Solution

BIOTECHNOLOGY AND ITS APPLICATIONS WS 1

Class 12 - Biology

1. **(b)** DNA amplification
Explanation: DNA amplification

2. **(b)** Escherichia coli and Agrobacterium tumefaciens
Explanation: Escherichia coli and Agrobacterium tumefaciens

3. **(c)** Vector
Explanation: Vector

4. **(a)** Alkaline solution
Explanation: Deoxyribose nucleic acid is denatured to produce single stranded by using an alkaline solution. DNA is acidic in nature, in alkaline solution the hydrogen bonds between the nitrogenous bases are broken to separate two strands.

5. **(c)** Complementary sequence of DNA
Explanation: A probe is a complementary sequence of DNA having radioactive particles. It is used in ELISA and other biotechnological investigations.

6. **(a)** Azotobacter
Explanation: Azotobacter

7. **(d)** Inactive toxin
Explanation: Protoxins are inactive toxins which later get activated in certain conditions.

8. **(d)** Carrying an endotoxin gene from Bacillus thuringiensis.
Explanation: Carrying an endotoxin gene from Bacillus thuringiensis.

9. **(a)** Transposons
Explanation: Mobile genetic elements that replicate an RNA intermediate are called transposons. It is a small piece of DNA that inserts itself into another place in the genome.

10. **(d)** Periodic infusion of genetically engineered lymphocytes having functional ADA cDNA.
Explanation: Severe combined immunodeficiency (SCID) caused by adenosine deaminase deficiency (ADA) is the first genetic disorder to be treated with gene therapy. T-cell directed gene transfer was useful in the treatment of ADA-SCID, whereas the retroviral-mediated gene transfer to haematopoietic stem cells was insufficient for achievement of clinical benefits.

11. **(b)** Either RNA or DNA
Explanation: A single-stranded DNA or RNA, tagged with a radioactive molecule, known as a probe, is allowed to hybridize to its complementary DNA in a clone of cells followed by detection using autoradiography.

12. **(a)** Western blot and ELISA
Explanation: Western blot and ELISA

13. **(d)** Western blotting
Explanation: Western blotting

14. **(c)** Emphysema
Explanation: Transgenic organisms produce useful biological products. Augmentation therapy is the use of alpha-1 antitrypsin

protein (AAT) from the blood plasma of healthy human donors to augment (increase) the alpha-1 levels circulating in the blood and lungs of Alphas diagnosed with emphysema.
Human protein $\alpha - 1$-antitrypsin is used to treat emphysema is also obtained from transgenic animal.

15.

(d) Plasmids
Explanation: Plasmids are used in genetic engineering to reproduce recombinant genetic material. When a plasmid is inserted into a bacterium, the bacterium is encouraged to multiply, creating more copies of the recombinant DNA.

16.

(c) Study of viral disease.
Explanation: Transgenic animals are developed to study normal physiology and development, vaccine testing, chemical safety testing, obtaining biological product, etc. These animals are not used to study viral disease.

17.

(c) Proteases
Explanation: Proteases

18.

(b) Transposes
Explanation: Transposable elements are discrete DNA segments that can move between nonhomologous positions within a genome and have been found in virtually all organisms examined. The recombination pathway by which such elements move is called transposition. Most elements encode a transposase, that is, the recombinase that executes the DNA breakage and joining reactions that underlie transposition, as well as special recombination sequences at the ends of the transposon arranged as inverted terminal repeats that include transposase binding sites; elements lacking a transposase can often be mobilized by the transposase from another cognate element. The insertion of a transposable element into a new insertion site alters the host DNA at that point and often results in a mutation through gene disruption.

19.

(d) The order of discovery from source.
Explanation: The order of discovery from source.

20.

(c) Polymerase chain reaction
Explanation: Polymerase chain reaction

21.

(b) PCR and RAPD
Explanation: PCR and RAPD

22.

(b) Microinjection
Explanation: Gene transfer in biotechnology can be done by a number of methods. Microinjection is the use of a glass micropipette to inject a liquid substance at a microscopic or borderline macroscopic level. The target is often a living cell but may also include intercellular space.
Microinjection is one of the best methods to transfer the desired gene into a suitable host.

23.

(d) Study of altered physiology of host
Explanation: Pathophysiology – a convergence of pathology with physiology – is the study of the disordered physiological processes that cause, result from, or are otherwise associated with a disease or injury.

24.

(c) Ashbya gossypii
Explanation: Ashbya gossypii

25.

(c) Insects
Explanation: Insects

26.

(b) Corn borer
Explanation: Corn borer

27.

(c) Bacillus thuringiensis toxin
Explanation: Bacillus thuringiensis toxin

28. **(a)** Two polypeptides of 21 and 30 amino acids.
Explanation: Two polypeptides of 21 and 30 amino acids.

29.

(c) Howard Florey
Explanation: Howard Florey

30.

(d) ds RNA
Explanation: RNAi involves the silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA (silencing).

31.

(b) Agrobacterium tumifaciens - tumour
Explanation: Agrobacterium tumifaciens - tumour

32. **(a)** Karry Mullis
Explanation: Karry Mullis

33. **(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.

34.

(d) Yeast
Explanation: A plasmid containing a portion of hepatitis B virus gene coding for HBsAg is cloned into yeast, and the vaccine for hepatitis B is produced from cultures of this recombinant yeast strain. RECOMBIVAX HB is indicated for immunization against infection caused by all known subtypes of hepatitis B virus (HBV).

35.

(d) Alkaline pH of gut
Explanation: The Bt toxin protein exists as inactive protoxins but once an insect ingests the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilizes the crystals.

36.

(b) Streptomyces griseus
Explanation: Streptomyces griseus

37.

(c) Pbr322
Explanation: Plasmid is extra nuclear genetic materials present in bacterial humulin is produced by using plasmid Pbr322. It is an E.coli plasmid vector containing the origin of replication.

38. **(a)** Toxin released by Bacillus thuringiensis
Explanation: Toxin released by Bacillus thuringiensis

39.

(c) ADA deficiency
Explanation: A four-year-old girl became the first gene therapy patient on September 14, 1990, at the NIH Clinical Center. She has adenosine deaminase (ADA) deficiency, a genetic disease that leaves her defenseless against infections. White blood cells were taken from her, and the normal genes for making adenosine deaminase were inserted into them.
The corrected cells were reinjected into her. Dr. W. French Anderson helped develop this landmark clinical trial when he worked at the National Heart, Lung, and Blood Institute.

40.

(c) Sources of mixed proteins extracted from pure or mixed culture of organisms or cells.

Explanation: Sources of mixed proteins extracted from pure or mixed culture of organisms or cells.

41.

(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.

42.

(d) Lymphocytes

Explanation: Lymphocytes are the main site of the production of ADA.

43.

(d) Genetically modified organism

Explanation: GMO is an abbreviation for the genetically modified organism, an organism whose genetic material has been modified, especially by genetic engineering.

44.

(c) PCR

Explanation: PCR

45.

(c) DNA fingerprinting

Explanation: DNA fingerprinting

46. **(a)** Removed during maturation of pro-insulin to insulin.

Explanation: In mammals, including humans, insulin is synthesized as a pro-hormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the C peptide. This C peptide is not present in the mature insulin and is removed during maturation into insulin.

47. **(a)** Autoradiography

Explanation: Radioactive probes are single stranded DNA or RNA having radioactive components. This probe can be detected in the individual by using autoradiography technique.

48.

(d) Resistant to all pesticides

Explanation: Bt cotton plant is a genetically modified crop as it is incorporated with Bt toxin genes which makes it pest resistant.

49.

(c) Bio-insecticidal plants

Explanation: Bio-insecticidal plants

50.

(d) Hirudin

Explanation: Hirudin

51.

(c) Bacillus thuringiensis

Explanation: Bacillus thuringiensis

52.

(d) Protease

Explanation: Protease

53. **(a)** All of these

Explanation: All of these

54.

(c) By removal of C-peptide

Explanation: In the insulin synthesis pathway, the first preproinsulin is translocated into the endoplasmic reticulum of beta cells of the pancreas with an A-chain, a C-peptide, a B-chain, and a signal sequence.

The signal sequence is cleaved from the N-terminus of the peptide by a signal peptidase, leaving proinsulin. After proinsulin is packaged into vesicles in the Golgi apparatus (beta-granules), the C-peptide is removed, leaving the A-chain B-chain, bound together by disulfide bonds, that constitute the insulin molecule.

55.

(b) Protein
Explanation: The milk produced by transgenic cow contain a protein called alpha lactaalbumin. The milk containing this protein is more suitable for babies as compare to normal cow's milk.

56.

(b) World War II
Explanation: World War II

57.

(b) Insulin
Explanation: Insulin

58.

(d) Synthetic antigen
Explanation: Synthetic antigen

59.

(d) toxin is inactive
Explanation: In bacteria, the toxin is present in an inactive form, called prototoxin, which gets converted into active form when it enters the body of an insect.

60. **(a)** directly proportional to the antigen.
Explanation: The rate of fluorescence in a titer plate in ELISA is directly proportional to antigens present in the sample. This indicates presence of pathogen in the sample also.

61.

(c) Embryonic stem cells
Explanation: Embryonic stem cells

62.

(c) Invertase
Explanation: Invertase

63.

(c) SCID (Severe Combined Immuno Deficiency resulting from deficiency of ADA)
Explanation: The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase (ADA) deficiency.

64.

(b) DNA fingerprinting
Explanation: DNA fingerprinting

65.

(d) Antigen and Antibody interaction
Explanation: ELISA technique is based on Antigen and Antibody interaction

66.

(b) Zymase
Explanation: Zymase

67.

(c) Leech
Explanation: Leech

68.

(d) Vaccine
Explanation: Transgenic mice are developed for use in testing the safety of vaccine before use on human beings. Polio vaccine was first tested on mice for its safety before use on humans.

69.

(d) Chemotherapy drugs for cancer
Explanation: Chemotherapy drugs for cancer

70.

(b) Bacteria
Explanation: Thermus aquaticus, a bacterium that lives in hot springs and hydrothermal vents, is the source of DNA polymerase because it is a heat-stable DNA polymerase.

71.

(c) 1024 molecules
Explanation: Each cycle doubles the number of DNA molecules. Using automated equipment, each cycle of replication can be completed in less than 5 minutes. After 10 cycles, what began as a single molecule of DNA has been amplified into 2^{10} = 1024 copies.

72.

(d) Insect pests
Explanation: Insect pests

73.

(d) Therapeutic drugs
Explanation: Therapeutic drugs

74.

(d) Help in regulating metabolism.
Explanation: Help in regulating metabolism.

75.

(c) Introns
Explanation: Introns