

**Entrance Examinations – 2021**  
**Int. M.Sc.-Ph.D. Biochemistry and Molecular Biology**

Hall Ticket No.

**Time : 2 hours**

**Max. Marks : 70**

Please read the following instructions carefully before answering:

1. Enter Hall Ticket number in the space provided above and also on OMR sheet.
2. Paper contains two sections: Part A and Part B together with 60 questions for 70 marks. **Part A contains 25 questions. Questions 1 to 15 carry one mark each. Questions 16 to 25 carry 2 marks each. Part B contains 35 questions; each question carries one mark.**
3. Answers have to be marked on the OMR sheet as per the instructions provided.
4. Apart from OMR sheet, the question paper contains 9 (nine) pages including the instructions and rough work sheets.
5. **Please return the OMR answer sheet at the end of examination.**
6. No additional sheet will be provided.
7. Rough work can be carried out in the question paper itself in the space provided at the end of the booklet.
8. Non programmable calculators are allowed.

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**PART-A**

1. Which of the following amino acids has two asymmetric carbons  
A) Lysine                      B) Proline                      C) Cysteine                      D) Isoleucine
2. Nicotinic acid is formed from  
A) Glutamic acid              B) Tryptophan                      C) Tyrosine                      D) Glycine
3. Which of the following phospho sugars is a precursor for amino sugar synthesis in cells  
A) Fructose 6-phosphate              B) Ribose 5-phosphate  
C) Glucose 6-phosphate              D) Xylose 5-phosphate
4. Which one of the following properties are common to both NADH and NADPH?  
A) Same net charge pH 7.0              B) Similar oxidation-reduction potential  
C) Interchangeable as cofactors to dehydrogenases      D) Equimolar concentration in cells
5. Urea cycle enzymes  
1) are found in the mitochondria and cytosol  
2) seen in amoeba  
3) facilitate removal of toxic excess ammonia from the blood  
4) also found in some plants

The option that has all correct answers is

- A) 2 & 3      B) 1 & 2                      C) 1 & 3                      D) 1 & 4

6. Lipoproteins exist as  
 1) Glycolipids 2) Low Density Lipoproteins 3) High density lipoproteins 4) Free lipids  
 A) 1 & 3 B) 1 & 2 C) 2 & 3 D) 1 & 4
7. Which of the following compounds serves as an amino group acceptor in amino acid catabolism?  
 A) Glutamine B) Aspartamine C) alpha-ketoglutarate D) Oxalate
8. Most bacteria in the normal adult gastrointestinal tract are members of the genus  
 A) Lactobacillus B) Clostridium C) Enterobacter D) Bacteroides
9. Oxidation number indicates the number of electrons lost or gained in a chemical reaction. Select the correct oxidation number of oxygen in  $H_2O_2$   
 A) 1 B) -1 C) 2 D) -2
- 10) Find the wrongly paired mechanism with respect to cellular location of occurrence.  
 A) Translation – Cytoplasm  
 B) Transcription – Nucleus  
 C) Post-transcriptional mechanism - Endoplasmic Reticulum  
 D) Post-translational mechanism - Endoplasmic Reticulum
- 11) Most bacteria can be placed into one of three groups based on their colour after specific staining procedures are performed: Gram-positive, Gram-negative, or acid-fast. Their respective colours when observed under microscope are-  
 A) Purple, pink and red B) Blue, red and pink  
 C) Blue, pink and red D) Pink, red and purple
- 12) In which genetic recombination process a DNA fragment from a dead bacterium enters into a competent recipient bacterium to exchange for a piece of recipient DNA?  
 A) Transformation B) Transduction  
 C) Conjugation D) Translation
13. Acetabularia is a kind of  
 A) Fungi B) Protist C) Multicellular algae D) Unicellular algae
14. Flat thickened area of ectoderm is  
 A) neural plate B) neural tube C) neural folds D) neural groove
15. Many cells in the body divide only rarely, such as neurons. In which portion of the cell cycle would such cells be considered to be?  
 A) G1 phase B) G2 phase C) G0 phase D) M phase
16. Green plants and photosynthetic bacteria can effectively use carbon dioxide as the sole source of all the carbon atoms. Animals and heterotrophic organisms are unable to bring net reduction of  $CO_2$  although C is being taken up at several metabolic reactions such as: a) Conversion of acetyl-CoA to malonyl-CoA during fatty acid synthesis b) Pyruvate carboxylase during gluconeogenesis c) carbamoyl phosphate synthesis during urea formation. This is because of  
 1. loss of  $CO_2$  in the later steps of pathways  
 2. availability of  $CO_2$  is limited

3. does not have distinct metabolic route for the use of  $\text{CO}_2$

4.  $\text{CO}_2$  is being used for other purposes

Choose the option that has all the correct reasons.

- A) only 1 and 2 are correct      B) only 1, 2 and 3 are correct  
C) only 1 and 3 are correct      D) only 2 and 3 are correct

17. Given below are columns with names of some proteases and the class they belong to.

Protease	Class of proteases
(i) HIV-1 protease	(a) metalloproteinase
(ii) Thermolysin	(b) cysteine protease
(iii) Thrombin	(c) aspartyl protease
(iv) Papain	(d) Serine protease

Select the option that represents the correct match.

- A) (i)-(a); (ii)-(b); (iii)-(c); (iv)-(d)  
B) (i)-(c); (ii)-(d); (iii)-(a); (iv)-(b)  
C) (i)-(b); (ii)-(a); (iii)-(d); (iv)-(c)  
D) (i)-(c); (ii)-(a); (iii)-(d); (iv)-(b)

18. If a helium balloon has an initial volume of 1 L at  $25^\circ\text{C}$  but a final volume of 0.95 L after a temperature change, what is the final temperature?

- A) 283.1 K      B) 25 K      C)  $37^\circ\text{C}$       D) 273 K

19. Which of the following statements are true about Sigma factor ( $\sigma$ ) during transcription initiation?

- (i) In prokaryotes, initiation requires binding of sigma factor to RNA core polymerase  
(ii) Sigma factor allows proper binding of RNA polymerase to the promoter site  
(iii) Sigma released upon transcription initiation  
(iv) sigma factors recognize only one specific promoter

- A) (i) and (ii) only  
B) (ii), (iii) and (iv) only  
C) (i), (ii), and (iii) only  
D) (i), (ii), (iii) and (iv)

20. Structures of all 20 common amino acids can be represented using the elements \_\_\_\_\_, and nucleosides of DNA and RNA by \_\_\_\_\_ respectively.

- A) C, N, H, O and C, N, H, O  
B) C, N, H, O, S and C, N, H, O, P  
C) C, N, H, O, P and C, H, O, N  
D) C, N, H, O, S and C, H, O, N

21. Following are statements about the regulation of HMG-CoA reductase activity?

- 1) Depletion of ATP levels activates HMG-CoA reductase  
2) Insulin activates and glucagon inhibits HMG-CoA reductase

- 3) Insulin inhibits and glucagon activates HMG-CoA reductase  
 4) Lovastatin and oxysterol inhibits HMG-CoA reductase

Choose the option that has all the correct statements.

- A) 1 & 2 are correct                      B) 1&3 are correct  
 C) 1,3&4 are correct                      D) 1,2,&4 are correct

22. Following are statements about inhibitors of phosphofruktokinase 1.

- 1) ATP & Citrate  
 2) Citrate & fructose 2,6 bisphosphate  
 3) ATP & Malate  
 4) ATP & fructose 2,6 bisphosphate

Choose the option that has all the correct statements.

- A) 1&4 correct                              B) 1&2 correct  
 C) 1 & 3 correct                              D) 3 & 4 correct

23. Mitochondria-associated membranes (MAMs) are found at the

- A) Inter-membrane space of the inner and outer membranes of mitochondria  
 B) Interface of mitochondria and plasma membrane  
 C) Interface of mitochondria with nuclear membrane  
 D) Interacting region between mitochondria and ER

24. Following are a few statements about focal adhesions and hemidesmosomes.

- 1) Both are cell-matrix interactions  
 2) Both are cell-cell interactions  
 3) Focal adhesions are cell-cell and hemidesmosomes are cell-matrix interactions  
 4) Both are anchoring junctions

Choose the option that has all the correct statements

- A) 1 & 4 are correct  
 B) 2 & 4 are correct  
 C) 3 & 4 are correct  
 4) only 2 is correct

25. A synthetic template with a sequence 5' AACUAACUAACUAACUAACUAAC3' was translated in a cell-free translational system. How many peptides the synthetic template can code for? (UAA, UAG and UGA refer to stop codons)

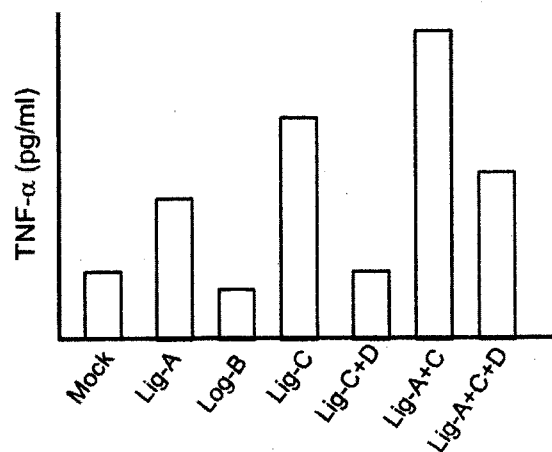
- A) two peptides  
 B) four peptides  
 C) six peptides  
 D) eight peptides

## PART B

26. Which of the following lung volumes and capacities regulated by the external intercostal muscles will be affected if the external intercostal muscles are damaged during an accident?
- expiratory reserve volume (ERV)
  - inspiratory reserve volume (IRV)
  - vital capacity (VC)
  - both B and C

27. In which of the following cases an ecological pyramid can be inverted?
- A pyramid of energy flow in an ecosystem
  - A pyramid of biomass in a terrestrial ecosystem
  - A pyramid of numbers in an ecosystem where the community contains parasites
  - A pyramid of energy flow in an aquatic ecosystem where phytoplanktons are the producers

28. You treated cells with different ligands (as shown in the X-axis of the plot below) and measured the levels of TNF- $\alpha$  upon treatment. The graphical interpretation of the results is given below.



Which of the following statements cannot be logically made based on the graph provided above?

- Ligand D antagonizes the impact of ligand C
- Effect of ligand A and C is additive
- Effect of ligand A and C is synergistic
- Ligand D is a suppressor for this experiment

29. Two proteins, A and B, got mixed in a single tube and you are required to separate them to maximum purity in two different tubes. Protein A is 50 kDa with pI 5.0 and Protein B is a 57kDa with pI 8.0. Which of the following techniques will give you the desired outcome?

- SDS-Poly Acrylamide Gel Electrophoresis
- Size-exclusion chromatography
- Ion-exchange chromatography
- Affinity chromatography

30. You are travelling during your vacation. If the odds against this travel are 7 to 3, what is the probability of the travel happening?

- 7/10
- 3/10
- 1
- None of the above

31. The heights of a population of your 5 pets are: 600mm, 470mm, 170mm, 430mm and 300mm. The variance is:

A) 147            B) 394            C) 21704            D) 165

32. Which of the following amino acids furnishes carbon atoms for synthesis of both glucose and ketone bodies?

A) Valine      B) Glutamate      C) Histidine      D) Lysine

33. The irons in hemoglobin and cytochrome of cytochrome oxidase under normal physiological conditions differ by their

A) Oxygen affinity            B) Oxidation state  
C) Prosthetic group            D) CO binding ability

34. Which one of the following statements best describes passive diffusion?

A) Rate is proportional to the concentration difference  
B) Can be saturated  
C) Can occur in only one direction across a biological membrane  
D) Does not expect to transport L and D amino acids at the same rate

35. When comparing the size of an ion with the parent atom, which would be true?

A) A cation is generally larger than the parent atom, but an anion is smaller than the parent atom  
B) A cation is generally smaller than the parent atom, while an anion would be larger  
C) They are likely to be of the same size as the parent atom  
D) Any ion would be generally smaller than the parent atom

36. List the compounds in decreasing order of acidity

A) chloroacetic acid, acetic acid, dichloroacetic acid, trichloroacetic acid  
B) trichloroacetic acid, chloroacetic acid, dichloroacetic acid, acetic acid,  
C) Trichloroacetic acid, dichloroacetic acid, chloroacetic acid, acetic acid  
D) acetic acid, chloroacetic acid, dichloroacetic acid, trichloroacetic acid

37. Which of the following amino acids can be estimated by Xanthoproteic Test?

A) Methionine      B) Serine      C) Tyrosine      D) Lysine

38. The 3C intermediate of pentose phosphate pathway is?

A) Glycerol    B) Glyceraldehyde    C) 3-Phosphoglycerate    D) Glyceraldehyde 3-phosphate

39. Denovo synthesis of pyrimidine nucleotides is repressed by \_\_\_\_\_.

A) ATP      B) UTP      C) PRPP      D) Glutamine

40. In paracrine signaling growth factors

A) act on their own cells where they are synthesized  
B) act on surrounding cells in a tissue  
C) act on another tissue via circulation  
D) act on another organism

41) Covid19 genetic material

A) minus-single stranded RNA            B) plus-single stranded RNA  
C) minus-double stranded RNA            D) plus-double stranded RNA

42) Lucien Cuenoit was breeding mice with different coat colours. When he crossed two yellow mice, he never got 100% yellow mice. The ratio was always 2 yellow mice for 1 non-yellow. This is a case of

- A) Recessive lethal
- B) Dominant lethal
- C) Incomplete dominance
- D) Epistasis

43) The probability of heterozygotes arising from a test cross is

- A) 0%
- B) About 25%
- C) 100%
- D) At least 50%

44) Snapdragon flowers are colored red or white. When true breeding plants producing red flowers are crossed with plants producing white flowers, the F1 offsprings have pink flowers. Which one of the following phenomena explains this type of gene interaction accurately?

- A) Red is dominant over white
- B) Codominant
- C) Epistasis
- D) Incompletely dominant

45. Which one of the cell types among the ones mentioned below has shortest life span?

- A) Red blood cells
- B) Liver Cells
- C) Intestinal Epithelial Cells
- D) Beta Cells of Pancreas

46. At the end of initiation, eukaryotic mRNA carrying initiator tRNA with its methionine is positioned in the

- A) On the ribosome binding site
- B) A site of ribosome
- C) P site of ribosome
- D) E site of ribosome

47. Protein (s) that have polymerase and nuclease activities

- i) Prokaryotic DNA Polymerase III
- ii) Prokaryotic RNA Polymerase
- iii) Ribozymes
- iv) Prokaryotic DNA Polymerase I

Choose the option that has the enzyme with both activities.

- A) i and ii only
- B) i only
- C) i, iii and iv only
- D) i and iii only.

48. Choose the option that arranges the following in the order of their appearance during Nucleotide excision repair (NER) in *E. coli*: DNA pol I, DNA ligase, Uvr AB, UvrC.

- A) DNA pol I, DNA ligase, Uvr AB, UvrC
- B) Uvr AB, UvrC, DNA pol I, DNA ligase
- C) Uvr AB, UvrC, DNA ligase, DNA pol I
- D) DNA pol I, DNA ligase, UvrC, Uvr AB

49. In the Messelson and Stahl experiment, after growing cells for many generations in heavy Nitrogen ( $N^{15}$ ) isotope, cells were allowed to undergo 2 division cycles in light ( $N^{14}$ ) isotope. What percent of the DNA in these cells would have 1 light strand and 1 heavy strand?

- A) 0%
- B) 25%
- C) 100%
- D) 50%

50. Choose the option that matches mammalian DNA polymerases with their respective activities:

DNA pol	Activity
a. Alpha ( $\alpha$ )	i. Translesion DNA synthesis bypassing cyclobutyl-dimer
b. Beta ( $\beta$ )	ii. Involved in priming along with primase
c. Gamma ( $\gamma$ )	iii. Replicating nuclear DNA
d. Delta ( $\delta$ )	iv. Base excision repair
e. Epsilon ( $\epsilon$ )	v. Replicating mitochondrial DNA

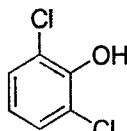
- A) a-i; b-ii; c-iii; d-iv; e-v.  
 B) a-ii; b-iv; c-v; d-iii; e-i.  
 C) a-ii; b-i; c-iii; d-iv; e-v.  
 D) a-iv; b-ii; c-v; d-iii; e-i.

51. If a DNA is treated with an enzyme that produces, on the average, one single-strand break in each molecule, the percentage of unbroken DNA would be:

- A) 0.37%                      B) 0.63%                      C) 37%                      D) 63%

52. The unit of molar absorptivity or molar absorption coefficient used in Beer Lambert's formula is

- A)  $L^{-1} \text{ mol}^{-1} \text{ cm}^{-1}$   
 B)  $\text{gm L}^{-1} \text{ cm}^{-1}$   
 C)  $L \text{ gm}^{-1} \text{ cm}^{-1}$   
 D)  $L \text{ mol}^{-1} \text{ cm}^{-1}$



53. The name of the compound is

- A) 1-hydroxy-2,5-dichlorobenzene  
 B) 1,3-dichlorophenol  
 C) 2,6-dichlorophenol  
 D) 2,5-dichlorophenol

54. Which one of the following molecules does not own enantiomers?

- A)  $\text{CH}_3\text{CH}_2\text{CHClCH}_3$   
 B)  $\text{CH}_2\text{ClCH}_2\text{CH}_2\text{CH}_2\text{Cl}$   
 C)  $\text{CH}_3\text{CHClCH}_2\text{CH}_2\text{Cl}$   
 D)  $\text{CH}_3\text{CHClCH}_2\text{CH}_2\text{Cl}$

55. If the oxidation of isopropyl alcohol to acetone was monitored by IR spectroscopy, what bands in the IR spectra would you observe for the substrate and the product?

- A) Substrate  $3300 \text{ cm}^{-1}$  and  $1750 \text{ cm}^{-1}$   
 B) Substrate  $1750 \text{ cm}^{-1}$  and  $3300 \text{ cm}^{-1}$   
 C) Substrate  $2300 \text{ cm}^{-1}$  and  $1750 \text{ cm}^{-1}$   
 D) Substrate  $3300 \text{ cm}^{-1}$  and  $1000 \text{ cm}^{-1}$

56. How many pairs of cranial nerve are present in humans?

- A) 6                      B) 10                      C) 12                      D) 15



57. \_\_\_\_\_ is found in plants but not in animals.

- A) Asexual Reproduction                      B) Sexual Reproduction  
C) Metabolism                                      D) Autotrophy

58. The number of chromosomes in the roots of hexaploid wheat plant is 42. What is the number of chromosomes in its gametes after meiosis?

- A) 7                      B) 21                      C) 6                      D) 14

59. Which of the following will not generate an immune response when injected into a BALB/c mouse?

- A) A 23 kDa neutral protein  
B) A C57BL/6 immunoglobulin G (IgG)  
C) Albumin from the same mouse  
D) A rabbit immunoglobulin G (IgG)

60. Which component of the lipopolysaccharide of a Gram-negative bacterium is considered responsible for the toxicity?

- A) O antigen or O polysaccharide-the outermost domain Lipid A  
B) Lipid A-the innermost lipid component  
C) Core oligosaccharide that connects o-antigen and lipid A  
D) Host antibodies binding to O antigen

**University of Hyderabad**  
**Entrance Examinations - 2021**

School/Department/Centre : Life Sciences, Biochemistry  
Course/Subject : Int. MSc PhD Biochemistry and Molecular Biology  
Code No: A-46 (Biochemistry and Molecular Biology)

Q.No.	Answer	Q.No.	Answer	Q.No.	Answer	Q.No.	Answer
1	D	26	D	51	C	76	
2	B	27	C	52	D	77	
3	A	28	B	53	C	78	
4	A	29	C	54	B	79	
5	C	30	B	55	A	80	
6	C	31	C	56	C	81	
7	C	32	cancelled	57	D	82	
8	B	33	B	58	B	83	
9	B	34	A	59	C	84	
10	C	35	B	60	B	85	
11	A	36	C	61		86	
12	A	37	C	62		87	
13	D	38	D	63		88	
14	A	39	B	64		89	
15	C	40	B	65		90	
16	C	41	B	66		91	
17	D	42	A	67		92	
18	A	43	D	68		93	
19	C	44	D	69		94	
20	D	45	C	70		95	
21	D	46	C	71		96	
22	C	47	C	72		97	
23	D	48	B	73		98	
24	A	49	D	74		99	
25	C	50	B	75		100	

Note/Remarks : Q.No. 32 benefit will be given to all candidates.

Signature  
School/Department/Centre