

Plant Biotechnology

Answer Key

26/06/2021



Gujarat Biotechnology Research Centre

Plant Biotechnology (Scientist B)

This question booklet contains 28 pages

Application No: _____

Time: 2 Hours

Total Marks: 200

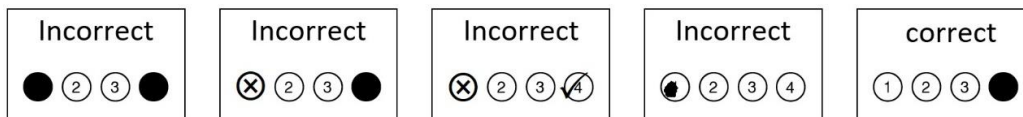
Total Questions: 200

Candidate Signature :

Invigilator Signature :

Instructions for Candidate

1. This question booklet contains 200 questions.
2. Each correct answer carries 1 mark.
3. Use only Black Ball Point Pen to darken the appropriate circle in OMR.
4. Please darken the complete circle.
5. Darken ONLY ONE CIRCLE for each Question as shown below:



6. Answer once marked cannot be changed.
7. Please do not make any stray marks on the Question Booklet.
8. Rough works must be done on the blank page of Question Booklet.
9. Mark your answer in the appropriate space in the Answer Sheet against the Number corresponding to the question.
10. The Candidate is NOT allowed to carry Question booklet and OMR response sheet with him/her on conclusion of examination.

- 1 A reaction mixture for PCR consists of _____
- (A) deoxynucleoside triphosphate
 - (B) primers in a limited amount
 - (C) heat unstable polymerase
 - (D) a region complementary to the sequence to be amplified
- 2 Sequences can be cloned flanking the reporter genes using the transposon tagging approach. The use of reporter genes to identify sequences expressed in this way is called as _____
- (A) trapping
 - (B) blotting
 - (C) identification
 - (D) tagging
- 3 Phosphoribosyl amino-imidazole carboxylase is a component of _____ biosynthesis pathway.
- (A) pyrimidine
 - (B) purine
 - (C) both purine and pyrimidine
 - (D) only adenine
- 4 In Jukes–Cantor Model to correct evolutionary distances, A formula for deriving evolutionary distances that include hidden changes is introduced by using a logarithmic function. It is _____
- (A) $d_{AB} = -(3/4) \ln[1 - (4/3)p_{AB}]$
 - (B) $d_{AB} = -(3/4) \log[1 - (4/7)p_{AB}]$
 - (C) $d_{AB} = -(3/4) \log[1 - (4/3)p_{AB}]$
 - (D) $d_{AB} = -(3/4) \ln[1 - (5/3)p_{AB}]$
- 5 For transformation of the chloroplast of higher plants, a vector is used which _____ in the chloroplast.
- (A) doesn't replicates
 - (B) replicates
 - (C) replicates under certain specified conditions
 - (D) may or may not replicate
- 6 For a convenient transformation system, _____ can be used for gene silencing.
- (A) transposon insertion
 - (B) either antisense RNA or transposon insertion
 - (C) antisense RNA
 - (D) transposon insertion followed by antisense RNA
- 7 If transfer of DNA from Agrobacterium to plants is done via incubation of explanted material and the vector containing DNA of interest and then selection is done via selectable marker then this method is called as _____
- (A) co-cultivation
 - (B) transformation
 - (C) co-transformation
 - (D) co-culture

- 8 The main disadvantage of maximum likelihood methods is that they are _____
- (A) mathematically less folded
 - (B) computationally intense
 - (C) mathematically less complex
 - (D) computationally lucid
- 9 If a small intermediate vector system is used along with a selectable marker, then it is called as _____
- (A) fusion plasmids
 - (B) hybrid plasmids
 - (C) complex plasmids
 - (D) co-integrative plasmids
- 10 If gene of interest is inserted into protoplasts but the transformation is not stable, then it is called as _____ expression systems.
- (A) temporary
 - (B) unstable
 - (C) transient
 - (D) un-transformed
- 11 criss-cross inheritance is shown by?
- (A) polygamy
 - (B) sex-influenced character
 - (C) sex-quantitative character
 - (D) sex-linked character
- 12 For Mendel's pea plants, tall (T) was dominant over dwarf (t), and purple flowers (P) were dominant over white flowers (p). A plant with genotype the ttPp would have which phenotype?
- (A) tall plant with white flowers
 - (B) dwarf plant with white flowers
 - (C) dwarf plant with purple flowers
 - (D) tall plant with purple flowers
- 13 A plant with orange flowers is crossed with another plant with orange flowers. The offspring show the phenotypic ratio of one red flower:two orange flowers:one yellow flower. These plants are displaying a classic example of
- (A) pleiotropy
 - (B) incomplete dominance
 - (C) codominance
 - (D) multiple alleles
- 14 Which of the following is not a condition for PCR?
- (A) Initial melting followed by 30 cycles each consisting of melting for 1 minute at 94 degrees
 - (B) Initial melting carried out for 5 minutes at 94 degrees
 - (C) DNA synthesis at 72 degrees for 1.5 minutes
 - (D) Renaturation for 5 minutes at 60 degrees

- 15 An organism has a diploid number of 12. On the basis of segregation and independent assortment, how many different types of gametes can be formed?
- (A) 1
 - (B) 2
 - (C) 12
 - (D) 64
- 16 Which of the following is a description of chromatin?
- (A) All the genetic sequences contained by members of a particular species
 - (B) The DNA-protein complex which comprises eukaryotic chromosomes
 - (C) Repetitive sequences contained within the genome of an organism
 - (D) The protein coding sequences and their regulatory elements
- 17 A plant resulting from the combination of chromosome sets from different species is said to be
- (A) Autopolyploid
 - (B) Allopolyploid
 - (C) Autotetraploid
 - (D) Polyploid
- 18 In a statistical learning process called support vector machine (SVM), a hyperplane is _____
- (A) linear mathematical function
 - (B) nonlinear mathematical function
 - (C) a linear or nonlinear mathematical function
 - (D) exponential mathematical function
- 19 What type of experiment can be done to differentiate between a homozygous dominant and a heterozygous genotype for a dominant trait?
- (A) chi-square test
 - (B) test cross
 - (C) Punnett square
 - (D) human pedigree analysis
- 20 A chromosome is _____ if the centromere is located very close to a chromosome tip
- (A) metacentric
 - (B) submetacentric
 - (C) acrocentric
 - (D) telocentric
- 21 A nucleic acid was analyzed and found to contain 37 percent A, 16 percent G, 22 percent C, and 25 percent T. The nucleic acid must be
- (A) single-stranded RNA
 - (B) single-stranded DNA
 - (C) double-stranded RNA
 - (D) double-stranded DNA
- 22 Which of the following is NOT a necessary component of translation?
- (A) anticodon
 - (B) mRNA
 - (C) ligase
 - (D) amino acid

- 23 Which of these describes a contig?
(A) A complete genomic library including overlapping clones
(B) A complete mRNA library
(C) A chromosome-specific library of overlapping clones
(D) An ordered genomic library
- 24 Once all positions in the sequence alignment have been examined, the likelihoods given by each column in the alignment for each tree are _____ to give the likelihood of the tree.
(A) added
(B) squared
(C) multiplied
(D) divided
- 25 How many different types of gametes can be formed by individuals of the genotype AaBbcc?
(A) AaBbcc
(B) Aa, Bb, cc
(C) ABC, Abc, aBc, abc
(D) ABc, Abc, aBc
- 26 Which of the following activity is not present in Taq polymerase?
(A) 5'-3' polymerase
(B) 3'-5' exonuclease
(C) 5'-3' exonuclease
(D) Both 5'-3' polymerase and 5'-3' exonucleas
- 27 Which is the mutant variety of Wheat?
(A) Shresth
(B) Sharbati Sonora
(C) Aditya
(D) Khorasan
- 28 James Watson and Francis Crick are credited with determining _____ in 1953
(A) the nature of base-pairing in DNA
(B) the chemical composition of DNA
(C) the three-dimensional structure of DNA
(D) DNA is located in the nucleus
- 29 Which of the following most accurately restates Mendel's law of segregation?
(A) Genes are inherited in discrete units from one generation to the next
(B) Genes can exist in different forms, known as alleles
(C) Homologous chromosomes separate during gamete formation
(D) Genes on different chromosomes are inherited independently
- 30 Which of the following is not suitable if the PCR product is non-specific?
(A) Increasing annealing temperature
(B) Adjusting the concentration of magnesium ions
(C) Using inverse PCR
(D) Using touchdown PCR

- 31 In mRNA the "start" sequence is
- (A) UAA
 - (B) UAG
 - (C) UGA
 - (D) AUG
- 32 Glyphosate prevents plants from growing by
- (A) cleaving critical DNA in the plant and halting cell division
 - (B) preventing the production of gametes
 - (C) preventing the formation of spindle fibers and halting mitosis
 - (D) stopping them from synthesizing proteins
- 33 What is gene conversion?
- (A) A process by which a gene is rendered nonfunctional
 - (B) A process that changes an allele to the allele existing on the homologous chromosome
 - (C) A process that restores the wild type function of a gene
 - (D) A process that creates a new allele of a gene
- 34 A trait that is present in one parent but not present in the second generation is characteristic of a(n)
- (A) autosomal dominant
 - (B) Y-linked trait
 - (C) autosomal recessive trait
 - (D) quantitative trait
- 35 Barbara McClintock noted that, in a particular strain of corn, chromosome 9 tended to break at the same site at a relatively high rate. What caused this breakage?
- (A) Random double stranded breaks
 - (B) Inaccurate excision of a transposable element
 - (C) Insertion of a transposable element
 - (D) Holliday junctions
- 36 In the final steps of the bootstrap method, the _____ the decay value, the _____ significant the original branches.
- (A) greater, less
 - (B) lesser, more
 - (C) greater, more
 - (D) more, less
- 37 In the case of uncertainty, if more than one nucleotide is included at a position it is called _____
- (A) polynucleotide site
 - (B) degenerate site
 - (C) unique site
 - (D) mixed site
- 38 Which of the following is shared by both prokaryotes and eukaryotes?
- (A) promoters
 - (B) introns
 - (C) 3'-poly A tails
 - (D) RNA splicing

- 39 In a population in Hardy-Weinberg equilibrium, the proportion of homozygous dominant genotypes is _____
- (A) p^2
 - (B) $2pq$
 - (C) q^2
 - (D) q^2+2pq
- 40 When both glucose and lactose are present
- (A) cyclic AMP is high so transcription occurs
 - (B) the lac repressor binds with the lactose and transcription occurs
 - (C) RNA polymerase is able to bind to the operator so transcription occurs
 - (D) transcription is turned off
- 41 Transcription factors are _____
- (A) regulatory DNA sequences that bind to the promoter site
 - (B) regulatory bases that bind to the promoter
 - (C) regulatory sequences that bind to a protein
 - (D) regulatory proteins that bind to a promoter site
- 42 A population is in genetic equilibrium when _____
- (A) the mutation rate is high
 - (B) allele and genotype frequencies do not change from generation to generation
 - (C) mating is not at random
 - (D) allele frequencies change across generations but genotype frequencies do not
- 43 Which of the following nucleotides should be there at 3' end in a primer?
- (A) Any of A, T, G or C will work out
 - (B) Either G or C
 - (C) Either A or T
 - (D) Specifically G
- 44 A key finding of intragenic mapping was
- (A) that genes consist of indivisible particles, like beads on a string
 - (B) that genes do not change over time
 - (C) that genes can be modified by crossing over and mutation
 - (D) that genes sometime change over time
- 45 DNA sites bound by regulatory transcription factors
- (A) Are trans acting factors
 - (B) Are cis acting factors
 - (C) Are promoters
 - (D) Have similar sequences in all cells
- 46 How might antisense RNA affect translation?
- (A) It can interfere with ribosome binding by blocking binding sites
 - (B) It can enhance ribosome binding by modifying binding sites
 - (C) It can prevent identification of the start codon by the ribosome
 - (D) It can interfere with the normal secondary structure of the mRNA molecule

- 47 Which of the following is involved in seedless watermelon production?
- (A) Apomixes
 - (B) Interspecific crosses
 - (C) tetraploidy
 - (D) Apomixes and Interspecific crosses
- 48 Which of the following is present on a Ti plasmid, but not on any component of a binary vector system?
- (A) Vir genes
 - (B) GUS genes
 - (C) LB, RB
 - (D) Opine genes
- 49 The quickest way to produce homozygous breeding lines from heterozygous parents is through
- (A) Aneuploidy
 - (B) half seed technique
 - (C) doubled haploids
 - (D) introgression
- 50 What does the CT value (cutoff threshold) in real time PCR experiments mean?
- (A) The lower the value, the higher the transcript amount.
 - (B) The higher the value, the higher the transcript amount
 - (C) No transcript, if the value is lower than 30
 - (D) No transcript, if the value is larger than 30
- 51 In tissue culture, disease resistance can be obtained by
- (A) Soma clonal variation
 - (B) Meristem culture
 - (C) Anther culture
 - (D) Somatic hybridisation
- 52 A molecular marker which is amplified by PCR and is polymorphic by length is a(n) ____
- (A) Restriction fragment length polymorphism (RFLP)
 - (B) Variable number of tandem repeats site (VNTR)
 - (C) Amplified fragment length polymorphism (AFLP)
 - (D) Single nucleotide polymorphism (SNP)
- 53 Which of these would not be an example of sequence element?
- (A) A recognition site for binding of a particular transcription factor
 - (B) A restriction endonuclease cut site
 - (C) An open reading frame
 - (D) A stop codon
- 54 What will heterozygous single nucleotide substitution look like on your chromatogram?
- (A) Two peaks of equal height at the same position
 - (B) One peak twice the height of those around it
 - (C) Two peaks in the same position, one twice the height of the other
 - (D) Three peaks of equal height at the same position

- 55 Genome duplication has led to polyploidy in plants. What event(s) led to the genome in domestic wheat?
- (A) Transposons from bacteria combined with genes from a grass species
 - (B) Two allopolyploid events occurred in the grass species Triticum
 - (C) Two separate grass species exchanged DNA through sexual reproduction
 - (D) Two separate grass species exchanged DNA through asexual reproduction
- 56 A discrete collection of gene fragments on a stamp-sized chip is called a _____
- (A) reference sequence
 - (B) SNP profile
 - (C) gene microarray
 - (D) semiconductor
- 57 Roughly what percentage of human genome is made up of transposon repeats?
- (A) 45%
 - (B) 0.45%
 - (C) 4.50%
 - (D) 25%
- 58 'Physical gaps' in a DNA sequence
- (A) Are easier to close than 'sequence gaps'
 - (B) Are usually smaller than 100 bp
 - (C) Can only be closed by making a new clone library
 - (D) Can only be closed by sequencing all clones in a library a second time
- 59 If 42% of a population shows the recessive phenotype, what is the expected frequency of heterozygotes?
- (A) 0.18
 - (B) 0.23
 - (C) 0.43
 - (D) 0.46
- 60 What function do homeotic genes in plants and animals have in common?
- (A) They activate the same group of target genes in both groups
 - (B) They encode identical proteins in each group
 - (C) They are transcriptional activators that regulate other genes
 - (D) They prevent cell division when they are active
- 61 Name the marker gene of streptomycin?
- (A) SPT
 - (B) HPT
 - (C) PAT
 - (D) BXN
- 62 DNA _____ is also a method for gene silencing through short RNAs.
- (A) acetylation
 - (B) acylation
 - (C) methylation
 - (D) phosphorylation

- 63 The process of RNA inactivation by siRNAs is termed as _____
- (A) RNA silencing
 - (B) Short RNA inactivation
 - (C) RNA disfunction
 - (D) RNA interference
- 64 Environmental factors most affect the expression of _____
- (A) codominant alleles
 - (B) additive alleles
 - (C) recessive alleles
 - (D) multiple alleles
- 65 Name the mapping technique used to determine the position of restriction sites in a DNA molecule.
- (A) Genetic map
 - (B) DNA markers
 - (C) Restriction mapping
 - (D) Biochemical markers
- 66 High heritability is best demonstrated in which of the following situations?
- (A) Within a wild population of clover plants, there is a very low amount of variation in the number of leaves per stem
 - (B) When studying obesity in a human population, there tends to be less variation within families than across the entire population
 - (C) In a study of adopted children, the children's height is much more similar to that of their biological parents than their adoptive parents
 - (D) The DNR maintains records of deer shot each hunting season. In drought years, the average weight is much lower than in years of sufficient rain
- 67 Polygenic inheritance centers around _____
- (A) epistasis and is qualitative
 - (B) additive alleles and is quantitative
 - (C) multiple alleles and is quantitative
 - (D) additive alleles and is qualitative
- 68 A crossing-over
- (A) Can occur late in meiosis
 - (B) Is the basis of physical mapping
 - (C) Involves 8 chromatids
 - (D) Can occur early in meiosis
- 69 Tac promoter is an example of which type of promoter?
- (A) hybrid promoter
 - (B) fusion promoter
 - (C) lacZ promoter
 - (D) araBAD promoter

- 70 The method of post transcriptional gene silencing is particularly useful in _____
- (A) animals
 - (B) insects
 - (C) plants
 - (D) microorganisms
- 71 During shRNA sequence design, why is it beneficial to incorporate A-T residues towards the 5' region of the antisense sequence of the target mRNA, and G-C residues towards the 5' region of the sense sequence of the target mRNA?
- (A) A-T residues confer more thermodynamic instability than G-C residues. The use of A-T residues at the 5' region of the antisense strand and G-C residues at the 5' region of the sense strand promote loading of the antisense strand at the 5' end into the RIS
 - (B) A-T residues confer more thermodynamic instability than G-C residues. The use of A-T residues at the 5' region of the antisense strand and G-C residues at the 5' region of the sense strand promote loading of the sense strand at the 3' end into the RISC
 - (C) G-C residues confer more thermodynamic instability than A-T residues. The use of A-T residues at the 5' region of the antisense strand and G-C residues at the 5' region of the sense strand promote loading of the sense strand at the 5' end into the RISC
 - (D) G-C residues confer more thermodynamic instability than A-T residues. The use of A-T residues at the 5' region of the antisense strand and G-C residues at the 5' region of the sense strand promote loading of the antisense strand at the 3' end into the RIS
- 72 RNA editing is the mechanism in which specific amino acids are converted after _____
- (A) transcription
 - (B) mutation
 - (C) splicing
 - (D) translation
- 73 Which statement best describes the main distinction between the origin of the two classes of small regulatory RNAs: siRNA and miRNA?
- (A) siRNAs originate within the cell cytoplasm; miRNAs originate from the cell genome
 - (B) miRNAs are expressed whenever siRNAs are unable to appropriately degrade RNA sequences
 - (C) miRNAs are processed from dsRNA viruses, siRNAs are processed from ssRNA viruses
 - (D) siRNAs originate from predominantly exogenous dsRNA; miRNAs originate from the cell genome
- 74 In CRISPR, a PAM is
- (A) a 15-20 bp sequence snipped from a viral genome that serves as a tracer DNA to locate viruses later
 - (B) a 3-5 bp sequence that adjacent to viral DNA in a CRISPR array
 - (C) Name of scientist who discovered
 - (D) the target sequence of Cas9
- 75 If gene frequency between genes a and c is 2%; b and c is 13%; b and d 4%; a and b 15%; c and d 17 and a and d 19%. The sequence of genes in a chromosome is
- (A) a,d,b,c
 - (B) d,b,a,c
 - (C) a,b,c,d
 - (D) a,c,b,d

- 76 The hierarchical genome sequencing approach is _____
- (A) dissimilar to the shotgun approach
 - (B) entirely dissimilar to the shotgun approach
 - (C) similar to the shotgun approach, but on a smaller scale
 - (D) similar to the shotgun approach, but on a larger scale
- 77 Linkage analysis
- (A) Is used in physical mapping
 - (B) Is based on recombination frequencies
 - (C) Utilizes genomic libraries
 - (D) Is primarily used with prokaryotes
- 78 Father of Indian green revolution is
- (A) M.S. Swaminathan
 - (B) Dilbagh Singh Athwal
 - (C) T.S. Venkataraman
 - (D) J.C. Boss
- 79 ADP-glucose pyrophosphorylase regulates the flux of carbohydrates into starch by
- (A) 3-PGA
 - (B) PEP
 - (C) OAA
 - (D) RuBP
- 80 In inactive state of cyclin-Cdk complex without bound cyclin the active site is blocked by a protein region known as
- (A) R-Loop
 - (B) S-Loop
 - (C) P-Loop
 - (D) T-Loop
- 81 In plants sucrose synthesis takes place in
- (A) Stroma
 - (B) Inner membrane of thylakoids
 - (C) Grana
 - (D) Cytosol
- 82 Salicylic acid is biosynthesized from the amino acid
- (A) Tyrosine
 - (B) Alanine
 - (C) Tryptophan
 - (D) Phenylalanine
- 83 A double stranded B-DNA which has a length of 340nm will contain approximately following number of base pairs
- (A) 100
 - (B) 200
 - (C) 400
 - (D) 1000

- 84 A freely reversible reaction of the citric acid cycle is catalysed by
- (A) citrate synthase
 - (B) isocitrate dehydrogenase
 - (C) α -ketoglutarate dehydrogenase
 - (D) succinyl-CoA synthetase
- 85 A laboratory set up to simulate particular environmental conditions is known as
- (A) Microcosm
 - (B) Bioremediation
 - (C) Mibridization
 - (D) Rhizosecretion
- 86 A particular enzyme loses its activity if just stored in normal saline. However, if normal saline contains 5 mM 2-mercaptoethanol, the enzyme retains its activity. What can you conclude about the enzyme from above?
- (A) It has methionine residues that are necessary for activity
 - (B) It has sulphhydryl groups that are necessary for activity
 - (C) It has disulphide bonds that are necessary for activity
 - (D) It has histidine residues that are necessary for activity
- 87 A virus having double-stranded RNA genome was found to contain 15% uracil. What is the percentage of guanine in this genome?
- (A) 15%
 - (B) 35%
 - (C) 25%
 - (D) 85%
- 88 Agropine is formed by
- (A) condensation of α -ketoglutarate with Arginine
 - (B) phosphodiester of sucrose and L-arabinose
 - (C) condensation of Pyruvate with Arginine
 - (D) condensation of Glutamate with mannose
- 89 All the following are thermostable polymerases except
- (A) Taq polymerase
 - (B) DNA polymerase III
 - (C) Vent polymerase
 - (D) pfu polymerase
- 90 Anticodon is present on
- (A) rRNA
 - (B) tRNA
 - (C) mRNA
 - (D) mtRNA

- 91 Arrange the following compounds in order of increasing membrane permeability: N₂, Urea, Fructose, Cl⁻ (chloride ion), Protein
- (A) N₂>Urea> Fructose>Cl⁻> Protein
 - (B) N₂> Fructose > Urea >Cl⁻> Protein
 - (C) N₂> Cl⁻> Fructose> Urea> Protein
 - (D) N₂> Cl⁻> Protein > Urea> Fructose
- 92 Beta-amylase is
- (A) constitutive promoter
 - (B) Seed promoters
 - (C) light regulated promoter
 - (D) root promoters
- 93 Coconut milk used in tissue culture is a source of
- (A) cytokinin
 - (B) auxin
 - (C) gibberellin
 - (D) ethylene.
- 94 Consider the ten steps of glycolysis, starting with glucose. What would be the effect on pyruvate concentration of increasing the concentration of AMP?
- (A) Increase
 - (B) Remains constant
 - (C) Decrease
 - (D) Increase or decrease
- 95 Cytoplasmic genes are called
- (A) Epigenes
 - (B) Karyon
 - (C) Plasmon
 - (D) alleles
- 96 During cytokinesis in plant cells, the cell plate is formed from the fusion of vesicles derived from which of the following
- (A) Golgi complex
 - (B) The contractile ring
 - (C) Plasma membrane
 - (D) Cell Wall
- 97 During the infection process Agrobacterium transfers a nucleoprotein complex (T-complex) into the plant cell via
- (A) type I secretion system
 - (B) type II secretion system
 - (C) type III secretion system
 - (D) type IV secretion system

- 98 E. coli found in the intestine can help the body to produce
(A) Vit A
(B) Vit C
(C) Vit D
(D) Vit K
- 99 Endosperm is
(A) Haploid
(B) Diploid
(C) Triploid
(D) Tetraploid
- 100 Flavin nucleotides are derived from the vitamin
(A) B1
(B) B2
(C) B6
(D) B12
- 101 Formation of the GFP Fluorophore is derived from
(A) Malondialdehyde and lysine
(B) p-hydroxybenzylidene-imidazolidone
(C) 4-Hydroxy-2-Nonenal and Lysine
(D) 4-N,N-dimethylamino-1,8-naphthalimide
- 102 Function of polynucleotide kinase is
(A) Addition of γ – phosphate at 3' – OH.
(B) Addition of γ – phosphate at 5' – OH.
(C) Removal of γ – phosphate at 3' – OH.
(D) Removal of γ – phosphate at 5' – OH.
- 103 Glucose is converted to acetyl coenzyme A via glycolysis, which carbon atoms of glucose are lost as CO₂?
(A) carbon atoms 1,6
(B) carbon atoms 3,4
(C) carbon atoms 2,5
(D) Any carbon depending on the pH
- 104 Heterogeneous nuclear RNA is the precursor of
(A) mRNA
(B) rRNA
(C) tRNA
(D) siRNA
- 105 In a dsDNA molecule the thymine concentration is 30%, the guanosine concentration will be
(A) 10%
(B) 20%
(C) 30%
(D) 40%

- 106 In eukaryotes, RNA primers are primarily removed by
- (A) DNA polymerase I.
 - (B) DNA polymerase α
 - (C) flap endonuclease.
 - (D) helicase
- 107 In mitochondria, the respiratory chain enzymes are located at
- (A) Matrix
 - (B) Inner membrane
 - (C) Outer membrane
 - (D) Inter membrane space
- 108 In RNAi pathway, during silencing messenger RNA of a gene is cleaved by
- (A) Dicer
 - (B) RISC
 - (C) Argonaute
 - (D) Drosha
- 109 Kinetic studies with the galactosyltransferase showed substrate inhibition by glucose and N-acetylglucosamine and could not form product. This inhibition could be due to the formation of
- (A) Apoenzyme complex
 - (B) substrate inhibitor complex
 - (C) inhibitor complex
 - (D) dead-end complex
- 110 Microtubules
- (A) Require nucleotide hydrolysis for polymerization G-actin
 - (B) Require nucleotide hydrolysis for polymerization of $\alpha\beta$ -tubulin
 - (C) Do not require nucleotide hydrolysis for polymerization G-actin
 - (D) Do not require nucleotide hydrolysis for polymerization of $\alpha\beta$ -tubulin
- 111 Molecule(s) used to regulate low glucose levels in Lac operon is
- (A) cAMP
 - (B) cGMP
 - (C) Pyruvate
 - (D) Lactose
- 112 Napin, the predominant storage protein in rapeseed, is an example of
- (A) Glutelin
 - (B) Globulin
 - (C) Prolamin
 - (D) 2S-Proteins
- 113 Okazaki pieces are made up of
- (A) RNA
 - (B) DNA
 - (C) RNA and DNA
 - (D) RNA and proteins

- 114 Photorespiration is
- (A) light-stimulated production of CO₂ by mitochondria
 - (B) Dark-stimulated production of CO₂ by peroxisome
 - (C) Dark-stimulated production of CO₂ by mitochondria
 - (D) light-stimulated production of CO₂ by peroxisome
- 115 Potent inhibitor of Na⁺/K⁺ ATPase
- (A) Ouabain
 - (B) Palytoxin from marine corals
 - (C) Digitalis
 - (D) Omeprazole
- 116 RUBISCO large subunit is encoded by
- (A) Plant nuclear genome
 - (B) Plant plastid genome
 - (C) Plant mitochondrial genome
 - (D) Bacterial genome
- 117 SmaI and XmaI are examples of
- (A) Isoschizomers
 - (B) Neoschizomers
 - (C) Rare cutters
 - (D) Isomers
- 118 Techniques used to identify the location of genes on a chromosome include
- (A) FISH
 - (B) Electrophoresis
 - (C) Reassociation kinetics
 - (D) X-ray diffraction analysis
- 119 The elements of xylem are dead except
- (A) Tracheids
 - (B) Vessels
 - (C) Xylem fibers
 - (D) Xylem parenchyma
- 120 The enzyme reverse transcriptase is also known as
- (A) DNA dependent DNA polymerase
 - (B) RNA dependent DNA polymerase
 - (C) DNA dependent RNA polymerase
 - (D) RNA dependent RNA polymerase
- 121 The first crop plant genome sequenced
- (A) Maize
 - (B) Rice
 - (C) Wheat
 - (D) Barley

- 122 The lac z gene marker codes for
(A) β galactosidase, which makes x-gal resistant to splitting
(B) ampicillin resistance
(C) white colonies
(D) β galactosidase, which splits x-gal
- 123 The nitrogenous base present in the RNA molecule is
(A) Thymine
(B) Uracil
(C) Xanthine
(D) Hypoxanthine
- 124 The pH of the lysosomal lumen is
(A) 4.5–5.0
(B) 2.0-3.0
(C) 8.0-9.0
(D) 6.5-7.5
- 125 The synthesis of histone takes place during
(A) G1 Phase
(B) G2 Phase
(C) M Phase
(D) S Phase
- 126 Totipotency is not found in
(A) leaf mesophyll
(B) tracheids
(C) meristem
(D) nodes
- 127 Vesicles containing enzymes that neutralize toxins such as alcohol are
(A) lysosomes.
(B) peroxisomes.
(C) centrosomes.
(D) endosomes
- 128 What is the form of chromatin when it is isolated in isotonic buffers?
(A) Beads-on-a-string form
(B) 30 nm condensed fibers
(C) Loop structure
(D) Condensed metaphase chromatin
- 129 Which enzyme participates in bacterial DNA replication and is directly inhibited by norfloxacin?
(A) DNA polymerase I
(B) Topoisomerase I
(C) DNA polymerase II
(D) Topoisomerase II

- 130 Which of the following are mismatched?
- (A) QTLs = RFLPs
 - (B) QTLs = more than one loci
 - (C) RFLPs = DNA markers
 - (D) Discontinuous variation = QTLs
- 131 Which of the following functions would be impaired, if excision endonuclease is mutated
- (A) Removal of introns
 - (B) Removal of pyrimidine dimers
 - (C) Protection against DNA viruses
 - (D) Repair of mismatched bases during DNA replication
- 132 Which of the following is an unsaturated fatty acid with two double bonds?
- (A) Oleic acid
 - (B) Palmitic acid
 - (C) Linoleic acid
 - (D) Stearic acid
- 133 Which of the following is known as guardians of the cell cycle?
- (A) CDKs
 - (B) CAKs
 - (C) p53
 - (D) cyclin
- 134 Which of the following is used as a measure to assess the purity of an enzyme, during the purification of the enzyme
- (A) K_m
 - (B) Katal
 - (C) Specific activity
 - (D) enzyme unit
- 135 Which of the following phosphate moiety involved in 5'-3' phosphodiester bond formation?
- (A) α
 - (B) δ
 - (C) β
 - (D) γ
- 136 Which of the following Promoter element is not found in plants?
- (A) TATA box
 - (B) CAAT box
 - (C) AGGA box
 - (D) GC box
- 137 Which one of following has the highest affinity for oxygen?
- (A) Myoglobin
 - (B) Haemoglobin
 - (C) Methemoglobin
 - (D) Porphyrin

- 138 Witches broom of Groundnut is caused by
(A) Bacteria
(B) Virus
(C) Fungi
(D) Mycoplasma
- 139 β -Amylase
(A) splits off β -maltose residues from the end of the starch molecule
(B) cleave (α 1- 4) bonds phosphorolytically, resulting in the formation of glucose 1-phosphate
(C) hydrolyze starch in the interior of the glucan chain
(D) cleave (α 1- 6) bonds phosphorolytically, resulting in the formation of glucose 1-phosphate
- 140 Transgenic variety _____ developed for virus resistance (coat protein) in papaya
(A) Maximizer
(B) Rain bow
(C) Roundup Ready
(D) Sonalika
- 141 In which crop bromoxynil herbicide resistance gene incorporated?
(A) Wheat
(B) Soybean
(C) Cotton
(D) Maize
- 142 Scientific name of bajra is
(A) *Hordeum vulgare*
(B) *Setaria italica*
(C) *Eleusine coracana*
(D) *Pennisetum glaucum*
- 143 Linkage drag is a problem in following population
(A) F₂:F₃
(B) Doubled haploids
(C) CSSLs
(D) F₂
- 144 The selectable marker gene aadA encodes
(A) Aminoglycoside 3'-adenylyltransferase
(B) Phosphinothricinacetyltransferase
(C) Betaine aldehyde dehydrogenase
(D) Glyceraldehyde 3-phospho dehydrogenase
- 145 Chloroplasts lack the machinery to perform
(A) m-RNA transcription
(B) Protein synthesis
(C) DNA replication
(D) Glycosylation

- 146 The first agricultural university of India
(A) PAU Punjab
(B) Indian Agriculture Research Institute, Pusa
(C) G. B. Pant University of Agriculture, Pantnagar
(D) Tamil Nadu Agricultural University, Coimbatore
- 147 Mapping population used for high resolution QTL mapping
(A) F2
(B) F2:F3
(C) CSSLs
(D) RSB
- 148 The population generated by crossing a set of diverse founder parents to one or two common parents
(A) MAGIC
(B) F2:F3
(C) NAM
(D) RILs
- 149 First plasmid produced and used for cloning is
(A) pBR322
(B) pSC101
(C) pUC19
(D) pMD20
- 150 Stuffer fragment is the characteristics feature of ____
(A) Insertional vector
(B) Replacement vector
(C) Gateway vector
(D) YAC vector
- 151 The enzyme reverse transcriptase first discovered by ____
(A) Richard Ros
(B) Har Gobind Khorana
(C) Beadle and Tatum
(D) Temin and Baltimore
- 152 The gene encoding phytoene synthase in Golden Rice 2 was isolated from
(A) Rice
(B) Daffodil
(C) Sanflower
(D) Maize
- 153 Transgenic focus on improving nutritional quality of canola oil by enhancing
(A) vit-E
(B) vit-A
(C) vit-B6
(D) vit-K

- 154 Frequency of crossing over is directly proportional to
(A) Number of genes
(B) Length of chromosome
(C) Width of chromosome
(D) Distance between gene
- 155 Telomeric sequences are found in ____ vector
(A) YAC
(B) HAC
(C) BAC
(D) PAC
- 156 Mitotic spindle is formed by bundles of
(A) Microtubules
(B) Microfilaments
(C) Microbodies
(D) Intermediate filaments
- 157 9 + 0 arrangement is found in
(A) Flagellum
(B) Centriole
(C) Cillium
(D) Spindle fibers
- 158 Following is the human therapeutic proteins that has been successfully produced in both transgenic animals and plants?
(A) Nerve growth factor
(B) Erythropoietin
(C) Serum albumin
(D) Somatotropin
- 159 Category III experiments could be conducted only after the clearance from _____ and notified by _____
(A) GEAC and DBT
(B) IBSC and SBCC
(C) RCGM and DBT
(D) IBSC
- 160 Precursor of ABA synthesis is
(A) Tryptophan
(B) Mevalonic acid
(C) Xanthoxin
(D) GGDP
- 161 Which of the following ion required for restriction enzyme to work
(A) Ca^{2++}
(B) Mg^{2++}
(C) Mn^{2++}
(D) Cl^{2++}

- 162 The diameter of microtubule is
(A) 10-100 nm
(B) 20-25 nm
(C) 1-10 nm
(D) 25- 30 nm
- 163 Selectable herbicides that inhibit glutamine synthase is
(A) Glufosinate ammonium
(B) Bromoxynil nitylase
(C) Streptomycin
(D) Gentamycin acetyltransferase
- 164 Which one of the following is an inhibitor of eukaryotic topoisomerase?
(A) Ciprofoxacin
(B) Puromycin
(C) Streptomycin
(D) Erythromycin
- 165 The chief source of nitrogen for green plants is
(A) Atmospheric nitrogen
(B) Low molecular weight organic nitrogenous compound
(C) Ammonium salts
(D) Nitrates
- 166 The root nodules of legumes that contain a pink pigment which has high affinity for oxygen is
(A) Nod haemoglobin
(B) Leg haemoglobin
(C) Haemoglobin
(D) Anthocyanin
- 167 Nod gene expression is induced by the presence of
(A) Flavonoids
(B) Sugars
(C) Sugar alcohol
(D) Nodules
- 168 SSR and SNP give _____ ratio for RIL population
(A) 1:0
(B) 1:2:1
(C) 1:1
(D) 3:1
- 169 The ideal temperature for Taq DNA polymerase is _____ deg C
(A) 22
(B) 65
(C) 42
(D) 72

- 170 Which one of the following is not an example of multigene families?
(A) Histocompatibility genes
(B) Heat shock proteins
(C) Zein protein
(D) Yolk proteins
- 171 Which of following is used in protoplast fusion
(A) Ammonium formate
(B) Silver nitrate
(C) Mannitol
(D) PEG
- 172 Gene silencing that is heritable is an example of
(A) Editing
(B) Imprinting
(C) Locus control region
(D) Basal factors
- 173 Following is the technique based on site specific recombination system
(A) TOPO TA cloning
(B) TA cloning
(C) Directional cloning
(D) Gateway cloning
- 174 Klenow enzyme is the product of enzymatic breakdown of
(A) DNA polymerase I
(B) DNA polymerase II
(C) DNA polymerase III
(D) RNA polymerase
- 175 One centiMorgan is defined as ____ per cent of the total recombination events
(A) 0.01
(B) 1
(C) 10
(D) 0.1
- 176 Popular LBA4404 agrobacterium strain is of following type
(A) Octopine
(B) Napaline
(C) Agropine
(D) Succinopine
- 177 Precursor of IAA synthesis is
(A) Histidine
(B) Tryptophan
(C) Phenylalanine
(D) Tyrosine

- 178 Following is the technique used for the development of marker free transgenic plants
- (A) Plasmid rescue technique
 - (B) Agrobacterium transformation
 - (C) FLP/FRT system
 - (D) Inducible system
- 179 Silicon carbide fibre method is also called as ___ transformation method
- (A) In planta
 - (B) Particle bombardment
 - (C) Whiskers
 - (D) Pollen tube
- 180 vir D operon in agrobacterium mediated gene transfer serves ___ activity
- (A) Topoisomerase and endonuclease
 - (B) Single strand binding protein
 - (C) Attachment to plant cell
 - (D) DNA polymerization
- 181 Following is the In PLANTA transformation technique
- (A) Microinjection
 - (B) Silicon carbide fibre
 - (C) Particle bombardment
 - (D) Pollen tube transformation
- 182 Autonomously replicating sequences (ARS) is a characteristic feature of
- (A) BAC
 - (B) YAC
 - (C) Cosmid
 - (D) pBR322
- 183 The Xa21 gene confers a broad resistance in rice against
- (A) Powdery mildews
 - (B) Sclerotinia rots
 - (C) Anthracnose
 - (D) Bacterial blight
- 184 Vectors which replicate in two different species are called
- (A) Shuttle vector
 - (B) Cosmid vector
 - (C) Replacement vector
 - (D) Fosmid vector
- 185 Desmosomes play a role in
- (A) Cell Adherence
 - (B) Cell division
 - (C) Cytolysis
 - (D) Cytokinesis

- 186 Phytoalexin present in chickpea is
(A) Pisatin
(B) Danielone
(C) Medicarpin
(D) Diterpenoid
- 187 Gene_____ provide tolerance to chilling in crop plants
(A) MYB
(B) Glycerol-3-phosphate acyltransferase
(C) Mannose-6 phosphate
(D) Ferritin
- 188 cryIVA and cryIVB protein found effective against
(A) Lepidoptera
(B) Nematode
(C) Diptera
(D) Arthropod
- 189 The protein packed potato developed by transferring gene from
(A) Amaranthus
(B) Carrot
(C) Tomato
(D) Onion
- 190 G-protein coupled receptor is also called as
(A) NBS-LRR receptor
(B) Tyrosin kinase receptor
(C) Serpentine receptor
(D) Clatherine coated receptor
- 191 _____ are cis-acting DNA sequences that often function at a distance from the gene they are regulating.
(A) Enhancer
(B) Regulator
(C) Promoter
(D) Terminator
- 192 The regulation of tryptophan is based on _____ mechanism
(A) Induction
(B) Anti-termination
(C) Repression
(D) Attenuation
- 193 How many structural genes are present in Tryptophan operon
(A) 3
(B) 7
(C) 5
(D) 9

- 194 In which crop three genes cry1Ab, EPSPS and gox stacked by transgenic technique?
(A) Rice
(B) Maize
(C) Tobacco
(D) Potato
- 195 Antibody against Hepatitis B through molecular farming is produced in
(A) Maize
(B) Tobacco
(C) Turnip
(D) Potato
- 196 Inhibitor of E2F transcription factor in cell cycle is
(A) Rb protein
(B) Cdc5p
(C) CYCB
(D) cdc6
- 197 A correction or alleviation of a genetic disorder by the introduction of normal gene copy into affected individual is called as
(A) Gene cloning
(B) Gene Probing
(C) Gene multiplication
(D) Gene therapy
- 198 Vacuoles are bounded by
(A) Plasmalemma
(B) Tonoplast
(C) Pellicle
(D) Chromoplast
- 199 The first generation DNA sequencing technique is based on
(A) Chain termination
(B) Pyrosequencing
(C) H proton
(D) Bridged amplification
- 200 The genes which are most important regulator of flower development are
(A) CO and CDF
(B) CO and FT
(C) Gigantea and FKF
(D) FT and 14-3-3

Q.No	Option	Q.No	Option	Q.No	Option	Q.No	Option
1	A	51	A	101	B	151	D
2	A	52	C	102	B	152	D
3	B	53	C	103	B	153	A
4	A	54	A	104	A	154	D
5	A	55	B	105	B	155	A
6	C	56	C	106	C	156	A
7	A	57	A	107	B	157	B
8	B	58	C	108	B	158	D
9	D	59	D	109	D	159	C
10	C	60	C	110	B	160	C
11	D	61	A	111	A	161	B
12	C	62	C	112	D	162	B
13	B	63	D	113	C	163	A
14	D	64	B	114	D	164	A
15	D	65	C	115	A	165	D
16	B	66	C	116	A	166	B
17	B	67	B	117	B	167	A
18	C	68	D	118	A	168	C
19	B	69	A	119	D	169	D
20	D	70	C	120	B	170	C
21	B	71	A	121	B	171	D
22	C	72	A	122	D	172	B
23	C	73	D	123	B	173	D
24	C	74	B	124	A	174	A
25	C	75	D	125	D	175	B
26	B	76	C	126	B	176	A
27	B	77	B	127	B	177	B
28	C	78	A	128	A	178	C
29	C	79	A	129	D	179	C
30	D	80	D	130	D	180	A
31	D	81	D	131	B	181	D
32	D	82	C	132	C	182	B
33	B	83	D	133	C	183	D
34	C	84	D	134	C	184	A
35	B	85	A	135	A	185	A
36	C	86	B	136	B	186	C
37	D	87	B	137	C	187	B
38	A	88	D	138	D	188	C
39	A	89	B	139	A	189	A
40	D	90	B	140	B	190	C
41	D	91	A	141	C	191	A
42	B	92	B	142	D	192	C
43	B	93	A	143	C	193	C
44	C	94	A	144	A	194	B
45	B	95	C	145	D	195	B
46	A	96	A	146	C	196	A
47	A	97	D	147	D	197	D
48	D	98	D	148	C	198	B
49	C	99	C	149	B	199	A
50	A	100	B	150	B	200	B