

# **Animal Biotechnology**

## **Answer Key**

**26/06/2021**



# Gujarat Biotechnology Research Centre

Animal Biotechnology (Scientist B)

This question booklet contains 28 pages

Application No: \_\_\_\_\_

Time: 2 Hours

Total Marks: 200

Total Questions: 200

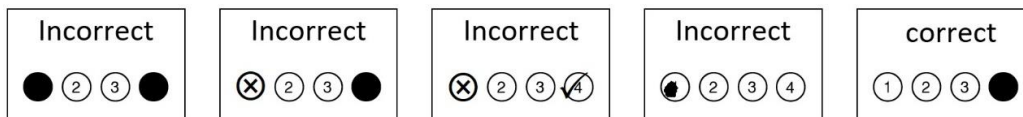
Candidate Signature : .....

Invigilator Signature : .....

## Instructions for Candidate

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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 Which of the following is called "discrete Karhunen–Loève transform"?
  - (A) PCA
  - (B) MANOVA
  - (C) log transform
  - (D) anti-log transform
  
- 2 The degree to which two entities share identities is indicated by:
  - (A) Identity
  - (B) Similarity
  - (C) InDel
  - (D) Chance-factor
  
- 3 In a peptide sequence, the average molecular weight of an amino acid residue is considered as
  - (A) 100
  - (B) 110
  - (C) 120
  - (D) 130
  
- 4 Which is the only amino acid whose 'R' group has a pK near 7.0?
  - (A) Threonine
  - (B) Glycine
  - (C) Arginine
  - (D) Histidine
  
- 5 Which of the following is not an alignment tool for short reads?
  - (A) BWA
  - (B) Bowtie
  - (C) Stampy
  - (D) Lalign
  
- 6 Who is considered as the "Mother of Bioinformatics"
  - (A) M Dayhoff
  - (B) M. Currie
  - (C) Walter Goad
  - (D) Antonia Tereskova
  
- 7 Which of the following is used for predicting the dynamical motion of molecules and bulk liquids for modeling biomolecules?
  - (A) GROMOS
  - (B) GALVIEW
  - (C) Glimmer
  - (D) HHPRED
  
- 8 What is BioGrid?
  - (A) It is an "online interaction repository with data compiled through comprehensive curation efforts"
  - (B) It's a human gene mutation database
  - (C) It's a global public domain database of structured bibliographical records on biological sciences
  - (D) a sequence alignment tool

- 9 Which was the first DNA-binding protein motif to be recognized?  
(A) Zinc Finger  
(B) Helix-turn-Helix  
(C) Beta-Helix-Beta  
(D) Ca-Finger
- 10 Which database only contains sequence families not covered in Pfam-A?  
(A) PIR  
(B) Pfam-B  
(C) Prints  
(D) BLOCKs
- 11 Which amino acid has no asymmetric carbon atoms, hence, no stereoisomers or enantiomers?  
(A) Threonine  
(B) Glycine  
(C) Arginine  
(D) Histidine
- 12 Which of the following SAGE database is created by NCBI?  
(A) AdaSage  
(B) UsAge  
(C) SAGEmap  
(D) SAGANCB
- 13 Which one of the following is used for the identification and annotation of genetically mobile domains and their architectures?  
(A) ENSEMBL  
(B) SCOP  
(C) CATH  
(D) SMART
- 14 Who was the developer of Python?  
(A) Dennis Ritchie  
(B) Larry Wall  
(C) James Rice  
(D) Guido van Rossum
- 15 Which of the following program uses compares the masses of peptide fragments against the theoretical peptides in the experimentally determined peptide fingerprint information?  
(A) SCOP  
(B) CATH  
(C) Find Mod of Expasy  
(D) SRA
- 16 When the system is controlled and the system state is fully observable, the Markov model is known as:  
(A) Markov chain  
(B) Markov decision process  
(C) Hidden Markov model  
(D) Partially observable Markov decision process

- 17 Which of the given methods of phylogeny applies the Optimality criterion for tree construction based on distances?  
(A) UPGMA  
(B) Minimum evolution  
(C) Maximum Parsimony  
(D) Maximum Likelihood
- 18 Which type of structure shows the following bonding: "Carbonyl oxygen of one peptide bond links to the NH-group of the fourth amino acid away"  
(A) Alpha-helix  
(B) Beta-pleated sheets  
(C) Coils  
(D) Turns
- 19 The potential energy of a substance due to forceful interaction amongst the constituent entities or its position in space  
(A) Force-field  
(B) Gibbs free Energy  
(C) Entropy  
(D) Enthalpy
- 20 Which of the following tool converts input DNA or peptide sequence to specified output format?  
(A) Dotlet  
(B) READSEQ  
(C) CARMA  
(D) PEDANT
- 21 C language was developed by:  
(A) Larry Wall  
(B) E F Codd  
(C) M Dayhoff  
(D) Dennis Ritchie
- 22 Which angle in a peptide describes the rotation about the N-C( $\alpha$ ) bond and involves the C(O)-N-C( $\alpha$ )-C(O) bonds  
(A) Omega  
(B) Psi  
(C) Phi  
(D) Delta
- 23 Which of the following online tool is used for real-time PCR data analysis?  
(A) SuperSAGE  
(B) BLINK  
(C) CATH  
(D) REST
- 24 Which of the following is an NMR-active nucleus?  
(A)  $^1\text{H}$   
(B)  $^2\text{H}$   
(C)  $^{14}\text{C}$   
(D)  $^{20}\text{C}$

- 25 The tool COPIA is used for \_\_\_\_\_
- (A) Local alignment
  - (B) Copy number identification
  - (C) Molecular phylogeny
  - (D) Motif identification
- 26 In real time PCR, the change in reporter signal (as compared to background noise) normalized to a passive fluorescent reference dye is known as \_\_\_\_\_
- (A) ddCt
  - (B) Reporter normalized
  - (C) threshold cycle
  - (D) dCt
- 27 Which of the following is not used as the "Energy Minimization" method?
- (A) Newton-Raphson Method
  - (B) Steepest Descent Method
  - (C) Conjugate Gradient Method
  - (D) Cubical Gradient Method
- 28 SAGE is not suitable for which of the following?
- (A) Rapid screening of cells
  - (B) Absolute quantification of mRNA expression
  - (C) Manual identification of DEGs
  - (D) Manual screening for co-expressed genes
- 29 Which was the last amino acid discovered (from fibrin)?
- (A) Arginine
  - (B) Glycine
  - (C) Threonine
  - (D) Valine
- 30 Alpha helix regions of proteins is rich in \_\_\_\_\_
- (A) Proline (P)
  - (B) Glycine (G)
  - (C) Tyrosine (Y)
  - (D) Alanine (A)
- 31 The method of choice for constructing the phylogenetic tree using very divergent input sequences is:
- (A) Maximum parsimony
  - (B) Minimum evolution
  - (C) Maximum likelihood
  - (D) Clustering algorithm
- 32 Which British biochemist developed the technique of protein crystallography (and won Nobel prize in 1964 in recognition of that work)
- (A) John Masson Gulland
  - (B) Dorothy Crowfoot Hodgkin
  - (C) Derek Blake
  - (D) Pauline Harrison

- 33 Which of the following NGS platform offers the fastest run per sample?  
(A) 454 GS-FLX Plus (Roche)  
(B) Ion Proton (Life)  
(C) PacBio (RS)  
(D) SOLiD (Life)
- 34 Which of the following is not an alternative of BLAST?  
(A) BLASTp  
(B) BLASTn  
(C) xBLASTt  
(D) BLASTx
- 35 Which program uses HMM method to find motifs in a set of related protein sequences and the spacer regions between them  
(A) SMART  
(B) iPfam  
(C) Meta-MEME  
(D) BioEdit
- 36 A set of motifs representing a family of protein is called \_\_\_\_\_  
(A) PRINTS  
(B) Blocks  
(C) Motifs  
(D) Finger-Print
- 37 A high quality, manually and highly annotated database of protein that describes protein family and functions is called \_\_\_\_\_  
(A) PRINTS  
(B) Blocks  
(C) Motifs  
(D) Finger-Print
- 38 Which amino acid is the alpha-helix terminator of peptides?  
(A) Alanine (A)  
(B) Cysteine (C)  
(C) Glycine (G)  
(D) Proline (P)
- 39 A short conserved sequence pattern associated with distinct functions of a protein or DNA, is called \_\_\_\_\_  
(A) Domain  
(B) Motif  
(C) Family  
(D) Consensus
- 40 Which amino acid has hot H atom as R-group, making it the smallest amino acid  
(A) Proline  
(B) Alanine  
(C) Arginine  
(D) Glycine

- 41 In DBMS terms, a single piece of information is called:
- (A) Field
  - (B) File
  - (C) Record
  - (D) Key
- 42 The dimension of which tree has got no scale?
- (A) Ultrametric trees
  - (B) Phylogram
  - (C) Chronogram
  - (D) Cladogram
- 43 \_\_\_\_\_ are the low energy, side-chain conformations of peptide chains forming a set of conformers arising from restricted rotation around a single bond
- (A) BLOCKS
  - (B) Rotamers
  - (C) SCOP
  - (D) Isoenzymes
- 44 Which factor has no impact on the stability of an  $\alpha$ -helix?
- (A) Presence of Alanine (A) residues in the sequence of alpha-helix
  - (B) Repulsion due to electrostatic force
  - (C) Interaction between the Reactive groups that are spaced 3 residues apart
  - (D) The occurrence of Glycine and Proline residues
- 45 The non-amino acid portion of the conjugate protein is called \_\_\_\_\_
- (A) ProDom
  - (B) R-group
  - (C) Prosthetic group
  - (D) Stem-loop
- 46 Which kind of phylogenetic analysis is the best for very very close sequence inputs?
- (A) Maximum Parsimony
  - (B) UPGMA
  - (C) Maximum Likelihood
  - (D) Organogram
- 47 Which of the following tree construction method uses Fitch-Margoliash Algorithm to create a new distance table?
- (A) Maximum Parsimony
  - (B) UPGMA
  - (C) Neighbour joining
  - (D) Maximum likelihood
- 48 The offline version of Clustal for multiple sequence alignment is called
- (A) MEGA
  - (B) Clustal X
  - (C) Clustal W
  - (D) Clustal Omega

- 49 Needleman-Wunsch algorithm is an example of \_\_\_\_\_
- (A) local alignment algorithm
  - (B) Heuristic algorithm
  - (C) SVM
  - (D) Dynamic programming
- 50 Which of the following amino acid is known as alpha-amino acid?
- (A) Proline
  - (B) Threonine
  - (C) Glycine
  - (D) Arginine
- 51 Which resampling technique is used to determine the accuracy of branching of a phylogenetic tree?
- (A) Bootknifing
  - (B) Jackstrapping
  - (C) SNP-tagging
  - (D) Bootstrapping
- 52 \_\_\_\_\_ are mathematical models to predict measures of toxicity from physical characteristics of the structure of chemicals
- (A) SRS
  - (B) GROMOS
  - (C) NOESY
  - (D) QSAR
- 53 Homeodomain Proteins is a group of proteins that constitute a special class of \_\_\_\_\_
- (A) Globin proteins
  - (B) Cytoskeletal proteins
  - (C) Helix-turn-Helix
  - (D) C-binding
- 54 Which of the following has the mutation rate of 0.001 to 0.00001 per base per generation?
- (A) DNA viruses
  - (B) RNA viruses
  - (C) Mammalian genome
  - (D) Artificial chromosomes
- 55 Fruit fly genome was sequenced in:
- (A) 2000
  - (B) 2002
  - (C) 2006
  - (D) 2008
- 56 Which genome sequence was the first completed and published DNA completely sequenced by Sanger et al. in 1978?
- (A) T4 Phage
  - (B) Lambda Phage
  - (C)  $\Phi$ X174
  - (D) M13

- 57 The secondary structure of a peptide is mainly maintained by which of the following?  
(A) Hydrogen bond  
(B) Van der Waals force  
(C) Hydrophobic interactions  
(D) Ionic bonds
- 58 Which of the following motif can mediate both DNA-binding vis-à-vis protein dimerization?  
(A) Helix-turn-Helix  
(B) Leucine-zipper  
(C) beta-sheets  
(D) Zinc-finger
- 59 Which BLAST variant uses Nucleotide sequences as queries to search against a protein sequence database?  
(A) BLASTn  
(B) BLASTp  
(C) BLASTx  
(D) tBLASTx
- 60 The biocomputational method to best match the interaction between a ligand and a receptor is called \_\_\_\_\_  
(A) Inter-molecular fitting  
(B) Biomatching  
(C) Molecular-binding  
(D) Molecular docking
- 61 In Ramachandran's plot, the torsion angles are determined by considering the steric constraints from \_\_\_\_\_ radii of each atom  
(A) electron density  
(B) van der Waals  
(C) electrostatic  
(D) electromagnetic
- 62 What is the cutoff of the polar surface area of a drug?  
(A) <0.2 Angstrom  
(B) <120 Angstrom  
(C) <200 Angstrom  
(D) <250 Angstrom
- 63 Which information is not obtained from the X-Ray crystallography study?  
(A) Intramolecular interaction  
(B) Intermolecular interaction  
(C) the vibration frequency of atoms  
(D) the physical extent of vibration of atoms
- 64 \_\_\_\_\_ is a text listing of commands to be compiled or assembled into an executable computer program  
(A) Source code  
(B) Open code  
(C) Executable code  
(D) line of codes

- 65 The energy of the system relative to a reference point, that can be used to compare the relative stabilities of different conformations of the same molecule
- (A) Entropy
  - (B) Steric energy
  - (C) Free energy
  - (D) Bond energy
- 66 What is the maximum number of alleles a SNP can have?
- (A) One
  - (B) Two
  - (C) Three
  - (D) Four
- 67 The quantitative evaluation of DNA can be done using
- (A) OD<sub>260nm</sub>/OD<sub>280nm</sub>
  - (B) OD<sub>260nm</sub>
  - (C) OD<sub>280nm</sub>
  - (D) OD<sub>280nm</sub>/OD<sub>260nm</sub>
- 68 An advantage of genetically superior male germplasm can be easily exploited using
- (A) Superovulation
  - (B) IVF
  - (C) ETT
  - (D) AI
- 69 Analysis can be used to determine whether a sample has been sequenced to an extent sufficient to represent its true diversity
- (A) Johnson's diversity index
  - (B) Rarefaction analysis
  - (C) Marry's diversity Index
  - (D) MetaDiverse analysis
- 70 Which structure of bacteria causes fever, hypotension, septic shock and DIC?
- (A) Core polysaccharide
  - (B) O-side chain
  - (C) Lipid A
  - (D) Flagellin protein
- 71 A pair of tubes that allow fermentation of undigested food and routinely used to estimate microbial diversity of chicken gut
- (A) Duodenum
  - (B) Gizzard
  - (C) Jejunum
  - (D) Caeca
- 72 The melting temperature of primer ACTGGTCATCGACAGTTGAC is
- (A) 56 °C
  - (B) 60 °C
  - (C) 57 °C
  - (D) 58 °C

- 73 Melting curve analysis is associated with all except
- (A) Detect SNPs
  - (B) Real Time PCR
  - (C) Detecting annealing temperature of primer
  - (D) SYBR Green
- 74 Functional annotation of metagenomic data can be obtained using
- (A) Bowtie
  - (B) MG-RAST
  - (C) CuffMeta
  - (D) Cuffdiff
- 75 A large class of RNA molecules with size larger than 200 nucleotides exhibiting important role in cancer biology with no protein-coding capability
- (A) miRNA
  - (B) mRNA
  - (C) lncRNA
  - (D) small nuclear RNA
- 76 Identify the oxidizing agent used in Polyacrylamide gel electrophoresis?
- (A) TEMED
  - (B) APS
  - (C) EtBR
  - (D) Bisacrylamide
- 77 Which of the following is an unusual feature of the replication cycle in coronaviruses?
- (A) The all RNAs terminate in a common 3' and produce nested set transcripts
  - (B) They take advantage of recombination of RNA genome
  - (C) They are not highly mutable
  - (D) They use capped cellular mRNA's
- 78 In process of sterilisation, dry heat kills the organisms by
- (A) Coagulating and denaturing enzymes
  - (B) Coagulating and denaturing structural proteins
  - (C) Generating mutations in DNA
  - (D) Destructive oxidation of essential cell constituents
- 79 Antibiotic that interferes with protein synthesis by attaching to 50S ribosomal subunit
- (A) Erythromycin
  - (B) Gentamicin
  - (C) Streptomycin
  - (D) Colistin
- 80 Transgene insertion can be achieved using
- (A) Macroinjection
  - (B) Retroviral Vectors
  - (C) PCR
  - (D) Electrophoresis

- 81 The accessory molecule of helper T cells is  
(A) CD4 molecule  
(B) CD5 molecule  
(C) CD6 molecule  
(D) CD8 molecule
- 82 Identify the programme / software not associated with filtering or visualisation of NGS QC data?  
(A) FastQC  
(B) PRINSEQ  
(C) QUAST  
(D) WGSQC
- 83 Identify dominant molecular marker  
(A) RAPD  
(B) RFLP  
(C) Microsatellite  
(D) SNP
- 84 Numbers of chromosomes in Gir cow is  
(A) 60  
(B) 58  
(C) 50  
(D) 54
- 85 An important role of serum in animal tissue culture  
(A) Cell detachment and growth  
(B) Provides transport protein to carry hormone, lipids, and minerals  
(C) Buffering to media  
(D) Viscosity maintenance in culture
- 86 Which one of the following is most important in metagenomics, metatranscriptomics, and metabolomics studies,  
(A) MetaZeta  
(B) MetaData  
(C) MetaDoor  
(D) MetaBiom
- 87 Identify the relationship between evolution and mutations?  
(A) Mutations happened early in evolution, but not now  
(B) No relationship between evolution and mutation  
(C) Mutations can create new alleles  
(D) Mutations makes genes superior
- 88 A chemical used to get elongated chromosomes during short term lymphocyte culture in cattle  
(A) Ethidium Bromide  
(B) Colchicine  
(C) Phytohaemagglutinin  
(D) DNA Elongase

- 89 Which of the following step is not associated with "Genome Reconstruction" of an organism
- (A) Sequencing
  - (B) Binning
  - (C) Assembly
  - (D) RNA Editing
- 90 Phenol red can't be used a pH indicator in animal tissue culture with
- (A) Chicken fibroblast culture
  - (B) HeLa cells
  - (C) Estrogen sensitive cells
  - (D) BHK-21 Cells
- 91 Before being degraded by the proteasome, the cyclins are marked for destruction by the attachment of a small protein known as
- (A) Proteasome
  - (B) Cheperons
  - (C) Ubiquitin
  - (D) Protein Kinase
- 92 The current technology for production of 'Sexed Semen' is based on which of following?
- (A) Differential Centrifugation
  - (B) Flow Cytometry
  - (C) HPCL
  - (D) GC
- 93 An organism on which first cell line was observed?
- (A) C.elegans
  - (B) Zebra fish
  - (C) E.coli
  - (D) Mouse
- 94 Selective degradation of single stranded DNA is carried out by the enzyme
- (A) Nuclease
  - (B) Ribonuclease
  - (C) S1 nuclease
  - (D) Deoxy ribonuclease
- 95 Factor affecting rotational centrifugal force is
- (A) Gravitational force
  - (B) Weight of rotor
  - (C) Type of totor
  - (D) Company of rotor
- 96 Which one of the following is a cattle breed of Gujarat?
- (A) Deoni
  - (B) Kankrej
  - (C) Nellore
  - (D) Jaffrabadi

- 97 Stuffer is
- (A) The right arm of the vector DNA
  - (B) The left arm of the vector DNA
  - (C) Central fragment of the vector DNA
  - (D) RE digested marker fragment of vector DNA
- 98 Which type of immunoglobulins is secreted in highest amount in milk of cow?
- (A) IgD
  - (B) IgA
  - (C) IgG
  - (D) IgM
- 99 Bead-linked transposome tagmentation is an innovative technology used in
- (A) Bridge amplification
  - (B) Library preparation
  - (C) Sequencing on a flow cell
  - (D) Restriction Fragment Length Polymorphism
- 100 Antibody diversity is generated by
- (A) Allelic exclusion
  - (B) Protein Splicing
  - (C) Somatic mutation
  - (D) Interchromosomal recombination
- 101 The first monoclonal antibody licenced by FDA
- (A) Muromoban-OKT3
  - (B) Insulmonab-INS1
  - (C) Osteomonab-OST2
  - (D) KohlMelmonab-KOHME1
- 102 Following are characteristics of 'Hapten' except
- (A) Low molecular weight protein
  - (B) Partial antigen
  - (C) Having only antigenicity
  - (D) Having only immunogenicity
- 103 A visualisation tool facilitate the identification and analysis of similarities as well as differences arising from comparisons of genomes
- (A) Circos
  - (B) Blast2Go
  - (C) NCBI-BLAST
  - (D) Cytoscape
- 104 A process not associated with automated Sanger's sequencing
- (A) Cycle Sequencing
  - (B) Chain termination by dNTPs
  - (C) Capillary Electrophoresis
  - (D) Clean-up for primers and unincorporated dNTPs

- 105 A reaction involved in removal of introns  
(A) Trans-esterification  
(B) Methylation  
(C) Acetylation  
(D) Glycosilation
- 106 Cell culture is in-vitro because  
(A) Genetic changes occur in the cell nucleus and cell membrane  
(B) Cells are not directly touching each other  
(C) Cells lost some proteins during culture  
(D) Interactions with other cell types and 3D interactions are lost
- 107 A highly heritable trait in cattle is  
(A) Milk yield  
(B) Fat percentage  
(C) Conception rate  
(D) Body weight
- 108 Genome of Corona virus is  
(A) Segmented positive-sense single-stranded RNA  
(B) Nonsegmented negative-sense single-stranded RNA  
(C) Segmented negative-sense single-stranded RNA  
(D) Non-segmented positive-sense single-stranded RNA
- 109 Which of the following technology is most accurate to quantify X bearing spermatozoa in semen of buffalo bull?  
(A) ddPCR  
(B) Reverse Transcriptase PCR  
(C) qPCR  
(D) LAMP
- 110 The biological motor proteins that are ATP-dependent and function to assist cells with the transport of molecules along microtubules  
(A) Tubulins  
(B) Kinesins  
(C) Axoneme  
(D) Centriole
- 111 ORF scanning is used to find  
(A) Intergenic sequences  
(B) Exons  
(C) Gene homologies  
(D) Protein coding genes
- 112 Isobaric tags are  
(A) Fluroscently labelled proteins  
(B) DiGE  
(C) Molecules of equal mass  
(D) Molecules of equal charge

- 113 Which of the following NGS chemistry will generate >70-80% DNA reads with Q30?  
(A) MiSeq  
(B) IonTorrent S5  
(C) Nanopore Sequencing  
(D) Sanger's Sequencing
- 114 Paracrine signals come from which of the following in animal tissue culture?  
(A) Serum  
(B) Components of media except serum  
(C) Other neighboring cells  
(D) Contaminants of cell culture media
- 115 What should be the pH of phenol used in RNA extraction?  
(A) Neutral  
(B) Acidic  
(C) Basic  
(D) Doesn't matter
- 116 Which of the following metabolic process occurs in mitochondria?  
(A) Cholesterol synthesis  
(B) Fatty acid synthesis  
(C) Beta oxidation of fatty acids  
(D) Glycolysis
- 117 Identify the software / pipeline used for metagenomic data analysis  
(A) QIIME  
(B) STAR  
(C) Cuffdiff  
(D) GBrowse
- 118 Showing actual metaphase spread image of a chromosome in systematically arranged fashion  
(A) Idiotype  
(B) Idiogram  
(C) Karyogram  
(D) Karyotype
- 119 Crossing over occurs in which phase of meiosis?  
(A) Metaphase I  
(B) Metaphase II  
(C) Prophase I  
(D) Prophase II
- 120 The most probable cause of extinction of dinosaurs may be  
(A) Meteorite striking  
(B) Competition  
(C) Environmental change  
(D) Unknown

- 121 Tay-Sachs disease is the result of a genetic defect in the metabolism of
- (A) Triacylglycerols
  - (B) Gangliosides
  - (C) Steroids
  - (D) Vitamin D
- 122 Identify the component which moves in opposite direction to that of DNA during agarose gel electrophoresis?
- (A) Xylene Cyanol
  - (B) Bromophenol Blue
  - (C) Ethidium Bromide
  - (D) Glycerol
- 123 A commonly used genomic marker for characterisation of livestock breed is
- (A) RAPD
  - (B) RFLP
  - (C) VNTRs
  - (D) PCR
- 124 Which one of the following software can't be used for normalization, quantitative analysis and differential expression of RNA-Seq data?
- (A) TopHat
  - (B) Cufflinks
  - (C) DESeq
  - (D) EdgeR
- 125 Response to selection (Genetic gain) is inversely proportional to
- (A) Generation interval
  - (B) Accuracy of selection
  - (C) Intensity of selection
  - (D) Genetic variability
- 126 Which phage is commonly used for phage display technique?
- (A) T7 phage
  - (B) Lamda phage
  - (C) M13 phage
  - (D) T3 phage
- 127 Enzyme responsible for replication and repair of mitochondrial DNA in cattle is
- (A) DNA Pol gamma
  - (B) DNA Pol alpha
  - (C) DNA Pol epsilon
  - (D) DNA Pol beta
- 128 Which is a tool for analyzing gene expression that consists of a small membrane or glass slide containing samples of many genes arranged in a regular pattern.
- (A) qPCR
  - (B) Microarray
  - (C) NGS
  - (D) Ion Torrent PGM

- 129 The strongest non-covalent interaction known in nature is,  
(A) Hydrogen Bonds of A:T  
(B) Streptavidine:Biotin  
(C) Peptide bonds of protein  
(D) Hydrogen Bond of G:C
- 130 Andrew Fire and Craig Mello won a Nobel Prize in 2006 for their work, begun in the late 1990s, on RNA interference. Which of the following organisms did they work on?  
(A) Drosophila  
(B) C. elegans  
(C) E.coli  
(D) House fly
- 131 Mary Fances Lyon is best known for her discovery of  
(A) Sexed semen  
(B) Site directed mutagenesis  
(C) Gene editing  
(D) X-chromosome inactivation
- 132 ..... are small DNA sequences that can move virtually any position in a cell's genome.  
(A) Transposons  
(B) Inserons  
(C) Jumping genes  
(D) Random genes
- 133 A short DNA or an RNA molecule used in hybridization is known as  
(A) Nucleotide  
(B) Probe  
(C) Oligonucleotide  
(D) Primer
- 134 Which medium is used for selection of hybrid cell in hybridoma technology  
(A) GMEM  
(B) HGPRT  
(C) RPMI-1640  
(D) HAT
- 135 Nobel Prize awardee for IVF  
(A) Sir Robert Geoffrey Edwards  
(B) Amartya Sen  
(C) Paul Berg  
(D) Sir Frank Macfarlane Burnet
- 136 Which is/are act as stop codon in transcription of gene in eukaryotes.  
(A) AUC, UAG and ATG  
(B) UGG, UAA, and UAG  
(C) UGA, UAA, and UAG  
(D) UGA and UAG

- 137 A technique of using very small metal particles coated with desired gene in the gene transfer is called
- (A) Liposome
  - (B) Microinjection
  - (C) Electroporation
  - (D) Biolistics
- 138 A totipotent cell means
- (A) Cell which lacks the capability to differentiate into an organ or system
  - (B) An undifferentiated cell capable of developing into complete embryo
  - (C) An undifferentiated cell capable of developing into an organ
  - (D) An undifferentiated cell capable of developing into complete embryo and extraembryonic cells
- 139 Monte Carlo simulation is used to \_\_\_\_\_
- (A) multiple sequence alignment
  - (B) neighbor joining
  - (C) model the outcomes of a random experiment
  - (D) Sequence format conversion
- 140 DNA fingerprints will be exactly the same for
- (A) mother and daughter
  - (B) monozygotic twins
  - (C) sibling
  - (D) All members of the same species
- 141 EcoRI is which type of RE enzyme
- (A) Type I
  - (B) Type II
  - (C) Type III
  - (D) Type IV
- 142 GMO means
- (A) Genetically Modified Organism
  - (B) Genetic Modification Organization
  - (C) Genome Management Organization
  - (D) Gene Mutated Organism
- 143 Inventor of PCR
- (A) K. Mullis
  - (B) Watson and Crick
  - (C) Nirenberg and Khorana
  - (D) F. Sangar
- 144 One of the following techniques employs the use of positively charged molecules like polymers or lipids to deliver gene into cells.
- (A) Viral gene transfer
  - (B) Lipofection
  - (C) Microinjection
  - (D) Biolistic particle delivery

- 145 Phagemid vectors are
- (A) combination of phages and cosmid
  - (B) phages carrying properties of plasmids
  - (C) Its one type of plasmid only
  - (D) combination of plasmid and phage  $\lambda$
- 146 Process of cloning dolly by Wilmut et al is known as
- (A) Somatic transfer
  - (B) Gametic cell transfer
  - (C) Gametic Nuclear Transfer
  - (D) Somatic Cell Nuclear Transfer
- 147 Sangar's DNA sequencing use
- (A) dNTP
  - (B) ddNTP
  - (C) NTP
  - (D) Radiolabelled NTP
- 148 Sterilization is defined as the removal or destruction of
- (A) all bacteria and viruses
  - (B) all pathogenic micro-organisms
  - (C) all micro-organisms including bacterial spores
  - (D) all micro-organisms excluding bacterial spores
- 149 Which of the following is NOT a characteristic of Taq polymerase
- (A) most common enzyme used for PCR amplification
  - (B) extremely heat resistant
  - (C) incorporated nucleotides at a rate of 1–2 kilobases per minute
  - (D) Has proof reading activity
- 150 The viral enzyme reverse transcriptase is used in gene cloning to
- (A) cut DNA into smaller fragments
  - (B) create "sticky" ends to facilitate joining DNA fragments together
  - (C) generate cDNA corresponding to cellular mRNA
  - (D) break down bacteria membranes to aid transformation
- 151 What would be the sequence of bases in RNA transcribed from the sequence TACCAG?
- (A) TACCAG
  - (B) UACCAG
  - (C) ATGGTC
  - (D) AUGGUC
- 152 Which of the following statements is correct?
- (A) Cy3 and Cy5 dyes used in microarrays to label to the 5' and 3' ends of DNA respectively
  - (B) Microarrays have only one for each gene
  - (C) Oligodendrimers are used to amplify the fluorescent signal from microarrays
  - (D) qPCR quantify the protein present in the sample

- 153 Which of the following techniques is not used for studying /detecting gene Expression ?
- (A) Subtractive hybridization
  - (B) Microarray hybridization
  - (C) Differential display PCR
  - (D) Southern hybridization
- 154 Animals that are engineered to express a desired protein in their milk are known as
- (A) Transpharmers
  - (B) Transgender
  - (C) Non-transgenic
  - (D) Knock out animal
- 155 Which of the following marker system reveal higher polymorphism ?
- (A) RAPD
  - (B) AFLP
  - (C) SSCP
  - (D) SNP
- 156 Desmin is tissue marker for
- (A) Muscle
  - (B) Astrocytes
  - (C) Epithelium
  - (D) Neuron
- 157 Nucleotide sequence within a gene that is transcribed into RNA but exercised before translation is called
- (A) Liposome
  - (B) Exon
  - (C) Intron
  - (D) miRNA
- 158 Enzymes that recognize 4 to 8 base pair sequences of DNA to cleave it in specific fragments is
- (A) DNA ligase
  - (B) Helicases
  - (C) Restriction endonucleases
  - (D) DNA gyrase
- 159 What is the role of Isoamyl Alcohol on RNA isolation process
- (A) Formation of Precipitate
  - (B) Formation of gas
  - (C) Formation of foam
  - (D) Removal of debris
- 160 The animal that was transfected first using microinjection is
- (A) Mouse
  - (B) Human
  - (C) Drosophila
  - (D) Pig

- 161 In RNA, Adenine pairs with  
(A) Cytosine  
(B) Guanine  
(C) Uracil  
(D) Thymine
- 162 A technique in which DNA is injected directly into the cell, or even into the cell nucleus using fine glass micro pipette  
(A) Electroporation  
(B) Microinjection  
(C) Biolistics  
(D) Liposome
- 163 Sequencing techniques used by Celera Genomics for rapid genome sequencing was  
(A) Map based cloning  
(B) End sequencing  
(C) Pyrosequencing  
(D) Shotgun sequencing
- 164 Products separation following restriction digestion by  
(A) Centrifugation  
(B) Agarose gel electrophoresis  
(C) PAGE  
(D) PCR
- 165 Size of E. Coli genome is approximately  
(A) 4.6KB  
(B) 6.4MB  
(C) 4.6 MB  
(D) 12.2 MB
- 166 Which of the following is a retroviral vector used in animal cloning ?  
(A) BPV  
(B) MLV  
(C) EBV  
(D) SV40
- 167 The 5 carbon sugar compound present in DNA molecule is  
(A) Erythrose  
(B) Deoxyribose  
(C) Ribose  
(D) Ribulose
- 168 Which of the following enzyme has 5' exonuclease activity?  
(A) Exonuclease III  
(B) Lambda exonuclease  
(C) Reverse transcriptase  
(D) Terminal transferase

- 169 The ability of the cell to acquire DNA from environment is called:
- (A) Competence
  - (B) Compatibility
  - (C) Interference
  - (D) Conjugation
- 170 First bacterial genome sequenced was of
- (A) *Salmonella typhimurium*
  - (B) *Bacillus anthracis*
  - (C) *Pseudomonas aeruginosa*
  - (D) *Haemophilus influenza*
- 171 The 260/280 nm ratio of pure DNA sample should be
- (A) < 1.8
  - (B) 1.8
  - (C) > 1.8
  - (D)  $\geq 2.8$
- 172 Oligo dT attached to resin is used for the column based isolation of
- (A) Prokaryotic DNA
  - (B) Eukaryotic DNA
  - (C) Prokaryotic m-RNA
  - (D) Eukaryotic m-RNA
- 173 The principle of pyrosequencing of DNA is
- (A) Chemical method
  - (B) Sequencing by synthesis
  - (C) Chain Termination Method
  - (D) Sequencing by hybridization
- 174 Larger fragment of DNA molecule can be easily separated by
- (A) Polyacrylamide gel electrophoresis
  - (B) Agarose gel electrophoresis
  - (C) Pulse Field electrophoresis
  - (D) Capillary Electrophoresis
- 175 Which of the following uses HMM-based analysis to discriminate between signal peptides and the N-terminal transmembrane anchor segments of membrane-bound proteins?
- (A) SignalP
  - (B) CATH
  - (C) RCSB
  - (D) ChemSpider
- 176 For transformation reactions competent *E. coli* cells can be prepared by treating log phase *E. coli* cells with
- (A) Calcium Chloride
  - (B) Magnesium Chloride
  - (C) EDTA
  - (D) Sodium dodecyl sulfate

- 177 The source of "Reverse transcriptase" enzyme used for cDNA synthesis is/are
- (A) Moloney murine leukemia virus (MuLV)
  - (B) Avian myeloblastosis virus (AMV)
  - (C) MuLV nad AMV
  - (D) Thermus aquaticus and MuLV
- 178 For restriction analysis of DNA molecule, the most commonly use type of "restriction endonucleases" is
- (A) Type I RE
  - (B) Type II RE
  - (C) Type III RE
  - (D) Type I and Type III RE
- 179 The enzymes used for joining two DNA molecule is
- (A) DNA gyrase
  - (B) DNA ligase
  - (C) Topoisomerase
  - (D) Helicase
- 180 Genes cloned with M 13 based vector can be obtained in the form of
- (A) Single stranded DNA
  - (B) Double stranded DNA
  - (C) Single stranded RNA
  - (D) Double stranded RNA
- 181 At 600 nm, one unit optical density (OD) of E. coli culture corresponds roughly to
- (A)  $1 \times 10^6$  cells/ml
  - (B)  $1 \times 10^7$  cells/ml
  - (C)  $1 \times 10^8$  cells/ml
  - (D)  $1 \times 10^9$  cells/ml
- 182 Exonucleases activity of enzymes means
- (A) Removes nucleotides one at a time from the end of DNA molecule
  - (B) Break internal phospho-diester bonds within DNA molecule
  - (C) Removes nucleotides only in 3'-5' direction
  - (D) Removes nucleotides only in 5'-3' direction
- 183 Eco RI restriction enzymes produces
- (A) Blunt end
  - (B) Sticky end
  - (C) Poly A end
  - (D) Doesn't cleave the DNA
- 184 The fact that not all codons are used equal frequency in the genes of a particular organism is called
- (A) Codon preference
  - (B) Codon bias
  - (C) Codon choice
  - (D) Law of inequality

- 185 The ability of two different types of plasmid to co-exist in same cell is called:
- (A) Competence
  - (B) Compatibility
  - (C) Interference
  - (D) complementarity
- 186 A relatively short fragments of DNA synthesized on the lagging strand during DNA replication is called
- (A) Primer
  - (B) Okazaki fragment
  - (C) Klenow fragment
  - (D) Restriction Fragment
- 187 The part of a  $\lambda$  replacement vector that is removed during insertion of new DNA is called
- (A) Klenow fragment
  - (B) Okazaki fragment
  - (C) Stuffer fragment
  - (D) Antibiotic resistant gene(s)
- 188 The nucleotide sequence, upstream of a gene, that acts as a signal for RNA polymerase binding is called
- (A) Promoter
  - (B) Operator
  - (C) Inducer
  - (D) Enhancer
- 189 A gene whose phenotype can be assayed in transformed cells is called
- (A) Reporter gene
  - (B) Promoter gene
  - (C) Dominant gene
  - (D) Co-dominat genes
- 190 A synthetic double stranded oligonucleotide carrying a number of restriction sites is called
- (A) Adaptor
  - (B) Polylinker
  - (C) Vector
  - (D) Scorpion probe
- 191 A mutant micro-organism that grows only when additional supply of nutrient is made is called
- (A) Auxotroph
  - (B) Prototroph
  - (C) Phototroph
  - (D) Chemotrophs
- 192 Goldberg-Hogness box is present in promoter region of
- (A) Prokaryotes and eukaryotes
  - (B) Prokaryotes and Archea
  - (C) Archea and Eukaryotes
  - (D) Only Prokaryotes

- 193 Pribnow box is a  
(A) A-T rich sequence  
(B) G-C rich sequence  
(C) Sequence having equal quantity of A-T and G-C  
(D) Doesn't contain nucleotide(s)
- 194 The Pribnow box is located how many base pairs upstream from the start site for transcription?  
(A) -10 bp  
(B) -15 bp  
(C) -20 bp  
(D) -25 bp
- 195 Identify the enzyme which is used in Pyrosequencing  
(A) RNA Polymerase  
(B) DNA Polymerase  
(C) DNA Pyrogyrase  
(D) Reverse Transcriptase
- 196 Which one of the following is a tool used for comparative Metagenomic analysis  
(A) VELVET  
(B) BLAST  
(C) MEGA  
(D) MEGAN
- 197 In PCR, the first copy of targeted amplicon DNA generated on completion of which cycles of denaturation, annealing and extension?  
(A) First cycle  
(B) Second cycle  
(C) Third cycle  
(D) Fourth cycle
- 198 The temperature at which half of the DNA remain in double helix while half in random coil state is called  
(A) Dissociation temperature  
(B) Melting temperature  
(C) Denaturation temperature  
(D) Annealing Temperature
- 199 The pH of Tris saturated phenol used for the purpose of DNA isolation should be  
(A) 5  
(B) 6  
(C) 7  
(D) 8
- 200 Guanidinium thiocyanate is useful in DNA isolation due to following characteristics EXCEPT  
(A) It forms complexes with DNA molecule  
(B) It denatures and dissolves all biochemical substances other than nucleic acid  
(C) In its presence DNA binds tightly to silica particles  
(D) Act as cell lysing agent



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