Code No.	V – 2337

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2025

CSS

BIOCHEMISTRY

For office use only

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								

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Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. What is the first step in designing scientific experiment in biochemistry?
   A. Data Collection
   B. Interpretation of results
   C. Observation
   D. Formulating hypothesis

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2. Why is repeatability important in scientific experiments?
   A. To ensure the results are unique
   B. To confirm the reliability and validity of the results
   C. To make the experiment more complex
   D. To avoid the need for replication

3. Which of the following best describes the hypothetico-deductive model in science?
   A. Making observations and then formulating a hypothesis
   B. Collecting data without any prior hypothesis
   C. Formulating a hypothesis and then testing it through experimentation
   D. Using inductive reasoning to draw conclusions

4. What is the primary purpose of using units and dimensions in scientific experiments?
   A. To make the data look more professional
   B. To ensure consistency and comparability of measurements
   C. To complicate the experimental process
   D. To avoid the need for replication

5. Which of the following is an example of a scientific revolution in biochemistry?
   A. Discovery of the structure of DNA
   B. Development of the periodic table
   C. Invention of the telescope
   D. Discovery of gravity

6. What is the ionic product of water (Kw) at 25°C?
   A. 1×10^{-7}
   B. 1×10^{-14} g. moles/lit
   C. 7
   D. 14

7. Which of the following is true about a solution with a pH of 5?
   A. It is basic
   B. it is neutral
   C. It has a higher concentration of OH^- ions than H^+ ions
   D. It has a pOH of 9

8. According to the Brønsted-Lowry theory, what is a base?
   A. A proton donor
   B. A proton acceptor
   C. An electron donor
   D. An electron acceptor

9. What is the osmotic pressure of a solution dependent on?
   A. Temperature and volume of the solution
   B. Volume and concentration of solute particles
   C. Temperature and concentration of solute particles
   D. pH and pOH of the solution

10. Which of the following solutions is isotonic to human red blood cells?

    A. 0.9% NaCl solution

    B. 5% glucose solution

    C. Distilled water

    D. 10% NaCl solution

11. Which type of chromatography separates molecules based on their affinity to a specific ligand?

    A. Partition chromatography

    B. Adsorption chromatography

    C. Affinity chromatography

    D. Gas-liquid chromatography

12. What is the principle behind High Performance Liquid Chromatography (HPLC)?

    A. Separation based on volatility of compounds

    B. Separation based on differential partitioning between a mobile liquid phase and a stationary solid phase

    C. Separation based on molecular size using a gel matrix

    D. Separation based on charge differences in an electric field

13. In SDS-PAGE, what is the role of sodium dodecyl sulfate (SDS)?

    A. To add a negative charge to proteins proportional to their size

    B. To separate proteins based on their isoelectric point

    C. To stain proteins for visualization

    D. To act as a buffer for maintaining pH

14. In isoelectric focusing (IEF), how are proteins separated?

    A. Based on their molecular weight

    B. Based on their charge-to-mass ratio

    C. Based on their isoelectric point (pI)

    D. Based on their solubility in a buffer

15. Which of the following is a key difference between gas-liquid chromatography (GLC) and high-performance liquid chromatography (HPLC)?

A. GLC uses a liquid mobile phase, while HPLC uses a gas mobile phase.

B. GLC separates compounds based on volatility, while HPLC separates based on polarity.

C. GLC requires high pressure, while HPLC operates at atmospheric pressure.

D. GLC is used only for proteins, while HPLC is used for small molecules

16. Which of the following is a disaccharide?

A. Glucose

B. Fructose

C. Sucrose

D. Starch

17. What is the primary function of triglycerides in the body?

A. Structural component of cell membranes

B. Energy storage

C. Hormone production

D. Enzyme catalysis

18. Which level of protein structure is determined by the sequence of amino acids?

A. Primary structure

B. Secondary structure

C. Tertiary structure

D. Quaternary structure

19. Which of the following is true about the Watson-Crick DNA double helix model?

A. The two strands are parallel and run in the same direction.

B. The base pairing is between adenine and guanine and thymine and cytosine.

C. The sugar-phosphate backbone is on the inside, and the bases are on the outside.

D. The two strands are antiparallel and held together by hydrogen bonds between complementary bases.

20. Which type of RNA carries amino acids to the ribosome during protein synthesis?

A. Messenger RNA (mRNA)

B. Ribosomal RNA (rRNA)

C. Transfer RNA (tRNA)

D. Small nuclear RNA (snRNA)

21. Who is credited with the discovery of the cell?

A. Louis Pasteur

B. Robert Hooke

C. Anton van Leeuwenhoek

D. Rudolf Virchow

22. Which of the following is a key difference between prokaryotic and eukaryotic cells?

A. Eukaryotic cells have membrane-bound orgnalles, while prokaryotic cells do not.

B. Prokaryotic cells have a nucleus, while eukaryotic cells do not.

C. Prokaryotic cells are larger than eukaryotic cells.

D. Eukaryotic cells lack ribosomes, while prokaryotic cells have them.

23. During which phase of the cell cycle does DNA replication occur?

A. G1 phase

B. S phase

C. G2 phase

D. M phase

24. Which type of cell junction allows for direct communication between adjacent animal cells by permitting the passage of ions and small molecules?

A. Desmosomes

B. Tight junctions

C. Gap junctions

D. Plasmodesmata

25. What is the primary function of plasmodesmata in plant cells?

A. To provide structural support to the cell

B. To facilitate cell-to-cell communication and transport of materials

C. To anchor the cell to the extracellular matrix

D. To prevent the passage of water and solutes

26. What is the term for the protein part of an enzyme that requires a cofactor to become active?

A. Holoenzyme

B. Prosthetic group

C. Apo enzyme

D. Ribozyme

27. Which of the following is a non-protein enzyme that catalyzes RNA splicing?

A. Abzyme

B. Ribozyme

C. Coenzyme

D. Prosthetic group

28. Which coenzyme is involved in redox reactions and carries electrons in the form of hydrogen atoms?

A. Thiamine pyrophosphate (TTP)

B. Biotin

C. Pyridoxal phosphate (PLP)

D. Nicotinamide adenine dinucleotide (NAD)

29. Which coenzyme is involved in the transfer of acyl groups and is a critical component of the pyruvate dehydrogenase complex?

A. Flavin adenine dinucleotide (FDA)

B. Lipoic acid

C. Flavin mononucleotide (FMN)

D. Thiamine pyrophosphate (TPP)

30. Which of the following enzymes or enzyme complexes requires biotin as a coenzyme for its activity?

A. Pyruvate carboxylase

B. Lactate dehydrogenase

C. Alanine transaminase

D. Hexokinase

31. What is the primary function of telomeres in eukaryotic chromosomes?

A. To initiate DNA replication

B. To bind RNA polymerase

C. To facilitate transcription

D. To protect chromosome ends from degradation

32. Which enzyme is responsible for unwinding the DNA double helix during replication?

A. DNA polymerase

B. Helicase

C. Ligase

D. Primase

33. Which type of mutation involves the insertion or deletion of nucleotides, leading to a shift in the reading frame?

A. Missense mutation

B. Nonsense mutation

C. Frame shift mutation

D. Silent mutation

34. Which DNA repair mechanism corrects errors caused by UV-induced thymine dimers?

A. Nucleotide excision repair

B. Mismatch repair

C. Base excision repair

D. Direct repair

35. What is the role of the sigma (σ) factor in prokaryotic transcription?

A. To terminate transcription

B. To add the poly-A tail to mRNA

C. To unwind the DNA double helix

D. To bind RNA polymerase to the promoter

36. Which of the following is a key difference between the lac operon and the trp operon?

A. The lac operon is an inducible system, while the trp operon is a repressible system

B. The lac operon is a repressible system, while the trp operon is an inducible system

C. The lac operon regulates amino acid synthesis, while the trp operon regulates sugar metabolism

D. The lac operon is found in eukaryotes, while the trp operon is found in prokaryotes

37. Which enzyme is used to cut DNA at specific sequences during recombinant DNA technology?

A. DNA polymerase

B. Ligase

C. Restriction enzyme

D. Reverse transcriptase

38. What is the purpose of a cDNA library in molecular biology?

A. To store genomic DNA fragments

B. To represent only the expressed genes of an organism

C. To sequence entire genomes

D. To study non-coding regions of DNA

39. Which technique is used to amplify specific DNA sequences in vitro?

A. Southern blotting

B. Gel electrophoresis

C. Polymerase chain reaction (PCR)

D. DNA fingerprinting

40. Which of the following is an application of antisense RNA?

A. To enhance gene expression

B. To inhibit the translation of specific mRNA

C. To repair damaged DNA

D. To amplify DNA sequences

41. Which plasma protein is primarily responsible for maintaining osmotic pressure in the blood?

A. Albumin

B. Globulin

C. Fibrinogen

D. Hemoglobin

42. What is the primary function of hemoglobin?

A. To transport oxygen

B. To clot blood

C. To fight infections

D. To maintain osmotic pressure

43. Which of the following is a bile pigment formed during the degradation of hemoglobin?

A. Biliverdin

B. Heme

C. Ferritin

D. Transferrin

44. Which pathway of blood coagulation is initiated by tissue damage outside the blood vessel?

A. Intrinsic pathway

B. Extrinsic pathway

C. Common pathway

D. Fibrinolytic pathway

45. What is the primary site of erythropoiesis in adults?

A. Liver
B. Spleen
C. Bone marrow
D. Lymph nodes

46. What is the significance of the sigmoidal shape of the oxygen dissociation curve?

A. It indicates cooperative binding of oxygen to hemoglobin.
B. It shows that oxygen binds independently to each subunit of hemoglobin.
C. It reflects the linear relationship between oxygen partial pressure and hemoglobin saturation.
D. It demonstrates the inability of hemoglobin to release oxygen in tissues.

47. Which enzyme catalyzes the conversion of carbon dioxide and water into carbonic acid in red blood cells?

A. Carbonic anhydrase
B. Catalase
C. Cytochrome oxidse
D. Lactate dehydrogenase

48. Which of the following is the primary energy source for muscle contraction during prolonged exercise?

A. Creatine phosphate
B. Glycogen
C. Fatty acids
D. ATP

49. What is the role of calcium ions in skeletal muscle contraction?

A. To hydrolyze ATP
B. To bind to troponin and expose actin binding sites
C. To phosphorylate myosin
D. To stabilize the sarcolemma

50. Which type of glial cell is responsible for forming the myelin sheath in the central nervous system?

A. Astrocytes
B. Microglia
C. Oligodendrocytes
D. Schwann cells

51. Which of the following is essential for the absorption of calcium in the intestine?

A. Vitamin A
B. Vitamin C
C. Vitamin D
D. Vitamin K

52. Which hormone is secreted by the adrenal medulla and is involved in the “fight or flight” response?

A. Cortisol
B. Aldosterone
C. Epinephrine
D. Thyroxine

53. Which of the following hormones is derived from cholesterol and has a steroid structure?

A. Thyroxine
B. Cortisol
C. Epinephrine
D. Insulin

54. Which of the following is the primary site of biosynthesis for thyroxine?

A. Pancreas
B. Thyroid gland
C. Adrenal gland
D. Pituitary gland

55. Which type of immunity is mediated by B cells and the production of antibodies?

A. Innate immunity
B. Cell-mediated immunity
C. Humeral immunity
D. Passive immunity

56. Which of the following immunoglobulins is primarily involved in allergic reactions and defense against parasitic infections/

A. IgG
B. IgM
C. IgA
D. IgE

57. What is the principle behind the Enzyme-Linked Immunosorbent Assay (ELISA)?

A. Detection of antigen-antibody interactions using radioactive labels
B. Detection of antigen-antibody interactions using enzyme-linked antibodies
C. Separation of proteins based on size and charge
D. Amplification of DNA sequences

58. Which of the following enzymes is responsible for the digestion of proteins in the stomach?

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

59. Which of the following vitamins is water-soluble and acts as a coenzyme in energy metabolism?

A. Vitamin A
B. Vitamin B1 (Thiamine)
C. Vitamin D
D. Vitamin E

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

A. To digest carbohydrates
B. To emulsify fats
C. To digest proteins
D. To neutralize stomach acid

61. What is the approximate calorific value of 1 gram of carbohydrates?

A. 4 kcal
B. 9 kcal
C. 7 kcal
D. 2 kcal

62. Which enzymatic method is most commonly used for blood glucose estimation?

A. Folin-Wu method

B. Glucose oxidase-peroxidase (GOD-POD) method

C. Benedict's test

D. Biuret method

63. Which lipid fraction is considered "good cholesterol'' and helps in reverse cholesterol transport?

A. LDL (Low-Density Lipoprotein)

B. VLDL (Very Low-Density Lipoprotein)

C. HDL (High-Density Lipoprotein)

D. Chylomicrons

64. Which cardiac marker rises earliest (within 3-6 hours) after a myocardial infarction?

A. Troponin I

B. CK-MB (Creatine Kinase-MB)

C. Myoglobin

D. LDH (Lactate Dehydrogenase)

65. In a Glucose Tolerance Test (GTT), what blood glucose level after 2 hours indicates diabetes mellitus?

A. <140 mg/Dl

B. 140-199 mg/dL

C. ≥200 mg/Dl

D. 120-139 mg/Dl

66. Which of the following best defines Basal Metabolic Rate (BMR)?

A. Energy expended during intense exercise

B. Minimum energy required to maintain vital functions at rest

C. Total energy consumed in a day

D. Energy used for digesting food

67. Which liver function test is most specific for biliary obstruction?
    A. AST (Aspartate Aminotransferase)
    B. ALT (Alanine Aminotransferase)
    C. Alkaline Phosphatase (ALP)
    D. Gamma-Glutamyl Transferase (GGT)

68. Which thyroid hormone is biologically active and regulates metabolism?
    A. Thyroxine (T4)
    B. Triiodothyronine (T3)
    C. Thyroid Stimulating Hormone (TSH)
    D. Calcitonin

69. In renal function tests, which clearance test is considered the gold standard for GFR estimation?
    A. Urea clearance
    B. Creatinine clearance
    C. Inulin clearance
    D. Serum uric acid

70. What does a high albumin/globulin (A/G) ratio in serum indicate?
    A. Chronic liver disease
    B. Multiple myeloma
    C. Dehydration
    D. Nephrotic syndrome

71. Which of the following is a differential staining technique used to classify bacteria into Gram-positive and Gram-negative?
    A. Simple staining
    B. Negative staining
    C. Gram staining
    D. Capsule staining

72. What is the primary purpose of an autoclave in microbiology?

A. To culture bacteria

B. To isolate pure colonies

C. To sterilize equipment using steam tinder pressure

D. To stain microorganisms

73. Which of the following routes of drug administration bypasses first-pass metabolism?

A. Oral

B. Intravenous (IV)

C. Rectal

D. Sublingual

74. Which antibiotic inhibits bacterial cell wall synthesis by binding to penicillin-binding proteins (PBPs)?

A. Penicillin

B. Streptomycin

C. Tetracycline

D. Chloramphenicol

75. Acid-fast staining is used to identify which group of bacteria?

A. Mycobacterium tuberculosis

B. Escherichia coli

C. Staphylococcus aureus

D. Streptococcus pyogenes

76. What does a negative ΔG (Gibbs free energy change) indicate about a biochemical reaction?

A. non-spontaneous reaction

B. Equilibrium state

C. Spontaneous reaction

D. Requires energy input

77. Which of the following is a high-energy compound that directly drives muscle contraction?

A. NADH
B. ATP
C. $FADH_2$
D. GTP

78. in oxidative phosphorylation, the final election acceptor in the ETC is :

A. NAD^+
B. Cytochrome c
C. FAD
D. O_2

79. The standard reduction potential (E°) of NAD^+/NADH is –0.32 V, while for O_2/H_2O it is +0.82 V. What does this imply about electron flow in the ETC?

A. Electrons moves from NADH to O_2 because ΔAE° is positive
B. Electrons move from NADH to O_2 because ΔAE° is positive (1.14 V), favoring spontaneous ATP synthesis
C. Electrons move from O_2 to NADH
D. No net electron transfer occurs

80. Which pigment directly absorbs light energy in photosynthesis?

A. Chlorophyll a
B. Carotenoids
C. Phycobilin
D. Xanthophyll

81. Non-cyclic photophosphorylation produces :

A. ATP only
B. ATP + NADPH + O_2
C. NADPH only
D. Only O_2

82. C4 plants minimize photorespiration by :

A. Initial CO_2 fixation in mesophyll as oxaloacetate (C4)
B. Direct Calvin cycle in mesophyll
C. Stomatal closure at night
D. Avoiding Rubisco activity

83. Why does cyclic photophosphorylation only produce ATP?

A. Electrons cycle back to PSI, bypassing $NADP^+$ reduction

B. No water is split

C. It occurs only in C3 plants

D. Requires darkness

84. Phase I reactions in detoxification tvpically involve:

A. Conjugation

B. Oxidation (e.g., by Cytochrome P450)

C. Methylation

D. Acetylation

85. Which enzyme family is crucial for Phase I drug metabolism?

A. Cytochrome P450 monooxygenases

B. Glutathione S-transferases

C. UDP-glucuronosyl transferases

D. Acetyl transferases

86. Paracetamol toxicity arises due to depletion of which detoxifying agent?

A. NADPH

B. Glutathione

C. ATP

D. Heme

87. A reaction with $AG°' = – 30.5$ kJ/mol is :

A. At equilibrium

B. Requires ATP

C. Non-spontaneous

D. Spontaneous

88. Which compounds has the highest energy phosphate bond?

A. ATP

B. Phosphoenolpyruvate (PEP)

C. Glucose-6-phosphate

D. AMP

89. Complex II (Succinate-Q reductase) in ETC directly feeds electrons to :

A. NADH dehydrogenase

B. Cytochrome c

C. Ubiquinone (Q)

D. ATP synthase

90. If AE° '= + 0.25 V for a redox pair, $\Delta G^{\circ\prime}$ is :

A. + 24.1 kJ/mol

B. – 24.1 kJ/mol

C. Zero

D. – 48.2 kJ/mol

91. The primary electron donor in PSII is :

A. Water (H_2O)

B. NADPH

C. Plastoquinone

D. Ferredoxin

92. Cyclic photophosphorylation involves :

A. PSI only

B. PSI + Cytochrorne b_6f

C. PSII + PSI

D. RUBISCO

93. C4 plants initially fix CO_2 into :

A. 3-PGA

B. Oxaloacetate (OAA)

C. Pyruvate

D. RuBP

94. Why is Rubisco inefficient in C3 plants?

A. Oxygenase activity causes photorespiration

B. Low affinity for CO_2

C. Requires Mg^{2+}

D. Inhibited by ATP

95. Which of the following is an example of a primary nucleic acid database?

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

96. Which of the following databases is classified as a composite database?

A. EMBL
B. UniProt
C. DDBJ
D. PDB

97. Which tool is used for finding Open Reading Frames (ORFs) in a DNA sequence?

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

98. Which of the following is a protein structure database?

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

99. What does BLOSUM stand for in the context of sequence alignment?

A. Basic Local Optimization Search Utility Matrix
B. Blocks Substitution Matrix
C. Biological Lineage Optimization and Substitution Matrix
D. Binary Local Sequence Utility Matrix

100. What type of data does the Swiss-Prot database primarily contain?

A. Protein sequences
B. Genome data
C. Nucleotide sequence
D. Chemical data

RESPONSE 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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