



Gujarat Biotechnology Research Centre

Animal BT

Application No: _____

This question booklet contains 28 pages

Time: 2 Hours

Total Marks: 200

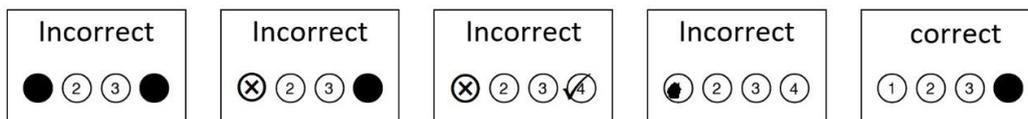
Total Questions: 200

Invigilator Signature :

Candidate Signature :

Instructions for Candidate

1. This question booklet contains 200 questions.
2. Each correct answer carries 1 mark.
3. Every attempted question with incorrect answer shall carry a negative mark of 0.25.
4. Use only Black Ball Point Pen to darken the appropriate circle in OMR.
5. Please darken the complete circle.
6. Darken ONLY ONE CIRCLE for each Question as shown below:



7. Answer once marked cannot be changed.
8. Please do not make any stray marks on the Question Booklet.
9. Rough works must be done on the blank page of Question Booklet.
10. Mark your answer in the appropriate space in the Answer Sheet against the Number corresponding to the question.
11. The Candidate has to submit Question booklet and OMR response sheet to the invigilator on conclusion of examination.

- 1 C. elegans is a preferred research model because:
 - (A) It is easily maintained in the laboratory
 - (B) It has a short life span and fast reproduction rate
 - (C) It's genome has functional counterpart genes in humans
 - (D) Sensitive assays are available for genome and proteome evaluation

- 2 The isolation of RNA from biological samples requires Trizol reagent prepared at a pH of 4.5 to 5.0. This pH is adjusted to:
 - (A) Maintain the double helical conformation of DNA and RNA
 - (B) Bring about denaturation of DNA
 - (C) Allow reassociation of RNA
 - (D) Prevent bacterial and fungal growth in the isolation reagent

- 3 In a certain test for genotoxicity, a thymine base analogue is added to the Peripheral blood lymphocyte culture for two rounds of cell division, in order to observe genotoxic effects. The test referred to here is:
 - (A) Micronucleus tests
 - (B) Ames Test
 - (C) Sister Chromatid Exchange
 - (D) Chromosomal aberration score

- 4 Type II restriction endonucleases, are more commonly used in Recombinant DNA Technology because:
 - (A) They cut the DNA to make blunt ends
 - (B) They have both endonuclease and methylase activity required for rDNA synthesis
 - (C) The ATP source for restriction activity can be easily provided
 - (D) They have cleavage sites and cut DNA at or near restriction site

- 5 To prepare a 2M solution of NaCl where the atomic weight of Na=23 and Cl=35.5, which of the following is correct:
 - (A) 117.0g NaCl made upto 1 litre with water
 - (B) 117.0g NaCl dissolved in 1 litre of water
 - (C) 58.5g NaCl made upto 1 litre with water
 - (D) 55.8g NaCl dissolved in 1 litre of water

- 6 To develop a Knock-out mice lacking a specific enzyme, the gene can be selectively disrupted by:
 - (A) Heterologous recombination
 - (B) Homologous recombination
 - (C) Restriction endonuclease splicing
 - (D) Irradiation of the target site

- 7 In the standardization of a new assay, intra-assay variation is determined by calculation of % CV. If the mean of the readings of an assay is 30 and calculated Standard deviation is 2.5, then co-efficient of variation is equal to:
 - (A) 3.85%
 - (B) 8.33%
 - (C) 9.83%
 - (D) 8.93%

- 8 In a hotstart PCR , Taq polymerase may be added after the rest of the PCR components are heated to DNA melting temperature. This is done to:
- (A) Avoid non-specific amplification
 - (B) Prevent primer dimer formation
 - (C) Avoid denaturation of the polymerase enzyme
 - (D) Allow the DNA to anneal properly
- 9 In a PAGE separation process, if the concentration of acrylamide is increased, the greater percent acrylamide in the gel will result in:
- (A) Increased electrophoretic mobility, faster migration
 - (B) Greater frictional coefficient, slower the migration rate
 - (C) Decreased frictional co-efficient, faster migration
 - (D) Increased frictional co-efficient, faster migration
- 10 In the Phase I of Clinical trials for Gene therapy, the main objective lies in the evaluation of:
- (A) The success of mode of administration of gene product
 - (B) The efficacy and success in therapy of gene product
 - (C) The safety of gene product
 - (D) Patient response to the therapy
- 11 The Cas-9 enzyme that cuts the foreign viral DNA is produced by which bacterium?
- (A) Streptococcus aureus
 - (B) Streptococcus pyogenes
 - (C) Streptococcus mutans
 - (D) Streptococcus pyrogeus
- 12 Having the capacity for multi-lineage differentiation Mesenchymal stem cells (MSCs) can give rise to a variety of cell phenotypes. Which of the following cannot be formed from MSCs?
- (A) Chondrocytes
 - (B) Lymphocytes
 - (C) Osteoblasts
 - (D) Adipocytes
- 13 Which of the following components are not found in the growth medium for animal cell culture?
- (A) Serum
 - (B) Plasma
 - (C) Carbon sources
 - (D) Inorganic salts
- 14 Non-viable or necrotic cells can be observed stained, while live cells are unstained with propidium iodide (PI) because:
- (A) PI is impermeable to intact cell membranes and cannot bind to DNA
 - (B) PI is membrane permeable but does not intercalate with intact DNA in live cells
 - (C) PI permeates and binds only to the altered bases in DNA of necrotic cells
 - (D) PI is membrane permeable and binds to lipofuscin granules in necrotic cells

- 15 Zebra fish is an important biomedical model but have certain limitations. For which of the following research studies would a researcher not select zebra fish as the model?
- (A) Developmental research
 - (B) Respiratory disease
 - (C) Metabolic diseases
 - (D) Toxicological studies
- 16 The main problem encountered when culturing *Drosophila melanogaster* in the laboratory for genetic studies is the inability to:
- (A) Provide sufficient nutrition to the larvae
 - (B) Provide sufficient light to the 3rd instar stage
 - (C) Prevent mold, mite and viral infections
 - (D) Contain or identify the adults
- 17 Ion-selective microelectrodes can be used for the purpose of:
- (A) Immunophenotyping
 - (B) Ion exchange particle purification
 - (C) Measure of intracellular ion concentrations
 - (D) Measure of pH in tissue samples
- 18 If DNA is kept at a pH of 4, it would cause selective breakage of:
- (A) Phosphodiester linkages
 - (B) N-glycosidic bonds between the sugar and pyrimidines
 - (C) N-glycosidic bonds between the sugar and purines
 - (D) Hoogsteen bonds
- 19 Which of the following is not a characteristic of Pluripotent stem cells?
- (A) They can develop into the three primary embryonic germ cell layers
 - (B) They can differentiate into all types of adult cells
 - (C) They have the capacity to self renew by dividing
 - (D) They differentiate to form extra-embryonic tissues like placenta
- 20 ELISA is considered as a heterogeneous EIA because:
- (A) Varied enzymes can be used with different substrates
 - (B) Separation system is not required for the reaction products
 - (C) Separation system is required for the reaction products
 - (D) It can be used to detect varied antigens and antibodies
- 21 In flow cytometric analysis, the intensity of the signal in the side scatter channel is proportional to:
- (A) Cell size
 - (B) Cytoplasmic granularity
 - (C) Membrane permeability
 - (D) Cell numbers
- 22 Which of the following is not a characteristic of a cancer cell?
- (A) Anchorage independent
 - (B) Continuous cell lines
 - (C) Dependent on external growth factor
 - (D) No contact inhibition

- 23 Which technique involves the production of PCR amplicons from particular regions to obtain sequence data used to identify the organism from other species?
- (A) DNA fingerprinting
 - (B) DNA barcoding
 - (C) DNA mapping
 - (D) DNA microarray
- 24 If a company requires production of a vaccine against Foot-and-Mouth disease and rabies, the cell line of preference would be:
- (A) Vero cell line
 - (B) BHK cell line
 - (C) HeLa cell line
 - (D) CHO cell line
- 25 Which gene delivery technique would be preferred for animal cells?
- (A) Microinjection and viral vectors
 - (B) Electroporation and gene gun
 - (C) Biolistic particle delivery and liposomes
 - (D) Biolistic particle delivery and BACs
- 26 Which of the following is commonly used for rapid detection of cell viability in an animal culture system?
- (A) Trypan blue dye exclusion
 - (B) Congo red stain
 - (C) Sudan black B
 - (D) Bromophenol blue stain
- 27 A research project requires a human embryonic lung cell line for a culture based investigation; which of the following would you select for this purpose?
- (A) HeLa
 - (B) HuH-7
 - (C) L- cells
 - (D) MRC-5
- 28 Genotoxicity testing is carried out in a certain laboratory. Which of the following tests would not be a part of the testing:
- (A) AMES test
 - (B) SCE Score
 - (C) MTT assay
 - (D) Micronucleus test
- 29 Which one of the following is not used as a cleaving agent in DNA footprinting?
- (A) DNase1
 - (B) Hydroxyl radical
 - (C) EcoRI
 - (D) Ultraviolet radiation

- 30 Specific chromosomal regions that exhibit an increased frequency of gaps and breaks when cells are exposed to DNA synthesis inhibitors are known as:
- (A) Chromosomal break points
 - (B) Chromosomal fragile sites
 - (C) Transposition sites
 - (D) Chiasmata regions
- 31 Radioactive isotopes are used for labeling; Specific radioactivity refers to:
- (A) Specific absorption rate of radiation
 - (B) Radioactivity per unit mass of the isotope
 - (C) Radioactivity associated with a specific isotope
 - (D) Radioactivity associated with specific particulate emission
- 32 Pedigree chart was drawn up for 4 generations of a patient with hereditary cancer, where the mutated gene shows an Autosomal dominant pattern. However, few individuals in the pedigree had the mutation but did not develop cancer. This is due to:
- (A) Variable phenotype
 - (B) Anticipation
 - (C) Incomplete expressivity
 - (D) Reduced penetrance
- 33 Which of the following statement is NOT correct for Facultative heterochromatin?
- (A) One of the X chromosome undergo inactivation to form Barr body
 - (B) Genes are silenced through histone deacetylation
 - (C) Affects nearby genes through position effect variation
 - (D) Genes silenced through Piwi-interacting RNA (piRNA) through RNAi
- 34 In gene therapy which enzyme can be designed to find specific DNA sequences in the genome and cut them out, deleting those sequences?
- (A) Zinc-finger nucleases
 - (B) Ribonucleases
 - (C) Pfu 1
 - (D) Hpa 1
- 35 An experimental cross carried out to verify whether the genotype of a dominant phenotypic expression is homozygous or heterozygous will be:
- (A) Back cross
 - (B) Test cross
 - (C) Hybrid cross
 - (D) Reciprocal cross
- 36 For cryopreservation of gametes, use of the vitrification method will aid in:
- (A) Prevention of fungal growth in extenders
 - (B) Making the cryo-medium isotonic to gametes
 - (C) Providing extra energy sources to the cells
 - (D) Prevention of ice crystal formation

- 37 During which stage of DNA replication do Helicase and topoisomerases play a major role?
- (A) Initiation
 - (B) Elongation
 - (C) Termination
 - (D) Proof Reading phase
- 38 Samples from different tissues were exposed to the same source of radiation keeping all exposure factors constant; which tissue would show most radiosensitivity?
- (A) Skin
 - (B) Intestine
 - (C) Bone marrow
 - (D) Brain
- 39 Pyroptosis is a form of programmed cell death, but differs from apoptosis in certain morphological features; which feature is not characteristic of Pyroptosis?
- (A) Chromatin condensation takes place
 - (B) Membrane blebbing is seen
 - (C) Karyolysis takes place
 - (D) Nucleus remains intact
- 40 For separation using HPLC, addition of solvent mixture (Mobile phase) of fixed composition during the whole separation process, is termed as:
- (A) Isocratic Elution
 - (B) Gradient Elution
 - (C) Fractional Elution
 - (D) Linear Elution
- 41 In the secondary structure of proteins, Proline is a helix-breaker of the α -helix because:
- (A) Proline has an aliphatic side chain and forms hydrogen bonds
 - (B) Proline has a polar side chain, not useful for hydrogen bonding
 - (C) Proline has no free carboxy group for hydrogen bonding
 - (D) Proline has no free amino group for hydrogen bonding
- 42 Spermatogonia are early gametogenic cells that are characterized by:
- (A) Complete meiotic division, complete cytokinesis, granular cytoplasm
 - (B) Mitotic division, incomplete cytokinesis and formation of a syncytium
 - (C) Complete cytokinesis, rapid mitosis and formation of spermatocytes
 - (D) Incomplete meiotic division, formation of a syncytium
- 43 Uncoupler of oxidative phosphorylation such as dinitrophenol (DNP):
- (A) Inhibits electron transport but promotes ATP synthesis
 - (B) Inhibits ATP synthesis without affecting the respiratory chain and ATP synthase
 - (C) Inhibits ATP synthesis by arresting the respiratory chain
 - (D) Inhibits ATP synthesis by inhibition of ATP synthase (H⁺)-ATPase)
- 44 What is the purpose of adding colchicine to cells in the PBL method?
- (A) To arrest the cells in metaphase
 - (B) To arrest the cells in S-phase of cell cycle
 - (C) To enable the chromosomes to move apart and be visualized without overlap
 - (D) To prevent bacterial and fungal growth

- 45 Which of the following are true for Ribosomal RNAs:
- (A) Function in transcription of genes
 - (B) Ribosomal RNA is not found in mitochondria
 - (C) Ribosomal RNA synthesis occurs in the cytoplasm
 - (D) Ribosomal RNA synthesis occurs in nucleolus
- 46 Genetic drift, in an isolated population, is change of gene frequency:
- (A) In species of same generation
 - (B) Due to appearance of recessive genes
 - (C) From one generation to next
 - (D) Due to natural selection
- 47 Which of the following statements is not True regarding the Telomeres:
- (A) DNA in the telomeres consists of G-T rich tandem sequences
 - (B) The sequence in telomeres is highly conserved in evolution
 - (C) It has a t-loop terminal and is responsible for chromosome stability
 - (D) The length of the telomere increases as the age of the cell increases
- 48 Bloom syndrome, Ataxia-telangiectasia and Fanconi anemia are characterized by:
- (A) Micro-deletion on chromosome 11
 - (B) Defect in homologous DNA repair
 - (C) Defect in G-1 phase checkpoint
 - (D) Insensitivity to particular drugs
- 49 Enhancers play a role in the regulation of transcription. Which of the following are not true regarding enhancers?
- (A) Enhancers can function in any orientation
 - (B) Enhancers function only upstream to a structural sequence
 - (C) Enhancers lie several base pairs upstream or downstream to a promoter
 - (D) Enhancers increase the level of transcription
- 50 A Confocal microscope is generally not used for:
- (A) Visualization of structures within thicker objects
 - (B) Optical sectioning for 3D reconstructions of imaged samples
 - (C) High resolution deep tissue imaging
 - (D) High resolution surface structure imaging
- 51 Which of the following methods would be preferred for determining the amino acid sequences in proteins:
- (A) Edman's reaction
 - (B) MALDI-TOF
 - (C) PITC method
 - (D) Maxam-Gilbert method
- 52 Recombinant pituitary hormones would be used for:
- (A) Maintenance of oyster culture
 - (B) Larval growth in prawn culture
 - (C) Induced breeding in fish
 - (D) Growth induction in Zebra fish

- 53 Triple helix structure of DNA is formed due to:
- (A) High ionic strength in the medium
 - (B) Sudden low pH in the cell
 - (C) Formation of Hoogsteen bonds
 - (D) Formation of phosphodiester bridges between DNA strands
- 54 The catalytic efficiency of two different enzymes can be compared by:
- (A) Rate of product formation
 - (B) K_m value
 - (C) Rate of denaturation
 - (D) Molecular structure of catalytic site
- 55 A protein domain is a part of protein structure that:
- (A) Binds and specifically recognizes only other proteins
 - (B) Causes the protein to recognize only DNA sites
 - (C) Evolves, functions and exists independent of the protein chain
 - (D) Occurs only in a single unit in a protein
- 56 Enzymes _____ the free energy of reactants/products and therefore _____ the equilibrium of the reaction:
- (A) Increase, increase
 - (B) Increase, decrease
 - (C) Decrease, increase
 - (D) Do not change, do not change
- 57 Which one of these is NOT true regarding p53?
- (A) p53 protein is found inside the nucleus of a cell
 - (B) p53 is associated with Li-Fraumeni syndrome
 - (C) p53 has been mapped to chromosome 17
 - (D) mutant p53 binds to DNA to induce p21 protein
- 58 According to the theory of Linkage:
- (A) Genes located proximal on a chromosome are inherited together during meiosis
 - (B) Genes located far apart on a chromosome are inherited together during meiosis
 - (C) Genes located proximal on a chromosome are segregated during meiosis
 - (D) There is no relationship between gene distance and linkage
- 59 The drug Methotrexate is a structural analog of folic acid and inhibits the activity of dihydrofolate reductase. Hence, this is termed as:
- (A) Uncompetitive inhibition
 - (B) Non competitive inhibition
 - (C) Competitive inhibition
 - (D) Irreversible inhibition
- 60 Two oncogenic viruses which have DNA as their genetic material are:
- (A) Hepatitis C virus, Merkel cell polyomavirus
 - (B) Human herpesvirus-8, HCV
 - (C) EBV, human papillomavirus (HPV)
 - (D) Hepatitis C virus, hepatitis B virus

- 61 Tumour suppressor genes that directly regulate cell growth by either inhibiting cell cycle progression or inducing apoptosis are the:
- (A) Caretaker genes
 - (B) Gatekeeper Genes
 - (C) Landscaper gene
 - (D) Proto-oncogenes
- 62 A key transcription factor for Epithelial-mesenchymal transition (EMT), associated with cellular de-differentiation, promotion of invasion and metastasis is:
- (A) Sox2
 - (B) SNAIL
 - (C) SONIC
 - (D) NANOG
- 63 A chemical substance that does not itself cause cancer but which can be converted by metabolic activation to another substance that can cause cancer is termed as:
- (A) Carcinogen
 - (B) Mutagen
 - (C) Procarcinogen
 - (D) Ultimate carcinogen
- 64 In a competitive immunoassay, the measurement of the labeled bound complex is:
- (A) Directly proportional to sample antigen concentration
 - (B) Inversely proportional to sample antigen concentration
 - (C) Equal to sample antigen concentration
 - (D) No relation to sample antigen concentration
- 65 A researcher wishes to carry out his research using adult male albino mice. He has to obtain permission and clearance for his experiments from:
- (A) WHO/ICMR
 - (B) EPA
 - (C) CPCSEA
 - (D) No permission is required since he plans to use adult laboratory animals
- 66 IC50 is the concentration of substance/drug at which 50% of the target is inhibited; this suggests that:
- (A) The lower the value of IC50, the more potent the molecule in its inhibitory effect
 - (B) The higher the value of IC50, the more potent the molecule in its toxic effect
 - (C) The lower the value of IC50, the less potent the molecule in its inhibitory effect
 - (D) The higher the value of IC50, the greater the toxic exposure effect on cultured cells
- 67 In a PCR reaction, what would the possible effect if changes are made to increase the temperature of annealing and the time period of the elongation?
- (A) Precision and yield will be reduced
 - (B) Precision and yield will be increased
 - (C) Precision will be reduced, but yield will be increased
 - (D) Precision will be increased, but yield will be reduced

- 68 Which of the following statements is true about mammalian cloning:
- (A) All cloned embryos show no adverse developmental problems
 - (B) Cloned embryos and live offspring often have developmental problems
 - (C) Facilities are now well established, with good success rate
 - (D) No permission needed if carried out for beneficial and therapeutic purpose
- 69 Which of the following correctly explains the difference between the origins of the two small regulatory RNAs: siRNA and miRNA?
- (A) siRNAs originate from exogenous dsRNA precursors; miRNAs are from cell genome
 - (B) siRNAs originate from mRNA in the cell cytoplasm; miRNAs originate from cell genome
 - (C) siRNAs are processed from ssRNA, miRNAs are processed from exogenous dsRNA
 - (D) miRNAs are expressed whenever siRNAs are unable to degrade RNA sequences
- 70 Which small regulatory RNAs are associated with mediating gene silencing that represents a cell defence mechanism against exogenous dsRNA?
- (A) snRNA
 - (B) miRNA
 - (C) siRNA
 - (D) pre-miRNA
- 71 Mutations that occur in the developing embryo during the first mitosis result in the presence of two or more different chromosomal complements and approximately half of the individual being affected. This condition is known as:
- (A) Mosaicism
 - (B) Congenital in-born error
 - (C) Uniparental disomy
 - (D) Lyonization
- 72 Nanoparticles used in biomedicine in pharmaceutical delivery systems are:
- (A) Nanodots
 - (B) Nanocapsules
 - (C) Nanotubes
 - (D) Nanocarriers
- 73 A family of RNA or DNA oligonucleotides that bind to select targets such as proteins and nucleic acids are:
- (A) Aptamers
 - (B) Single strand probes
 - (C) Transcript factors
 - (D) Receptor ligands
- 74 What is pleiotropy?
- (A) A single gene controls a single character
 - (B) One allele of a gene remains silenced
 - (C) Influence of a gene on multiple metabolic pathways
 - (D) Effect of multiple genes on a single pathway

- 75 Based on Chargaff's Law which of the following is true?
- (A) $A + T = G + C$
 - (B) $A = G; C = T$
 - (C) $A/T = G/C$
 - (D) $A + G = T + C$
- 76 Chondroblasts are the undifferentiated cells of:
- (A) Bone
 - (B) Lung
 - (C) Kidney
 - (D) Cartilage
- 77 Biological Safety Cabinet Class II type gives:
- (A) Protection to the operator only
 - (B) Protection to the product only
 - (C) Protection for both operator and product with vertical airflow and exhaust
 - (D) Protection for both operator and product with horizontal airflow and exhaust
- 78 An analytical method for the measurement of fluorescence, based upon emission of absorbed radiation by the molecules and the measurement of the emitted radiations (ie from singlet ES to singlet GS) is known as:
- (A) Polarimetry
 - (B) Scintillation counting
 - (C) Colorimetry
 - (D) Fluorimetry
- 79 The maximal number of molecules of substrate converted to product per active site per unit time when enzyme is saturated with substrate is termed as:
- (A) Specific activity of Enzyme
 - (B) Enzyme turnover
 - (C) K_m value of Enzyme
 - (D) V_{max} value of Enzyme
- 80 For best results, increasing the Resolving power of a microscope would involve using:
- (A) incident light of a longer wavelength and decreasing the numerical aperture
 - (B) incident light of a longer wavelength and increasing the numerical aperture
 - (C) incident light of a shorter wavelength and decreasing the numerical aperture
 - (D) incident light of a shorter wavelength and decreasing the numerical aperture
- 81 If the research requires visualizing cells in the live conditions, the microscope of choice would be:
- (A) Inverted fluorescence microscope
 - (B) Atomic force microscope
 - (C) Inverted phase contrast microscope
 - (D) Confocal microscope
- 82 Which one of the following is not included in Epigenetic mechanisms:
- (A) CpG methylation
 - (B) Chromatin remodeling
 - (C) DNA reassociation
 - (D) Regulatory ncRNAs

- 83 The branch of biomedical technology that deals with the generation and use of therapeutic stem cells, tissue engineering, production of artificial organs etc. is known as:
- (A) Regenerative medicine
 - (B) Nuclear medicine
 - (C) Bioengineering
 - (D) Bioinnovation
- 84 Chromatin comprises of DNA and proteins in the cell nucleus. Which of the following statements are true for Chromatin:
- (A) Histones H1, H2, H3 and H4 form the octomer in nucleosomes
 - (B) Histones H3 and H4 are rich in negatively charged, hydrophilic amino acids
 - (C) The packaged assembly of nucleosomes forms a 2 nm diameter Solenoid
 - (D) Linker DNA holds two nucleosome cores together, along with histone H1
- 85 A blotting technique where the separated proteins are analyzed to detect protein-protein interaction in-vitro is known as:
- (A) Western Blotting
 - (B) Eastern Blotting
 - (C) Far Western Blotting
 - (D) South-West Blotting
- 86 The biophysical property measured to evaluate blood friction against the vessel walls, the rate of venous return, capacity for the heart to pump blood and how much oxygen is transported to tissues is:
- (A) Blood pH
 - (B) Blood viscosity
 - (C) Blood volume
 - (D) Blood elasticity
- 87 The sequence of six nucleotides that is a part of the promoter site for transcription in eukaryotes is called
- (A) TATA box
 - (B) Pribnow box
 - (C) Hogness box
 - (D) CCAAT box
- 88 The regulation of gene expression at transcription regulated at the level of chromatin occurs through
- (A) Methylation
 - (B) Deacetylation
 - (C) Acetylation
 - (D) Phosphorylation
- 89 A polypeptide antibiotic that is used for measuring the half-life of mRNA in mammalian cells is
- (A) Chloramphenicol
 - (B) Actinomycin D
 - (C) Tobramycin
 - (D) Zeocin

- 90 The _____ assay is routinely used to identify DNA protein interactions
- (A) CHIP
 - (B) RT-PCR
 - (C) Comet assay
 - (D) ELISA
- 91 The first protein to be sequenced by Dr. Fredrick Sanger using the N-terminal labeling method with 1:2:4 fluorodinitrobenzene is
- (A) Hemoglobin
 - (B) Albumin
 - (C) Caesin
 - (D) Insulin
- 92 The proteins that help in highly condensed packaging of DNA in sperm cells
- (A) Gamma-globulins
 - (B) Beta-2-globulin
 - (C) Protamines
 - (D) Histones
- 93 The length of SINES are about
- (A) 10 to 100 bp long
 - (B) 200 to 400 bp long
 - (C) 100 to 300 bp long
 - (D) 100 to 200 bp long
- 94 The lactose operon is negatively controlled by the lactose repressor and positively controlled by which of the following?
- (A) Increased concentrations of glucose and cAMP
 - (B) Increased glucose and decreased cAMP
 - (C) Decreased concentrations of glucose and cAMP
 - (D) Decreased glucose and increased cAMP
- 95 To catalyze the reaction of an enzyme on substrate the non-protein organic molecule that is essential is
- (A) Cofactor
 - (B) Co-enzyme
 - (C) Modulator
 - (D) Prosthetic group
- 96 The chemical name of thymine is
- (A) 2 oxy 4 aminopyrimidine
 - (B) 2,4 dioxypyrimidine
 - (C) 2,4 dioxo 5 methylpyrimidine
 - (D) 2,4 deoxy 3 methylpyrimidine
- 97 For all experiments that involve manipulation of nucleic acids or handling infectious microorganisms the first point of clearance is required from
- (A) RCGM
 - (B) GEAC
 - (C) IBSC
 - (D) IAEC

- 98 The induced fit theory of enzyme action is referred to as
(A) Kohsland's theory
(B) Buchner's theory
(C) Kuhne's theory
(D) Urey Miller theory
- 99 The optimum concentration of Mg^{++} in the PCR amplification mix should be
(A) 1.0 mM
(B) 2.0 mM
(C) 2.5 mM
(D) 1.5 mM
- 100 Certain viruses escape the host defense mechanism by producing more than one protein product from a gene by the mechanism of
(A) Glycosylation
(B) Codon bias
(C) Differential splicing
(D) Use of modified nucleotides
- 101 Which framework is used by India for providing IPR protection?
(A) TRIPS
(B) The Geneva Treaty, 1978
(C) The Montreal Treaty, 1984
(D) The Paris Convention, 1967
- 102 In the production of Penicillin using immobilized cells _____ is the medium used for production
(A) LB broth
(B) Yeast extract
(C) Glucose medium
(D) Peptone water
- 103 Independently folded functional unit of protein is called a
(A) Motif
(B) Domain
(C) Tertiary structure
(D) Module
- 104 Which of the following ions favours maximum activity of MLV-reverse transcriptase?
(A) Ca^{2+}
(B) Mg^{2+}
(C) Mn^{2+}
(D) Cl^{2+}
- 105 The commonly used method of alkaline lysis protocol of plasmid extraction was developed by
(A) Mandel and Higa
(B) Birnboim and Mandal
(C) Birnboim and Mullis
(D) Birnboim and Doyle

- 106 The basic activity of the DNA polymerase that is targeted in the Loop mediated isothermal PCR is
- (A) 5' to 3' exonuclease activity
 - (B) 3' to 5' exonuclease activity
 - (C) Strand displacement activity
 - (D) Polymerase activity
- 107 The alignment method that is suitable for closely related sequence is
- (A) Multiple sequence alignment
 - (B) Global alignment
 - (C) Pairwise sequence alignment
 - (D) Local alignment
- 108 Measuring zeta potential is useful in determining the _____ property of liquid formulation
- (A) Viscosity
 - (B) Stability
 - (C) Solubility
 - (D) Particle size
- 109 RE from two different organisms that recognize the same DNA sequence for cleavage are called _____
- (A) Isochizomers
 - (B) Isozymes
 - (C) Concatemers
 - (D) Palindromes
- 110 The method used for prediction of three dimensional structure of a protein from known structures of one or more related protein is _____
- (A) Phylogeny
 - (B) Docking
 - (C) Homology modeling
 - (D) MSA
- 111 A culture vessel in which physical, physiochemical and physiological conditions, as well as cell concentration, are kept constant is known as _____
- (A) Biostat
 - (B) Incubator
 - (C) Batch bioreactor
 - (D) Cell concentrator
- 112 The flow cytometry-based platform recently developed to measure mRNA at the single-cell level is _____
- (A) Branched DNA
 - (B) Branched RNA
 - (C) Branched DNA & RNA
 - (D) Proteins array
- 113 The ionic interactions between amino acids that form a protein are also called as _____
- (A) Vander Waals attractions
 - (B) Hydrogen bonds
 - (C) Salt bridges
 - (D) Hydrophobic

- 114 The major criteria that is used for the initial separation of the proteins in a 2D- gel electrophoresis is
- (A) pH
 - (B) Net charge
 - (C) Molecular weight
 - (D) Isoelectric point
- 115 The foods that are used to reduce muscle breakdown before and after exercise are enriched with
- (A) Essential amino acids
 - (B) BCCA
 - (C) Hydrophobic amino acids
 - (D) FE
- 116 The term “genomics” was coined in 1986 by _____
- (A) Thomas Roderick
 - (B) Craig Venter
 - (C) Karry Mullis
 - (D) Southern
- 117 Gene predictions by computational biology do not correlate with experimental data because of
- (A) Overlapping genes
 - (B) Splice variants
 - (C) Counting difficulty
 - (D) Gene deletions
- 118 To be called as single nucleotide polymorphism, the mutation detected should make atleast ___ % of the population
- (A) 10%
 - (B) 1%
 - (C) 0.10%
 - (D) 5%
- 119 Monitor the whole genome on a single chip in order to obtain a better picture of the interaction among thousands of genes is
- (A) Gene cards
 - (B) Microarray
 - (C) Nanochip
 - (D) Proteome
- 120 The homology between normal and sickle cell haemoglobin demonstrated by_____paved way for the development of bioinformatics
- (A) Ingram
 - (B) Pauling
 - (C) Zuckerkandl
 - (D) Craig Venter
- 121 The turbulence in a culture medium to improve growth of microorganisms is
- (A) Baffle flask
 - (B) V-flask
 - (C) U flask
 - (D) Erlenmeyer flask

- 122 A continuous culture device in which the population density of an organism is held constant and the specific growth rate of the population becomes a dependant variable is _____
- (A) Turbidostat
 - (B) Chemostat
 - (C) Metabolostat
 - (D) Biostat
- 123 An example of a program for constructing a phylogenetic tree is _____
- (A) PHYLIP
 - (B) phrap
 - (C) ProDom
 - (D) PHDsec
- 124 Fibroblast cells in culture survive limited number of passages due to _____
- (A) Exhaustion of nutrients
 - (B) Contact inhibition
 - (C) Shortening of telomeres
 - (D) Loss of cell adherence
- 125 The phenomenon in which one gene inhibits the expression of another gene is called _____
- (A) Dominance
 - (B) Epistasis
 - (C) Penetrance
 - (D) Expressivity
- 126 Which one of the following is NOT common to both chloroplast and mitochondria?
- (A) Electron transport
 - (B) Electron donor – acceptor pair
 - (C) Proton pump
 - (D) Independent genomes
- 127 In case of uniparous animals, if the number of breeding females is between 1- 5000, then the population is classified as _____
- (A) Insecure
 - (B) Endangered
 - (C) Critical
 - (D) Independent genomes
- 128 In biotherapeutics, the higher order structure (HOS) is critical as they impact its efficacy and immunogenicity and the HOS analysis is done by
- (A) Circular dichroism
 - (B) UV-spectroscopy
 - (C) Surface Plasma Resonance
 - (D) NMR
- 129 In translocation, the exchange of chromosomal segments occurs _____
- (A) Between homologous chromosomes
 - (B) Between non-homologous chromosomes
 - (C) Within the same chromosome
 - (D) Between the ends of the chromosome

- 130 Chromosome consists of
(A) DNA and basic proteins as histones
(B) DNA and acidic proteins as non-histones
(C) DNA, RNA and histones
(D) DNA, RNA and basic proteins
- 131 Forms of Diabetes mellitus in man is the best example for _____
(A) Variable expressivity
(B) Incomplete penetrance
(C) Incomplete lethal
(D) Semi-dominant lethal
- 132 QTL analysis is used to
(A) Determine the most rapidly-evolving parts of genes
(B) Identify RNA polymerase binding sites
(C) Identify chromosome regions associated with a complex trait
(D) Determine which genes are expressed at a developmental stage
- 133 In the context of interval mapping, the log likelihood ratio is called
(A) QTL score
(B) LOD score
(C) Mapping distance
(D) Centimorgan
- 134 Major histocompatibility complex is present in
(A) Autosomes
(B) X-chromosome
(C) H-Y antigen
(D) mtDNA
- 135 Maintaining the live animals outside the breeding tract of a breed, as part of conservation programme, is termed as
(A) In-situ conservation
(B) Ex-situ conservation
(C) Haploid form of preservation
(D) Environmental conservation
- 136 The denaturing of conditions in SSCP is usually achieved by using
(A) Methanol
(B) Sodium citrate
(C) Urea
(D) Formamide
- 137 Bacterial DNA is not cleaved by their own restriction enzymes because bacteria add _____ to their own DNA
(A) Peptides
(B) Methyl groups
(C) Dideoxynucleotides
(D) Glyphosate

- 138 Eugenics is the application of principles of heredity to
(A) The improvement of mankind
(B) The improvement of livestock
(C) The conservation of livestock
(D) True genetics dealing with laboratory animals
- 139 How many amino acids are coded in this mRNA 5'- AUGGGGUUAUGAAGAUUUUGAUAGUAA -3'
(A) 9
(B) 3
(C) 7
(D) 8
- 140 The transfer of genetic material from one bacterium to another through the mediation of a vector like virus is termed as
(A) Transformation
(B) Infection
(C) Transfection
(D) Transduction
- 141 Constitutive heterochromatic regions can be identified by
(A) G-banding
(B) Q-banding
(C) Ch-banding
(D) C-banding
- 142 The phenomenon leading to telomere shortening in cells eventually making cell division impossible

(A) Mutation
(B) Telomere translocation
(C) Hayflick limit
(D) Deletion of Telomeres
- 143 The absence of a pair of homologous chromosomes in the chromosome complement is known as

(A) Disomy
(B) Monosomy
(C) Trisomy
(D) Nullisomy
- 144 The monoclonal antibody that is usually used to prevent rejection following kidney transplantation is _____
(A) YKT-3
(B) YET-2
(C) OKT-3
(D) OET-3
- 145 A heterozygous SNP is confirmed in a sequence chromatogram by the presence of
(A) Two peaks twice the height of the other around it
(B) Two peaks in the same position, one twice the height of the other
(C) One peak of equal height with the other around it
(D) Two peaks of equal height at the same position

- 146 In which phase of the mitosis, precise localization (with high resolution) of genes is possible
- (A) Pro-metaphase
 - (B) Metaphase
 - (C) Late Metaphase
 - (D) Anaphase
- 147 Pattern recognition receptors (PRR) include
- (A) Lectin-like molecules
 - (B) Lipoteichoic acid
 - (C) PAMPs
 - (D) Unmethylated CpG sequences
- 148 The PCR for Antigen Receptor Rearrangement is used for the detection of
- (A) Liomas
 - (B) Luekaemia
 - (C) Lymphoma
 - (D) Breast Cancer
- 149 Both class I and class II MHC molecules present antigens to T cells. Class I molecules present processed _____ antigen, while class II molecules present processed - _____ antigen to T cells, respectively.
- (A) Endogenous and exogenous
 - (B) Exogenous and endogenous
 - (C) Viral and bacterial
 - (D) Endocytic and Exogenous
- 150 Interleukin-2 is an important molecule in the immune response. What is its function?
- (A) Binds and presents antigen
 - (B) Kills virus infected cells
 - (C) Stimulates proliferation of Cytotoxic T cells
 - (D) Proliferation of helper T cells
- 151 Which type of heritability is important for cloned stocks?
- (A) Narrow sense h^2
 - (B) Broad sense h^2
 - (C) Square-root of h^2
 - (D) Realised h^2
- 152 The statistic test used for testing linkage between genes _____
- (A) Standard normal deviate
 - (B) F- test
 - (C) Paired t-test
 - (D) Chi-square test
- 153 Which of the following classes of immunoglobulin plasma cells is rarely found in the mouse?
- (A) IgA
 - (B) IgD
 - (C) IgM
 - (D) IgE

- 154 The quality of the reads generated in the NGS platforms is based on _____
- (A) No. of Reads
 - (B) Length of reads
 - (C) Depth of sequencing
 - (D) Quality scores
- 155 The cyclic amplification of protein misfolding is used for the detection of _____
- (A) Creutzfeldt-Jakob disease
 - (B) Alzheimer's disease
 - (C) Parkinsons disease
 - (D) Huntington's disease
- 156 The proteomic technique that enables to determine the amount of proteins from different sources in a single experiment _____
- (A) LC-MS
 - (B) FPLC
 - (C) iTRAQ
 - (D) EI-LC-MS
- 157 A variant of gel electrophoretic technique that allows simulataneous separation of up to three samples on a single gel
- (A) PFGE
 - (B) 2D-PAGE
 - (C) DIGE
 - (D) Zone electrophoresis
- 158 The genotyping technique that assess the separation of large fragments of DNA molecules _____
- (A) PAGE
 - (B) PFGE
 - (C) SSCP
 - (D) MLVA
- 159 In a laboratory generating information on the RNAseq for their experiments, the best database of choice for annotating the transcripts is
- (A) GenBank
 - (B) PDB
 - (C) Prosite
 - (D) Swiss-Prot
- 160 The enzyme that plays a role in relaxing the DNA by favoring negative supercoiling
- (A) Topoisomerase I
 - (B) Topoisomerase II
 - (C) Topoisomerase III
 - (D) Topoisomerase IV
- 161 WIPO stands for
- (A) World information and patents organization
 - (B) World information protection organization
 - (C) World international proprietary organization
 - (D) World intellectual property organization

- 162 The Nobel prize for the discovery of Restriction enzymes in 1978 was not awarded to
(A) W. Arber
(B) H. Smith
(C) D. Nathans
(D) H. Khorana
- 163 Organophosphate compounds selectively react with the acidic amino acid to knock of the enzyme activity is
(A) Histidine
(B) Asparagines
(C) Serine
(D) Glycine
- 164 The amount of protein nitrogen retained by the body from a given amount of protein is
(A) PER
(B) BV
(C) FCR
(D) KCR
- 165 Protein-DNA interactions in vivo can be studied by
(A) Gel shift assay
(B) Southern hybridization
(C) CHIP assay
(D) FISH
- 166 Creeper condition in domestic fowl is due to
(A) Semi-dominant lethal gene
(B) Non-additive gene action
(C) Co-dominance
(D) Epistasis
- 167 The father of modern animal breeding is
(A) Robert Bakewell
(B) Gregor Mendel
(C) Prof. J.L. Lush
(D) R.A. Fisher
- 168 National Biodiversity Authority comes under the Ministry of
(A) Science and Technology
(B) Agricultural Research
(C) Environment and Forests
(D) Dept. of Biotechnology
- 169 Identify the non-sense codon
(A) UCA
(B) UAC
(C) CCA
(D) UGA

- 170 The fusion agent used by Kohler and Milstein was
(A) PEG
(B) Sendai Virus
(C) Electro-fusion
(D) Vaccinia virus
- 171 Replication of chromosomes without subsequent cell division
(A) Aneuploidy
(B) Cross-over
(C) Non-disjunction
(D) Endoreduplication
- 172 The human genome project was initiated by
(A) Cold spring harbor laboratory
(B) NCBI
(C) US-NIH and NCBI
(D) US-DOE and US-NIH
- 173 The fundamental theory of natural selection was stated by
(A) Darwin
(B) Mendel
(C) Fischer
(D) Henderson
- 174 According to the Animal Welfare Act and its regulations, which of the following animal species must be housed separately when nursing young?
(A) Hamsters
(B) Guinea pigs
(C) Non-human primates
(D) Rabbits
- 175 The mononuclear phagocyte system does not include
(A) Endothelial cells
(B) Mesangial cells
(C) Kupffer cells
(D) Medullar macrophages
- 176 In the selection of clones following fusion in mAb generation, the cells are screened for
(A) Phosphokinase
(B) HGPRT
(C) GAPDH
(D) HPGRT
- 177 The emulsion PCR technique that enables absolute quantification of gene targets
(A) Real-time PCR
(B) ddPCR
(C) NASBA
(D) LAMP

- 178 The principle of stacking in SDS PAGE gel happens due to the neutral zwitterion in the form of _____
- (A) Tris Base
 - (B) SDS
 - (C) Ammonium persulphate
 - (D) Glycine
- 179 In gene transfer technology, transfer of genes to nerve cells is mediated by which of the following vectors?
- (A) BAC
 - (B) Retroviral vectors
 - (C) Herpes simplex viral vectors
 - (D) Adeno associated viral vectors
- 180 In Flow cytometry, sample pressure and sheath fluid pressure determine flow rate. If DNA analysis is to be carried out, it is preferable to keep:
- (A) High flow rate
 - (B) Low flow rate
 - (C) Medium paced flow rate
 - (D) Extreme high flow rate
- 181 Embryo technology for pre-implantation genetic diagnosis involves a blastocyst biopsy, which is done by collection of:
- (A) Inner cell mass of day 5 embryo
 - (B) Trophectoderm cells from day 3 embryo
 - (C) Trophectoderm cells from day 5 blastocyst
 - (D) 1st polar body of day 2 embryo
- 182 In a cell culture system, the ratio of CO₂: O₂ should ideally be kept at:
- (A) 01:15
 - (B) 01:18
 - (C) 01:20
 - (D) 01:19
- 183 iPSC are stem cells which are:
- (A) Derived from the inner cell of the blastocyst
 - (B) Generated from adult cells by forced expression of certain factors
 - (C) Generated from differentiating foetal cord blood
 - (D) Initiated by culture of early pluripotent cells
- 184 A process where particles such as bacteria are targeted for destruction by a phagocyte is termed as:
- (A) Lysogeny
 - (B) Agglutination
 - (C) Bacteriolysis
 - (D) Opsonization
- 185 An autosomally recessive inherited disease occurs with the genotype ss. What is the probability of the offsprings being normal, if both parents are carriers?
- (A) 50%
 - (B) 33%
 - (C) 25%
 - (D) 75%

- 186 A natural cell recovery phenomenon that rescues cells from the brink of death is termed as:
- (A) Metastasis
 - (B) Anastasis
 - (C) Apoptosis
 - (D) Anaphylaxis
- 187 For measurement of the antibody titers in plasma sample which of the following techniques would be preferred:
- (A) Competitive ELISA
 - (B) Sandwich ELISA
 - (C) Direct ELISA
 - (D) Indirect ELISA
- 188 The activity of VEGF-A which is mediated by three receptor tyrosine kinases results in:
- (A) Regulates angiogenesis and vascular permeability
 - (B) Inhibits angiogenesis in a variety of cancers
 - (C) Regulates lymphangiogenesis
 - (D) Stimulate the PI3K-Akt pathway toward cell proliferation
- 189 Svedberg is a unit used for:
- (A) Comparison of molecular mobility of charged ions
 - (B) Sedimentation rate in centrifugation
 - (C) Centrifugal force in a centrifugation
 - (D) SAR values for non-ionizing radiation
- 190 In microscopy, the most common monochromatic aberration is:
- (A) Coma
 - (B) Stigmatism
 - (C) Asymmetrical aberration
 - (D) Spherical aberration
- 191 Uncompetitive inhibition :
- (A) V_{max} remains constant, K_m increases
 - (B) V_{max} increases, K_m remains unchanged
 - (C) V_{max} decreases, K_m decreases
 - (D) V_{max} increases, k_m increases
- 192 A regimen of toxicity testing carried out by administration of tests substance to approximately 30 animals, repeated daily for 90 days will be:
- (A) Acute toxicity testing
 - (B) Sub acute
 - (C) Chronic
 - (D) Sub-chronic

- 193 The expansion of ddPCR is:
(A) dual digital PCR
(B) di-deoxy PCR
(C) droplet digital PCR
(D) di-deoxy digital PCR
- 194 What is the main role of urea in the sequencing gel?
(A) To promote adherence
(B) To minimize DNA secondary structure
(C) To minimize lateral or reverse flow of sample
(D) To increase pH of the gel
- 195 Identify which of the following nanomaterial is known to have antioxidant properties:
(A) Quantum dots
(B) Silver nanoparticles
(C) Fullerenes
(D) Carbon nanotubes
- 196 Eukaryotic chromosomes are metabolically most active in:
(A) Interphase
(B) Prophase
(C) Metaphase
(D) Telophase
- 197 In January 2016, scientists at the Central Institute for Research in Hisar, India announced an achievement in Animal Biotechnology:
(A) cloned a goat for the production of a pharmaceutical product
(B) cloned a buffalo using cells of the ventral side of the tail of superior buffalo
(C) cloned a buffalo using adult udder cells of a superior strain
(D) cloned a goat for production of insulin in milk
- 198 Which of the following is not a component of a micromanipulator?
(A) Temperature controlled stage
(B) Holding micropipette
(C) Borosilicate microinjector
(D) Transducer probe
- 199 Matrigel is generally used for:
(A) Monoclonal antibody production
(B) Histotypic cell cultures
(C) Suspension cultures
(D) Induction of pluripotency
- 200 The SI unit of Enzyme activity is:
(A) Katal
(B) King-Armstrong units
(C) logU/ml
(D) ug enzyme activity/ml

Animal Biotechnology
Provisional Answer Key

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