IMPORTANT PRACTICE QUESTION SERIES FOR NEET EXAM – 1

1. The organism, which is used for gene transfer in higher organisms is
   a) *Agrobacterium tumefaciens* b) *E. coli*
   c) *Acetobacter aceti* d) *Bacillus thuringiensis*
2. Which of the following statements are false?
   I. Insulin for curing diabetes, used to be extracted from the pancreas of slaughtered pig and cattle
   II. Animal insulin is slighty different from the human insulin
   III. Animal insulin causes some undesirable side effects such as allergy
   IV. Bacteria cannot be made to synthesise insulin from its gene because of the presence of introns
   Choose the correct option
   a) I, II and III b) I, III and IV c) II, III and IV d) None of these
3. Which of the following ways are suitable for increasing food production?
   I. Agrochemical based agriculture
   II. Organic agriculture
   III. Genetically engineered crop-based agriculture
   Choose the correct option
   a) I and II b) I and III c) II and III d) I, II and III
4. Green revolution is related to the increase in production of
   a) Better irrigation, fertilizers and pesticides facilities
   b) Exploitation of high yielding varieties
   c) Intensive cultivation
   d) All of the above
5. Tobacco plant resistant to a nematode have been developed by the introduction of DNA that produces (in the host cells)
   a) An antifeedent b) Both sense and antisense RNA
   c) A particular hormone d) Toxic protein
6. Which one of the following pairs of term/names means one and the same thing?
   a) Gene pool – Genome b) Codon – Gene
   c) Cistron – Triplet d) DNA fingerprinting – DNA profiling
7. At what temperature milk gets pasteurized?
   a) 58°C b) 60°C c) 62°C d) 68°C
8. Continuous addition of sugars in 'fed batch' fermentation is done to

a) Obtain antibiotics b) Purify enzymes c) Degrade sewage d) Produce methane

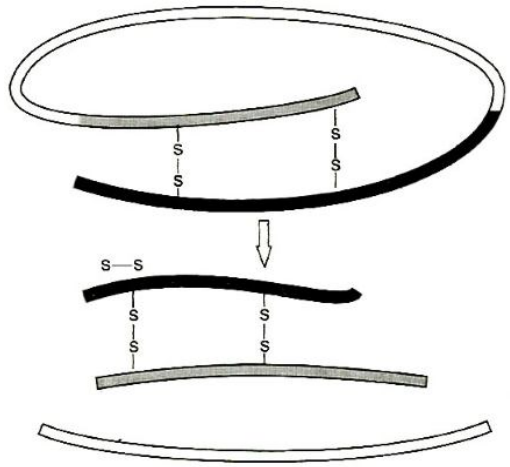
9. Genetic engineering has been successfully used for producing
   a) Transgenic mice for testing safety of polio vaccine before use in humans
   b) Transgenic models for studying new treatments for certain cardiac diseases
   c) Transgenic cow-Rosie, which produces high fat milk for making ghee
   d) Animals like bulls for farm work as they have super power
10. Who discovered recombinant DNA (*r*DNA) technology?
   a) Har Gobind Khurana b) James D Watson
   c) Stanley Cohen and Herbert Boyer d) Walter Sutton and Avery
11. In which of the following method, a probe is allowed to hybridise to its complementary DNA in the clone of cells?
   a) Gene therapy b) Recombinant DNA technology
   c) Polymerase chain reaction d) Enzyme Linked Immuno-Sorbent Assay (ELISA)
12. Which of the following is/are correct about Adenosine Deaminase (ADA) deficiency?
   I. In the absence of adenosine deaminase enzyme, purine metabolism is disturbed and T-lymphocytes fails to function
   II. ADA deficiency is caused by the deletion of the gene for ADA
   III. In some cases, it can be cured by bone marrow transplantation and enzyme replacement therapy. But in both approaches, the patients are not completely cured
   IV. For permanent cure, genes isolated from the bone marrow cells producing ADA at early embryonic stages can be a possible cure
   Which of the above statements are correct?
   a) I, II and III b) II, III and IV c) I, III and IV d) I, II, III and IV
13. Which variety of rice was patented by a US company even through the highest number of varieties of this rice is found in India?
   a) Basmati b) Parmal c) Lerma Roja d) CO-668
14. DNA fingerprinting technique was first developed by
   a) Jeffreys, Wilson and Thien b) Boysen and Jensen
   c) Schleiden and Schwann d) Edward and Steptoe
15. Both in callus and suspension cultures commonly used auxin is
   a) Napthalene acetic acid b) Indole-3 butyric acid
   c) 2, 4, 5- trichlorophenoxy acetic acid d) Dichlorophenoxy acetic acid (2, 4,-D)
16. A drug obtained through genetic engineering and useful for treating infertility is
   a) Calcitonin b) Chorionic gonadotropin
   c) Interleukin d) Tissue plasminogen activator
17. According to NCERT text which Indian plants have either been patented or attempts have been made to patent them by Western nations for their commercial use?
   I. Basmati rice II. Neem
   III. Turmic IV. Tulsi
   a) I and II b) I and III c) I, II and III d) I, II, III and IV
18. 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
19. Bt toxin gene have been expressed in plant in order to provide resistance against
   I. tobacco budworm and armyworm
   II. beetles
   III. flies and mosquitoes
   Choose the correct option
   a) I and II b) I and III c) II and III d) I, II and III
20. Somaclonal variation is seen in

a) Tissue culture grown plants b) Apomicts
c) Polyploids d) Vegetatively propagated plants

21. Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?
    a) 5' – CGTTCG – 3' b) 5' – GATATG – 3' c) 5' – GAATTC – 3' d) 5' – CACGTA – 3'
    3' – ATCGTA – 5' 3' – CTACTA – 5' 3' – CTTAAG – 5' 3' – CTCAGT – 5'
22. Crop plants grown in monoculture are
    a) Low in yield b) Free from intraspecific competition
    c) Characterized by poor root system d) Highly prone to pests
23. Agrochemical based agriculture includes
    a) Fertilisers and pesticides b) Genetically modified crops
    c) RNA interference d) DNA interference
24. 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
25. Plants are more rapidly manipulated by genetic engineering than animals due to
    a) Single somatic cell, which can regenerate a whole plant body
    b) A group of somatic cells, which can regenerate a whole plant body
    c) May be (a) or (b)
    d) None of the above
26. Test tube baby means, a baby born when
    a) The ovum is fertilized externally and thereafter implanted in the uterus
    b) It develops from a non-fertilized egg
    c) It is developed in a test-tube
    d) It is developed through tissue culture method
27. 'Silencing of mRNA molecule' in order to control the production of a harmful protein has been used in the protection of plants from
    a) Bettles b) Armyworm c) Budworm d) Nematodes
28. Bt corn the been made resistant from corn borer disease by the introduction of the gene
    a) *Cry* I Ac b) *Cry* II Ab c) *Cry* I Ab d) *Cry* II Ac
29. Genetically engineered bovine (bSI), sometimes called rbST (recombinant bovine somatotropin) or rbGH (recombinant bovine growth hormone) are used in the
    a) Therapeutic drugs b) Agriculture c) Dairy industry d) DNA fingerprinting
30. Which one of the following is a correct statement?
    a) '*Bt*' in '*Bt* cotton' indicates that it is a genetically modified organism produced through biotechnology
    b) Somatic hybridization involves fusion of two complete plant cells carrying desired genes
    c) The anticoagulant hirudin is being produced from transgenic *Brassica napus* seeds
    d) '*Flavr savr*' variety of tomato has enhanced the production of ethylene, which improves its taste
31. Biopatents means
    a) Right to use an invention b) Right to use biological resources
    c) Right to use applications d) Right to use processes
32. A USA patent was taken for
    a) Basmati rice b) Lerma Roja c) CO-668 d) Sharbati Sonara
33. Fined the incorrect statement.
    a) Gene therapy is a genetic engineering technique used to treat disease at molecular level by replacing defective genes with normal genes
    b) Calcitonin is a medically useful recombinant product in the treatment of infertility

c) Bt toxin is biodegradable insecticide obtained from *bacillus*
d) *Trichoderma* sp. Is a biocontrol agent for fungal diseases of plants

34. 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
35. The below diagram shows

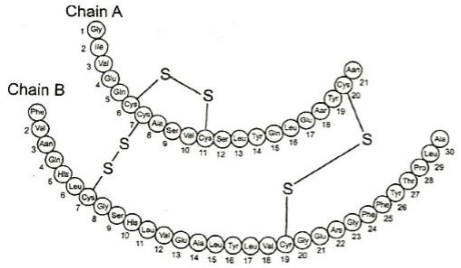


    a) Maturation of pro-insulin into insulin
    b) Method of pro-insulin formation
    c) Gene therapy
    d) Enzyme replacement therapy
36. Solution of polyethylene glycol (PEG) or a very brief high voltage electric current is used in fusion of
    a) Protoplasms b) Protoplasts c) Somatic cells d) Germinal cells
37. Transgenic animals are developed by
    a) Introducing foreign genes
    b) Introducing gene mutations
    c) Deleting certain chromosomes parts
    d) Stopping spindle formation
38. Correct chronological order of the steps occurring during gene therapy are
    I. Lymphocytes are obtained from the patients
    II. Lymphocytes are transferred to the culture dishes
    III. Lymphocytes are transfected with the normal ADA genes
    IV. The transfected cell are returned to the patients
    The chronological order should be
    a) I, II, III and IV b) II, I, III and IV c) I, III, II and IV d) III, II, IV and I
39. Maximum application of animal cell culture technology today is in the production of
    a) Vaccines b) Edible proteins c) Insulin d) Interferons
40. Manipulation of DNA in genetic engineering become easy due to invention of
    a) Polymerase chain reaction
    b) Dot blot
    c) Enzyme linked immune sorbent assay
    d) Eastern blotting
41. *Cry* II *Ab* and *cry* I *Ab* produce toxins that control
    a) Cotton bollworms and corn borer respectively
    b) Corn borer and cotton bollworms respectively
    c) Tobacco budworms and nematodes respectively
    d) Nematodes and tobacco budworms respectively
42. Genetically engineered bacteria are being employed for production of
    a) Thyroxine b) Human insulin c) Cortisol d) Epinephrine
43. Micropropagation is a technique for production of
    a) True type plants b) Haploid plants c) Somatic hybrids d) Somaclonal plants
44. Which of the following radioisotope is not suitable for DNA labeling based studies?

a) H^3 b) P^{32} c) N^{15} d) S^{35}

45. Gene therapy in humans was first practiced by Blease and Andresco to cure
    a) Cystic fibrosis
    b) Haemophilia
    c) Thalassaemia
    d) Severe Combined Immuno Deficiency Disease
46. For production of haploids, we culture
    a) Shoot tip b) Anther c) Root tip d) None of these
47. Differentiation of organs and tissues in a developing organism, is associated with
    a) Developmental mutations b) Differential expression of genes
    c) Lethal mutations d) Deletion of genes
48. How many varieties of rice has been estimated to be present in India?
    a) 2200 b) 20000 c) 200000 d) 2000000
49. Who discovered that restriction enzymes have the capability of cutting DNA strands in a particular fashion, which left what has became known as 'sticky ends' on the strads?
    a) Ramdeo Mishra b) Stanley Cohen c) Herbert Boyer d) James D Watson
50. A cybrid is hybrid carrying
    a) Genomes and cytoplasms of two different plants
    b) Cytoplasms of two different plants
    c) Cytoplasms of two different plants but genome of one plant
    d) Genomes of two different plants
51. Which of the following is correctly matched?
    a) *Agrobacterium tumefaciens* – Tumour b) *Thermos aquaticus* – *Bt-gene*
    c) pBR322 – Enzyme d) Ligase – Molecular scissors
52. Which of the following shows correct chronological order of the events occurring during callus culture?
    a) Callus → Cell division → Explant → Addition of cytokinin → Cells acquire merstematic property
    b) Explant → Callus → Cell division → Addition of cytokinin → Cells acquire meristematic property
    c) Explants → Cell division → Callus → Addition of cytokinin → Cells acquire meristematic property
    d) Callus → Explant → Cell division → Addition of cytokinin → Cells acquire meristematic property
53. Bt toxin is
    a) Intracellular crystalline protein b) Extracellular crystalline protein
    c) Intracellular monosaccharide d) Extracellular polysaccharide
54. A major use of embryo culture is in
    a) Production of alkaloids b) Clonal propagation
    c) Induction of somaclonal variations d) Overcoming hybridization barriers
55. Which one of the following hydrolyses internal phosphodiester bonds in a polynucleotide chain?
    a) Lipase b) Exonuclease c) Endonuclease d) Protease
56. White revolution is related to the increase in production
    a) Egg b) Milk c) Meat d) Wool
57. What is true about *Bt* toxin?
    a) The inactive protoxin gets converted into active form in the insect gut
    b) *Bt* protein exists as active toxin in the *Bacillus*
    c) The activated toxin enters the ovaries of the pest to sterilize it and thus, prevent its multiplication
    d) The concerned Bacillus has antitoxins

58. In recombinant DNA technique, the term vector refers to
    a) Donor DNA, is identified and picked up through electrophoresis
    b) Plasmid, transfers DNA into living cell
    c) Collection of entire genome in form of plasmid
    d) Enzyme, cuts the DNA at specific sites
59. A plant species which has been exploited for the production of hirudin is
    a) *Brassica napus* b) *Zea mays* c) *Solanun nigrum* d) *Oryza sativa*
60. The aims and objectives of Genetic Engineering Approval Committee are
    I. To permit the use of genetically modified organisms and their product for commercial applications
    II. To adopt the procedures for restriction, production and application of GM organisms
    III. approval to conduct large scale field trails and release of transgenic crops in the environment
    Which of the statements are given above are correct?
    a) I and II b) I and III c) II and III d) I, II and III
61. Identify the figure given below



    a) Glyphosphatase b) Insulin c) TPA d) Erythropoietin
62. Btcotton is not
    a) a GM plant b) Insect resistant
    c) A bacterial gene expressing system d) Resistant to all pesticides
63. Which of the following is/are true?
    I. Biowar is the use of biological weapons against humans and/or their crops and animals.
    II. Bioethics is the unauthorized use of bioresources and traditional knowledge related to bioresources for commercial benefits.
    III. Biopatent is exploitation of bioresources of other nations without proper authorization.
    a) II only b) I only c) I and II d) I and III
64. Alec Jeffreys developed the DNA fingerprinting technique. The probe he used was
    a) Ribozyme b) Sex chromosomes c) SNP d) VNTR
65. ADA is an enzyme, which is found lacking in a genetic disorder SCID. What is the full form of ADA?
    a) Adenosine Deoxyaminase b) Adenosine Deaminase
    c) Aspartate Deaminase d) Arginine Deaminase
66. Cellular totipotency is demonstrated by
    a) All eukaryotic cells b) Only bacterial cells
    c) Only gymnosperm cells d) All plant cells
67. The problem of blindness in poor countries can be taken care of by using which of the following?
    a) Golden rice b) Transgenic tomato c) Transgenic maize d) *Bt* brinjal
68. Consider the following statements about the responsibility of GEAC (set-up by the Indian Government)
    I. GEAC make decisions regarding the validity of the GM research
    II. It checks the safety of introducing GM organisms for the public services for their large scale use
    Which of the statements given above is/are correct?
    a) Only I b) Only II c) I and II d) None of these

69. All are the biotechnological application in order to increase food production, except
    a) Pisciculture
    b) Agro-chemical based agriculture
    c) Organic-agriculture
    d) Genetically engineered crop-based agriculture
70. Which of the following is false for Bt transgenic plant?
    a) Disease resistance
    b) Prepared by *Bacillus thuringiensis*
    c) It is recombinant type
    d) No such plant is known
71. DNA fingerprinting technique was discovered by
    a) Wilmut
    b) A Jeffreys
    c) Ethoven
    d) Kary Mullis
72. C-peptide of human insulin is
    a) A part of mature insulin molecule
    b) Responsible for the formation of disulphide bridges
    c) Removed during the maturation of pro-insulin to insulin
    d) Responsible for its biological activity
73. Consider the following statements about therapeutic drugs
    I. The recombinant DNA technology is used for production of therapeutic drugs which are safe and effective
    II. It avoid unwanted immunological responses, commonly observed with similar products isolated from non-human sources
    III. About thirty recombinant therapeutics have been approved for human use in the world including India
    Which of the statements given above are correct?
    a) I and II
    b) I and III
    c) II and III
    d) I, II and III
74. Choose a correct option for the uses of PCR technique in diagnosis
    I. It is used to detect HIV in suspected AIDS patients
    II. It is used to detect mutations in the genes in suspected cancer patients
    III. It is used to detect swine flu in human beings
    IV. It is used to detect different common diseases in pigs, sheep and cow
    V. It is a good technique to identify many other genetic disorders
    Which of the above statements are correct?
    a) I and II
    b) III and IV
    c) I, II and V
    d) II, III and IV
75. What might be an advantage of beginning gene therapy prior to birth?
    a) This would give the body plenty of time
    b) The body would not reject it as it has not yet recognised 'self'
    c) The cells being extremely young are more receptive of gene therapy
    d) There probably is not any advantage
76. 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
77. Which Indian plants have either been patented or attempts have been made to patent them by Western nations for their use?
    a) Basmati rice
    b) Turmeric
    c) Neem
    d) All of these
78. The T_i – plasmid, is often used for making transgenic plants. This plasmid is found in
    a) *Azotobacter*
    b) *Rhizobium* of the roots of leguminous plants
    c) *Agrobacterium*
    d) Yeast as a 2 μm plasmid
79. 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
80. A nutritionally wild type organism, which does not required any additional growth supplement is known as

a) Phenotype b) Holotype c) Auxotroph d) Prototroph

81. PCR is used to
    a) Detect HIV in suspended AIDS patients
    b) Detect mutations in the genes in suspended cancer patients
    c) Diagnose many genetic disorders
    d) All of the above
82. The technique that was employed to produce haploids of *Datura* was
    a) Meristem culture b) Anther culture c) Embryo culture d) Protoplast culture
83. Find out the wrong statement.
    a) Mobile genetic elements, transposons were visualized by Barbara McClintock
    b) Udder cell, a somatic cell is used to produce the cloned sheep by nuclear transplantation method
    c) In pedigree analysis, a person immediately affected by an action is called propositus
    d) DNA ligases are used to cleave a DNA molecule
84. Phytotron is
    a) A controlled condition chamber for tissue culture
    b) Leaf culture process
    c) Special culture of plants
    d) Root culture process
85. Which of the following bio-engineered bacteria is utilized for cleaning of marine oil slicks?
    a) *Escherichia coli* b) *Pseudomonas syringae*
    c) *Pseudomonas putida* d) *Rhizoctonia solani*
86. The RNAi stands for
    a) RNA interference b) RNA interferon c) RNA inactivation d) RNA initiation
87. Which of the following peptide chain is removed during the maturation of proinsulin into insulin?
    a) A-chain (21 amino acid) b) B-chain (30 amino acid)
    c) C-chain (33 amino acid) d) A and B chain
88. Which of the following is obtained from genetic engineering?
    a) Haemoglobin b) Glucose c) Golden rice d) None of these
89. The enzyme employed for amplification of DNA during PCR is commercially obtained from
    a) *Streptococcus pyogenes* b) *Bacillus licheniformis*
    c) *Trichoderma reesi* d) *Thermos aquaticus*
90. A genetically engineered microorganism used successfully in bioremediation of oil spills, is a species of
    a) *Pseudomonas* b) *Trichoderma* c) *Xanthomonas* d) *Bacillus*
91. The vector for T-DNA is
    a) *Thermos aquaticus* b) *Salmonella typhimurium*
    c) *Agrobacterium tumefaciens* d) *Escherichia coli*
92. What is true for plasmid?
    a) Found in viruses b) Contains genes for vital activities
    c) Part of nuclear chromosome d) Widely used in gene transfer
93. β-carotene is a principal source of
    a) Vitamin-A b) Vitamin-B c) Vitamin-C d) Vitamin-D
94. Consider the following statements
    I. Earlier, insulin was extracted from pancreas of slaughtered cattle and pigs which was more efficient than the genetically engineered insulin
    II. PCR technique is being used for the detection of HIV in suspected AIDS patients and genetic mutations in suspected cancer patients
    III. Cystic fibrosis, haemophilia, cancer, Parkinon's etc., are treated by gene therapy
    Which of the statements given above are correct?

a) I and II b) I and III c) II and III d) I, II and III

95. A single strand of nucleic acid tagged with a radioactive molecule is called
a) Plasmid b) Vector c) Probe d) Selectable marker

96. Product of biotechnology is
a) Transgenic crops (GM crops) b) Humulin
c) Biofertilizer d) All of the above

97. Cultivation of *Bt* cotton has been much in the news. The prefix *Bt* means
a) Barium-treated cotton seeds
b) Bigger thread variety of cotton with better tensile strength
c) Produced by biotechnology using restriction enzymes and ligases
d) Carrying an endotoxin gene from *Bacillus thuringiensis*

98. Enzyme that is used in PCR technology is
a) *Taq polymerase* b) Polymerase c) Helicase d) Reverse transcriptase

99. Transgenic animals are those which have foreign
a) DNA in some of its cells b) DNA in all its cells
c) RNA in all of its cells d) RNA in some of its cells

100. The application of biotechnology includes all except
a) Waste treatment
b) Energy production
c) Genetically modified crops
d) Conventional hybridization

IMPORTANT PRACTICE QUESTION SERIES FOR NEET EXAM – 2

1. Consider the following statements

I. Bioreactors are vessels of large volumes in which raw materials are biologically converted into specific products

II. One of the most commonly used bioreactors is of stirring type

III. Shake flasks are used for growing and mixing the desired materials on a small scale in the laboratory

IV. A large scale production of desired biotechnological product is done by using 'bioreactors'

a) I and II b) I and III c) I, II and III d) I, II, III and IV

2. The term 'Biotechnology' was given by
   a) Craig Venter b) Robert Edward c) Karl Erkey d) Temin and Baltimore
3. A collection of organisms, usually viruses, bacteria or yeast, which have been transformed by the addition of extra genes from another species:
   a) Gene replication b) Gene cloning c) Gene pool d) Gene library
4. Exonucleases cleaving nucleotides one at a time from the end of the polynucleotide chain are:
   a) Specific for 5' end of RNA strand
   b) Specific for 3' end of RNA strand
   c) Specific for both 5' and 3' ends of nucleotide strands
   d) Non-specific for 5' and 3' ends of nucleotide strand
5. The genetic recombinants obtained by insertion of plasmid into 1 phage genome is called:
   a) Cosmid b) Phasmid c) Phagmid d) Foreign DNA
6. Which of the following statements is true?
   a) In the historic cloning experiment of Dr. Wilmut, the transplanted nucleus was taken from an udder cell
   b) Mammalian characters appeared first in dinosaurs
   c) Heart of mammals is incapable of being in vitro
   d) Pyramid of biomass is upright in pond ecosystem
7. Which of the following statement is not true?

   I. DNA being a hydrophilic molecule cannot pass through cell membranes

   II. *Agrobacteriumtumefaciens* delivers a piece of DNA known as 'Z-DNA' in the Ti-plasmid which transforms normal plant cells into tumour cells to produce chemical against pathogens

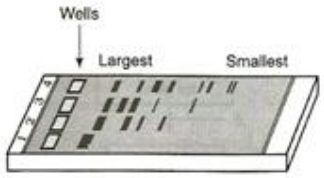
   III. Retrovirus, adenovirus, papillomavirus are also now used as cloning vectors in animal because of their ability to transform normal cells into cancerous cell.

   IV. In genetic engineering, DNA from different sources are cut with the same restriction enzymes so that both DNA fragments have same kind of sticky ends

   Choose the correct option

   a) Only I b) Only II c) Only III d) Only IV
8. Which one of the following pairs is correctly matched?
   a) RNA polymerase -RNA primer b) Restriction enzymes-Genetic Engineering
   c) Central Dogma-codon d) Okazaki fragments-splicing
9. Bam HI, Eco RI, Sma H are the types of:
   a) Restriction endooxidases b) Restriction endonucleases
   c) Restriction exonucleases d) Restriction polymerases
10. PCR technique was invented by
    a) Boyer b) Kary Mullis c) Cohen d) Sanger
11. Somaclonal variation can be obtained by:
    a) Hybridization b) Tissue culture
    c) Application of colchicine d) Irradiation with gamma rays
12. Ability to absorb foreign DNA is:
    a) Sexduction b) Competence c) Hfr d) Transduction
13. Which of the following is specifically used in genetic engineering?
    a) Ligase b) Gyrase
    c) DNA polymerase d) Restriction endonuclease

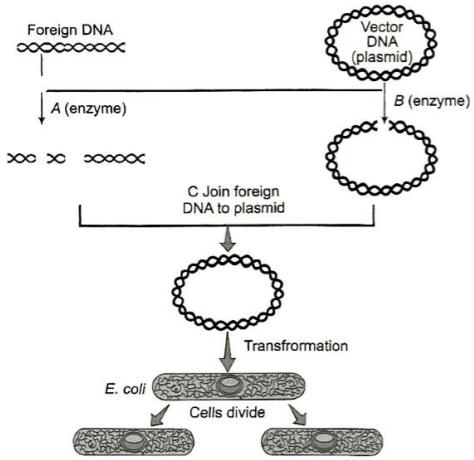
14. The tumour inducing capacity of $Agrobacteriumtumefaciens$ is located in large extrachromosomal plasmids called
    a) Ri-plasmid b) Lambda phage c) pBR322 d) Ti-plasmid
15. Who discovered recombinant DNA (rDNA) technology?
    a) Har Gobind Khorana b) James D Watson
    c) Stanley Cohen and Herber Boyer d) Walter Sutton and Avery
16. Which of the following is used in recombinant DNA technique?
    a) Cell wall of virus b) Gene which produces capsid of virus
    c) Virus d) Capsid of virus
17. There are special proteins that help to open up DNA double helix infront of the replication fork. These proteins are:
    a) DNA gyrase b) DNA polymerase I c) DNA ligase d) DNA topoisomerase
18. Agarose extracted from sea weeds finds use in:
    a) Spectrophotometry b) Tissue culture
    c) Gel electrophoresis d) PCR
19. For selectable marker.
    I. It helps to select the host cells which contain the vector and eliminate the non transformants
    II. Genes encoding resistance to antibiotics like ampicillin, chloramphenicol, tetracycline or kanamycin, are useful selectable markers for $E.coli$
    Which of the statements given above are correct?
    a) Only I b) Only II c) I and II d) None of these
20. The first clone animal of the world is:
    a) Molly sheep b) Polly sheep c) Dolly sheep d) Molly goat
21. Common bacterium used in genetic engineering is:
    a) $E.coli$ b) $Diplococcus$ c) $Rhizobium$ d) $Spirillium$
22. Who discovered that restriction enzymes have the capability of cutting DNA strands in a particular fashion, which left what has became known as 'sticky ends' on the strands?
    a) Ramdeo Mishra b) Stanley Cohen c) Herbert Boyer d) James D Watson
23. A restriction fragment containing a specific gene of interest can be identified by gel electrophoresis followed by transferring the DNA to a membrane as a solid support matrix using a procedure called
    a) An allozyme b) A southern blot
    c) Identification of a gene d) A restriction fragment length polymorphism
24. About gene gun method
    I. This method is also known as biolistic technique
    II. In this method cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in plants
    III. Important crop plants like maize, rice and wheat have now been transformed by this method
    Which of the statements given above are correct?
    a) I and II b) I and III c) II and III d) I, II and III
25. Identify the correct match for the given diagram



    a) Electrophoresis – Migration of undigested and digested set of DNA fragments
    b) Bioreactor – Raw materials are biologically converted into specific products
    c) Microinjection – Technique of introducing foreign genes into a host cell
    d) Gene cloning – Technique of obtaining identical copies of a particular DNA segment
26. In DNA fingerprinting which of the following is true?

a) VNTR is used as probes
b) Specific metabolic genes are used as probes
c) House keeping or luxury genes are use as probes
d) All of the above

27. The message from nuclear DNA for the synthesis of specific cytoplasmic protein is carried by:
a) mRNA b) t-RNA c) s-RNA d) r-RNA
28. The recent techniques used for separating fragments of DNA is:
a) Northern blotting b) Southern blotting c) Eastern blotting d) Western blotting
29. The flowchart given below represent the process of recombinant technology. Identify A and D



a) A-Restriction endonuclease, B-Restriction exonuclease, C-RNA ligase, D-Transformation
b) A-Restriction endonuclease, B-Restriction endonuclease, C-DNA ligase, D-Transformation
c) A-Restriction exonuclease, B-Restriction endonuclease, C-DNA polymerase , D-Transduction
d) A-Restriction endonuclease, B-Restriction endonuclease, C-DNA polymerase, D-Transformation

30. RNA is removed by the treatment with
a) Ribonuclease b) Protease c) Chitinase d) Cellulase
31. Which one of the following scientists developed the process of DNA fingerprinting?
a) Kary B. Mullis b) T.H. Morgan c) H.O. Smith d) Alec Jeffreys
32. Which of the following statement is not correct regarding Eco RI restriction endonuclease enzyme?

I. Eco. RI restriction endonuclease enzyme is isolated from $Escherichiacoli$ RY13
II. Its recognition sequence is 5'–GAATTC – 3'
3'–CTTAAG – 5'
↓
5' – G – A – A –T – T – C – 3'
III. Its site of cleavage is
3' – C – T – T – A – A – G – 5'
↑

a) I and II
b) I and III
c) I, II and III
d) None of the above

33. Process of formation of RNA from DNA is called
a) Transduction b) Transcription c) Transformation d) Translation
34. Which of the following would not be used in preparing recombinant DNA?
a) Plasmids b) Phages
c) Restriction enzymes d) DNA polymerase III
35. Which one of the following bacteria has found extensive use in genetic engineering work in

plants?

a) *Agrobacteriumtumefaciens* b) *Clostridiumsepticum*

c) *Xanthomonascitri* d) *Bacilluscoagulens*

36. Which of the following components are used in gel electrophoresis?

I. Ethidium bromide

II. Restriction endonuclease

III. Agarose

IV. UV radiation

Choose the correct option

a) I and II b) I and III c) I, II and IV d) I, II, III and IV

37. What is the first step in Southern Blotting technique?

a) Isolation of DNA from a nucleated cell such as the one from the scene of crime

b) Denaturation of DNA on the gel for hybridization with specific probe

c) Production of group of genetically identical cells

d) Digestion of DNA by restriction enzyme

38. The most thoroughly studied of the known bacteria-plant interaction is the:

a) Plant growth simulation by phosphate-solubilising bacteria

b) Cyanobacterial symbiosis with some aquatic ferns

c) Gall formation on certain angiosperms by Agrobacterium

d) Nodulation of Sesbania stems by nitrogen fixing bacteria

139. Microorganisms can be grown in the bioreactor by

a) Support growth system b) Agitated growth system

c) Suspended growth system d) Both (a) and (b)

40. In Northern blotting RNAs are separated by gel electrophoresis and the RNA bands are transferred onto a membrane of:

a) Diazobenzyl oxymethyl b) Diazobenzene

c) Diazobromine d) None of the above

41. Which one of the following is commonly used in transfer of foreign DNA into crop plants?

a) *Trichoderma harzianum* b) *Meloidogyne incognitia*

c) *Agrobacterium tumefaciens* d) *Penicillium expansum*

42. Which one among the following is just a cloning plasmid not an expression plasmid?

a) pBAD-18-Cam b) pBCSK c) pUC 18 d) pET

43. There ...A... are the DNA molecules that can carry a foreign ...B... segment into the host cell. Here A and B refers to

A B

a) Vector RNA b) Vector DNA

c) Gene RNA d) Gene DNA

44. Probes, used in DNA fingerprinting are initially

a) Single-stranded RNA b) Mini satellite

c) 19 base long oligonucleotides d) All of the above

45. Application of PCR are

I. detection of pathogens

II. diagnosis of specific mutation

III. DNA fingerprinting

Choose the correct option

a) I and II b) I and III c) II and III d) I, II and III

46. A clone of sheep Dolly has been made by:

a) Gene transfer b) Somatic cell cloning

c) Nucleus transfer d) Germinal cell cloning

47. T_1-plasmid used in genetic engineering is obtained from

a) *Bacillus thuringiensis* b) *Agrobacterium rhizogenes*

c) *Agrobacterium tumefaciens* d) *Psedomonas syringae*

48. The role of DNA ligase in the construction of a recombinant DNA molecule is
    a) Formation of phosphodiester bond between two DNA fragments
    b) Formation of hydrogen bonds between sticky ends of DNA fragments
    c) Ligation of all purine and pyrimidine bases
    d) None of the above
49. Transgenic animals are produced by injecting foreign gene into the:
    a) Egg b) Nucleus of unfertilized egg
    c) Nucleus of fertilized egg d) Nucleus of sperm
50. Clonal cell lines can be obtained by:
    a) Autoradiography b) Tissue culture c) Centrifugation d) Cell fractionation
51. Electroporation procedure involves:
    a) Fast passage of food through sieve pores in phloem elements with the help of electric stimulation
    b) Opening of stomatal pores during night by artificial light
    c) Making transient pores in the cell membrane to introduce gene constructs
    d) Purification of saline water with the help of a membrane system
52. Which of the following is associated with genetic engineering?
    a) Plastids b) Plasmids c) Mutations d) Hybrid vigour
53. Biolistics (gene gun) is suitable for
    a) Disarming pathogen vectors b) Transformation of plants cells
    c) Construction recombinant DNA by joining with vectors d) DNA fingerprinting
54. Which of the following statements are correct for the enzyme taq polymerases?
    I. Taq polymerase is thermally unstable
    II. It requires primers for carrying out the process of polymerization
    III. Taq polymerase is isolated from thermophilic bacterium, $Thermusaquaticus$
    Choose the correct option
    a) I and II b) I and III c) II and III d) I, II and III
55. EFB stands for
    a) European Federation of Biotechnology b) Eurasian Federation of Biotechnology
    c) East Asia Federation of Biotechnology d) Ethiopian Federation of Biotechnology
56. The commonly used DNA fingerprinting technique in forensic studies is simply a method involving
    a) Southern blotting b) Northern blotting c) Eastern blotting d) Western blotting
57. Cry I endotoxins obtained from $Bacillusthruigiensis$ are effective against
    a) Nematodes b) Bollworms c) Mosquitoes d) Flies
58. In the naming of restriction enzymes the first letter is derived from ...A... name and next two letters from the ...B... and fourth letter from ...C... of ...D... where the enzymes are extracted A to D in the statement can be
    A B C D
    a) Genus species strain bacteria b) Species genus strain bacteria
    c) Genus species variety eukaryote d) Species genus variety eukaryote
59. Which of the following techniques is most commonly used to separate DNA molecules by size?
    a) Chromatography b) PCR c) RFLP d) Gel electrophoresis
60. Which one of the following scientists got the Nobel Prize for his invention polymerase chain reaction (PCR)?
    a) F. Sanger b) Paul Berg c) Alec Jeffreys d) Kary B. Mullis
61. Which is non-invasive technique of genetic counselling?
    a) Amniocentesis b) Chorionic biopsy
    c) Foetal blood sampling d) Ultrasonography

62. The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of:
    a) Insertional inactivation of alpha-galactosidase in non-recombinant bacteria
    b) Insertional inactivation of alpha-galactosidase in recombinant bacteria
    c) Inactivation of glycosidase enzyme in recombinant bacteria
    d) Non-recombinant bacteria containing beta-galactosidase
63. Which of the following steps are catalyzed by taq polymerase in a PCR reaction?
    a) Denaturation of template DNA b) Annealing of primers to template DNA
    c) Extension of primer end on the template DNA d) All of the above
64. I. In the process of recombinant DNA technology after several treatment the purified DNA is precipitated by adding chilled ethanol
    II. The bacterial/plant, animal cell is broken down by enzymes to release DNA, along with RNA, proteins, polysaccharides and lipids
    Choose the correct option for above statements
    a) I is true, but II is false b) I is false, but II is true
    c) I and II are true d) I and II are false
65. Which of the statements are correct about bioreactors?
    I. It provides all the optimal conditions for achieving the desired product by providing optimal growth conditions like temperature, pH, substrate, salt, vitamin and oxygen
    II. It is suited for large-scale production of microorganisms under aseptic conditions for a number of days
    Correct option is
    a) Only I b) Only II c) I and II d) None of the above
66. Taq polymerase enzyme used in PCR is isolated from
    a) *Thermus aquaticus* b) *Thermococcus litoralis*
    c) *Salmonelia typhimurium* d) None of the above
67. The first hormone artificially produced by culturing bacteria is:
    a) Insulin b) Thyroxine c) Testosterone d) Adrenaline
68. A gene is made up of:
    a) DNA b) RNA c) Either DNA or RNA d) Amino acids
69. The first restriction endonuclease type II ...A..., was isolated by Smith, Wilcox and Kelley from ...B... bacterium. It was formed to cut DNA molecules at a particular point by recognizing a specific sequence of six base pairs, known as the ...C... . Here A, B and C can be

	A	B	C
a)	*Eco* RI	*Escherichia* RY 13	Restriction sequence
b)	*Eco* RII	*E.coli* R 245	Recognition sequence
c)	*Hind* II	*Haemophilus influenza*	Recognition sequence
d)	*Bam* HI	*Bacillus amyoliquefaciens*	Restriction sequence

70. In gel electrophoresis, the separated DNA fragments are visualized after staining the DNA with ...A... followed by exposure to ...B...
    Here A and B refers to

	A	**B**
a)	B-galactosidase	Infrared radiation
b)	Ethidium bromide	UV radiation
c)	Ethidium nitrate	γ-rays
d)	Ethidium chloride	Radiowave

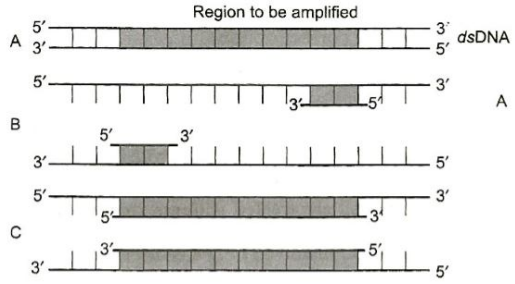
71. In DNA fingerprinting:
    a) A positive identification can be made
    b) Multiple restriction enzyme digests/generate unique fragments
    c) The polymerase chain reaction amplifies fewer DNA
    d) The variability of repeated sequences between two restriction sites is evaluated
72. Cosmid is:

a) Extragenetic material in Mycoplasma
b) Circular DNA in bacteria
c) Extra DNA in bacteria
d) Fragment of DNA inserted in bacteria for forming copies

73. Following enzymes/chemical/technique are used in the process of gel electrophoresis
I. sample DNA is cut into fragments
II. restriction endonucleases
III. agarose gel
IV. ethidium bromide
V. UV-radiation
VI. elution
Mark the correct sequence of their use
a) I, II, III, VI, V and IV b) I, II, III, VI, V and IV c) IV, V, VI, I, II and III d) I, II, IV, V, VI and III
74. Improvement of genotype of an organism by addition of some foreign genes is:
a) Genetic diversity
b) Gene handling
c) Tissue culture
d) Genetic engineering
75. Which one is a true statement regarding DNA polymerase used in polymerase chain reaction?
a) DNA polymerase is responsible for DNA synthesis
b) It is isolated from Protozoa
c) It is serves as a selectable marker
d) It is used to ligate introduced DNA in recipient plant cell
76. Most sensitive technique to detect malignant cell in non-hodgkin's lymphoma is
a) Polymerase chain reaction
b) Gene therapy
c) Stem cell therapy
d) None of the above
77. Gene therapy involves:
a) Introducing of a normal genes in cell
b) Eliminating defective and useless genes
c) Treating of defective genes with radiations
d) Replacement of defective genes by normal ones
78. Human Genome project was the thought of:
a) Jean Dausset b) Watson c) Crick d) None of the above
79. Which conserved motifs are found in $E.coli$ genes?
a) TATA box b) CAAT box c) Pribnow box d) All of these
80. Given below is a sample of a portion of DNA strand giving the base sequence on the opposite strands. What is so special shown in it?
5'_____GAATTC_____3'
3'_____CTTAAG_____5'
a) Replication completed
b) Deletion mutation
c) Start codon at the 5' end
d) Palindromic sequence of base pairs
81. The DNA used as a carrier for transferring a fragment of foreign DNA into a suitable host is called
a) Cloning vector b) Vehicle DNA c) Gene carrier d) All of these
82. The nuclease enzyme, which beings its attack from free end of a polynucleotide, is?
a) Exonuclease b) Kinase c) Polymerase d) Endonuclease
83. Genetically engineered bacterium used in production of:
a) Thyroxine b) Human insulin c) Epinephrine d) Cortisol
84. In Southern blotting..... is separated by gel electrophoresis:
a) DNA b) m-RNA c) t-RNA d) Protein
85. Taq polymerase enzyme is found in:
a) $Thermusaquatecus$ b) $E.coli$ c) $Pseudomonas$ d) $Agrobacterium$
86. The process used for separation of protein in polyacrylamide gel is called:
a) Southern blotting b) Northern blotting c) Western blotting d) Eastern blotting

87. Which of the following methods(s) is used to introduce foreign DNA into host cells?
a) Gene gun method b) Gel electrophoresis c) Elution d) Extension

88. The figure shown three steps (A, B, C) of Polymerase Chain Reaction PCR. Select the option giving correct identification together with what represents?



a) B-denaturation at a temperature of about 98°C separating the two DNA strands
b) A-denaturation at a temperature of about 50°C
c) C-extension in the presence of heat stable DNA polymerase
d) A-annealing with three sets of primers

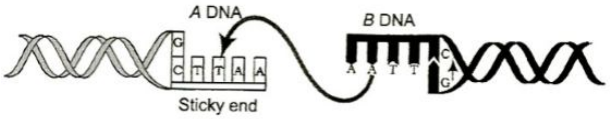
89. DNA fingerprinting method is very useful for:
a) DNA tests for identity and relationships b) Forensic studies
c) Polymorphism d) All of the above

90. Restriction endonucleases are used as:
a) Molecular build up at nucleotides
b) Molecular degradation to DNA breakup
c) Molecular knives for cutting DNA at specific sites
d) Molecular cement to combine DNA sites

91. After completion of the biosynthetic stage in the bioreactors, the product undergoes. Separation and purification processes, collectively termed as
a) Transformation b) Transduction
c) Downstream processing d) Upstream processing

92. Which of the following should be choosen for best yield if one has to produce a recombinant protein or enzyme on a large scale, using microbial plants/anima/human cell?
a) Stirred-tank bioreactor b) Electrophoresis
c) Laboratory flask of largest capacity d) All of the above

93. Go through the figure and select the option for C and D. Here A and B are taken as vector/plasmid DNA and foreign DNA respectively



Restriction enzyme recognizing palindrome *C* **Enzyme joining the sticky ends *D***
a) *Eco* RI DNA ligase b) DNA ligase *Eco* RI
c) Exonuclease DNA ligase d) DNA ligase Exonuclease

94. Which of the following is known as molecular scissors of DNA?
a) Ligase b) Polymerases
c) Restriction endonucleases d) Transcriptase

95. A kind of biotechnology involving manipulation of DNA is
a) DNA replication b) Genetic engineering c) Denaturation d) Renaturation

96. Harris and J.F. Watkins in 1965 first time reported the fusion of following cell lines to form hybrids:
a) Mouse and man b) Mouse and hamster
c) Mouse and click erythrocytes d) Mouse and *Drosophila*

97. Polymerase chain reaction employs
    a) Primers and DNA ligase b) DNA ligase only
    c) DNA polymerase d) Primer and DNA polymerase
98. An antibiotic resistance gene in a vector usually helps in the selection of
    a) Competent cells b) Transformed cells c) Recombinant cells d) None of these
99. The collection of bacteria with gDNA is called:
    a) DNA clones b) DNA library
    c) Genomic DNA library d) cDNA library
100. Which of the following statements are correct with respect to a bioreactor?
    I. It can process small volume of culture
    II. It provides optimum temperature, pH, salt, vitamins and oxygen
    III. Sparged stirred-tank bioreactor is a stirred type reactor in which air is bubbled
    Choose the correct option
    a) I and II b) I and II c) II and III d) I, II and III

IMPORTANT PRACTICE QUESTION SERIES FOR NEET EXAM – 1 (ANSWERS)

1)	**a**	**2)**	**d**	**3)**	**d**	**4)**	**d**
5)	**b**	**6)**	**d**	**7)**	**c**	**8)**	**b**
9)	**a**	**10)**	**c**	**11)**	**b**	**12)**	**d**
13)	**a**	**14)**	**b**	**15)**	**d**	**16)**	**b**
17)	**c**	**18)**	**a**	**19)**	**d**	**20)**	**c**
21)	**c**	**22)**	**d**	**23)**	**a**	**24)**	**b**
25)	**a**	**26)**	**a**	**27)**	**d**	**28)**	**c**
29)	**c**	**30)**	**c**	**31)**	**b**	**32)**	**a**
33)	**b**	**34)**	**d**	**35)**	**a**	**36)**	**b**
37)	**a**	**38)**	**a**	**39)**	**a**	**40)**	**b**
41)	**a**	**42)**	**b**	**43)**	**d**	**44)**	**d**
45)	**d**	**46)**	**b**	**47)**	**b**	**48)**	**c**
49)	**c**	**50)**	**c**	**51)**	**a**	**52)**	**c**
53)	**a**	**54)**	**d**	**55)**	**c**	**56)**	**b**
57)	**a**	**58)**	**b**	**59)**	**a**	**60)**	**d**
61)	**b**	**62)**	**d**	**63)**	**b**	**64)**	**d**
65)	**b**	**66)**	**d**	**67)**	**a**	**68)**	**c**
69)	**a**	**70)**	**a**	**71)**	**b**	**72)**	**c**
73)	**d**	**74)**	**c**	**75)**	**b**	**76)**	**c**
77)	**d**	**78)**	**c**	**79)**	**c**	**80)**	**d**
81)	**d**	**82)**	**b**	**83)**	**d**	**84)**	**a**
85)	**c**	**86)**	**a**	**87)**	**c**	**88)**	**c**
89)	**d**	**90)**	**a**	**91)**	**c**	**92)**	**d**

93) a 94) c 95) c 96) d
97) d 98) a 99) b 100) d

1 **(a)**
T_i – plasmid of the bacterium *Agrobacterium tumefaciens*is used to carry DNA into plant cells.

2 **(d)**
Earlier, insulin was extracted from the pancreas of slaughtered cattle and pigs but some patients began developing allergies. Bacteria can not be made to synthesise insulin from its gene because of the presence of introns. Bacteria do not possess enzymes for removing intron mediated transcription

3 **(d)**
Food production can be increased by applying biotechnology in the following ways
(i) Agrochemical – based agriculture
(ii) Organic agriculture
(iii) Genetically engineered crop-based agriculture

4 **(d)**
The term green revolution leads to the very substantial yield increase obtained by plants resulted from the development of new crop varieties under intensive programme of fertilizers, water and pesticide management. The high yielding varieties of wheat and rice have been the key element in the green revolution.

5 **(b)**
A nematode *Meloidegyne incognitia* infects the roots of tobacco plants, which reduces the production of tobacco. It can be prevented by using RNA interference process. In this process, by using *Agrobacterium* vector, nematode specific genes were introduced into the host plants, which produced both sense and antisense RNA in the host cells

6 **(d)**
DNA fingerprinting (= DNA typing = DNA profiling = genetic fingerprinting) was invented by Sir Alec Jeffreys of UK in 1985. It is a technique to identify a person on the basis of his or her DNA specificity. During this technique, the dark bands on X-ray film present the DNA fingerprint (= DNA profiles). It is very helpful in identifying criminals of rape/murder (using blood/semen/hair) as well as for settling matters related to parentage and paternity.

7 **(c)**
Pasteurization is the heating of milk at 62°C for 30 minutes or at 73°C for 15 seconds. It kills all the microorganisms of milk.

11 **(b)**
In recombinant DNA technology, a probe is allowed to hybridise to its complementary DNA in the clone of cells. The cells are then detected by autoradiography. The cells with mutated genes will not be observed on the photographic film because the probe was not complementary to the mutated genes

12 **(d)**
Adenosine deaminase enzyme is very important for the immune system to function. In the absence of adenosine deaminase enzyme, purine metabolism is disturbed and T-lymphocytes fails to function. ADA deficiency can lead to Severe combiuned Immune Deficiency (SCID)
SCID is caused due to defect in the genes for the enzyme adenosine deaminase. The genetic diseases that are being investigated for gene therapy ranges from sickle-cell anaemia to Severe Combined Immuno Deficiency (SCID). In some children, ADA deficiency can be cured

by bone marrow transplantation
However, in others it can be treated by the enzyme replacement therapy, in which functional ADA is given to the patient by injection. But in both approaches, the patients are not completely cured. For permanent cure, gene isolated from the bone marrow cells producing ADA at early embryonic stage can be a possible cure

13 **(a)**

The diversity of rice in India is one of the richest in the world. Basmati rice is distinct for its aroma and flavour and 27 documented varieties of Basmati are grown in India. There is reference to Basmati in ancient books as it has been grown for centuries.
In 1997, an American company got patent rights on Basmati rice through the US patent and Trademark office. This allowed the company to sell a new variety of Basmati, in the US and abroad. This new variety of basmati had actually been derived from Indian farmer's varieties. Indian Basmati was crossed with semi dwarf varieties and claimed as an invention or a novelty

14 **(b)**

The technique of DNA fingerprinting was developed for the first time by **Alec Jeffreys** (1985, 86) and his colleagues at Leicester University in UK.

15 **(d)**

Callus culture and suspension culture are two types of plant tissue cultures differentiated on the basis of in vitro growth of the explant, which is higher is case of suspension culture than in callus culture. Usually, the medium contains the auxin 2, 4-D (dichlorophenoxy acetic acid) and BAP.

16 **(b)**

The drug chorionic gonadotropin is obtained through genetic engineering and is useful for treating infertility.

17 **(c)**

India is a country rich in traditions, communal knowledge and expertise in natural medicines spices, food preparation, biological pesticides and diverse agriculture. That's why, it is under the surge from biopirates.
The patents have been taken out on the plants such as Basmati rice (*Oryza sativa*), black pepper (*piper nigrum*), pomegranate (*Punica granantum*), Indian mustard (*Brassica compestris*), turmeric (*Curcuma/longa*) and neem (*Azadirachta indica*). US, Japanese and German companies are the principal patenting pirates

18 **(a)**

Genes of plants, bacteria, fungi and animals have been changed by manipulations therefore, these organisms are called Genetically Modified Organisms (GMOs). The behavior of a GMOs depends on the nature of genes transferred, nature of host plants, bacterium and animals

19 **(d)**

Some strains of *Bacillus thuringiensis* produces proteins that kills some insects like lepidopteran (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes)

20 **(c)**

The genetic variability present among cultured cells or plants derived from such cells or progeny of such plants is called **somaclonal variation**. Generally, the term somaclonal variation is used for genetic variability present among all kinds of cells/plants obtained from cells cultured in vitro.

21 **(c)**

Out of the given options

5' – GAATTC – 3'

3' – CTTAAG – 5'

Is a palindromic sequence that can be cut at about the middle by particular restriction enzyme.

22 **(d)**

Monoculture involves the exclusive cultivation of a single crop over wide areas. It is an efficient way to use certain kinds of soils but the crop plants grown in monoculture are highly prone to pests and thus, it carries the risk of an entire crop being destroyed with the appearance of a single pest species or disease.

23 **(a)**

Agrochemical based agriculture includes fertilisers and pesticides. Agrochemicals are expensive for farmers in developing countries and also have harmful effects on environment

24 **(b)**

Golden rice a variety of *Oryza sativa* is produced through genetic engineering to biosynthesize' beta-carotene, a precursor of pro-vitamin-A in the edible parts of rice. The research that led to golden rice was conducted with the goal of helping children who suffer from vitamin-A deficiency in poor countries. Golden rice has been bred to be especially disease-resistant, resulting in better crop yields.

25 **(a)**

Plants are more rapidly manipulated by genetic engineering than animals because single somatic cell can regenerate a whole plant body.

27 **(d)**

Silencing of *m*RNA molecule' in order to control the production of a harmful protein has been used in the protection of plants from nematodes

28 **(c)**

Cry I Ab.

β-Carotene pro vitamin-A.

Golden rice a variety of *Oryza sativa* is produced through the genetic engineering of biosynthesis beta-carotene, a precursor of provitamin-A in the edible parts of rice. The research that led to golden rice was conducted with the goal of helping children who suffer from vitamin-A deficiency and blindness in poor countries. Golden rice has been breed to be especially disease-resistant, resulting in better crop yield

29 **(c)**

These hormones are used in the dairy industry, when injected into cows would increase their milk production.

30 **(c)**

'Bt' in 'Bt' cotton stands for Bacillus thuringiensis, a soil bacterium from which Bt gene (encoding Bt toxin) is obtained. Somatic hybridization involves the fusion of protoplast (i.e, cell minus cell wall) of two cells. Flavr savr is a transgenic tomato with hard skin and improved flavor and recombinant hirudin is obtained from the seeds of transgenic Brassica napas at commercial scale.

31 **(b)**

Biopatent is a government protection to an inventor of a biological material, securing to him for a specific time the exclusive right of manufacturing, exploiting, using and selling an invention

32 **(a)**

Indian Basmati was crossed with semi dwarf variety and was claimed as a new variety for which the patent was filled by a USA company

33 **(b)**

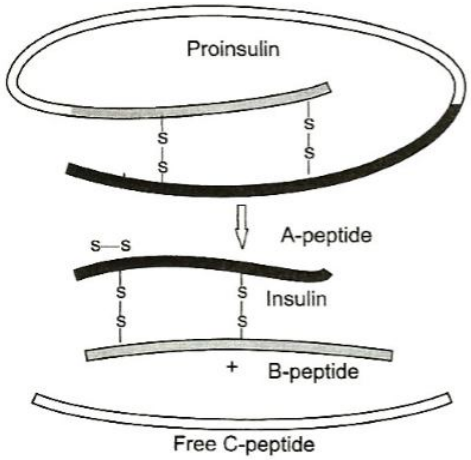
Calcitonin is a hormone secreted from parafollicular cell of thyroid gland. It is chorionic gonadotrohin hormone which is medically useful recombinant product in the treatment of infertility.

34 **(d)**

Characteristic of *Bt* cotton are high yield and resistance to boll worms.

35 **(a)**

Maturation of proinsulin into insulin after removal of C-peptide



36 **(b)**

Protoplasts are naked cells from which cell wall has been removed. Fusion of protoplast is done with solution of PEG or a very brief high voltage current.

37 **(a)**

Introducing foreign genes.

Animals whose DNA is manipulated to possess and express an extra (foreign) gene are known as transgenic animals. Transgenic rats, rabbits, pigs, sheep and cows have been produced

38 **(a)**

(i) → (ii) → (iii) → (iv).

Adenosine deaminase enzyme is very important for the immune system to function. In the absence of adenosine deaminase enzyme, purine metabolism is disturbed and T-lymphocytes fails to function. ADA deficiency can lead to Severe combiuned Immune Deficiency (SCID)

SCID is caused due to defect in the genes for the enzyme adenosine deaminase. The genetic diseases that are being investigated for gene therapy ranges from sickle-cell anaemia to Severe Combined Immuno Deficiency (SCID). In some children, ADA deficiency can be cured by bone marrow transplantation

However, in others it can be treated by the enzyme replacement therapy, in which functional ADA is given to the patient by injection. But in both approaches, the patients are not completely cured. For permanent cure, gene isolated from the bone marrow cells producing ADA at early embryonic stage can be a possible cure

40 **(b)**

Manipulation of DNA becomes easy due to invention of polymerase chain reaction developed by **Karry Mullis**. It generates microgram quantities of DNA copies of the desired DNA segment, present even as a single copy.

41 **(a)**

Bt toxin is coded by a gene named *Cry*. There are a number of them, *e.g.*, the proteins encoded by the genes *Cry* I *Ac* and *Cry* II *Ab* control the cotton bollworms, that of *Cry* I *Ab* controls corn borer.

42 **(b)**

In 1983, an American company Eli Lilly synthesized artificial insulin with the help of plasmids of *Escherichia coli.* It was named as humulin. Since then, genetically engineered E. coli bacteria are being used to produce human insulin.

43 **(d)**

Micropropagation is the practice of rapidly multiplying stock plant material to produce a large number of progeny plants, using modern plant tissue culture methods. It is used to provide a sufficient number of plantlets for planting from a stock plant, which does not produce seeds or does not respond well to vegetative reproduction.

44 **(d)**

S^{35} radioisotope is not suitable for DNA labeling based studies as DNA does not contain sulphur. S^{35} radioisotope is suitable for protein labeling based studies because protein contains sulphur.

45 **(d)**

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. The SCID patient has a defective gene for the enzyme Adenosine Deaminase (ADA)

46 **(b)**

Haploids hae a single genome as found in the gametes of the species. A haploid has only one copy of each chromosome and is highly sterile. **Guha** and **Maheshwari** (1964), developed a culture techniquee to produce haploid plants. It is called androgenic haploid culture, in which very young unopened sterilised flowers are opened to remove young anthers. **Anthers** are introduced over **culture medium** for 4-6 weeks, to give rise to large number of **embryoids** (haploids).

47 **(b)**

Differentiation of organs and tissues in a developing organism, is associated with differential expression of genes. In regulation of gene expression, the chromosomal proteins play important role. The chromosomal proteins are of two types-histones and non-histones. The regulation of gene expression involves an interaction between histones and non-histones.

48 **(c)**

Rice is being used since thousands of years in Asia's agricultural history of which 200,000 varieties are in India alone

50 **(c)**

A cybrid is a hybrid carrying cytoplasms of two different plants but genome of only one plant.

51 **(a)**

Agrobacterium tumefaciens (updated scientific name: Rizobium radiobacte) is the causal agent of crown gall desease (the formation of tumour) in over 140 species of dicot. It is a rod-shaped, Gram negative soil bacterium (Smith, et. al, 1907). Symptoms are caused by the insertion of a small segment of DNA, known as T-DNA (transfer DNA) into the plant cell, which is incorporated at a semi-random location into the plant genome.

52 **(c)**

In callus culture, cell division in explant forms a callus. Callus is irregular unorganized and undifferentiated mass of actively dividing cells. Darkness and solid medium gelled by agar stimulates callus formation. The culture medium contains growth regulators auxin 2, 4-D and often a cytokinin like BAP. Both of these growth regulators stimulate meristematic property in callus.

53 **(a)**

Bt toxin is an intracellular crystalline protein. Specific *Bt* toxin genes obtained from *Bacillus thuringiensis* are used in several crop plants like cotton. *Bt* toxins are initially inactive protoxins but after ingestion by the insects their inactive toxin becomes active due to the alkaline pH of the gut which dissolves the crystals

55 **(c)**

Endonuclease hydrolyses internal phosphodiester bonds in a polynucleotide chain.

56 **(b)**

White revolution – Milk production

Golden revolution – Egg production

Blue revolution – Fish production

57 **(a)**

Bacillus thuringiesis toxin is an inactive protoxin, which gets converted into active form in the insect gut. It works as an insecticide.

59 **(a)**

Hirudin is an anticoagulant protein found in leech (*Hirudinaria).* It is now produced through genetic engineering from seeds of a plant Brassica napus. The hirudin accumulates in seeds and it is purified as medicine.

60 **(d)**

GEAC was set up by the ministry of environment and forests to regulate research, testing and commercial release of GM crops, food and organisms

The aim and objectives of GEAC are

(i) to permit the use of GM organisms and their products for the commercial applications

(ii) to adopt the procedures for restriction, production a scale, import, export and application of GM organisms

(iii) approval to conduct a large scale field trails and release of transgenic crops in the environment

(iv) to authorise agencies or persons to have large scale production and the release of GM organisms into the environment or curb and take **punitive** action against them

61 **(b)**

Insulin

62 **(d)**

Bt cotton is not resistant to all pesticides

63 **(b)**

Biowaror biological war or **bioterrorism** is the development of biological weapons against people, their crops and animals.

64 **(d)**

The technique of fingerprinting was initially developed by **Alec Jeffreys**. He used a satellite DNA as probe that shows very high degree of polymorphisms. It was called as Variable Number of Tandem Repeats (VNTR).

65 **(b)**

ADA – Adenosine Deaminase

66 **(d)**

Professor **F C Steward** of Cornell University (USA) demonstrated that mature cells removed from a carrot and placed in a suitable culture solution could be stimulated to start dividing again and to provide new carrot plants (totipotency). Totipotency is inherent capability of a single cell, which provides the genetic programme required to direct the development of an entire individual.

67 **(a)**

Golden rice is transgenic rice having carotene and iron. Carotene is precursor of vitamin-A *Flavr savr* (transgenic tomato) remains fresh and retain their flavor much longer than normal tomato. *Bt brinjal* is insect resistance brinjal.

68 **(c)**

Both statements are corrects.

GEAC was set up by the ministry of environment and forests to regulate research, testing and commercial release of GM crops, food and organisms

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69 **(a)**

Food production can be increased by applying biotechnology is the following ways

(i) Agrochemicals based agriculture

(ii) Organic agriculture

(iii) Genetically engineered crop base agriculture

Fish farming in isolated water bodies is called pisciculture

70 **(a)**

All the statements given are correct for Bt transgenic plant except option (d).

71 **(b)**

DDNA fingerprinting technique was discovered by **A Jeffreys**. It is a modern technique that compares sets of DNA by locating identical sequences of nucleotides. It is oftenly used in forensic matters.

72 **(c)**

Removed during the maturation of proinsulin to insulin.

Insulin contains two short polypeptide chains, chain A and B-chain linked by disulphide bridge. In mammals, insulin is synthesised as prohormone (that needs to be processed to

become mature and functional hormone). It contains an extra stretch called-peptide. C-peptide is absent in mature insulin and is removed during the maturation into insulin

73 **(d)**

The recombinant DNA technology process have made great impact in the area of healthcare by the mass production of safe and more effective therapeutics drugs. Further, the recombinant therapeutics do not induces unwanted immunological responses. Now, about 30 recombinant therapeutics have been approved for human use all over the world. In India, 12 of these are presently being marketed

74 **(c)**

PCR can detect very low amount of DNA. PCR is now usually used to detect HIV in suspected AIDS patients. It is also used to detect mutations in the genes in suspected cancer patients. It is a good technology to detect many other genetic disorders. Option III and IV are incorrect

75 **(b)**

The body would not reject it as it has not yet recognised self

76 **(c)**

Transgenic mice are developed to tests the safety of polio vaccine before being used on human

77 **(d)**

The patents have been taken out on the plants such as Basmati rice (*Oryza sativa*), black pepper (*piper nigrum*), pomegranate (*Punica granantum*), Indian mustard (*Brassica compestris*), turmeric (*Curcuma/longa*) and neem (*Azadirachta indica*). US, Japanese and German companies are the principal patenting pirates

78 **(c)**

T_i – plasmid, used for making transgenic plants is found in the bacterium *Agrobacterium tumefaciens*. Ti-plasmid is used as a vector for gene transfer to plant cells. T_i – plasmid has a vir region responsible for irulence towards host and a *t*DNA region, which is transferred to the host.

79 **(c)**

The main challenge for the production of insulin using RiDNA technique was getting insulin assembled into a mature form. In 1983, Eli Lilly an American company, first prepared two DNA sequences corresponding to A and B chains of human insulin and introduced them into the plasmids of *Escherichia coli* to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulphide bonds to form human insulin (humulin)

80 **(d)**

An organism (such as bacterium) that will grow on a minimal medium (means having no specific nutritional requirement) is called a prototroph, while a 'mutant' of it that will not grow on a minimal medium but requires the addition of some compound like an amino acid or vitamin is called **auxotroph.**

81 **(d)**

PCR can detect very low amounts of DNA. PCR is now usually used to detect HIV in suspected AIDS patients. It is also used to detect mutations the in genes in suspected cancer patients. It is a good technique to identify many other genetic disorders

82 **(b)**

Anther culture is the technique of 'tissue culture' developed by **Guha** and **Maheshwari** (1964). It is the culturing of anthers over suitable culture medium.

83 **(d)**

Restriction endonucleases cleave DNA molecules only at specific nucleotide sequence called

restriction sites. DNA Ligase enzyme is used to join bits of DNA.

84 **(a)**
Phytotron is a chamber, in which plants can be grown in controlled condition for the study of effect of environmental condition on their growth.

85 **(c)**
Pseudomonas Putida is a genetically engineered bacterium with many different plasmids to degrade the pollutants. It is developed by **Dr. Anand Mohan Chakravorty** and is known as superbug or oil eating bug or Chakraborty's superbug. Now-a-days, this genetically engineered bacterium is utilized for cleaning of marine oil slicks.

86 **(a)**
RNA interference.
Nematodes is a group of organisms, which parasites a large number of plants and animals including human being. One of the common nematodes *Meloidegyne incognitia* infects the roots of tobacco plants and causes a great loss by causing reduction in yield.
This infestation was prevented by using a novel strategy, which was based on the process of RNA interference (RNAi). RNA is powerful reverse genetic tool to study gene function

87 **(c)**
Insulin contains two short polypeptide chains, chain A and B-chain linked by disulphide bridge. In mammals, insulin is synthesised as prohormone (that needs to be processed to become mature and functional hormone). It contains an extra stretch called-peptide. C-peptide is absent in mature insulin and is removed during the maturation into insulin

89 **(d)**
The enzyme used in PCR is commercially obtained from *Thermus aquaticus*.

90 **(a)**
Genetically engineered microorganism called *Pseudomonas putida* is used in bioremediation of oil spills. It is also known as 'Chakravorty's super bug or oil eating super bug.

91 **(c)**
Vector is used to introduce genes into a host cell, where the genes may be amplified or otherwise manipulated, e.g., *A. tumefaciens.*

92 **(d)**
Plasmid is an exrtachromosomal genetic element of DNA that is capable of replicating independently of host chromosome. It forms the basis of many cloning vectors used in genetic engineering.

93 **(a)**
β-carotene is principal source of vitamin-A generally, seeds of rice do not have vitamin-A but golden rice, which is developed through genetic engineering has the high vitamin-A content

94 **(c)**
Earlier, insulin was extracted from the pancreas of slaughtered cattle and pigs but some patients began developing allergies. The injection of this insulin into patients occasionally produces sensitivity reaction and side effects

95 **(c)**
The molecular probes are usually single stranded pieces of DNAs (sometimes RNAs), labelled with radio-isotopes such as P^{32}. Molecular probes are available for many genetic disorders such as, Duchenne muscular dystrophy, cystic fibrosis, Tay-Sachs disease

96 **(d)**

Biotechnology may be, simply defined as the use of micro-organisms animals or plant's cells, or thin components to generate products and services useful to human beings. Now-a-days, biotechnology is very helpful in producing transgenic crops or genetically modified (GM) crops, transgenic animals, biofertilizers, antibodies, hormones like humulin (genetically engineered human insulin), antibodies and various other useful products.

97 **(d)**

Bt cotton, *Bt* tobacco, *Bt* tomato, etc are transgenic plants having *Bt*-2 gene encoding *Bt* toxin, (e.g., thurioside). *Bt* toxin gene has been isolated from a bacterium *Bacillusthuringiensis* therefore, called *Bt* (*i.e., Bacillus thuringiensis*). These plants are resistant for more than 140 species of insects including common cabbage worm, caterpillars, bag worms, canker worms, gypsy worm, etc.

98 **(a)**

The polymerase chain reaction (PCR) is a technique by which small samples of DNA can be quickly amplified. The repeated amplification is achieved by the use of thermostable DNA polymerase, *i.e., (Taq*-polymerase isolated from a bacterium, *Thermus aquaticus*) which remain active during the high temperature induced denaturation of double-stranded DNA.

99 **(b)**

Transgenic animals are those, which have foreign DNA in all of its cells

100 **(d)**

The application of biotechnology includes

(i) therapeutics
(ii) diagnostics
(iii) genetically modified crops for agriculture
(iv) processed food
(v) bioremediation
(vi) waste treatment and
(vii) energy production

IMPORTANT PRACTICE QUESTION SERIES FOR NEET EXAM – 2 (ANSWERS)

1)	**d**	**2)**	**c**	**3)**	**d**	**4)**	**c**
5)	**b**	**6)**	**a**	**7)**	**b**	**8)**	**b**
9)	**b**	**10)**	**b**	**11)**	**b**	**12)**	**b**
13)	**d**	**14)**	**d**	**15)**	**c**	**16)**	**c**
17)	**a**	**18)**	**c**	**19)**	**c**	**20)**	**a**
21)	**a**	**22)**	**c**	**23)**	**b**	**24)**	**d**
25)	**a**	**26)**	**a**	**27)**	**a**	**28)**	**b**
29)	**b**	**30)**	**a**	**31)**	**d**	**32)**	**d**
33)	**b**	**34)**	**d**	**35)**	**a**	**36)**	**d**
37)	**d**	**38)**	**c**	**39)**	**d**	**40)**	**a**
41)	**a**	**42)**	**c**	**43)**	**b**	**44)**	**b**
45)	**d**	**46)**	**c**	**47)**	**c**	**48)**	**a**
49)	**c**	**50)**	**b**	**51)**	**c**	**52)**	**b**
53)	**b**	**54)**	**c**	**55)**	**a**	**56)**	**a**
57)	**b**	**58)**	**a**	**59)**	**d**	**60)**	**d**
61)	**d**	**62)**	**c**	**63)**	**c**	**64)**	**c**
65)	**c**	**66)**	**a**	**67)**	**a**	**68)**	**c**
69)	**c**	**70)**	**b**	**71)**	**d**	**72)**	**d**
73)	**b**	**74)**	**a**	**75)**	**a**	**76)**	**a**
77)	**d**	**78)**	**a**	**79)**	**c**	**80)**	**d**
81)	**d**	**82)**	**a**	**83)**	**b**	**84)**	**a**
85)	**a**	**86)**	**c**	**87)**	**a**	**88)**	**c**
89)	**d**	**90)**	**c**	**91)**	**c**	**92)**	**a**
93)	**a**	**94)**	**c**	**95)**	**b**	**96)**	**a**
97)	**d**	**98)**	**b**	**99)**	**a**	**100)**	**c**

1 **(d)**

Small volume cultures are usually employed in laboratories for research and production of less quantities of products. *e.g.,* in shake flasks. However, large scale production of the products is carried out in 'bioreactor'

Bioreactors are large vessels (having a volume of 100 to 1000 L) which are used for biological conversion of raw materials into specific products. The most commonly used bioreactors are of stirring type

2 **(c)**

The term 'Biotechnology' was given in 1917 by a Hungarian Engineer, Karl Erkey, to describe a process or large scale production of pigs

7 **(b)**

Agrobacterium tumefaciens delivers a piece of DNA known as 'T-DNA' in the Ti-plasmid which transforms normal plant cells into tumour cells to produce chemical against pathogens

10 **(b)**

Kary Mullis

Gene encoding resistance to antibiotics like ampicillin, chloramphenicol, tetracycline or Kanamycin, are useful selectable markers for *E.coli.* The normal *E.coli* cells do not carry resistance against any of these antibiotics

14 **(d)**

Ti-plasmid is found in *Agrobacterium tumefaciens,*which produces crown gall (tomour) in a

large number of dicot species. *A. tumefaciens* is a Gram negative soil bacterium that infects a wide range of plants and causes crown galls

15 **(c)**

The science of recombinant technology took birth when Cohen and Boyer (1972) were able to introduce a piece of antibiotic resistance gene containing foreign DNA into plasmid of *Salmonella typhimurium.* This modified plasmid was them inserted into *E. coli* to get clones of recombinant DNA. Thus, Cohen and Boyer discovered recombinant technology

16 **(c)**

In recombinant DNA technology, a desired segment of DNA or a gene is made to combine with the DNA of an organism where it will multiply and produce it copies. Plasmids and viruses are the most commonly used cloning vectors in recombinant DNA technology

19 **(c)**

Selectable marker helps to select the host cells which contain the vector and eliminate the non-transformants. Genes encoding resistance to antibiotics like ampicillin, chloramphenicol, tetracycline or kanamycin are useful selectable markers of *E.coli*. The normal *E.coli* cells do not carry resistance against any of these antibiotics

22 **(c)**

Herbert Boyer discovered that restriction enzymes have the capability of cutting DNA strands in a particular fashion, which left what has became known as sticky ends on the strands

23 **(b)**

A Southern blot.

A restriction fragment containing a specific gene of interest can be identified by gel electrophoresis followed by transferring of DNA to a membrane as a solid support matrix using a procedure called a Southern blot

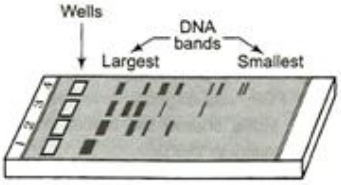
24 **(d)**

In biolistic or gene gun method, cells are a high velocity micro-particles of gold or tungsten coated with DNA in plants. Important crop plants like maize, rice and wheat have now been transformed by this method

25 **(a)**

Electrophoresis.

A molecule of DNA can be cut into fragments by the enzyme restriction endonucleases. These fragments of DNA can be separated by a technique of gel electrophoresis. In this process the smallest segment of DNA travel towards anode (+ ve electrode), farthest away from the wells



30 **(a)**

RNA is removed by treatment with ribonuclease

32 **(d)**

All statements are correct

Restriction Enzymes	Source	Recognition Sequence and Site of Cleavage	Product
Eco RI	*Escherichia coli* RY 13	5'-G-A-A-T-T-C-3' 3'-C-T-T-A-A-G-5'	G A-A-T-T-C C-T-T-A-A G Sticky ends

33 **(b)**

During annealing two oligonucleotide primers hybridise to each of single stranded template DNA in presence of excess of synthetic oligonucleotides

36 **(d)**

In gel electrophoresis a molecule of DNA can be cut into fragments by the enzyme restriction endonuclease. DNA fragments move towards the anode according to their molecular size through the agarose gel

The separated DNA fragments can be observed only after staining them with a solution of ethidium bromide. The bright orange coloured bands of DNA can be seen only under UV light. These bands of DNA fragments are cut out from the gel and extracted by using convenient technique. This step is called elution

39 **(d)**

Microorganisms can be grown in the bioreactors by support growth system and suspended growth system

41 **(a)**

Escherichia coli and *Agrobacterium tumefaciens* are the microbes found to be very useful in genetic engineering. *E.coli* is a motile, Gram negative, rod-shaped bacterium which is a normal inhabitant of human colon. It is most extensively used in bacterial genetic and molecular biology

Agrobacterium tumefaciens is a soil bacterium. It has Ti-plasmid (tumour inducing plasmid) and it can be used for the transfer of a desired gene in dicot plants

42 **(c)**

pUC 18 is a plasmid cloning vector commonly used with *E.coli.* The vector length is 2686 bp and is isolated from *E.coli* strain DH5α by standard procedures

43 **(b)**

A – Vector; B-DNA

44 **(b)**

The probes used for DNA fingerprinting are usually prepared from minisatellite or microsatellite DNA

45 **(d)**

In recent times, PCR is being used in the detection of HIV (virus of AIDS) mutation are related to genetic disease. By using PCR phenylketonuria, muscular dystrophy, sickle-cell anaemia, hepatitis, chlamydia and tuberculosis can be diagnosed. PCR is also used in DNA fingerprinting

47 **(c)**

Ti-plasmid is a plasmid present in *Agrobacterium tumefaciens*. It is used in genetic engineering in plants, *e. g.*,as a vector in gene transfer to dicot plants

48 **(a)**

The role of DNA ligase in the construction of a recombinant DNA molecule is formation of phosphodiester bond between two DNA fragments. DNA ligase help in sealing gaps in DNA fragments

Therefore, they act as a molecular glue. In 1969 Har Govind Khorana discovered DNA ligase in T_4-bacteriophage

53 **(b)**

In gene gun or biolistic method tungsten or gold particles, coated with foreign DNA are bombarded into target cells at a very high velocity

Although this method is suitable for plants yet this technique is also used to insert genes into animal that promote tissue repair into cells (particularly cancer of mouth) near wounds

54 **(c)**

The final step in PCR is extension (polymerization), where in *Taq* DNA polymerase

synthesizes the DNA region between the primers using deoxynucleotide triphosphates and Mg^{2+}. It means the primers are extended towards each other so that the DNA segment lying between the two primer is copied. The optimum temperature for this polymerization step is 72°C

Taq polymerase is thermostable enzyme, isolated from Thermophilic bacterium, Thermus aquaticus

55 **(a)**

EFB – European Federation of Biotechnology

A definition of biotechnology which covers both traditional views and modern molecular biotechnology has been given by European Federation of Biotechnology. According to EFB "Biotechnology is the integrated use of biochemistry, microbiology and engineering sciences in order to achieve technological application of the capabilities of microorganisms, cultured tissues/cells and part there of"

56 **(a)**

A technique developed by EM Southern in 1975 for detection of a specific DNA sequences(gene or other) in a large, complex sample of DNA ($e.g.$,cellular DNA). It is also used to determine the molecular weight of a restriction fragment and to measure relative amounts in different sample

Uses Southern blots are used in gene discovery and mapping, evolution and development studies, diagnostics and forensics

In regards to genetically modified organisms, Southern blotting is used as a definitive test to ensure that a particular section of DNA of known genetic sequence has been successfully incorporated into the genome of the host organism

57 **(b)**

Cry I endotoxins obtained from *Bacillus thuringiensis* are effective against bollworm larvae

58 **(a)**

In the naming of restriction enzymes the first letter is derived from genus name and next two letters from the species name of the prokaryotic cell from where the enzymes are extracted

59 **(d)**

A molecule of DNA can be cut into fragments by the enzyme restriction endonucleases. These fragments of DNA can be separated by a technique of gel electrophoresis. It is a technique used for the separation of substances of different ionic properties

63 **(c)**

During extension, the enzymes *Taq* polymerase synthesizes the DNA segment between the primers. The two primers extend towards each other in order to copy the DNA segment typing between the two primers

This step requires presence of deoxynucleoside triphosphate (*d* NTPs) and Mg^{2+} and occurs at 72°C

64 **(c)**

both are true in the process for the isolation of DNA, after several treatments the purified DNA is precipitated by adding chilled ethanol. The bacterial/plant, animal cell is broken down by enzymes to release DNA, along with RNA, proteins, polysaccharide and lipids

65 **(c)**

Bioreactors are vessels of large volumes (100-1000 litres) in which raw materials are biologically converted into specific products. It provides all the optimal conditions for achieving the desired product by providing optimal growth conditions like temperature, pH, substrate, salts vitamins and oxygen. Stirred-tank bioreactors are commonly used bioreactors. There are cylindrical with curved base to facilitate proper mixing of the contents. The stirrer mixes the contents and makes oxygen available throughout the

bioreactor

66 **(a)**

Thermus aquaticus.

DNA polymerase which is stable at high temperature (>90°C) is required to carry out the synthesis of new DNA. The DNA polymerase like *Taq* polymerase is generally used in PCR reactions which is isolated from a bacterium *Thermus aquaticus*

69 **(c)**

The first restriction endonuclease type II was isolated by Smith, Wilcox and Kelley from *Haemophilus influenza* bacterium. It was formed to cut DNA molecules at a particular point of recognizing a specific sequence of six base pairs, known as the recognition sequence

70 **(b)**

In gel electrophoresis, the separated DNA fragments are visualized after staining the DNA with ethidium bromide followed by exposure to UV radiation

73 **(b)**

In gel electrophoresis a molecule of DNA can be cut into fragments by the enzyme restriction endonuclease. DNA fragments move towards the anode according to their molecular size through the agarose gel

The separated DNA fragments can be observed only after staining them with a solution of ethidium bromide. The bright orange coloured bands of DNA can be seen only under UV light. These bands of DNA fragments are cut out from the gel and extracted by using convenient technique. This step is called elution

75 **(a)**

DNA polymerase which is stable at high temperature (>90°C) is required to carry out the synthesis of new DNA. The DNA polymerase like *Taq* polymerase is generally used in PCR reactions which is isolated from a bacterium *Thermus aquaticus*

76 **(a)**

Most sensitive technique to detect malignant cell in non-hodgkins lymphoma is polymerase chain reaction. In recent times, PCR is being used in the detection of HIV (Virus of AIDS)

79 **(c)**

The Pribnow box (also known as the Pribnow – Schaller box) is the sequence TATAAT of six nucleotides that is an essential part of a promoter site on DNA for transcription to occur in bacteria

87 **(a)**

Gene gun method was first developed by Prof. Stanford and coworkers at Cornell University, USA in 1987. This method is used to introduce foreign DNA into host cell

88 **(c)**

During extension, the enzyme DNA polymerase synthesizes the DNA segment between the primers. DNA polymerase is a heat stable enzyme

91 **(c)**

after the formation of the product in the bioreactors, it undergoes through some processes before a finished product to be ready for marketing. The processes include (i) separation and (ii) purification of products, which are collectively called the downstream processing

92 **(a)**

The stirred-tank bioreactor is well suited for large-scale production of protein of enzyme by using microbial plant/animal/human cells

93 **(a)**

A-DNA is vector/plasmid DNA and B-is foreign DNA.

C-The restriction enzyme that recognizes this palindrome-*Eco* RI

D-The enzyme that can link these two DNA fragment-DNA ligase

94 **(c)**

Restriction endonuclease was isolated for the first time by W Arber in 1962 in bacteria.

They are called molecular scissors or biological scissors. In 1978 Arber, Smith and Nathan were awarded the Nobal Prize for the discovery of restriction endonuclease

95 **(b)**

In genetic engineering *r*DNA technology is applied to several biotechnological processes for obtaining particular biochemical improvement of genetic make up of an organism and fighting genetic defects

97 **(d)**

Primer and DNA polymerase.

PCR is a technique of synthesizing multiple copies of the desired gene or (DNA) *in vitro. The basic requirement of PCR* are DNA template, two nucleotide primers and enzyme (DNA polymerase)

98 **(b)**

An antibiotics resistance gene in a vector usually helps in the selection of transformed cell

100 **(c)**

Bioreactors are considered as vessels in which raw materials are biologically converted into specific products by microbes, plant and animal cells and or their enzymes. Small volume cultures can not give large quantities of the products. Large scale production (100-1000 L) of the products is carried out in bioreactors. A bioreactor provides the optimal conditions for obtaining the desired product by providing optimum growth conditions such as temperature, pH, substrate, vitamins, oxygen and salts. In the sparged stirred tank bioreactor, sterile air bubbles are sparged. The surface area for oxygen transfer is increased