CHAPTER 12

Biotechnology and Its Applications

12.1 Biotechnological Applications in Agriculture

1. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to
(a) insect pests (b) fungal diseases
(c) plant nematodes (d) insect predators.
(NEET 2020)

2. What triggers activation of protoxin to active toxin of *Bacillus thuringiensis* in bollworm?
(a) Acidic pH of stomach
(b) Body temperature
(c) Moist surface of midgut
(d) Alkaline pH of gut *(NEET 2019)*

3. Which of the following is true for Golden rice?
(a) It has yellow grains, because of a gene introduced from a primitive variety of rice.
(b) It is vitamin A enriched, with a gene from daffodil.
(c) It is pest resistant, with a gene from *Bacillus thuringiensis*.
(d) It is drought tolerant, developed using *Agrobacterium* vector. *(NEET 2019)*

4. In RNAi, the genes are silenced using
(a) ds-RNA (b) ss-DNA
(c) ss-RNA (d) ds-DNA.
(Odisha NEET 2019)

5. Which part of the tobacco plant is infected by *Meloidogyne incognita*?
(a) Stem (b) Root
(c) Flower (d) Leaf *(NEET-I 2016)*

6. Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of
(a) omega 3 (b) vitamin A
(c) vitamin B (d) vitamin C. *(2015)*

7. In Bt cotton, the Bt toxin present in plant tissue as protoxin is converted into active toxin due to
(a) action of gut microorganisms
(b) presence of conversion factors in insect gut
(c) alkaline pH of the insect gut
(d) acidic pH of the insect gut. *(2015 Cancelled)*

8. The crops engineered for glyphosate are resistant/tolerant to
(a) insects (b) herbicides
(c) fungi (d) bacteria.
(2015 Cancelled)

9. Which of the following Bt crops is being grown in India by the farmers?
(a) Brinjal (b) Soybean
(c) Maize (d) Cotton *(NEET 2013)*

10. RNA interference involves
(a) synthesis of cDNA and RNA using reverse transcriptase
(b) silencing of specific *m*RNA due to complementary RNA
(c) interference of RNA in synthesis of DNA
(d) synthesis of *m*RNA from DNA.
(Karnataka NEET 2013)

11. Consumption of which one of the following foods can prevent the kind of blindness associated with vitamin 'A' deficiency?
(a) 'Flavr Savr' tomato (b) Canolla
(c) Golden rice (d) Bt-Brinjal *(2012)*

12. Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produces (in the host cells)
(a) both sense and anti-sense RNA
(b) a particular hormone
(c) an antifeedant
(d) a toxic protein. *(Mains 2012)*

13. The process of RNA interference (RNAi) has been used in the development of plants resistant to
(a) nematodes (b) fungi
(c) viruses (d) insects. *(2011)*

14. *Bacillus thuringiensis* forms protein crystals which contain insecticidal protein. This protein
(a) binds with epithelial cells of midgut of the insect pest ultimately killing it
(b) is coded by several genes including the gene *cry*
(c) is activated by acid pH of the foregut of the insect pest
(d) does not kill the carrier bacterium which is itself resistant to this toxin. *(Mains 2011)*

15. Silencing of *m*RNA has been used in producing transgenic plants resistant to
(a) boll worms (b) nematodes
(c) white rusts (d) bacterial blights. *(Mains 2011)*

16. The genetically-modified (GM) brinjal in India has been developed for
(a) insect-resistance
(b) enhancing shelf life
(c) enhancing mineral content
(d) drought-resistance. *(2010)*

17. Some of the characteristics of Bt cotton are
(a) long fibre and resistance to aphids
(b) medium yield, long fibre and resistance to beetle pests
(c) high yield and production of toxic protein crystals which kill dipteran pests
(d) high yield and resistance to bollworms. *(2010)*

18. An improved variety of transgenic basmati rice
(a) does not require chemical fertilizers and growth hormones
(b) gives high yield and is rich in vitamin A
(c) is completely resistant to all insect pests and diseases of paddy
(d) gives high yield but has no characteristic aroma. *(2010)*

19. What is true about Bt toxin?
(a) Bt protein exists as active toxin in the *Bacillus*.
(b) The activated toxin enters the ovaries of the pest to sterilise it and thus prevent its multiplication.
(c) The concerned *Bacillus* has antitoxins.
(d) The inactive protoxin gets converted into active form in the insect gut. *(2009)*

20. Transgenic plants are the ones
(a) generated by introducing foreign DNA into a cell and regenerating a plant from that cell
(b) produced after protoplast fusion in artificial medium
(c) grown in artificial medium after hybridization in the field
(d) produced by a somatic embryo in artificial medium. *(2009)*

21. The bacterium *Bacillus thuringiensis* is widely used in contemporary biology as
(a) insecticide
(b) agent for production of dairy products
(c) source of industrial enzyme
(d) indicator of water pollution. *(2009)*

22. What is antisense technology?
(a) When a piece of RNA that is complementary in sequence is used to stop expression of a specific gene
(b) RNA polymerase producing DNA
(c) A cell displaying a foreign antigen used for synthesis of antigens
(d) Production of somaclonal variants in tissue cultures *(2009)*

23. *Cry* I endotoxins obtained from *Bacillus thuringiensis* are effective against
(a) nematodes (b) bollworms
(c) mosquitoes (d) flies. *(2008)*

24. A transgenic food crop which may help in solving the problem of night blindness in developing countries is
(a) Bt soybean (b) Golden rice
(c) Flavr Savr tomatoes (d) Starlink maize. *(2008)*

25. Main objective of production/use of herbicide resistant GM crops is to
(a) encourage eco-friendly herbicides
(b) reduce herbicide accumulation in food articles for health safety
(c) eliminate weeds from the field without the use of manual labour
(d) eliminate weeds from the field without the use of herbicides. *(2008)*

26. Golden rice is a promising transgenic crop. When released for cultivation, it will help in
(a) producing a petrol-like fuel from rice
(b) alleviation of vitamin A deficiency
(c) pest resistance
(d) herbicide tolerance. *(2006)*

27. *Bacillus thuringiensis* (Bt) strains have been used for designing novel
(a) biofertilizers
(b) bio-metallurgical techniques
(c) bio-mineralization processes
(d) bioinsecticidal plants. *(2005)*

28. Golden rice is a transgenic crop of the future with the following improved trait
(a) insect resistance
(b) high lysine (essential amino acid) content
(c) high protein content
(d) high vitamin-A content. *(2005)*

29. The first transgenic crop was
(a) tobacco (b) cotton
(c) pea (d) flax. *(1999)*

12.2 Biotechnological Applications in Medicine

30. Match the following columns and select the correct option.

	Column-I		**Column-II**
(A)	Bt cotton	(i)	Gene therapy
(B)	Adenosine deaminase deficiency	(ii)	Cellular defence
(C)	RNA*i*	(iii)	Detection of HIV infection
(D)	PCR	(iv)	*Bacillus thuringiensis*

	(A)	**(B)**	**(C)**	**(D)**
(a)	(iv)	(i)	(ii)	(iii)
(b)	(iii)	(ii)	(i)	(iv)
(c)	(ii)	(iii)	(iv)	(i)
(d)	(i)	(ii)	(iii)	(iv)

(NEET 2020)

31. Which of the following statements is not correct?
(a) In man insulin is synthesised as a proinsulin.
(b) The proinsulin has an extra peptide called C-peptide.
(c) The functional insulin has A and B chains linked together by hydrogen bonds.
(d) Genetically engineered insulin is produced in *E.Coli*. *(NEET 2020)*

32. Which kind of therapy was given in 1990 to a four-year-old girl with adenosine deaminase (ADA) deficiency?
(a) Gene therapy (b) Chemotherapy
(c) Immunotherapy (d) Radiation therapy
(NEET-II 2016)

33. The two polypeptides of human insulin are linked together by
(a) covalent bond
(b) disulphide bridges
(c) hydrogen bonds
(d) phosphodiester bond. *(NEET-I 2016)*

34. The first human hormone produced by recombinant DNA technology is
(a) insulin (b) estrogen
(c) thyroxin (d) progesterone. *(2014)*

35. Which one of the following vectors is used to replace the defective gene in gene therapy?
(a) Adenovirus (b) Cosmid
(c) Ri plasmid (d) Ti plasmid
(Karnataka NEET 2013)

36. The first clinical gene therapy was given for treating
(a) diabetes mellitus
(b) chicken pox
(c) rheumatoid arthritis
(d) adenosine deaminase deficiency. *(Mains 2012)*

37. Which one of the following is now being commercially produced by biotechnological procedures?
(a) Nicotine (b) Morphine
(c) Quinine (d) Insulin *(Mains 2010)*

38. The genetic defect–adenosine deaminase (ADA) deficiency may be cured permanently by
(a) administering adenosine deaminase activators
(b) introducing bone marrow cells producing ADA into cells at early embryonic stages
(c) enzyme replacement therapy
(d) periodic infusion of genetically engineered lymphocytes having functional ADA cDNA.
(2009)

39. Human insulin is being commercially produced from a transgenic species of
(a) *Rhizobium* (b) *Saccharomyces*
(c) *Escherichia* (d) *Mycobacterium*. *(2008)*

40. ELISA is used to detect viruses where the key reagent is
(a) alkaline phosphatase
(b) catalase
(c) DNA probe
(d) RNase. *(2004, 2003)*

41. Maximum application of animal cell culture technology today is in the production of
(a) insulin (b) interferons
(c) vaccines (d) edible proteins.
(2003)

42. The term 'humulin' is used for
(a) hydrolytic enzyme (b) powerful antibiotic
(c) human insulin (d) isoenzyme. *(1999)*

43. Hybridoma cells are
(a) only cells having oncogenes
(b) product of spore formation in bacteria
(c) nervous cells of frog
(d) hybrid cells resulting from myeloma cells.
(1999)

12.3 Transgenic Animals

44. Maximum number of existing transgenic animals is of
(a) fish (b) mice
(c) cow (d) pig. *(2011)*

45. Read the following four statements (A-D) about certain mistakes in two of them.
(A) The first transgenic buffalo, Rosie produced milk which was human alpha-lactalbumin enriched.
(B) Restriction enzymes are used in isolation of DNA from other macromolecules.
(C) Downstream processing is one of the steps of *r*DNA technology.
(D) Disarmed pathogen vectors are also used in transfer of *r*DNA into the host.
Which of the two statements have mistakes?
(a) B and C (b) C and D
(c) A and C (d) A and B *(Mains 2011)*

46. Genetic engineering has been successfully used for producing
(a) transgenic mice for testing safety of polio vaccine before use in humans
(b) transgenic models for studying new treatments for certain cardiac diseases
(c) transgenic cow-Rosie which produces high fat milk for making ghee
(d) animals like bulls for farm work as they have super power. *(2010)*

47. Production of a human protein in bacteria by genetic engineering is possible because
(a) the human chromosome can replicate in bacterial cell
(b) the mechanism of gene regulation is identical in humans and bacteria
(c) bacterial cell can carry out the RNA splicing reactions
(d) the genetic code is universal. *(2005)*

48. In transgenics, expression of transgene in target tissue is determined by
(a) enhancer (b) transgene
(c) promoter (d) reporter. *(2004)*

49. The transgenic animals are those which have
(a) foreign RNA in all its cells
(b) foreign DNA in some of its cells
(c) foreign DNA in all its cells
(d) both (a) and (b). *(1995)*

12.4 Ethical Issues

50. A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to
(a) Co-667 (b) Sharbati Sonora
(c) Lerma Rojo (d) Basmati. *(NEET 2018)*

51. In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is
(a) Indian Council of Medical Research (ICMR)
(b) Council for Scientific and Industrial Research (CSIR)
(c) Research Committee on Genetic Manipulation (RCGM)
(d) Genetic Engineering Appraisal Committee (GEAC). *(NEET 2018)*

52. Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called
(a) bio-infringement (b) biopiracy
(c) biodegradation (d) bioexploitation.
(NEET 2018)

53. Which body of the Government of India regulates GM research and safety of introducing GM organisms for public services?
(a) Genetic Engineering Approval Committee
(b) Research Committee on Genetic Manipulation
(c) Bio-safety committee
(d) Indian Council of Agricultural Research
(2015 Cancelled)

ANSWER KEY

1.	(a)	**2.**	(d)	**3.**	(b)	**4.**	(a)	**5.**	(b)	**6.**	(b)	**7.**	(c)	**8.**	(b)	**9.**	(d)	**10.**	(b)
11.	(c)	**12.**	(a)	**13.**	(a)	**14.**	(a)	**15.**	(b)	**16.**	(a)	**17.**	(d)	**18.**	(b)	**19.**	(d)	**20.**	(a)
21.	(a)	**22.**	(a)	**23.**	(b)	**24.**	(b)	**25.**	(c)	**26.**	(b)	**27.**	(d)	**28.**	(d)	**29.**	(a)	**30.**	(a)
31.	(c)	**32.**	(a)	**33.**	(b)	**34.**	(a)	**35.**	(a)	**36.**	(d)	**37.**	(d)	**38.**	(b)	**39.**	(c)	**40.**	(a)
41.	(c)	**42.**	(c)	**43.**	(d)	**44.**	(b)	**45.**	(d)	**46.**	(a)	**47.**	(d)	**48.**	(d)	**49.**	(c)	**50.**	(d)
51.	(d)	**52.**	(b)	**53.**	(a)														