Solution

CET25B10 BIOTECHNOLOGY AND ITS APPLICATIONS

Class 12 - Biology

1. **(d)** Antigen and Antibody interaction
   Explanation: ELISA technique is based on Antigen and Antibody interaction
2. **(a)** Toxin released by Bacillus thuringiensis
   Explanation: Toxin released by Bacillus thuringiensis
3. **(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.
4. **(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.
5. **(c)** Ashbya gossypii
   Explanation: Ashbya gossypii
6. **(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.
7. **(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.
8. **(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.
9. **(c)** Proteases
   Explanation: Proteases
10. **(b)** Zymase
    Explanation: Zymase
11. **(d)** CAT
    Explanation: CAT
12. **(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.
13. **(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).
14. **(d)** Take decisions regarding GM research and safety of introducing GM genes.

Explanation: The GEAC is also responsible for approval of proposals relating to the release of genetically engineered organisms and products into the environment including experimental field trials (Biosafety Research Level trial-I and II known as BRL-I and BRL-II).

15.

(d) Without proper authorization from concerned country.
Explanation: Biopiracy describes a practice in which indigenous knowledge of nature, originating with indigenous peoples, is used by others for profit, without permission from and with little or no compensation or recognition to the indigenous people themselves.

16.

(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.

17. **(a)** Dr. R.A. Mashelkar
Explanation: Dr. R.A. Mashelkar challenge the patent right granted to the university of Mississippi medical centre.

18.

(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.

19.

(c) Extracellular crystalline protein
Explanation: Extracellular crystalline protein

20.

(c) Production of insulin by rDNA technique
Explanation: Production of insulin by rDNA technique

21.

(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).

22.

(d) RNAi
Explanation: FlavrSavr tomato is produced to increase its durability. For the production of this tomato by genetic engineering the sense and antisense RNA hybridize. This technique is called RNA interference that inhibits gene expression.

23.

(b) Insulin
Explanation: Insulin

24.

(b) PCR and RAPD
Explanation: PCR and RAPD

25.

(c) Bacillus thuringiensis
Explanation: Bacillus thuringiensis

26.

(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.

27. **(a)** High vitamin A content
Explanation: High vitamin A content

28. **(c)** Basmati rice
Explanation: In September 1997 Texas, USA company RiceTec was granted U.S. Patent No. 5,663,484 on "basmati rice lines and grains." The patent secures lines of basmati and basmati-like rice and ways of analyzing that rice. RiceTec, owned by Prince Hans-Adam of Liechtenstein, faced international outrage over allegations of biopiracy.

29. **(d)** Hirudin
Explanation: Hirudin

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

31. **(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.

32. **(c)** Leech
Explanation: Leech

33. **(a)** Nucleolus
Explanation: Nucleolus

34. **(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.

35. **(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.

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

37. **(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.

38. **(a)** Obtain results in less time
Explanation: Transgenic animals are made to carry a gene that makes them sensitive to toxic substances than non-transgenic animals and exposed to toxic substances. Toxicity testing in transgenic animals allows us to obtain results in less time.

39. **(d)** More than 95% of them are mice.
Explanation: The majority of transgenic animals produced so far are mice, the animal that pioneered the technology. The first successful transgenic animal was a mouse. A few years later, it was followed by rabbits, pigs, sheep, and cattle.
Transgenic mice, rabbit, pigs, sheep, cows, etc. have been produced but more than 95% of them are mice.

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

41.

(c) Serious ethical questions

Explanation: The current interest in the manipulation of microbes, plants, and animals has raised serious ethical questions due to the involvement of multinational companies and other organizations in exploiting bio-resources of other countries.

42. **(a)** 2.4 gram per litre

Explanation: In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk at 2.4 grams per litre. This transgenic milk is a more nutritionally balanced product than natural bovine milk and could be given to babies or the elderly with special nutritional or digestive needs. Rosie's milk contains the human gene alpha-lactalbumin.

43.

(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.

44.

(b) Only A, C and D

Explanation: Medicines required to treat certain human diseases can contain biological products. Transgenic animals that produce useful biological products can be created by the introduction of the portion of DNA (or genes) which codes for a particular product such as human protein (α-1-antitrypsin) used to treat emphysema. Similar attempts are being made for the treatment of phenylketonuria (PKU) and cystic fibrosis. In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre). The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow-milk.

45.

(b) Human gene alpha lactalbumin

Explanation: The first transgenic cow Rosie produced human protein-enriched milk. The milk contained Alpha-lactalbumin which was nutritionally more balanced than normal cow milk for babies.

46. **(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.

47.

(c) Bio-insecticidal plants

Explanation: Bio-insecticidal plants

48.

(c) Meloidogyne incognitia

Explanation: A nematode Meloidogyne incognita infect the roots of tobacco plants and causes a great reduction in yield. RNAi takes place in all eukaryotic organisms as a method of cellular defence. This method involves the silencing of a specific mRNA due to a complementary dsRNA molecule that builds to and prevents translation of the mRNA.

49.

(b) DNA fingerprinting

Explanation: DNA fingerprinting

50.

(d) Insect pests

Explanation: Insect pests

51.

(c) Biopiracy

Explanation: Exploiting biological resources of other nation without proper authorization from the country or people concerned without compensatory payment is called biopiracy.

52.

(d) Western blotting

Explanation: Western blotting

53.

(d) Inactive toxin

Explanation: Protoxins are inactive toxins which later get activated in certain conditions.

54.

(b) Inoculating gene that make them more sensitive to toxic substances

Explanation: Chemical safety testing: This is known as toxicity/safety testing. The procedure is the same as that used for testing toxicity of drugs. Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals. They are then exposed to the toxic substances and the effects studied. Toxicity testing in such animals will allow us to obtain results in less time.

55. **(a)** develop modern applications to save time and expenditure.

Explanation: Most of the industrialized nations are rich financially but poor in biodiversity and traditional knowledge. In contrast, the developing and the underdeveloped world is rich in biodiversity and traditional knowledge related to bio-resources. Traditional knowledge related to bio-resources can be exploited to develop modern applications and can also be used to save time, effort, and expenditure during their commercialization.

56.

(b) Evaluate the morality

Explanation: The manipulation of living organisms by the human race cannot go on any further, without regulation. Some ethical standards are required to evaluate the morality of all human activities that might help or harm living organisms. Going beyond the morality of such issues, the biological significance of such things is also important. Genetic modification of organisms can have unpredictable results when such organisms are introduced into the ecosystem.

57.

(c) Introns

Explanation: Introns

58.

(d) Carrying an endotoxin gene from Bacillus thuringiensis.

Explanation: Carrying an endotoxin gene from Bacillus thuringiensis.

59.

(c) Vector

Explanation: Vector

60.

(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.

61.

(d) A transgenic rice having gene for β - carotene

Explanation: Golden rice is a variety of rice produced through genetic engineering to biosynthesize beta-carotene, a precursor of vitamin A, in the edible parts of rice.

62.

(b) Use of bio resources without proper authorization.

Explanation: Biopiracy describes a practice in which indigenous knowledge of nature, originating with indigenous peoples, is used by others for profit, without permission from and with little or no compensation or recognition to the indigenous people themselves.

63.

(d) Chemotherapy drugs for cancer

Explanation: Chemotherapy drugs for cancer

64.

(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.

65. **(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.

66. **(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.

67. **(a)** Genetic engineering approval committee
Explanation: The Genetic Engineering Approval Committee (GEAC) is the apex body constituted in the Ministry of Environment and Forests under 'Rules for Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells 1989', under the Environment Protection Act, 1986.

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

69. **(b)** Corn borer
Explanation: Corn borer

70. **(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.

71. **(c)** α-lactalbumin
Explanation: α-lactalbumin produce as a result of DNA manipulation in the first transgenic cow Rosie.

72. **(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.

73. **(b)** World War II
Explanation: World War II

74. **(c)** Bacillus thuringiensis toxin
Explanation: Bacillus thuringiensis toxin

75. **(b)** Model for human disease
Explanation: Many transgenic animals are used to increase our understanding of how genes contribute to the development of the disease. The animals are genetically engineered to produce the disease symptoms so new and effective treatments can be studied. Today transgenic models exist for many human diseases such as cancer, cystic fibrosis, rheumatoid arthritis, and Alzheimer’s disease.