Code No.	T – 2113

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2024

CSS

BIOCHEMISTRY

General Instructions

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be (✓) 'tick marked' **only** in the "**Response Sheet**" provided.
3. **Negative marking** : **0.25 marks** will be deducted for each wrong answer .

Time : 2 Hours **Max. Marks : 100**

To be filled in by the Candidate									
Register Number	in Figures								
	in words								

Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. Which model of scientific inquiry involves formulating hypotheses based on specific observations?

   A. Hypothetico–deductive model
   B. Inductive model
   C. Deductive model
   D. Experimental model

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2. What is a scientific revolution?
   A. A sudden change in scientific beliefs and practices
   B. A gradual accumulation of scientific knowledge
   C. A major breakthrough in a specific scientific field
   D. A change in scientific terminology

3. What is the Bronsted theory of acids and bases?
   A. Acids donate protons, bases accept protons
   B. Acids accept protons, bases donate protons
   C. Acids donate electrons, bases accept electrons
   D. Acids accept electrons, bases donate electrons

4. Which type of solution has a lower solute concentration compared to another solution?

A. Hypertonic
B. Isotonic
C. Hypotonic
D. Homogeneous

5. What is the formula for calculating molality?

A. Moles of solute/Volume of solution
B. Moles of solute/Mass of solvent (in kg)
C. Moles of solute/Mass of solute (in kg)
D. Moles of solute / Volume of solvent

6. What is the primary factor affecting osmotic pressure?

A. Temperature
B. Solute concentration
C. Pressure
D. Volume

7. Which of the following concepts describes the concentration of hydrogen ions in a solution?

A. POH
B. Molarity
C. pH
D. Normality

8. What is the principle of partition chromatography?

A. Separation based on molecular size
B. Separation based on charge
C. Separation based on solubility in two immiscible phases
D. Separation based on affinity for a stationary phase

9. In gas-liquid chromatography, which component serves as the mobile phase?

A. Gas
B. Liquid
C. Solid
D. Gel

10. In electrophoresis, migration of charged molecules occurs under the influence of:

A. Temperature gradient
B. Chemical gradient
C. Electric field
D. Pressure gradient

11. Which electrophoresis technique is commonly used for separating proteins based on their size and charge?

A. Gel electrophoresis

B. PAGE (Polyacrylamide gel electrophoresis)

C. SDS-PAGE (Sodium dodecyl sulfate polyacrylamide gel electrophoresis)

D. Isoelectric focusing

12. In isoelectric focusing, molecules migrate to the point in the gel where:

A. pH is lowest

B. pH is highest

C. pH equals their isoelectric point

D. pH is neutral

13. Which of the following is a polysaccharide?

A. Glucose

B. Fructose

C. Starch

D. Sucrose

14. Which lipid is commonly known as a storage lipid in animals?

A. Phospholipids

B. Steroids

C. Triglycerides

D. Waxes

15. Which type of amino acid side chain can form disulfide bonds?

A. Hydrophobic

B. Hydrophilic

C. Basic

D. Cysteine

16. Which nucleic acid is typically single-stranded and involved in protein synthesis?

A. DNA

B. mRNA

C. rRNA

D. tRNA

17. Which type of DNA has a circular structure commonly found in prokaryotic cells?

A. Linear DNA

B. Circular DNA

C. Supercoiled DNA

D. Branched DNA

18. What is the chemical composition of a nucleotide?
    A. Sugar, phosphate group, nitrogenous base
    B. Sugar, amino group, nitrogenous base
    C. Sugar, phosphate group, fatty acid
    D. Sugar, carboxyl group, nitrogenous base

19. Which cellular structure is unique to plant cells and not found in animal cells?
    A. Mitochondria
    B. Nucleus
    C. Chloroplasts
    D. Golgi apparatus

20. What is a defining characteristic of prokaryotic cells?
    A. Presence of a nucleus
    B. Presence of membrane-bound organelles
    C. Presence of a cell wall
    D. Absence of a plasma membrane

21. Subcellular fractionation is a technique used to:
    A. Isolate whole cells from tissues
    B. Separate cellular components based on size
    C. Identify cell types in a tissue sample
    D. Determine the number of cells in a culture

22. Which type of cell division results in the formation of gametes with half the chromosome number of the parent cell?
    A. Mitosis
    B. Meiosis
    C. Cytokinesis
    D. Binary fission

23. Which cellular structure is found in plant cells but not in animal cells?
    A. Centrioles
    B. Lysosomes
    C. Plasmodesmata
    D. Peroxisomes

24. During which phase of the cell cycle does DNA replication occur?
    A. G1 phase
    B. S phase
    C. G2 phase
    D. M phase

25. What is the function of desmosomes in cell adhesion?
    A. To prevent the leakage of small molecules between cells
    B. To allow the rapid exchange of ions and small molecules between cells
    C. To provide strong mechanical attachments between adjacent cells
    D. To facilitate communication between neighboring cells

26. What term refers to the protein portion of an enzyme without its cofactor?
    A. Holoenzyme
    B. Apoenzyme
    C. Prosthetic group
    D. Ribozyme

27. What is the function of a coenzyme in enzyme catalysis?
    A. It stabilizes the enzyme-substrate complex
    B. It provides energy for the reaction
    C. It acts as a prosthetic group
    D. It serves as a cofactor in enzyme reactions

28. Which term describes the region of an enzyme where the substrate binds and the reaction takes place?
    A. Active site
    B. Allosteric site
    C. Prosthetic site
    D. Regulatory site

29. What type of enzyme specificity involves the recognition and binding of a specific substrate?
    A. Structural specificity
    B. Stereochemical specificity
    C. Group specificity
    D. Absolute specificity

30. What is the clinical significance of elevated levels of urea and creatinine in the blood?
    A. Indication of dehydration
    B. Early sign of liver disease
    C. Impaired kidney function
    D. Increased metabolic rate

31. Which method of isolation involves spreading a sample over the surface of solid media using a sterile loop?
    A. Streak plate method
    B. Pour plate method
    C. Spread plate method
    D. Agar slant method

32. Which of the following is a classification of microorganisms based on their cell type?

A. Prokaryotes and eukaryotes
B. Gram-positive and Gram-negative
C. Aerobic and anaerobic
D. Autotrophs and heterotrophs

33. Which pharmacokinetic process involves the movement of a drug from the site of administration into the bloodstream?

A. Absorption
B. Distribution
C. Metabolism
D. Excretion

34. What is the target site of action for penicillin antibiotics?

A. Cell wall synthesis
B. Protein synthesis
C. DNA replication
D. Cell membrane function

35. Which type of receptor undergoes a conformational change upon binding to a drug, leading to activation of intracellular signaling pathways?

A. G protein-coupled receptors (GPCRs)
B. Ligand-gated ion channels
C. Tyrosine kinase receptors
D. Nuclear receptors

36. Which staining technique is commonly used to differentiate between Gram-positive and Gramnegative bacteria?

A. Acid-fast staining
B. Simple staining
C. Gram staining
D. Endospore staining

37. Which enzyme catalyzes the conversion of glucose to glucose-6-phosphate in glycolysis?

A. Glucokinase
B. Hexokinase
C. Phosphofructokinase
D. Pyruvate kinase

38. Which lipid metabolism pathway involves the breakdown of triglycerides into fatty acids and glycerol?

A. Lipogenesis
B. Lipolysis
C. Beta-oxidation
D. Ketogenesis

39. What is the primary role of the salvage pathway in nucleic acid metabolism?

A. To synthesize nucleotides from scratch

B. To degrade nucleotides into nucleosides

C. To recycle nucleosides and bases from degraded nucleotides

D. To regulate the activity of DNA polymerase

40. In amino acid metabolism, which process involves the removal of the amino group from an amino acid?

A. Transamination

B. Deamination

C. Decarboxylation

D. Amidation

41. Which enzyme deficiency results in the accumulation of phenylalanine and its metabolites in individuals with phenylketonuria (PKU)?

A. Phenylalanine hydroxylase

B. Tyrosine hydroxylase

C. Phenylalanine transaminase

D. Phenylalanine deaminase

42. Which of the following is a major protein component of human blood plasma?

A. Hemoglobin

B. Collagen

C. Myoglobin

D. Albumin

43. Which term refers to the change in free energy under standard conditions?

A. ΔG

B. ΔG°

C. ΔG'

D. ΔG"

44. Which compound is considered an energy-rich molecule in biological systems?

A. ATP

B. Glucose

C. Water

D. Carbon dioxide

45. During oxidative phosphorylation, where is the electron transport chain located in eukaryotic cells?

A. Mitochondrial matrix

B. Inner mitochondrial membrane

C. Outer mitochondrial membrane

D. Cytoplasm

46. What is the primary function of oxidative phosphorylation in cellular respiration?

A. To generate AIP
B. To produce NADH
C. To synthesize glucose
D. To oxidize lipids

47. What is the main driving force for ATP synthesis during oxidative phosphorylation?

A. Proton gradient
B. Electron transfer
C. ATP hydrolysis
D. Glucose oxidation

48. Which pigment is primarily responsible for capturing light energy during photosynthesis?

A. Chlorophyll
B. Carotenoids
C. Xanthophylls
D. Phycobilins

49. During the light reaction of photosynthesis, what molecule is produced as a result of splitting water molecules?

A. Oxygen
B. Carbon dioxide
C. Glucose
D. ATP

50. What enzyme is responsible for catalyzing the addition of Carbon dioxide to Ribulose-1,5-bisphosphate (RuBP) during the Calvin cycle?

A. Rubisco
B. ATP synthase
C. NADP+ reductase
D. Phosphofructokinase

51. What is the structure of chlorophyll?

A. A porphyrin ring with a magnesium ion at the center
B. A porphyrin ring with an iron ion at the center
C. A porphyrin ring with a zinc ion at the center
D. A porphyrin ring with a calcium ion at the center

52. What is the final electron acceptor in noncyclic photophosphorylation?

A. NADP+
B. Oxygen
C. Water
D. Cytochrome b6f complex

53. Which photosynthetic pathway exhibits a spatial separation of initial carbon fixation and the Calvin cycle, with carbon fixation occurring at night and the Calvin cycle during the day?

A. C3 plants
B. C4 plants
C. CAM plants
D. Xerophytes

54. Which of the following is responsible for organizing DNA into chromatin structure?

A. Histones
B. Telomeres
C. Centromeres
D. Polymerases

55. In prokaryotic DNA replication, which enzyme is responsible for unwinding the DNA double helix?

A. DNA polymerase
B. Helicase
C. Ligase
D. Topoisomerase

56. Which of the following is a physical mutagen?

A. UV radiation
B. Ethyl methanesulfonate (EMS)
C. Nitrous acid
D. 5-bromouracil

57. What sequence serves as the binding site for RNA polymerase in prokaryotic transcription?

A. Promoter
B. Enhancer
C. Silencer
D. Operator

58. Which process involves the addition of a 5’ cap and a poly-A tail to mRNA in eukaryotes?

A. Splicing
B. Capping
C. Polyadenylation
D. Transcription

59. What type of mutation results from the substitution of one nucleotide base for another?

A. Silent mutation
B. Frameshift mutation
C. Missense mutation
D. Nonsense mutation

60. Which database is commonly used for storing nucleic acid sequences from around the world?

A. Swiss-Prot
B. PDB
C. GenBank
D. PIR

61. What type of data is typically stored in sequence databases?

A. Protein structures
B. Genetic variation data
C. DNA and RNA sequences
D. Metabolite concentrations

62. Which tool is used to identify open reading frames (ORFs) within a DNA sequence?

A. BLAST
B. FASTA
C. ORF Finder
D. BLOSUM

63. What is the main purpose of the BLAST tool in bioinformatics?

A. To predict protein structures
B. To search for similarities between biological sequences
C. To analyze microarray data
D. To predict metabolic pathways

64. Which type of sequence alignment compares the entire length of two sequences?

A. Global alignment
B. Local alignment
C. Semi-global alignment
D. Partial alignment

65. What is the main component of plasma?

A. Red blood cells
B. White blood cells
C. Platelets
D. Water and proteins

66. Which plasma protein is primarily responsible for maintaining osmotic pressure in blood vessels?

A. Albumin
B. Fibrinogen
C. Globulins
D. Hemoglobin

67. What is the main function of hemoglobin in the blood?

A. Transporting oxygen from the lungs to tissues

B. Coagulating blood to prevent bleeding

C. Fighting off infections

D. Regulating blood pressure

68. What is the process by which abnormal hemoglobin variants lead to the formation of bile pigments during hemoglobin degradation?

A. Glycosylation

B. Oxidative phosphorylation

C. Denaturation

D. Heme catabolism

69. Which of the following factors is NOT involved in the intrinsic coagulation pathway?

A. Factor VII

B. Factor VIII

C. Factor IX

D. Factor XII

70. What is the primary function of carbonic anhydrase in gas exchange?

A. Facilitating oxygen transport in blood

B. Catalyzing the conversion of carbon dioxide to bicarbonate ions

C. Regulating pH balance in muscle cells

D. Initiating muscle contraction

71. What is the main energy source for muscle contraction during exercise?

A. Glucose

B. Fatty acids

C. ATP

D. Lactic acid

72. Which of the following events occurs during the sliding filament theory of muscle contraction?

A. Myosin heads bind to actin filaments

B. Calcium ions are released from the sarcoplasmic reticulum

C. Sarcomeres shorten as actin and myosin filaments slide past each other

D. Troponin binds to tropomyosin, exposing myosin binding sites on actin

73. What is the role of glial cells in the nervous system?
    A. Generating action potentials
    B. Transmitting electrical signals
    C. Providing structural support and insulation for neurons
    D. Synthesizing neurotransmitters

74. Which of the following structures is responsible for maintaining acid-base balance in the body?
    A. Sarcomere
    B. Alveoli
    C. Kidneys
    D. Golgi apparatus

75. What are the primary roles of calcium and phosphorus in bone formation?
    A. Calcium strengthens tendons and ligaments, while phosphorus aids in nerve function
    B. Calcium provides energy for bone growth, while phosphorus maintains bone density
    C. Calcium and phosphorus provide structural support and strength to bones
    D. Calcium regulates blood sugar levels, while phosphorus aids in digestion

76. Which hormone is primarily responsible for regulating blood calcium levels?
    A. Thyroxine
    B. Cortisol
    C. Parathyroid hormone (PTH)
    D. Insulin

77. Which gland secretes cortisol?
    A. Thyroid gland
    B. Pituitary gland
    C. Adrenal gland
    D. Pancreas

78. Which hormone is synthesized in the zona glomerulosa of the adrenal cortex?
    A. Cortisol
    B. Aldosterone
    C. Testosterone
    D. Thyroxine

79. What is the primary function of thyroid hormones in the body?
    A. Regulating calcium levels in bones
    B. Stimulating growth and development
    C. Regulating blood sugar levels
    D. Controlling stress response

80. What is the primary function of antibodies in the immune system?

A. To kill pathogens directly
B. To recognize and bind to antigens
C. To produce antigens
D. To activate T cells

81. Which immunological technique is commonly used to detect the presence of specific antigens or antibodies in a sample using fluorescently labelled antibodies?

A. ELISA
B. RIA (Radioimmunoassay)
C. Immunodiffusion
D. Immunofluorescence

82. What is the main principle behind the production of monoclonal antibodies using hybridoma technology?

A. Fusion of B cells with cancer cells to produce hybrid cells
B. Cultivation of T cells in vitro to produce antibodies
C. Cloning of a single B cell to produce identical antibodies
D. Introduction of foreign DNA into bacterial cells to produce antibodies

83. In which immunological technique are antigens or antibodies separated based on their size and charge by diffusion through a gel medium?

A. ELISA
B. RIA (Radioimmunoassay)
C. Immunodiffusion
D. Immunofluorescence

84. What type of reaction occurs when antigens and antibodies combine to form visible aggregates or complexes?

A. Precipitation reaction
B. Agglutination reaction
C. ELISA reaction
D. Hybridoma reaction

85. Which enzyme is responsible for the breakdown of carbohydrates into simple sugars during digestion?

A. Lipase
B. Amylase
C. Trypsin
D. Pepsin

86. What is the primary function of bile in digestion?

A. Emulsification of fats
B. Activation of digestive enzymes
C. Breakdown of proteins
D. Neutralization of stomach acid

87. Which vitamin is water-soluble and primarily involved in the synthesis of collagen and wound healing?

A. Vitamin A
B. Vitamin D
C. Vitamin C
D. Vitamin E

88. Which enzyme is responsible for the breakdown of proteins into peptides during digestion in the small intestine?

A. Lipase
B. Amylase
C. Pepsin
D. Trypsin

89. What is the term for the recycling of bile acids from the intestine back to the liver via the bloodstream?

A. Enterohepatic circulation
B. Biliary excretion
C. Hepatic reabsorption
D. Intestinal absorption

90. What is the primary unit used to measure food energy?

A. Joule
B. Gram
C. Calorie
D. Newton

91. Which enzyme is commonly used for the estimation of glucose in blood samples?

A. Amylase
B. Lipase
C. Glucose oxidase
D. Catalase

92. What is the significance of the GTT (Glucose Tolerance Test) in diagnosing diabetes mellitus?

A. It measures fasting blood glucose levels
B. It assesses insulin sensitivity
C. It evaluates blood lipid profile
D. It measures postprandial blood glucose levels

93. Which of the following enzymes is a marker of liver injury?

A. Creatine kinase
B. Amylase
C. Alkaline phosphatase
D. Lipase

94. Which hormone is primarily responsible for regulating thyroid function?

A. T3
B. T4
C. TSH
D. ACTH

95. Which organ is primarily responsible for detoxification processes in the body?

A. Kidneys
B. Lungs
C. Liver
D. Brain

96. What are the primary types of reactions involved in phase I metabolism of xenobiotics?

A. Oxidation, hydrolysis, and reductions
B. Glycosylation, methylation, and acetylation
C. Conjugation, esterification, and phosphorylation
D. Hydroxylation, carboxylation, and deamination

97. What is the primary role of cytochrome P450 enzymes in xenobiotic metabolism?

A. Conjugation of metabolites
B. Hydrolysis reactions
C. Phase II detoxification
D. Oxidation reactions

98. Which phase II reaction involves the addition of a sulfate group to xenobiotics?

A. Glucuronidation
B. Acetylation
C. Sulfation
D. Methylation

99. Which of the following is an example of a phase I reaction in xenobiotic metabolism?

A. Glucuronidation of bilirubin
B. Hydroxylation of benzene
C. Methylation of aspirin
D. Acetylation of isoniazid

100. Which phase II reaction involves the addition of a glucuronic acid moiety to xenobiotics?

A. Glucuronidation
B. Sulfation
C. Methylation
D. Acetylation

ANSWER SHEET

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

ROUGH WORK

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