

A-48

**Entrance Examination – 2021**  
**Integrated M.Sc.-Ph.D. in Biotechnology**

**Time: 2 Hours**

**Maximum Marks: 70**

**Hall Ticket number:**

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**INSTRUCTIONS**

Please read the instructions carefully before answering the question.

1. Write your hall ticket number in the OMR Answer sheet given to you. Also write the Hall ticket number in space provided above.
2. There is **no negative** marking for wrong answers.
3. Answers are to be marked on the OMR answer sheet following the instructions provided there upon.
4. Hand over the OMR answer sheet at the end of the examination to the investigator.
5. The question paper contains 70 questions of multiple choices, printed in **19 pages** including this page. No additional sheets will be provided. Rough work can be done in the question paper itself/space provided at the end of the booklet.
6. All questions carry **one** mark each.
7. In case the candidates have equal marks, preference will be given towards the candidate who has obtained higher marks in Part A.
8. Non-programmable scientific calculators are permitted.
9. Cell/Mobile phone are strictly prohibited in the examination hall.

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**PART A**

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1. If two numbers A and B are 20% and 60% more than the third number C respectively, then what would be the ratio of the numbers A and B?
  - A. 3:4
  - B. 1:3
  - C. 2:3
  - D. 2:5
  
2. Reaction rate was calculated at increasing concentrations of substrate, when (a) rate is plotted with substrate concentrations, a curve was obtained; (b) reciprocal of rate is plotted with reciprocal of substrate a straight line was obtained. This indicates that,
  - A. Reaction is first order
  - B. Reaction is auto-inhibited
  - C. There exist pre-equilibrium before product formation
  - D. Reaction is second order
  
3. A square matrix whose determinant value is zero is referred to as \_\_\_\_\_ matrix
  - A. An Identity
  - B. A symmetric
  - C. A non-singular
  - D. A singular
  
4. Which of the following element emits high energy radiation?
  - A. S-35
  - B. Tritium
  - C. C-14
  - D. P-32
  
5. Which phase of bacterial growth is considered suitable to induce the expression of recombinant protein in growing culture?
  - A. Lag phase
  - B. Log phase
  - C. Stationary phase
  - D. Decline phase

6. The function  $f(x) = x^3 + 6x^2 - 15x + 7$  has minimum and maximum, respectively, at \_\_\_\_
- $x = 1$  and  $x = -5$
  - $x = -5$  and  $x = 1$
  - $x = -1$  and  $x = 5$
  - $x = 5$  and  $x = -1$
7. Tesla is the unit of \_\_\_\_.
- magnetic flux
  - magnetic intensity
  - magnetic induction
  - magnetic moment
8. Put the following words from human taxonomy in the correct order.
- Hominidae
  - Homo*
  - Homininae
  - Primates
  - Haplorhini
- III, I, II, IV, V
  - IV, V, III, I, II
  - IV, V, I, III, II
  - V, IV, I, III, II
9. The wavelength of electromagnetic radiation having frequency  $5 \times 10^{14}$  Hz is \_\_\_\_.
- 1.7 nm
  - 1.7  $\mu\text{m}$
  - 0.6 nm
  - 0.6  $\mu\text{m}$
10. Which of the following properties do **NOT** decrease from top to bottom down the group in case of hydrides of oxygen family members?
- Dipole moment
  - Bond angle
  - Covalent character
  - Thermal stability

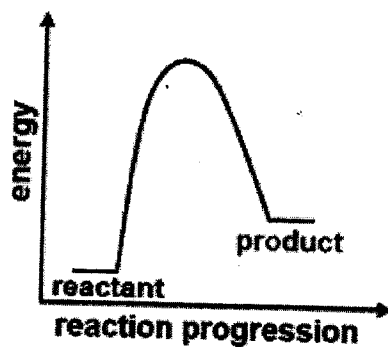
11. The splitting of spectral lines under the effect of magnetic field is called:
- Zeeman effect
  - Bohr effect
  - Heisenberg effect
  - Magnetic effect
12. According to Faraday's first law of electromagnetic induction, a conductor when placed in a varying electromagnetic field\_\_\_\_\_.
- resists the flux
  - sees induced current based on the flux change
  - does nothing
  - creates a short-circuit
13. (irrespective of neutrons or electrons), the identity of an element is determined by\_\_\_\_\_
- the number of its protons
  - mass-charge ratio
  - density of the element
  - its atomic mass
14. Match the Following questions.

	<b>List 1</b>	<b>List 2</b>
I.	Oxalic acid	1. Used for electrode
II.	NaOH	2. Buffer standard
III.	Borax	3. Primary standard
IV.	Calomel	4. A ligand
		5. Secondary standard

Which of the pairs are correctly matched?

	I	II	III	IV
A.	1	2	3	4
B.	3	5	2	1
C.	2	1	3	5
D.	2	5	4	3

15. What does the given energy diagram depicts?



- A. a catalyzed-reaction  
B. an endothermic reaction  
C. an exothermic reaction  
D. an irreversible reaction
16. Which atmospheric layer contains the highest density of gases?  
A. Exosphere  
B. Thermosphere  
C. Stratosphere  
D. Troposphere
17. Which of the following statement (s) is/are true?  
I. An emission of alpha particle reduces atomic weight by four  
II. Chloride possess electropositive nature  
III. Ionic dissociation in acid base pair of strong acid is higher that weak acid  
IV. Dissociation of neutron gives one positron and one proton
- A. Only I  
B. III and IV  
C. I and III  
D. II and III
18. Amino acid can be detected using\_\_\_\_.  
A. Biuret reagent  
B. Fehling reagent  
C. Ninhydrin  
D. Hydrazine

19. Which of the following point mutation in a DNA sequence can be identified as transition?

- A.  $A \rightarrow C$
- B.  $A \rightarrow T$
- C.  $G \rightarrow A$
- D.  $G \rightarrow C$

20. Arrange the following in decreasing order of permeability across lipid bilayer.

- I. Glycerol
  - II. Glucose
  - III.  $CO_2$
  - IV.  $Na^+$
  - V. Tryptophan
- A.  $I > III > V > II > IV$
  - B.  $III > V > II > IV > I$
  - C.  $III > I > V > II > IV$
  - D.  $I > III > IV > V > II$

21. The genome of the corona virus is

- A. Single stranded RNA
- B. Double stranded DNA
- C. Single stranded DNA
- D. Double stranded RNA

22. If distribution of a data has tall peak then the data can be identified as \_\_\_\_\_.

- A. Platykurtic
- B. Leptokurtic
- C. Mesokurtic
- D. None

23. The total number of atoms per unit cell in a face-centred cubic cell is \_\_\_\_\_.

- A. 2
- B. 4
- C. 6
- D. 8

24. Which of the following does **NOT** have co-planar geometry?

- A.  $\text{BF}_3$
- B.  $\text{NH}_3$
- C.  $\text{NO}_3^-$
- D.  $\text{XeF}_5$

25. Match the following

**List 1**

- I. *Plasmodium gallinaceum* infects
- II. *Plasmodium vivax* infects
- III. *Plasmodium berghei* infects
- IV. *Plasmodium knowlesi* infects

**List 2**

- 1. Rodent
- 2. Primate
- 3. Human
- 4. Avian

	I	II	III	IV
A.	3	1	2	4
B.	4	3	1	2
C.	2	3	1	4
D.	3	4	2	1

26. If three numbers are in the ratio 4 : 5 : 6 and their average is 25. Which of the following statement(s) is/are true?

- I. The largest number is 30 and the smallest number is 20.
- II. The largest number is 50.
- III. The total of the three number is 85.
- IV. The total of the three number is 75 and the largest number is 30.

- A. I and III
- B. II and III
- C. I and IV
- D. Only IV

27. During evolution, the photosynthetic organism responsible for increasing atmospheric oxygen from less than 1% to about 20% were\_\_\_\_\_.

- A. Mosses
- B. Diatoms
- C. Flowering plants
- D. Cyanobacteria

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28. Which of the following statement (s) is/are true?

- I. Type I error is the rejection of true NULL hypothesis
- II. Type II error is the acceptance of false NULL hypothesis
- III. Type I error is the rejection of true ALTERNATIVE hypothesis
- IV. Type II error is the acceptance of false ALTERNATIVE hypothesis

- A. II and IV
- B. III and IV
- C. I and II
- D. I and IV

29. Which of the following is an important mechanism of bacterial transformation?

- A. Conjugation
- B. Mutation
- C. Adhesion
- D. Sumoylation

30. Which one is the laughing gas?

- A. NO
- B. NO<sub>2</sub>
- C. NO<sub>3</sub>
- D. N<sub>2</sub>O

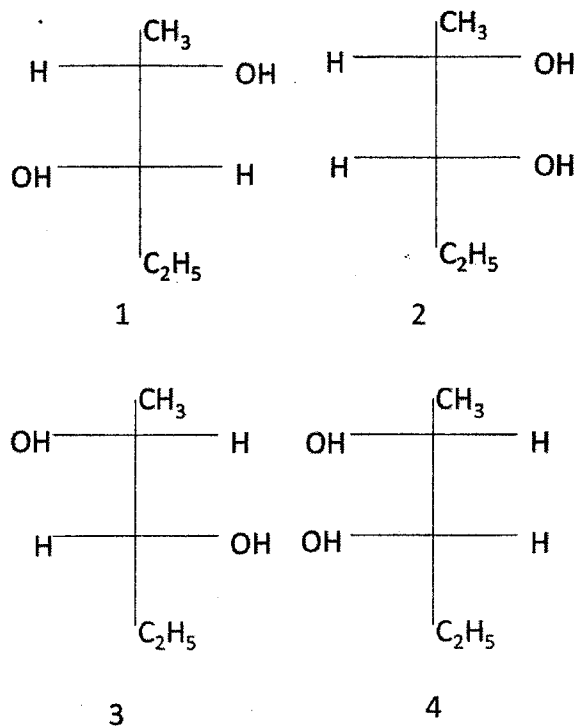
31. What is the correct order of the following steps in Southern hybridization?

- I. Binding of primary antibody
- II. Transfer onto membrane
- III. Denaturation of Protein
- IV. Reduction of hydrogen peroxide

- A. I, II, III, IV
- B. IV, III, II, I
- C. II, III, IV, I
- D. III, II, I, IV



32. Consider the following structures.



Which of the following statements are correct?

- I. Compound 1 and 2 are enantiomers.
- II. Compound 2 and 4 are enantiomers
- III. Compound 1 and 4 are diastereomers
- IV. Compound 1 and 2 are diastereomers

- A. I and IV
- B. II, III, and IV
- C. I, III, and IV
- D. I and II

33. Which of the following statement (s) is/are true?

- I. Gold dissolves in aqua regia.
- II. Silica dissolves in hydrofluoric acid
- III. Carbon black can be removed by sulphuric acid in the presence of peroxide
- IV. Teflon dissolves in acetone

- A. I, II and III
- B. II, III and IV
- C. III and IV
- D. I, II and IV

34. Paternal alleles can be detected by using the technique.

- A. Polymerase chain reaction (PCR)
- B. Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS PAGE)
- C. Agarose gel electrophoresis
- D. Restriction fragment length polymorphism (RFLP)

35. An infinitely long straight wire is along Z-direction carrying a current  $i$ . The corresponding magnetic lines of force are in \_\_\_\_\_.

- A. X direction
- B. XZ plane
- C. YZ plane
- D. XY plane

## PART B

36. Activation energy of a chemical reaction can be evaluated using\_\_
- A. Gibbs-Helmholtz equation
  - B. Arrhenius equation
  - C. Van't Hoff equation
  - D. Maxwell-Boltzmann equation
37. Which of the following is a part of the forward genetics approach?
- A. generation of random mutations in the genome that confer a specific phenotype
  - B. site-directed mutagenesis of a cloned gene
  - C. silencing of a specific gene by RNA interference
  - D. generation of knockout individuals in which a specific gene is disabled
38. A protein has six cysteine residues. In how many different ways three disulphide linkages can be formed?
- A. 9
  - B. 12
  - C. 15
  - D. 21
39. Which of the following is the characteristic of a cancer cell?.
- A. Density dependent inhibition
  - B. Contact inhibition
  - C. Loss of anchorage dependence
  - D. Apoptosis
40. Restriction Enzyme A has the recognition sequence 5'CTGCAG3'. Restriction Enzyme B has the recognition sequence 5'GCGC3'. Based on this information, you can infer that,
- A. Enzyme A will cut a genome into more pieces than will Enzyme B
  - B. Enzyme A will cut the genome into fewer pieces than will Enzyme B
  - C. Enzyme A will generate DNA pieces with blunt ends and Enzyme B will generate DNA pieces with sticky ends
  - D. Enzyme A will generate DNA pieces with sticky ends and Enzyme B will generate DNA pieces with blunt ends

41. Which of the following conditions leads to maximal expression of the lac operon?

- A. lactose present, glucose absent
- B. lactose present, glucose present
- C. lactose absent, glucose absent
- D. lactose absent, glucose present

42. Arrange in the sequential order, the process of western blotting.

- I. Incubation with secondary antibody
- II. Run the protein samples on SDS gel
- III. Incubation with primary antibody
- IV. Transfer to nitrocellulose membrane
- V. Blocking

- A. II, III, I, IV, V
- B. II, IV, III, I, V
- C. II, IV, III, V, I
- D. II, IV, V, III, I

43. Match the correct pairs.

- |      | List 1      | List 2             |
|------|-------------|--------------------|
| I.   | Amino acid  | 1. Racemic mixture |
| II.  | Deoxyribose | 2. Trans-isomer    |
| III. | SN1-product | 3. Inversion       |
| IV.  | SN2-product | 4. Dextro          |
|      |             | 5. Levo            |

- |    | I | II | III | IV |
|----|---|----|-----|----|
| A. | 1 | 2  | 3   | 4  |
| B. | 3 | 5  | 2   | 1  |
| C. | 5 | 4  | 1   | 3  |
| D. | 2 | 5  | 4   | 3  |

44. The site of hematopoiesis during the 5<sup>th</sup> month of an infant is

- A. Cranium
- B. Yolk sac
- C. Long bone
- D. Liver and spleen

45. Identify the correct statements.

- I. Methylation of DNA helps in gene silencing.
  - II. Regulation of promoter activity is the only way to regulate the gene expression.
  - III. 3'UTR often contains the binding sites for miRNAs
  - IV. miRNAs enhance the translation process for a particular mRNA.
- A. I and III
  - B. I and II
  - C. II and III
  - D. I and IV

46. The scientist who discovered the process of phagocytosis is.

- A. Louis Pasteur
- B. Cesar Milstein
- C. Elie Metchnikoff
- D. August Wasserman

47. Match the correct pairs for the functions performed by plant(s).

- | List 1 |                    | List 2 |  |
|--------|--------------------|--------|--|
| I.     | Phytosiderophores  | 1.     | Removal of organic contaminants in the rhizosphere             |
| II.    | Phytoextraction    | 2.     | complexation and immobilization of toxins within the soil      |
| III.   | Phytostabilization | 3.     | chelate and solubilize Fe(III) to make it available for uptake |
| IV.    | Phytodegradation   | 4.     | Removal of toxins from soil                                    |

- |    | I | II | III | IV |
|----|---|----|-----|----|
| A. | 4 | 1  | 2   | 3  |
| B. | 2 | 1  | 4   | 3  |
| C. | 3 | 4  | 2   | 1  |
| D. | 2 | 3  | 4   | 1  |

48. The defense mechanism presented by human skin is \_\_\_\_\_.

- A. Innate immunity
- B. Adaptive immunity
- C. Environmental immunity
- D. Pathogen immunity

49. The shape of the tobacco mosaic virus is \_\_\_\_.
- A. Icosahedral
  - B. Spherical
  - C. Helical
  - D. Pleomorphic
50. Which genetic elements are covalently closed, circular, self-replicating and transmissible?
- A. Integrons
  - B. IS elements
  - C. Plasmids
  - D. Prophages
51. Which of the immune cells are produced in bone marrow but mature in thymus?
- A. Plasma cells
  - B. T cells
  - C. Dendritic cells
  - D. B cells
52. The Sanger's sequencing method is based on \_\_\_\_.
- A. Dideoxy chain termination
  - B. Chemical modification of DNA
  - C. Polymerization of DNA
  - D. Reverse transcription of DNA
53. Identify the correct statements related to Cytoplasmic male sterility in plants.
- I. Caused by mutations in the mitochondria
  - II. Caused by mutations in the nucleus
  - III. Mitochondria are inherited from the cytoplasm of egg cell
  - IV. Follow Mendel's law of segregation
- A. I and III
  - B. II and III
  - C. III and IV
  - D. II and IV

54. Which of the following regarding the Ames test is true?
- A. It is used to identify newly formed auxotrophic mutants
  - B. It is used to identify mutants with restored biosynthetic activity
  - C. It is used to identify spontaneous mutants
  - D. It is used to identify mutants lacking photo-reactivation activity

55. Match the correct pairs.

- | List 1                      | List 2                         |
|-----------------------------|--------------------------------|
| I. Phosphofructokinase      | 1. Product inhibition          |
| II. Glycogen synthase       | 2. Covalent modification       |
| III. $\beta$ -galactosidase | 3. Allosteric interaction      |
| IV. Lactate dehydrogenase   | 4. Control of enzyme synthesis |

Which of the pairs are correctly matched?

- |    | I | II | III | IV |
|----|---|----|-----|----|
| A. | 2 | 4  | 1   | 3  |
| B. | 3 | 2  | 4   | 1  |
| C. | 2 | 3  | 1   | 4  |
| D. | 1 | 4  | 3   | 2  |

56. Cyclin is associated with \_\_\_\_\_.
- A. Leptospirosis
  - B. Glycolysis
  - C. Cyclosis
  - D. Mitosis

57. The scientists who are involved in initial experiments of phototropism and geotropism.
- I. Fritz Went
  - II. Charles Darwin
  - III. Eiichi Kurosawa
  - IV. Theophil Ciesielski
- A. I and II
  - B. III and IV
  - C. I and III
  - D. II and IV

58. What is the main epigenetic event in the genome?  
A. Reversible phosphorylation of DNA  
B. Methylation of DNA and histone modification  
C. Oxidation of DNA  
D. Glycosylation of DNA.
59. The first step in allopatric speciation is  
A. splitting of a population into two or more groups by a geographic barrier  
B. origin and spread of a new mutation in part of the population  
C. strong disruptive selection  
D. formation of allopolyploid individuals
60. The amino acid, which accumulate in plants during freezing tolerance is \_\_\_\_\_.  
A. Aspartate  
B. Proline  
C. Serine  
D. Arginine
61. The enzymes which convert phosphoenolpyruvate to Malate  
A. PEP carboxylase and Malate dehydrogenase  
B. Pyruvate dehydrogenase and Malate dehydrogenase  
C. Malate dehydrogenase and Aspartate aminotransferase  
D. PEP carboxylase, Malate dehydrogenase and Aspartate aminotransferase
62. Match the correct pairs of alkaloids with their plant source.

	<b>List 1</b>	<b>List 2</b>
I.	Ajmaline	1. <i>Papaver somnifera</i>
II.	Codeine	2. <i>Cinchona officinalis</i>
III.	Scopolamine	3. <i>Rauwolfia serpentina</i>
IV.	Quinine	4. <i>Hyoscyamus niger</i>

- |    | I | II | III | IV |
|----|---|----|-----|----|
| A. | 4 | 1  | 2   | 3  |
| B. | 2 | 1  | 4   | 3  |
| C. | 3 | 4  | 2   | 1  |
| D. | 3 | 1  | 4   | 2  |



63. In which of the following cells Lysosomes are absent?

- A. Animal cells
- B. Erythrocytes
- C. Hepatocytes
- D. Muscle cells

64. Which of the following pairs match with each other?

**List 1**

- I. Polymerase involved in transcription of ribosomal RNA (Except 5S rRNA)
- II. Polymerase that incorporates wrong bases in DNA and used in translesion synthesis
- III. Polymerase that is involved in transcription of tRNA
- IV. Polymerase that makes DNA from RNA template, and remains associated with the enzyme

**List 2**

- 1. Reverse transcriptase
- 2. Telomerase
- 3. RNA Polymerase III
- 4. RNA polymerase I
- 5. DNA Polymerase V

- |    | I | II | III | IV |
|----|---|----|-----|----|
| A. | 3 | 2  | 4   | 5  |
| B. | 3 | 5  | 4   | 1  |
| C. | 4 | 5  | 3   | 2  |
| D. | 4 | 2  | 5   | 1  |

65. The reactions of two enzymes, Enzyme A and Enzyme B, are studied at pH = 7.0. Both enzymes produce lactose and have the same  $V_{max}$ . Enzyme A has a  $K_M$  of 2.0 mM while Enzyme B has a  $K_M$  of 5.0 mM. Consider the following statements, when Enzyme A and Enzyme B both carry out their reaction at pH, 7.0:

- I. Enzyme A will produce more lactose than Enzyme B when [S] is 5.0 mM
- II. Enzyme B will produce more lactose than Enzyme A when [S] is 5.0 mM
- III.  $V_0$  for Enzyme A will double as [S] increases from 5.0 mM to 10 mM
- IV.  $V_0$  for Enzyme B will double as [S] increases from 5.0 mM to 10 mM

Which of the statement(s) is/are correct?

- A. I only
- B. II and IV
- C. I and III
- D. III and IV

66. Which is a characteristic of protein quaternary structure?
- A. A protein composed of identical subunits has quaternary structure but not tertiary structure
  - B. A protein composed of non-identical subunits contains two polypeptide chains with opposite charges
  - C. The quaternary structure of a multimeric protein always includes covalent crosslinks between the subunits
  - D. The quaternary structure of a multimeric protein always depends upon the primary structure of the subunits

67. Consider the following statements
- I. DNA methylation allows the transcription factors to access the promoter and hence it always activates the gene expression
  - II. Histone methylation always causes silencing of gene expression
  - III. DNA methylation is always associated with gene silencing
  - IV. Histone deacetylation is responsible for gene silencing

Which of the following statements is/are correct?

- A. I and II
- B. II and IV
- C. I and IV
- D. III and IV

68. Which of the following pairs match with each other?

**List 1**

- I. Degrades mRNA from RNA-DNA hybrid
- II. Separates two daughter chromosomes after replication
- III. Cleaves the phosphodiester bond of RNA
- IV. Unwinds the dsRNA

**List 2**

- 1. Nuclease
- 2. Helicase
- 3. Topoisomerase
- 4. RNase H
- 5. RNase A

- |    | I | II | III | IV |
|----|---|----|-----|----|
| A. | 1 | 2  | 3   | 4  |
| B. | 4 | 3  | 5   | 2  |
| C. | 4 | 2  | 5   | 1  |
| D. | 5 | 2  | 4   | 3  |

69. Match the given microbial products with their producing micro-organisms.

	<b>List 1</b>	<b>List 2</b>
I.	Amino acid	1. <i>Xanthomonas</i>
II.	Organic acids	2. <i>Eremothecium ashbyi</i>
III.	Vitamins	3. <i>Aspergillus niger</i>
IV.	Polysaccharides	4. <i>Corynebacterium glutamicum</i>

	I	II	III	IV
A.	1	2	3	4
B.	2	1	4	3
C.	3	1	4	2
D.	4	3	2	1

70. Trypsin and chymotrypsin are example of digestive enzymes and the active site of these enzymes consists of a catalytic triad. Which of the following amino acid residues are involved in the active site?

- A. Serine, methionine and aspartate
- B. Serine, methionine and glutamate
- C. Serine, histidine and aspartate
- D. Serine, histidine and glutamate

**University of Hyderabad**  
**Entrance Examination - 2021**

School/Department : Dept. of Biotechnology and Bioinformatics, School of Life Sciences

Course/Subject : Int-MSc./PhD in Biotechnology

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

Note/Remarks:

- Question no. 7 has 2 right answers.
- Question no. 54 and 67 has no correct answer hence all candidates may get mark for these questions

Signature  
School/Department/Center