in limited amount of space.

52. **What is Meristem culture?**

Ans: It is used to accomplish micro-propagation. If the correct proportions of auxins and cytokinin are added to a liquid medium, many new shoots will develop from a single shoot tip. when these are removed more shoots form which are genetically identical.

53. **What are clonal plants?**

Ans: The shoots which develop by meristem culture are genetically identical the adult plants that develop from them are **called** clonal plants because all have the same traits.



54. **What are somaclonal variations?**

Ans: Plants generated from the somatic embryos vary somewhat because of mutations that arise during the production process. These variations are **called** somaclonal variations.

55. **What is Anther culture technique?**

Ans: In this technique mature anthers are cultured in a medium containing vitamins and growth regulators.

56. **What is cell suspension culture technique?**

Ans: In this technique, first of all rapidly growing cultures are cut into small pieces and shaken in a liquid nutrient medium so that single cells or small clumps of cells break off and form a suspension. These cells will produce the same chemicals as the entire plant.

57. **Define hybridization. What was its use?**

Ans: Hybridization is the crossing of different varieties of plants or even species. It was used to produce plants or even species. It was used to produce plants with desirable traits.

Hybridization, followed by vegetative propagation of the mature plants, generated a large number of identical plants with these traits.

58. **What is luciferase and luciferin?**

Ans: The luciferase is firefly enzyme whose gene was inserted into tobacco protoplast and the adult plants glowed when sprayed with the substrate luciferin.

59. **What is Agrobacterium?**

Ans: Foreign DNA is inserted into the plasmid of the bacterium, Agrobacterium; which normally infects the plant cells.

60. **What is particle gun?**

Ans: In **1987**, John C Sanford and Theodore M. Klein developed a method of introducing DNA into a plant tissue - culture callus. They constructed a device, called the particle gun that bombards a callus with DNA - coated microscopic metal particles. Then genetically altered somatic embryos develop into genetically adult plants.

