

Entrance Examination — 2019
Integrated M.Sc., Ph.D. Biotechnology

Time: 2 hours

Maximum Marks: 70

HALL TICKET NUMBER

INSTRUCTIONS

1. Enter your Hall Ticket number in the OMR answer sheet given to you. Also write the Hall Ticket number in the space provided above.
 2. Please read carefully the instructions before answering the questions.
 3. Answers are to be marked on the OMR answer sheet with BLACK/BLUE ball point/sketch pen following the instructions provided there upon.
 4. Hand over the OMR answer sheet at the end of the examination to the Invigilator. The candidate can take the question paper with him at the end of the examination.
 5. The question paper contains 70 questions of multiple choice types printed in 14 pages including this page. OMR answer sheet is provided separately.
 6. The question paper consists of Part A and Part B. All questions carry one mark each.
 7. The marks obtained in part A will be taken into consideration in case of tie, when more than one student gets equal marks.
 8. There is a negative marking, each wrong answer carries 0.33 negative mark.
 9. No additional sheets will be provided. Rough works may be done in the question paper / in the space provided at the end of the booklet.
 10. Use of non-programmable scientific calculator is permitted.
 11. Cell/Mobile Phones are strictly prohibited in the examination hall.
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PART - A

1. Amino acid at its isoelectric point when placed in an electric field exhibits which of these properties?

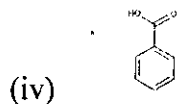
- A. Moves towards cathode
- B. Moves towards anode
- C. No movement
- D. None of the above

2. pH of blood in the body is maintained by

- A. Glucose and salt concentration
- B. Protein and salt concentration
- C. Carbonate and bicarbonate concentration
- D. Salt and carbonate

3. The order of acidity in the given series of compound is

- (i) CH_3COOH
- (ii) HCOOH
- (iii) CH_2ClCOOH



- A. (iv)<(ii)<(i)<(iii)
- B. (i)<(ii)<(iii)<(iv)
- C. (i)<(ii)<(iv)<(iii)
- D. (i)<(iv)<(ii)<(iii)

4. A molal solution contains one-gram mole of solute in

- A. 1 Litre of the solution
- B. 1000 g of the solvent
- C. 1 Litre of the solvent
- D. 2.4 Litre of the solution

5. Tyndall effect in a colloid is due to

- A. interference of light
- B. diffraction of light
- C. reflection of light
- D. scattering of light

6. If a constant slope observed at different concentrations of substrate for a plot of product formed versus the time course of reaction, the order of reaction is
- Zero order
 - First Order
 - Second order
 - Fractional order
7. In a DC circuit, a noise is observed, which component could be defective.
- Transformer
 - Rectifier
 - Capacitor
 - All the above
8. A primary standard used for both acid-base and redox reaction is
- Potassium dichromate
 - Oxalic acid
 - Potassium hydrogen phthalate
 - Potassium iodate
9. pH of a solution is estimated with reference to
- 0.1 N NaOH
 - 0.1N Oxalic acid
 - 0.1N HCl
 - 0.1N Sodium Bicarbonate
10. Oxidation of M^{2+} to M^{4+} is inhibited by a ligand, then ligand is complexing with
- Both M^{2+} and M^{4+}
 - M^{2+} only
 - M^{4+} only
 - Neither M^{2+} or M^{4+}
11. A cationic detergent
- CTAB
 - Tween-20
 - Triton X-100
 - SDS
12. A substitution reaction yielded racemic mixture, type of reaction is
- SN2
 - E1
 - SN1
 - E2

13. Addition of following to Iodine turn blue is
- Cellulose
 - Lignin
 - Starch
 - Glycogen
14. Electronegativity is expressed in
- eV
 - Debye
 - kJ/mol
 - None of the above
15. The speed of light in water is (refractive index of water = 1.33)
- 0.44×10^8 m/s
 - 1.33×10^8 m/s
 - 2.26×10^8 m/s
 - 3.99×10^8 m/s
16. If an electromagnetic wave needs to travel 30 m to complete a cycle, the frequency will be
- 0.1 MHz
 - 0.5 MHz
 - 1 MHz
 - 10 MHz
17. When applied a brake, the car moving at a speed of 15 m/s could come into halt within 1.5 s. What would be the distance travelled by the car after applying the brake (assume a uniform reduction in acceleration)
- 10 m
 - 5 m
 - 0.2 m
 - 0.1 m
18. The ionic radii of F^- , O^{2-} , N^{3-} follow the order of
- $F^- < O^{2-} < N^{3-}$
 - $O^{2-} < N^{3-} < F^-$
 - $O^{2-} < F^- < N^{3-}$
 - $N^{3-} < O^{2-} < F^-$
19. Which of the following statement about water is NOT true?
- Surface tension of water is higher than the other molecular liquids
 - Capillary action of water is due to its adhesion with glass
 - Specific heat of water is lower than the other molecular liquids
 - Volume of water increases in solid state compared to liquid state

20. A van with a siren of frequency of 700 Hz is moving away from a shopkeeper on the side of the road with a constant speed of 10 m/s. The frequency of siren felt by the shopkeeper would be, (speed of sound in air is 340 m/s)
- 680 Hz
 - 709 Hz
 - 715 Hz
 - 721 Hz
21. Primary alcohols form alkenes by catalytic
- Reduction
 - Oxidation
 - Dehydration
 - Hydrolysis
22. The reaction $\text{CH}_3\text{-CH=CH}_2 + \text{HBr} \rightarrow \text{CH}_3\text{-CH(Br)-CH}_3$ is noted as
- Markovnikov's addition
 - Michael's addition
 - Claisen reaction
 - Clemmensen reaction
23. Which of the following statements is correct
- Magnetic lines of force represent direction while electric lines do not
 - Electric lines of force represent direction while magnetic lines do not
 - Magnetic lines of force are closed curves while electric lines are not
 - Electric lines of force are closed curves while magnetic lines are not
24. Nervous system in vertebrates originates from the following
- Ectoderm
 - Endoderm
 - Mesoderm
 - None of the above
25. Which of the following pairs is incorrect?
- amyloplasts – store starch in potatoes
 - chloroplasts – contain ATP synthase complex
 - chromoplasts – store pigments in flowers
 - etioplasts – formed in intense light
26. The type of isomerism due to different types of alkyl group on either side of functional groups in the molecule of compounds $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ and $\text{CH}_3\text{OC}_3\text{H}_7$
- Metamerism
 - Functional isomerism
 - Position isomerism
 - Chain isomerism

27. For the past 'n' days, the average (arithmetic mean) daily production at a company was 50 units. If today's production of 90 units raises the average to 55 units per day, what is the value of 'n'?

- A. 18
- B. 7
- C. 10
- D. 9

28. Amar, Akbar, and Anthony each try independently to solve a problem. If their individual probabilities for success are $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{5}{8}$, respectively, what is the probability that Amar and Akbar, but not Anthony, will solve the problem?

- A. $\frac{7}{8}$
- B. $\frac{9}{64}$
- C. $\frac{5}{64}$
- D. $\frac{3}{64}$

29. A store has a parking lot which contains 70 parking spaces. Each row in the parking lot contains the same number of parking spaces. The store has bought additional property in order to build an addition to the store. When the addition was built, 2 parking spaces will be lost from each row; however, 4 more rows will be added to the parking lot. After the addition is built, the parking lot will still have 70 parking spaces, and each row will contain the same number of parking spaces as every other row. How many rows were in the parking lot before the addition was built?

- A. 5
- B. 10
- C. 6
- D. 7

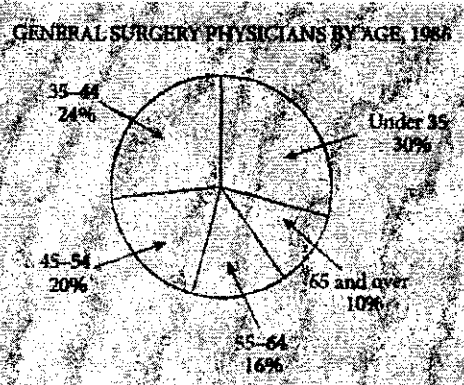
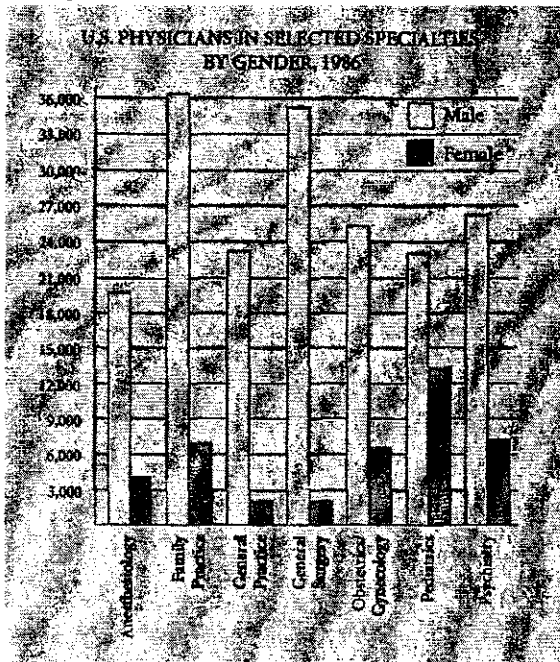
30. The probability that event A occurs is 0.4, and the probability that events A and B both occur is 0.25. If the probability that either event A or event B occurs is 0.6. What is the probability that event B will occur?

- A. 0.15
- B. 0.55
- C. 0.45
- D. 0.05

31. At a certain fruit stand, the price of each apple is 40 rupees and the price of each orange is 60 rupees. Mary selects a total of 10 apples and oranges from the fruit stand, and the average price of the 10 pieces of fruit is 56 rupees. How many oranges must Mary put back so that the average price of the pieces of fruit that she keeps is 52 rupees?

- A. 2
- B. 3
- C. 4
- D. 5

For questions 32-34 refer to the charts below:



32. Which of the following physician specialties had the lowest ratio of males to females in 1986?

- A. Family Practice
- B. General Surgery
- C. Obstetrics/gynecology
- D. Pediatrics

33. If the number of female general surgery physicians in the under 35 category represented 3.5 percent of all the general surgery physicians, approximately how many male general surgery physicians were under 35 years?

- A. 9,050
- B. 10,710
- C. 12,260
- D. 13,980

34. Approximately what percent of all general practice physicians in 1986 were male?

- A. 90%
- B. 50%
- C. 75%
- D. 23%

35. In how many ways can the letters of the word 'LEADER' be arranged?
- A. 144
 - B. 72
 - C. 360
 - D. 720

PART - B

36. Which of the following vectors can carry the largest size of DNA insert?
- A. Plasmids
 - B. Bacteriophages
 - C. Cosmids
 - D. YACs
37. What can be measured with DNA-microarrays?
- A. mRNA size
 - B. Vector size
 - C. mRNA concentration
 - D. Relative mRNA abundance
38. The T cells receptors can bind to antigenic peptides
- A. only in the free form
 - B. only when loaded onto MHC molecule
 - C. only when bound to hapten
 - D. only when bound by antibodies
39. Cytotoxic T cells are distinguished from Helper T cells by the presence of?
- A. CD2
 - B. CD3
 - C. CD8
 - D. Class II MHC antigen
40. Which of the following isotype of immunoglobulins are both membrane bound and secretary?
- A. IgG
 - B. IgM
 - C. IgA
 - D. IgE
41. Which of the following are Professional antigen presenting cells?
- A. B-Cells
 - B. Follicular dendritic cells
 - C. Glial cells
 - D. All of the above

42. Which of the following is true about the Blood transfusion reactions, Erythro-blastosis fetalis and Auto-immune hemolytic anemia?
- A. Type-II hypersensitive responses
 - B. Type-I hypersensitive responses
 - C. Type-III hypersensitive responses
 - D. Type-IV hypersensitive responses
43. Linked genes always exhibit
- A. recombination frequencies of less than 50%.
 - B. homozygosity when involved in a testcross.
 - C. a greater number of recombinant offspring than parental offspring when involved in a testcross.
 - D. a lack of recombinant offspring when a heterozygous parent is testcrossed.
44. Which of the following statements is *incorrect* concerning an X-linked recessive trait in humans?
- A. All the sons of an affected woman will be affected.
 - B. An affected woman almost always has an affected mother.
 - C. An affected man usually has a mother who carries the recessive allele.
 - D. A phenotypically normal woman whose father was affected is likely to be heterozygous for the condition.
45. How is colchicine useful for studying chromosomal mutations?
- A. Colchicine induces chromosome condensation during interphase, which allows the visualization of interphase chromosomes.
 - B. Colchicine causes chromosomal breakage, leading to inversions and translocations that can be observed with a microscope.
 - C. Colchicine inhibits microtubule polymerization, which stalls cells in metaphase with condensed chromosomes.
 - D. Colchicine aids in the formation of microtubules during mitosis, which promotes anaphase and completion of the cell cycle.
46. You are studying a new virus with a DNA genome of 12 Kb. It can synthesize DNA at a rate of 400 nucleotides per second. If the virus uses theta replication, how long will it take to replicate its genome?
- A. 7.5 seconds
 - B. 15 seconds
 - C. 30 seconds
 - D. 1 minute

47. What is the function of DNA gyrase?
- Connects Okazaki fragments by sealing nicks in the sugar-phosphate backbone
 - Unwinds the double helix by breaking the hydrogen bonding between the two strands at the replication fork
 - Reduces the torsional strain that builds up ahead of the replication fork as a result of unwinding
 - Binds to *oriC* and causes a short section of DNA to unwind
48. Telomerase activity is most likely to be found in which cells in humans?
- Red blood cells
 - Muscle cells
 - Neurons
 - Germ line
49. Over time, DNA replaced RNA as the primary carrier of genetic information, and the chemical stability of DNA is believed to be the key reason for this. Which attribute of DNA is the reason behind its chemical stability?
- DNA lacks a free hydroxyl group on the 2'-carbon atom of its sugar.
 - Unlike RNA, DNA is usually double-stranded.
 - DNA does not usually form hairpin loops.
 - DNA contains thymines, which make it more chemically stable.
50. In the diagram below, which letter indicates the 5' end of the leading strand?

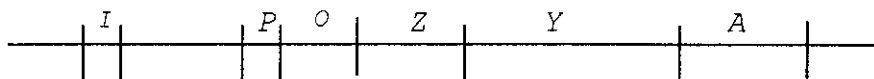


- A
 - B
 - C
 - D
51. Which of the following correctly describes the concept of alternative splicing?
- With the rare exception of RNA editing, every nucleotide contained in a processed mRNA molecule is derived from exon sequences.
 - Every other intron is removed in alternate manner to generate functional mRNA transcript.
 - Only a subset the same mRNA transcripts are specifically selected for splicing in the nucleus.
 - Multiple protein products are often produced from single eukaryotic genes.

52. The genetic code is said to be “degenerate” because:

- A. there are more codons than amino acids.
- B. there are more amino acids than codons.
- C. different organisms use different codons to encode the same amino acid.
- D. some codons specify more than one amino acid.

53. Where would the *lac* repressor be bound in a wild-type *E. coli* cell that is growing in low glucose and high lactose? (*I* = *lac* repressor gene; *Z*, *Y*, *A* = *lac* operon structural genes; *P* = *lac* promoter; *O* = *lac* operator)



- A. *O*
- B. *P* and *O*
- C. *I*, *P*, *O*
- D. The repressor would not be bound.

54. Antibodies are to Western blots as _____ are to Southern blots.

- A. RNA
- B. Proteins
- C. DNA
- D. microRNA

55. _____ is the product of sampling errors and chance events that may result in changes in allele frequencies.

- A. Directional selection
- B. Inbreeding
- C. Genetic drift
- D. Evolution

56. Which of the following statements about naturally occurring fatty acids is true?

- A. The double bonds found in fatty acids are nearly always in the *cis*-configuration.
- B. Saturated fatty acid chains can pack closely together.
- C. Unsaturated fatty acids produce flexible, fluid arrays because they cannot pack closely together.
- D. All of the above.

57. Which of the following lipid is a component of inner mitochondrial membrane?

- A. Cardiolipin
- B. Lecithin
- C. Plasmalogen
- D. Cephalin

58. Generally a PCR reaction involves following steps:

- i) Attachment of primers
- ii) Denaturation of strands
- iii) DNA synthesis
- iv) Heating

Which is the correct order from starting to ending the reaction?

- A. ii)-i)-iii)-iv)
- B. i)-ii)-iii)-iv)
- C. iv)-iii)-ii)-i)
- D. iv)-ii)-i)-iii)

59. Chromatography is the process for identification, purification and separation of components of a mixture on the basis of

- A. Difference in their solubility
- B. Difference in their boiling point
- C. Difference in their melting point
- D. Difference in their affinity for mobile and stationary phase

60. Find out the mismatch of the following

- A. Magnesium - Nitrate reductase
- B. Copper – Plastocyanin
- C. Iron – Ferridoxin
- D. Molybdenum – Nitrogenase

61. K_m value is expressed as the substrate concentration at

- A. $V_{max} \times 2$
- B. $\frac{1}{2} V_{max}$
- C. V_{max}
- D. $V_{max} - V_o$

62. During C4 pathway of photosynthesis malate is transported from

- A. Bundle sheath cell to mesophyll cell
- B. Epidermal cell to Mesophyll cell
- C. Mesophyll cell to Bundle sheath cell
- D. Mesophyll cell to Epidermal cell

63. The radioactive molecule that can be used in the analysis of proteins is

- A. ^{32}P uracil
- B. ^{32}P Threonine
- C. ^{35}S Methionine
- D. ^{32}P ribose

64. 'Hybridoma' technology is being used in
- Generating 'Monoclonal' antibodies
 - Producing hybrid animals
 - Producing hybrid plants
 - Producing hybrid microbes
65. Which of the following statements about antibiotic resistance in bacteria is NOT true?
- The antibiotic resistance gene can be transmitted to bacteria via transformation or transduction.
 - Antibiotic resistance cannot be conferred by conjugation, which only affects the fertility of bacteria.
 - Environments where antibiotics are frequently used such as hospitals are under the higher risk of developing antibiotic resistance.
 - Antibiotic resistance often originates from the microbes that produce antibiotics for their own survival.
66. Which of the following statement describes the 'wobble' rules correctly?
- There is a flexible pairing between tRNA and amino acid as there are more tRNAs than the number of amino acids.
 - There are multiple tRNA that may bind to the same amino acids.
 - There are multiple codons that may code for the same amino acids.
 - The third base pairing between the tRNA and mRNA is relaxed.
67. Modification of proteins as they pass through the Golgi include all of the following except
- Glycosylation
 - Proteolysis
 - Signal sequence removal
 - Sulfation
68. The marker for an enzyme to go from the Golgi to lysosome is
- acidic pH
 - glucosamine
 - phosphomannose
 - protease sensitivity
69. Uncouplers of electron transport from ATP synthesis, such as dinitrophenol, act by inhibiting
- ATP transport
 - Electron transport
 - Proton gradient
 - Oxygen consumption

70. Which statement is not true of gap junctions? They
- A. allow the passage of proteins between cells
 - B. are essential for metabolic cooperation between cells
 - C. occur in the developing embryo
 - D. synchronise the beating of heart muscle cells

University of Hyderabad

Entrance Examinations - 2019

School/Department/Centre : Department of Biotechnology & Bioinformatics

Course/Subject : Integrated MScPh.D in Biotechnology

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

Note/Remarks :


Signature