

JEMAS(PG)-2024 **QB No: 4103300001**
Subject: M.Sc in Medical Biotechnology(M.Sc MBT)

Duration: 90 minutes

No of MCQ: 100

Full Marks: 100

INSTRUCTIONS

1. All questions are of objective type having four answer options for each.
2. **Category-1:** Carries **1** mark each and only one option is correct. In case of incorrect answer or any combination of more than one answer, $\frac{1}{4}$ mark will be deducted.
3. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C, or D.
4. Use only **Black/Blue ink ball point pen** to mark the answer by filling up of the respective bubbles completely.
5. Write Question Booklet number and your roll number carefully in the specified locations of the **OMR** sheet. Also fill appropriate bubbles.
6. Write your name (in block letter), name of the examination center and put your signature (as is appeared in Admit Card) in appropriate boxes in the **OMR sheet**.
7. The OMR sheet is liable to become invalid if there is any mistake in filling the correct bubbles for Question Booklet number/roll number or if there is any discrepancy in the name/ signature of the candidate, name of the examination center. The OMR sheet may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be sole responsibility of candidate.
8. Candidates are not allowed to carry any written or printed material, calculator, pen, log-table, wristwatch, any communication device like mobile phones, bluetooth devices etc. inside the examination hall. Any candidate found with such prohibited items will be **reported against** and his/her candidature will be summarily cancelled.
9. Rough work must be done on the Question Booklet itself. Additional blank pages are given in the Question Booklet for rough work.
10. Hand over the OMR sheet to the invigilator before leaving the Examination Hall.
11. Candidates are allowed to take the Question Booklet after examination is over.

Signature of the Candidate: _____

(As in Admit Card)

Signature of the Invigilator: _____

ROUGH WORK ONLY

M.Sc. MBT

1. In anaerobic respiration, there is a net gain of :
 - (A) 38 ATP.
 - (B) 50 ATP.
 - (C) 2 ATP.
 - (D) 10 ATP.
2. Which name is associated with the chemical substances produced in endocrine ductless Glands?
 - (A) Vitamins.
 - (B) Antigens.
 - (C) Bile Acids.
 - (D) Hormones.
3. The reason for double helical structure of DNA is operation of :
 - (A) Electrostatic attraction.
 - (B) Vander Waal's Forces.
 - (C) Dipole-dipole Interaction.
 - (D) Hydrogen bonding.
4. _____ is a bacterial disease :
 - (A) Measles.
 - (B) Tuberculosis.
 - (C) Rabies.
 - (D) Small Pox.
5. Lysozymes are called suicidal bags because they have :
 - (A) Hydrolytic enzymes.
 - (B) Parasitic activity.
 - (C) Food vacuole.
 - (D) Catabolic enzymes.
6. Reducing sugars have :
 - (A) Free aldehyde.
 - (B) Bound aldehyde.
 - (C) Free aldehyde or ketone.
 - (D) Bound Ketone.
7. In meiosis, chromosomes replicate during :
 - (A) Prophase I.
 - (B) Prophase II.
 - (C) Telophase I.
 - (D) Interphase.
8. At which stage chromosomes come to lie over equatorial plate :
 - (A) Metaphase.
 - (B) Anaphase.
 - (C) Telophase.
 - (D) Prophase

9. Genetic recombination occurs during :
- (A) Zygotene.
 - (B) Diplotene.
 - (C) Pachytene.
 - (D) Metaphase – I.
10. The most common plasmid vector used in genetic engineering is :
- (A) pBR 328.
 - (B) pBR 322.
 - (C) pBR 325.
 - (D) pBR 330.
11. Triglyceride are composed of glycerol & _____ :
- (A) Phosphate.
 - (B) Glucose.
 - (C) Lactose.
 - (D) Fatty acid.
12. Which of the following is a water borne disease?
- (A) Tuberculosis.
 - (B) AIDS.
 - (C) Malaria.
 - (D) Typhoid.
13. In tissue / bacterial culture glassware and nutrients are sterilized through :
- (A) Water bath at 200⁰ C.
 - (B) Dry air oven at 200⁰ C.
 - (C) Dehumidifier.
 - (D) Autoclave.
14. Most abundant RNA of the cell is :
- (A) tRNA.
 - (B) rRNA.
 - (C) mRNA.
 - (D) dRNA.
15. Nucleotides present in one turn of DNA helix :
- (A) 4.
 - (B) 8.
 - (C) 10.
 - (D) 9.
16. Okazaki segments are formed during :
- (A) Transduction.
 - (B) Transcription.
 - (C) Replication.
 - (D) Translation.

17. Restriction endonuclease is employed for cutting :
- (A) A single stranded DNA.
 - (B) Double stranded DNA.
 - (C) RNA fragment.
 - (D) mRNA.
18. Isoelectric point (pI) is :
- (A) The pH at which net electric charge is zero.
 - (B) The pressure at which net volume is zero.
 - (C) The net conductance is zero.
 - (D) The fluidity at which net viscosity is zero.
19. Prion is a :
- (A) Abnormally folded form of DNA.
 - (B) Abnormally folded form of RNA.
 - (C) Abnormally folded form of Protein.
 - (D) Abnormally folded form of virus.
20. What is Microbiology?
- (A) Study of molecules that are visible to human eyes.
 - (B) Study of animals and their family.
 - (C) Study of organisms that are not visible to naked eyes.
 - (D) Study of microscope.
21. Who is known as the father of Microbiology?
- (A) Edwin John Butler.
 - (B) Ferdinand Cohn.
 - (C) Robert Koch.
 - (D) Antoni van Leeuwenhoek.
22. Which part of the compound microscope helps in gathering and focusing light rays on the specimen to be viewed?
- (A) Condenser lens.
 - (B) Magnifying lens.
 - (C) Objective lens.
 - (D) Eyepiece lens.
23. Growth of bacteria or microorganisms refer to _____ :
- (A) Changes in the total population.
 - (B) An increase in number of cells.
 - (C) An increase in the size of an individual organism.
 - (D) An increase in the mass of an individual organism.
24. Protozoa that eat other organisms are known as _____ :
- (A) Parasitic.
 - (B) Mutualistic.
 - (C) Holozoic.
 - (D) Saprophytic.

25. What does a viral DNA become after being associated with the bacterial chromosome?
(A) Plasmid.
(B) Plaque.
(C) Prophage.
(D) Gene.
26. Which drug is used for the treatment of brucellosis in humans?
(A) Erythromycin.
(B) Tetracycline.
(C) Carbenicillin.
(D) Gentamicin.
27. Dead organs are generally stored in formalin. Formalin is :
(A) Aqueous formaldehyde.
(B) Aqueous ferrous sulphate.
(C) Aqueous formic acid.
(D) Aqueous ferric alum.
28. Vaccination was invented by _____ :
(A) Watson.
(B) Jenner.
(C) Crick.
(D) Pasteur.
29. Which of the following amino acids require sulphur for their synthesis?
(A) Tryptophan.
(B) Arginine.
(C) Serine.
(D) Methionine and cysteine.
30. Which of the following method can be used to determine the number of bacteria quantitatively?
(A) Streak-plate.
(B) Spread-plate.
(C) Pour plate.
(D) Pour-plate and spread plate.
31. Nichrome loop wire is used in which of the following techniques?
(A) Pour-plate.
(B) Streak-plate.
(C) Spread-plate.
(D) Roll-tube technique.
32. The restriction endonuclease is having a defence mechanism in the bacterial system against foreign DNA such as viruses. But how it is able to protect its own DNA?
(A) By methylation of bacterial DNA by restriction enzyme.
(B) By methylation of foreign DNA by restriction enzyme.
(C) By phosphorylation of bacterial DNA by restriction enzyme.
(D) By phosphorylation of foreign DNA by restriction enzyme.

33. Even after replication, how the modified DNA remains protected?
- (A) It remains protected because of conservative mode of replication.
 - (B) It remains protected because of semi- conservative mode of replication.
 - (C) The mode of replication has no role to play in the protection.
 - (D) It is again modified after replication.
34. Who is known as the father of Genetics?
- (A) Linus Carl Pauling.
 - (B) Frederick Sanger.
 - (C) James Watson.
 - (D) Gregor Johann Mendel.
35. The sequence letters in a tetrapeptide TYDN constitutes :
- (A) Threonine, tyrosine, glutamine, asparagine.
 - (B) Threonine, tyrosine, aspartic acid, asparagine.
 - (C) Threonine, glutamine, tryptophan, asparagine.
 - (D) Glutamine tyrosine, tryptophan, aspartic acid.
36. Gene therapy applies to the use of :
- (A) Genetically engineered immunoglobins.
 - (B) Genetically engineered genes.
 - (C) Genetically engineered hormones.
 - (D) Genetically engineered cells.
37. The development and application in medicine using nanoshells is known as :
- (A) Robotics.
 - (B) Automation.
 - (C) Nanotechnology.
 - (D) Synthetic Biology.
38. Nucleophilic attack by water resulting in cleavage of biopolymers is called :
- (A) Biosynthesis.
 - (B) Catalysis.
 - (C) Photosynthesis.
 - (D) Hydrolysis.
39. Amphipathic molecules have :
- (A) Polar-functional groups.
 - (B) Non-polar functional groups.
 - (C) Both Polar-functional groups and non-polar functional groups.
 - (D) Neutral functional groups.
40. The unique biochemical function of amino acids are determined by their :
- (A) C group.
 - (B) F group.
 - (C) H group.
 - (D) R group.

41. HPLC is :
- (A) High-Pressure Liquid Chromatography.
 - (B) High-Potential Liquid Chromatography.
 - (C) Huge-Pressure Liquid Chromatography.
 - (D) Hydro-Phobic Liquid Chromatography.
42. Edman reaction enables :
- (A) Carbohydrate sequencing.
 - (B) Fatty acid sequencing.
 - (C) Gene sequencing.
 - (D) Protein and peptide sequencing.
43. Polyacrylamide gels provide porous matrix for separation of proteins on basis of their :
- (A) Mobility.
 - (B) Viscosity.
 - (C) Polarity.
 - (D) Colour.
44. “Chaperons” are proteins that participate in :
- (A) Cleavage of mammalian proteins.
 - (B) Synthesis of mammalian proteins.
 - (C) Folding of mammalian proteins.
 - (D) Un-folding of mammalian proteins.
45. X-Ray crystallography are used to study higher orders of :
- (A) RNA structures.
 - (B) DNA structures.
 - (C) Lipids structures.
 - (D) Proteins structures.
46. Apoptosis is :
- (A) Random cell death.
 - (B) Programmed cell death.
 - (C) Programmed cell movement.
 - (D) Random cell movement.
47. “Oncogene” is an altered gene who help to :
- (A) Accelerate cell division.
 - (B) Decelerate cell division.
 - (C) Cause cell movement.
 - (D) Is good for the host.
48. Neoplasm is :
- (A) Normal cell division.
 - (B) Abnormal new growth of tissue.
 - (C) New virus variant.
 - (D) Killing of bacteria.
49. Phagocytosis is :
- (A) The breakdown of old RBC.
 - (B) The breakdown of proteins.
 - (C) A mechanism by which WBC destroy micro-organisms.
 - (D) A mechanism of blood coagulation.

50. Erythropoiesis is the production of :
- (A) Red Blood Cells.
 - (B) White Blood Cells.
 - (C) Platelets.
 - (D) Cancer cells.
51. Autoimmune response is :
- (A) Response against foreign bodies.
 - (B) Response against hosts own cells and proteins.
 - (C) Response against increased external temperature.
 - (D) Response against excess water retention in the body.
52. Interleukins facilitate :
- (A) Intake of glucose from stomach.
 - (B) Intake of amino acids from stomach.
 - (C) Cell signalling for cellular responses.
 - (D) Dilation of iris.
53. Simple diffusion is :
- (A) Active flow of solute from higher to lower concentration.
 - (B) Passive flow of solute from lower to higher concentration.
 - (C) Active flow of solvent from higher to lower concentration.
 - (D) Passive flow of solvent from higher to lower concentration.
54. B-Lymphocytes mature in :
- (A) Brain tissue.
 - (B) Bacterial cells.
 - (C) Bone Marrow.
 - (D) Bile Duct.
55. Bacteriophages are :
- (A) Beneficial bacteria.
 - (B) Harmful bacteria.
 - (C) Bacterial Virus.
 - (D) Bacterial proteins.
56. Staining is a biochemical technique of :
- (A) Colouring specimens using dyes.
 - (B) Counting number of bacteria in a sample.
 - (C) Fixing specimens on a paper.
 - (D) Colouring the skin of experimental animals.
57. Cytokinesis is :
- (A) The destruction of cytoplasm.
 - (B) The movement of cytoplasm.
 - (C) The division of cytoplasm.
 - (D) The staining of cytoplasm.
58. The physiological roles of bile salts include :
- (A) They aid in digestion of lipid.
 - (B) They facilitate absorption of sugars.
 - (C) They facilitate absorption of vitamins.
 - (D) They provide means for protein digestion.

59. Water is an “amphoteric” substance which:
- (A) Can act only as an acid.
 - (B) Can act only as a base.
 - (C) Can act either as an acid or a base.
 - (D) Can act neither as an acid or a base.
60. Assignment of a gene to a locus on a chromosome is called :
- (A) Sanger sequencing.
 - (B) Translation.
 - (C) Gene mapping.
 - (D) Transformation.
61. Sickle –cell anaemia is caused by:
- (A) Bacteria.
 - (B) Virus.
 - (C) Defect in haemoglobin.
 - (D) Defect in rod cells.
62. Retinol is a derivative of :
- (A) Vitamin K.
 - (B) Vitamin C.
 - (C) Vitamin D.
 - (D) Vitamin A.
63. β -oxidation of fatty acids takes place usually in the :
- (A) Golgi complex.
 - (B) Endoplasmic reticulum.
 - (C) Nucleolus.
 - (D) Mitochondria.
64. Leishmaniasis is commonly known as:
- (A) Yellow fever.
 - (B) Black fever.
 - (C) White fever.
 - (D) Red fever.
65. What would be the effect on the PCR if any of the following circumstances arose: 1) there are no primers in the reaction, 2) there are no dNTPs in the reaction, 3) there is no Taq polymerase in the reaction?
- (A) PCR would proceed normally.
 - (B) Non-specific PCR of random templates will occur.
 - (C) The reaction will cease after a few cycles.
 - (D) PCR will not commence.
66. In an EMSA experiment free DNA is separated from protein-DNA complexes in a native gel by which following principle?
- (A) Charge.
 - (B) Molecular weight.
 - (C) DNA digestion with DNase.
 - (D) Antibody immune-precipitation.

67. 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) siRNAs originate from predominantly exogenous dsRNA; miRNAs originate from the cell genome.
 - (C) miRNAs are expressed whenever siRNAs are unable to appropriately degrade RNA sequences.
 - (D) miRNAs are processed from dsRNA viruses, siRNAs are processed from ssRNA viruses.
68. For an application where you require a sample of your target protein at high purity, what would be a good purification strategy? Assume that your starting point is *E. coli* cells in which the target protein fused to an affinity tag has been over-expressed.
- (A) Affinity chromatography (AC) followed by size exclusion chromatography (SEC).
 - (B) AC only.
 - (C) AC followed by ion-exchange (IEX) followed by SEC.
 - (D) AC followed by IEX, followed by hydrophobic interaction (HIC) and then SEC.
69. Which of the following process does not occur in prokaryotes?
- (A) Replication.
 - (B) Splicing.
 - (C) Translation.
 - (D) Transcription.
70. DNA helices exist in various forms.
Which of the following form is predominantly expressed in cells?
- (A) B-Helix.
 - (B) A-Helix.
 - (C) E-Helix.
 - (D) Z-Helix.
71. There are hopes that RNA interference will have a wide range of therapeutic applications. It may be possible to use microRNAs to silence oncogenes. Which of the following is caused by oncogenes?
- (A) Hepatitis.
 - (B) Macular degeneration.
 - (C) HIV/AIDS.
 - (D) Cancer.
72. The Chargaff rules state that the number of purines and pyrimidines are equal ($A+G = T + C$) in any double-stranded DNA molecule. Watson and Crick later solved the structure of DNA and nitrogen base pairings.
Which of the following base-pairing rule is true?
- (A) Adenine pairs with Guanine and Thymine pairs with Cytosine.
 - (B) Adenine pairs with Thymine and Guanine pairs with Cytosine.
 - (C) Adenine pairs with Cytosine and Guanine pairs with Thymine.
 - (D) DNA base pairing is nonspecific.

73. Which of the following methods for introducing DNA into cells is used only for plants?
(A) Electroporation.
(B) A gene 'gun'.
(C) Microinjection.
(D) Transformation of competent cells.
74. Which of the following enzymes involved in ribosomal protein synthesis is a ribozyme i.e. a catalytic RNA molecule?
(A) Amino acyl t-RNA synthase.
(B) Peptidyl transferase.
(C) Releasing factors 1 and 2.
(D) Ribosome recycling factor.
75. In prokaryotes, DNA replication begins at a single site that is rich in AT nucleotide sequence, where two strands unwind and separate.
This ATP dependent process is catalyzed by a protein known as.....?
(A) DnaA protein.
(B) Single-strand binding protein.
(C) DNA polymerase.
(D) Topoisomerase.
76. The short strand of primer is required for the replication of DNA :
(A) DNA.
(B) RNA.
(C) Histone.
(D) hnRNA.
77. As the two strands of the double helix are separated, the positive supercoiling interferes with the further unwinding of DNA.
Which of the following enzyme makes a break in a strand of DNA to release the supercoiling and facilitate the replication to occur?
(A) DnaA protein.
(B) Single-strand binding protein.
(C) DNA polymerase.
(D) Topoisomerase.
78. Which of the following enzyme has a unique ability to introduce positive and negative supercoiling of the DNA and it is the target for antibacterial agents such as ciprofloxacin/quinolones?
(A) DnaA protein.
(B) DNA helicase.
(C) DNA gyrase.
(D) DNA polymerase.
79. What would be the effect on the primary structure of the coded protein if a single base was deleted from a messenger RNA transcript?
(A) No effect.
(B) A single amino acid residue is changed.
(C) A complete change in amino acid sequence from the point of the deletion.
(D) A premature termination of the chain at the point of mutation.

80. In prokaryotes, the RNA primer from the lagging strand is removed and replaced by the DNA sequence. This process is catalyzed by an enzymewhich possess 5'-3' exonuclease activity and 5'-3' polymerase activity.
- (A) DNA polymerase I.
 - (B) DNA polymerase II.
 - (C) DNA polymerase III.
 - (D) DNA polymerase IV.
81. Which term describes the ability of a stem cell to differentiate into all cell types within an organism?
- (A) Multipotency.
 - (B) Pluripotency.
 - (C) Totipotency.
 - (D) Unipotency.
82. Which of the following statements about Michaelis-Menten kinetics is correct?
- (A) K_m , the Michaelis constant, is defined as the concentration of substrate required for the reaction to reach maximum velocity.
 - (B) K_m , the Michaelis constant, is defined as the dissociation constant of the enzyme-substrate complex.
 - (C) K_m , the Michaelis constant, is expressed in terms of the reaction velocity.
 - (D) K_m , the Michaelis constant, is a measure of the affinity the enzyme has for its substrate.
83. Which of the following statements about the competitive inhibition of an enzyme-catalyzed reaction is correct?
- (A) A competitive inhibitor and substrate can bind simultaneously to the enzyme.
 - (B) The V_{max} and K_m (Michaelis constant) for a reaction are unchanged in the presence of a competitive inhibitor.
 - (C) The V_{max} for a reaction remains unchanged in the presence of a competitive inhibitor.
 - (D) The K_m for a reaction remains unchanged in the presence of a competitive inhibitor.
84. Which of the following statements about the mechanism of the Na^+/K^+ pump is correct?
- (A) The Na^+/K^+ ATPase uses energy to pump Na^+ outside the cell and K^+ inside.
 - (B) The Na^+/K^+ ATPase uses energy to pump Na^+ inside the cell and K^+ outside.
 - (C) The Na^+/K^+ ATPase uses energy to bind both Na^+ and K^+ in turn.
 - (D) The phosphorylation of the Na^+/K^+ ATPase does not change its conformation.
85. 'RNAi' stands for which of the following?
- (A) RNA intron.
 - (B) RNA interference.
 - (C) RNA insertion.
 - (D) RNA inducer.

86. Recombinant plasmids are added to a bacterial culture that has been pretreated with _____ ions :
- (A) Iodine.
 - (B) Magnesium.
 - (C) Calcium.
 - (D) Ferric.
87. PCR technique was invented by :
- (A) Kary Mullis.
 - (B) Boyer.
 - (C) Sanger.
 - (D) Cohn.
88. Which of these bacterial components is least likely to contain useful antigens :
- (A) Cell wall.
 - (B) Flagella.
 - (C) Ribosomes.
 - (D) Capsules.
89. Which of the following component is not found in the cell wall of gram-negative bacteria?
- (A) Aminoacids.
 - (B) Teichoic acid.
 - (C) Lipopolysachharide.
 - (D) Peptidoglycan.
90. The function of the centrosome is :
- (A) Formation of spindle fibres.
 - (B) Osmoregulation.
 - (C) Secretion.
 - (D) Protein synthesis.
91. Which of the following cell organelles is called the power house of the cells?
- (A) Nucleus.
 - (B) Lysosomes.
 - (C) Chloroplast.
 - (D) Mitochondria.
92. Which enzyme is used to join nicks in the DNA strand?
- (A) Primase.
 - (B) DNA polymerase.
 - (C) DNA ligase.
 - (D) Endonuclease.
93. Select the incorrectly matched pairs :
- (A) Purines – Nitrogenous bases cytosine, thymine and uracil.
 - (B) Recombinant DNA – DNA formed by joining the DNA segments from two different sources.
 - (C) rRNA – RNA found in ribosomes.
 - (D) ATP – The energy-carrying compound in the cell.

94. The gene sequence that codes for proteins are :
- (A) Exons.
 - (B) Introns.
 - (C) Intervening sequences.
 - (D) Control regions.
95. *Thermus aquaticus* is the source of _____ :
- (A) Vent polymerase.
 - (B) Primase enzyme.
 - (C) Taq polymerase.
 - (D) Both (A) and (C).
96. ATP and ADP differ in the number of units of :
- (A) Ribose unit.
 - (B) Pyrimidine bases.
 - (C) Purine bases.
 - (D) Phosphate.
97. The sugar present in RNA is :
- (A) Ribose.
 - (B) Deoxyribose.
 - (C) Fructose.
 - (D) Pentose.
98. Which of the following is not a co-enzyme?
- (A) NAD.
 - (B) NADP.
 - (C) FAD.
 - (D) Mn^{++} .
99. Normal blood pH is:
- (A) 7.3.
 - (B) 7.2.
 - (C) 7.4.
 - (D) 8.4.
100. The nucleus contains :
- (A) Mitochondria.
 - (B) Golgi apparatus.
 - (C) Chromosomes.
 - (D) Lysosomes.