1. Match items in List I with items in List II

	List I		List II
A	Mitochondria	i	Hydrogen Peroxide generation
B	Endoplasmic Reticulum	ii	TCA cycle
C	Peroxisome	iii	Degradation of proteins
D	Lysosomes	iv	Protein trafficking and export

Choose the CORRECT answer from the options given below:

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

2. Match items in List I with items in List II:

	List I		List II
A	pH o as solution	i	Fredrick Sanger
B	Base composition of DNA	ii	Henderson-Hasselbalch equation
C	Molar absorption coefficient	iii	Lambert-Beer law
D	Dideoxy sequencing	iv	Chargaff s principle

Choose the CORRECT answer from the options given below:

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

3. Identify the **INCORRECT** statement about mitochondria:

(a) Its number increases by fission.
(b) Defective mitochondria are removed by a process called mitophagy.
(c) In actively respiring mitochondria, the matrix is more acidic than the inter.
(d) membrane space.
(e) Many of the mitochondrial proteins are encoded by the nuclear genome.

4. Which one of the following statements regarding miRNA is **INCORRECT**?

(a) Generated from large precursor RNAs.
(b) Inhibits translation by binding to the 3'-UTR of mRNAs.
(c) Biogenesis involves RNAse H.
(d) Present in higher eukaryotes including nematodes, fruit flies, plants, and mammals.

5. Match items in List I with items in List II:

	List I		List II
A	Sulphur containing amino acid	i	Aspartic acid
B	Optically inactive amino acid	ii	Methionine
C	Acidic amino acid	iii	Lysine
D	Basic amino acid	iv	Glycine

Choose the CORRECT answer from the options given below:

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

6. The rate constant of a first order reaction has the unit:

(a) s^{-1}
(b) mol L^{-1} s^{-1}
(c) mol $L^{-1}s$
(d) mol $^{-1}$ Ls^{-1}

7. How many grams of NaOH is required to make 100 ml of 0.2 M solution of NaOH?

(a) 2
(b) 40
(c) 8
(d) 0.8

8. Match items in List I with items in List II:

	List I		List II
A	Sucrose	i	Monosaccharide
B	Maltose	ii	Glucose + Galactose
C	Fructose	iii	Glucose + Fructose
D	Lactose	iv	Glucose + Glucose

Choose the CORRECT answer from the options given below:
(a) A-i, B-iv, C-ii, D-iii
(b) A-ii, B-i, C-iv, D-iii
(c) A-iv, B-ii, C-iii, D-i
(d) A-iii, B-iv, C-i, D-ii

9. How many oxygen atoms, in terms of Avogadro's number (N_A), are present in 9.0 g of H_2O?
(a) N_A
(b) $2N_A$
(c) $N_A/2$
(d) $N_A/4$

10. Polymerisation of isoprene gives:
(a) Natural rubber
(b) Polyester
(c) Buna-N
(d) Neoprene

11. How many pi-bonds are present in cyano-benzene?
(a) 6
(b) 5
(c) 4
(d) 3

12. Given below are two statements:
Statement I: Penicillin is an antibiotic derived from fungus.
Statement II: Antibiotics are compounds obtained from micro-organisms and are used as pain killers.
In light of the above statements, choose the CORRECT answer from the options given below:
(a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

13. In which of the following collisions, the total linear momentum of colliding bodies is completely conserved?
(a) Elastic collision.
(b) Completely inelastic collision.
(c) Partially elastic collision.
(d) Any type of collision i.e. elastic, completely inelastic or partially elastic.

14. Arrange the following in the ascending order of their frequencies:
A. Ultraviolet Rays
B. Microwaves
C. X-rays
D. Sound waves
E. Infrared waves
Choose the CORRECT answer from the options given below:
(a) (D), (E), (B), (A), (C)
(b) (E), (B), (A), (D), (C)
(c) (C), (A), (B), (E), (D)
(d) (B), (E), (D), (A), (C)

15. The value of acceleration due to gravity on the surface of earth is g. If diameter of earth becomes 4 times its present value and mass remains unchanged, the new value of g on the surface of earth will be:

(a) 4g
(b) 16g
(c) g/4
(d) g/16

16. A ball is thrown vertically upwards in the air with a certain velocity (v). Its acceleration and velocity at the highest point, respectively, will be:
(a) -g, 0
(b) 0, v
(c) g, 0
(d) 0, 0

17. The velocity of light in vacuum is 3 x 10^8 m/s. If the refractive index of glass is 1.5, what will be the velocity of light in glass?
(a) 4.5 10^8 m/s
(b) 2 x 10^8m/s
(c) 3 x 10^8 m/s
(d) 0 m/s

18. Sunita is looking for her father. She went 90 m east before turning to her right. She went 20 m, took a right turn and walked for 30 m to look for her father at her uncle's place. **NOT** finding him there, she went 100 m to the North before meeting her father in a street How far is Sunita from her starting point?
(a) 80m
(b) 100m
(c) 140m
(d) 260m

19. If sales tax is reduced from 3—$\frac{1}{2}$% to 3—$\frac{1}{3}$%, then what will be the reduction in the net price of an article with a marked value of 8,400?
(a) 23
(b) 32
(c) 14
(d) 45

20. 15 men, working 9 h a day, can reap a field in 16 days. In how many days will 18 men reap the same field, working 8 h a day?
(a) 14 days
(b) 15 days
(c) 13 days
(d) 16 days

21. A 150 m long train is running with a speed of 68 km/h. How long will it take for the train to pass a man who is running at 8 km/h in the same direction as the train?
(a) 12 s
(b) 11 s
(c) 9 s
(d) 10 s

22. What is the value of 'Z' in the equation given below?
$\frac{9}{7} * \frac{9}{7} * \frac{a}{7} * \frac{9}{7} * \frac{16}{7} * \frac{16}{7} = 1$
(a) 1
(b) 7
(c) 4.57
(d) 32

23. 380 bananas are distributed among 85 students. Each boy student gets four bananas and each girl student gets five. The number of boys is:
(a) 15
(b) 38
(c) 40

(d) 45

24. In a certain code language, '134' means 'good and tasty'; '478' means 'see good pictures' and '729' means 'pictures are faint'. Which of the following digits stands for 'see'?
(a) 9
(b) 2
(c) 1
(d) 8

25. In a row of boys. A who is 10th from the left and B who is 9th from the right interchange their positions. A now becomes 15th from the left, How many boys are there in the row?
(a) 23
(b) 31
(c) 27
(d) 28

26. Find the next number in the series 84, 83, 79. 7O, 54:
(a) 20
(b) 39
(c) 29
(d) 23

27. 10 workers working for 9 hours a day complete a piece of work in 20 days. In how many days will 15 workers working for 12 hours complete the same piece of work?
(a) 1O days
(b) 12 days
(c) 9 days
(d) 15 days

28. A, B and C started a business and invested capital in the ratio of 3 : 2 :1, The ratio of months for which they invested is 3 : 5 : 4. If A's profit shore is 1000/- more than C's, then B's share in the profit in Rs will be:
(a) 1200
(b) 2500
(c) 1500
(d) 2000

29. Ram invested Rs, 75,000 in a business. After few months, Shyam also joined him with an investment of Rs. 50,000/-. At the end of the year the total profit was divided between them in 3 :1 ratio. After how many months did Shyam join the business?
(a) 4
(b) 6
(c) 8
(d) 2

30. Fill the missing number in the given series:
(a) 30
(b) 38
(c) 34
(d) 42

31. From a point Ram started walking towards east and walked 30 meter. He then turned right and walked 20 meters Then, he again turned right and walked 42 meter. Finally, he again turned right and walked 15 meter to reach his destination. What is the aerial distance between his destination and the starting point?
(a) 13 meter
(b) 7 meter
(c) 30 meter
(d) 5 meter

32. A man is facing east He turns 60 degrees in the clockwise direction and then another 180 degrees in the same direction. He then turns 210 degrees in the anticlockwise direction- Which direction is he facing now?
(a) South East

(b) South West
(c) West
(d) South

33. In School A and School B, 20% and 25% of the students participate in sports respectively. If School B has 60% more students than School A, then the number of students participating in sports in School A is:
(a) $\frac{1}{4}$ the number participating in sports in School B.
(b) $\frac{1}{2}$ the number participating in sports in School B.
(c) $\frac{1}{16}$ the number participating in sports in School B.
(d) $\frac{1}{8}$ the number participating in sports in School B.

34. Which one of the following is the lowest integer that is divisible by each of the integers 1 through g, both inclusive?
(a) 210
(b) 420
(c) 840
(d) 2520

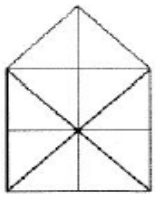
35. A tap X fills a tank in 5 hours. Another tap Y fills the same tank in 3 hours. If X starts filling the empty tank and tap Y joins after 1 hour, then how much time will it take for the tank to be completely filled starting from the time when the tap X started filling it?
(a) 90 minutes
(b) 120 minutes
(c) 100 minutes
(d) 150 minutes

36. If day 1 of a leap year is a Sunday, the last day of that year will be:
(a) Monday
(b) Tuesday
(c) Sunday
(d) Saturday

37. A glass jar contains 1 red, 3 green, 2 blue and 4 yellow marbles. If a single marble is chosen at random from the jar. What is the probability that it is yellow or green?
(a) 3/10
(b) 4/10
(c) 7/10
(d) 1/10

38. The product of two numbers is 24 times the difference of these two numbers. If the sum of these numbers is 14, then the larger number is:
(a) 6
(b) 8
(c) 7
(d) 9

39. Identify the number of triangles in the following figure:

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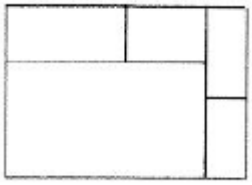
Maths Faculty
Tanya
(B.Tech)
English Faculty
बडा लालपुर,चांदमारी, सिंधोरा रोड, वाराणसी

(a) 20
(b) 21
(c) 22
(d) 25

40. Identify the total number of rectangles in the given figure:



(a) 6
(b) 8
(c) 10
(d) 9

41. Find the odd one out of the following:
(a) Bat-Wings
(b) Cat-Paws
(c) Mouse-Teeth
(d) Fish-Fin

42. Identify the next number in the following series: 8, 3, 16, 9, 32, 27, 64, ……..
(a) 45
(b) 81
(c) 72
(d) 50

43. If the length of the sides of an equilateral triangle is doubled then its area increases by:
(a) 100 percent
(b) 200 percent
(c) 300 percent
(d) 400 percent

44. In a class of 60 students, 30 students have taken Physics; 30 Chemistry and 30 Biology There are 10 students each who have taken a combo of 2 subjects i.e. Phy-Chem, Phy-Bio and Chem-Bio. The number of students who have taken all 3 subjects is?
(a) Zero
(b) 10
(c) 5
(d) 2

45. How many unique 15-mer peptides are possible using 20 natural amino acids?
(a) 15
(b) 20*15
(c) 15^{20}
(d) 20^{15}

46. The sum of 10 consecutive natural numbers is 605. What will be the value of the smallest of these numbers?
(a) 54
(b) 55
(c) 56
(d) 57

47. A trader allows successive discounts of 30% and 15% on selling price of an article. If he gets Rs. 476 for the article, its marked price is:
(a) Rs. 700
(b) Rs. 800
(c) Rs. 900

(d) Rs. 1000

48. A cylindrical vessel of diameters 8 cm is partially filled with water. What will be the rise in the level of water in the cylindrical vessel when a solid ball of radius 3cm is completely immersed in water?
(a) 2/9 cm
(b) 4/9 cm
(c) 9/4 cm
(d) 9/2 cm

49. How many lead shots of diameter 2 cm can be made out of lead cube with edge of 22 cm?
(a) 1347
(b) 2541
(c) 2662
(d) 5324

50. From a pack of 52 cards. One card is drawn at random. What is the probability that the card drawn is a four or a club?
(a) 1/4
(b) 4/13
(c) 1/13
(d) 1/26

51. What is the relationship between doubling time and specific growth rate of a microbial culture?
(a) Doubling time is directly proportional to the specific growth rate.
(b) Doubling time is inversely proportional to the specific growth rate.
(c) Doubling time is equal to the specific growth rate.
(d) Doubling time has no relationship with specific growth rate.

52. Given below are two statements: One is labelled as Assertion A and other is labelled as Reason R.
Assertion (A) All expression vectors are also cloning vectors.
Assertion (R): Expression vectors contain the features of the cloning vectors.
In light of the above statements, choose the CORRECT answer from the options given below:
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

53. An athlete participating in an early morning marathon before breakfast is likely to derive most of the energy for muscles from:
(a) Glucose
(b) Fats
(c) Ketone bodies
(d) Proteins

54. Which one of the following techniques will you use to resolve proteins ONLY on the basis of their molecular weight?
(a) Native-PAGE
(b) SDS-PAGE
(c) Agarose Gel electrophoresis
(d) 20-Gel electrophoresis

55. Given below are two statements: One is labelled as Assertion (A) and other is labelled as Reason (R)
Assertion (A):Spectrophotometry is a technique used for quantitative estimation of biomolecules in a solution
Reason (R): Reason (R): Spectrophotometry is based on the Bragg's Law.
In light of the above statements, choose the CORRECT answer from the options given Below:
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

56. Which one of the following techniques is used for detecting protein-protein interactions in Vivo?
    (a) Surface Plasmon Resonance
    (b) ELISA
    (c) Yeast Two Hybrid Assay
    (d) Yeast One Hybrid Assay

57. What is the purpose of using quantitative real time PCR (qRT-PCR)?
    (a) Quantify gene expression levels based on DNA content.
    (b) Quantify gene expression levels based on RNA transcripts.
    (c) Identification of transcription start site.
    (d) Sequence DNA fragments to determine their identity.

58. Which one of the following methods is based on the binding of Coomassie Brilliant Blue to proteins to determine the protein concentration?
    (a) Lowry method
    (b) BCA method
    (c) Bradford method
    (d) Kjeldahl method

59. Match the items in List I with items in List II :

	List I		List II
A	Surface Plasmon Resonance	i	Conformation difference of DNA
B	Iso-electric Focusing	ii	Melting temperature of DNA strands
C	Single-strand Conformation Polymorphism	iii	Resolving protein mixtures
D	Denaturing Gradient Gel Electrophoresis	iv	Protein-protein interaction

    Choose the CORRECT answer from the given below:
    (a) A-iv, B-iii, C-i, D-ii
    (b) A-i, B-iii, C-ii, D-iv
    (c) A-iv, B-ii, C-iii, D-i
    (d) A-ii, B-iii, C-i, D-iv

60. How much calcium chloride is required to make 40 mL of 0.02 M solution? Assume molecular weight of calcium chloride is 219:
    (a) 17.52 gm
    (b) 1.752 mg
    (c) 0.1752 am
    (d) 0.1752 mg

61. Given below are two statements:
    Statement I: The Michaelis constant (Km) characterizes the affinity of an enzyme to its substrate.
    Statement II: Higher the value of the Michaelis constant (K_m), stronger is the binding of the enzyme to the substrate.
    In light of the above statements, choose the CORRECT answer from the options given below:
    (a) Both Statement I and Statement II are correct.
    (b) Both Statement I and Statement II are incorrect.
    (c) Statement I is correct but Statement II is incorrect.
    (d) Statement I is incorrect but Statement II is correct.

62. In a Chemostat which one of the following would increase the exit cell concentration?
    (a) Increase in dilution rate.
    (b) Increase in inlet substrate concentration.
    (c) Increase in inoculum dilution.
    (d) Increase in impeller size.

63. Which one of the following uses a photocell to measure the cell density of a culture to regulate the flow of culture media?
    (a) Chemostat
    (b) Turbidostat
    (c) Hemostat

(d) Cryostat

64. In a bioprocess mainly producing cell biomass, if the microbial cell yield has halved what would be the rate of substrate consumption to maintain the same rate of cell mass production?
(a) It would be doubled
(b) It would also be halved
(c) It would remain unchanged
(d) It would increase four fold

65. The first commercially produced plant secondary metabolite using plant suspension culture in bioreactor was:
(a) Shikonin
(b) Colchicine
(c) Riboflavin
(d) Cytokinin

66. Two proteins have approximately the same molecular weight and isoelectric point. The best way to resolve them would be using:
(a) Reverse phase chromatography
(b) Thin laver chromatography
(c) Gel filtration
(d) Isoelectric focusing

67. Sugarcane molasses containing 50% sucrose, 1% invert sugars, 18% water and 31% other solids is mixed with corn steep liquor containing 2.5% invert sugars, 50% water and 47.5% other solids to produce a diluted sugar mixture containing 2% invert sugars. 125 kg corn steep liquor and 45 kg molasses are fed into the mixing tank. How much water should be added to the mixing tank to produce the desired diluted sugar mixture?
(a) 6.25 kg
(b) 10.05 kg
(c) 7.20 kg
(d) 8.75 kg

68. A bacterial culture, with the molecular formula – $C_{4.4}H_{7.3}0_{1.2}N_{086}$ is cultivated under aerobic conditions with hexadecane ($C_{16}H_{34}$) as substrate. The growth can be described byC_{16}+ $16.28O_2$ + $1.42NH_3$ → $1.65C_{4.4}H_{7.3}O_{12}N_{0.80}$+ $8.74CO_2$ +$13.11H_2O$. Assuming 100%conversion, the yield of cell mass from hexadecane will be:
(a) 0.45 $g.g^{-1}$
(b) 0.66 gg^{-1}
(c) 0.55 $g.g^{-l}$
(d) 0.50 $g.g^{-l}$

69. For an enzyme following Michaelis-Menten kinetics, the catalytic efficiency of the enzyme is measured by:
(a) K_{cat}/K_m
(b) V_{max}
(c) K_m
(d) K_{cat}

70. An airlift bioreactor uses:
(a) An impeller for mixing the contents.
(b) Air bubbles for mixing the contents.
(c) A sparger for mixing the contents.
(d) Differential densities for mixing purposes.

71. In alcoholic fermentation, $C0_2$ is evolved during:
(a) Decarboxylation of pyruvic acid only.
(b) Formation of acetaldehyde only.
(c) Both decarboxylation of pyruvic acid and formation of acetaldehyde.
(d) Oxidation of acetaldehyde.

72. During the life cycle of microbes, at which stage do they produce primary metabolites?
(a) Laq Phase

(b) Exponential Phase
(c) Stationary Phase
(d) Death Phase

73. Under high concentration of glucose, ethanol production by yeast cells, instead of increasing cell moss via TCA cycle is described as:
(a) Warburg effect
(b) Simpson's effect
(c) Crabtree effect
(d) Raman effect

74. A strain of E coli is cultured in a 15 m^3 mechanically stirred bioreactor. Under the operating conditions, the value of k_La is 0.17 s^{-1}. Oxygen solubility in the broth is $8*10^{-3}Kgm^{-3}$ If the specific rate of 0_2 uptake is 12.5 $mmoles.g^{-l}.h^{-l}$, what is the maximum possible cell concentration?
(a) 12 $g.l^{-1}$
(b) 15 $g.l^{-1}$
(c) 8.5$g.l^{-1}$
(d) 6.8 $g.l^{-1}$

75. A bioreactor of volume $1m^3$ is operated continuously under steady state with inlet substrate concentration of 1O $Kg.m^3$. The organism being cultivated has μm = 0.30 h^{-1} and saturation constant (K_S) = 0.5 $g.l^{-1}$ The feed flow rate required to achieve 90% conversion of the substrate will be:
(a) 0.2 $m^3.h^{-1}$
(b) 2.0 $m.h^{-1}$
(c) $1.0m^3$ $.h^{-1}$
(d) 0.3 $m^3.h^{-1}$

76. Which one of the following statements is CORRECT?
(a) The genome size and the number of genes are directly proportional for all species.
(b) The genome size and the number of genes are directly proportional only among eukaryotes.
(c) The genome size and the number of genes are directly proportional only among prokaryotes.
(d) The genome size is not directly proportional to the number of genes across species.

77. What is the mutation rate per generation for humans?
(a) 1.3 x 10^{-36} per base pair
(b) 1.3 x 10^{-4} per million base pair
(c) 1.3 x 10^{-8} per base pair
(d) 1.3 x 10^{-6} per base pair

78. In nature, 20 different amino acids can be coded by 4 different nucleotides (A T, G & C),
Suppose the number of available nucleotides increases to 6 (A. T, G , C, X & Y), for the genetic code to be made up of codons having equal number of nucleotides, what would be the minimum number of nucleotides required for each codon?
(a) Three
(b) Five
(c) Two
(d) Four

79. Match the items in List I with the items in List II:

	List I		List II
	(Database)		(Description)
A	1000 Genomes	i	Genes and Disease (Phenotype) database
B	GenBank	ii	Catalogue of genomic variants
C	OMIM	iii	Biomedical resource with genetic, environmental and clinical data
D	UK Biobank	iv	Nucleic Acid sequence database

Choose the CORRECT answer from the options given below:
(a) A-i, B-ii, C-iii, D-iv

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

80. The following sequence of DNA seems to form a structure:
5' ATCCGTGAATTACGGAT 3'
When the third base is changed from C to G the DNA loses its structure. However if in the background of this change, the 15th base (which is the 3rd last one) is changed from G to C, the DNA regains back its structure. The most plausible reason for these observations is:
(a) The 3rd base and 15th base are paired in a stem like structure.
(b) The 3rd and the 15th base are part of a loop like structure.
(c) The 3rd and 15th bases have steric clashes.
(d) The 3rd base pairs with the 5th base and the 15th base pairs with the 13th one.

81. Given below are two statements:
Statement I: Unfolded protein response occurs when cells are stressed.
Statement II: Unfolded protein response is a hallmark response by the nucleus to protect the genome.
(a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

82. While analyzing a multiple sequence alignment of homologous protease sequences the following was observed:
The 14th position was variable but always encoded by a hydrophobic amino acid.
The 17th position Was conserved end was Serine in all the sequences.
The 29th position was variable but always encoded by an Aspartate or a Glutamate.
The 50th position was conserved and always encoded by a Phenylalanine.
Which statements do you think are consistent with the above observations?
A. Residue 14th is a buried amino acid.
B. 17th position may be part of the active site of the protein.
C. 29th residue is a buried amino acid.
D. 50th position is an exposed amino acid.
Choose the CORRECT answer from the options given below:
(a) (A) and (B) only
(b) (B) and (D) only
(c) (A) and (D) only
(d) (B) and (D) only

83. The ΔG of unfolding reaction of a monomeric protein
Folded ↔ Unfolded
Varies with the concentration of Guanidine Hydrochloride [GdnHCl] with the following Relationship
$\Delta G = m \times [GdnHCl] + 10 kCal/mol$
Where, $m = -2\ kCalMol^{-1}M^{-1}$
What is the [GdnHCl] at which half of the protein is unfolded?
(a) 0M
(b) 2M
(c) 5M
(d) 10M

84. A protein X forms dimer:
$X\text{-}\ X \leftrightarrow X + X$
The K_D of the reaction is 1 μM.
At 1 μM concentration of the monomer X. What is the concentration of dimer of X:
(a) 0.5 μM
(b) 1μM
(c) 0.25μM
(d) 0.75μM

85. Sometimes phi and psi angles can be used to construct the 3D structure of a protein. Which one of the following statements are true with respect to this process?
    A. The omega angle is required to model the final 3D structure.
    B. phi and psi are not sufficient to model the 3D positions of the side chain atoms.
    C. The allowed regions of Ramachandran Map is sufficient to model the 3D structure ab initio.
    D. phi and psi are sufficient to fix all main chain atoms except for Glycine which is achiral.
    (a) (A) and (B) only.
    (b) (B) and (C) only.
    (c) (B) and (D) only.
    (d) (C) and (D) only.

86. Which one of the following forward primer(s) will you use to amplify the DNA sequence given below?
    5' ATGCAATCGATGCCGATC 3'
    3’ TACGTTAGCTACGGCTAG 5'
    (a) 5'ATGCA 3'
    (b) 5' TACGT 3'
    (c) 5' ACTAGC 3'
    (d) 5’ GATCG 3'

87. Approximately how many helical tums are generally present in a 4800 bp long, non-supercoiled B-DNA?
    (a) 48
    (b) 480
    (c) 4800
    (d) 400

88. Which one of the following is formed when the cytosine base is deaminated?
    (a) Uracil
    (b) Guanine
    (c) Adenine
    (d) Thymidine

89. After solving a protein structure by X-ray crystallography you found that a few residues are in the disallowed region of the Ramachandran Map. Which one of the following are plausible explanations for this observation?
    A. There may be errors in the structure of these residues.
    B. There may be side-chain interactions in those residues that off-set the disallowed cost.
    C. The protein may have a lot of Proline residues.
    D. The protein may **NOT** be in a proper folded state when it was crystallized.
    Choose the CORRECT answer from the options given below:
    (a) (A) and (B) Only
    (b) (B) and (C) Only
    (c) (A) and (D) Only
    (d) (C) and (D) only

90. Real time PCR was done with the two patient samples, A and B, to detect SARS-CoV-2 virus. The Ct value obtained in patient sample A was higher than that obtained in patient sample B. The inference to be drawn from this observation is that the:
    (a) Patient A has a higher viral load than patient B.
    (b) Patient B has higher viral load than patient A.
    (c) Strain infecting Patient A is more virulent than that in-Patient B.
    (d) Viral load cannot be determined by the Ct value.

91. RNAi was discovered in:
(a) Drosophila / melanogaster
(b) Caenorhabditis elegans
(c) Escherichia coli
(d) Saccharomyces cerevisiae

92. Which one of the following statements about neutrophils is **INCORRECT**?
(a) They are the most abundant circulating leukocytes.

(b) They differentiate in the bone marrow and move into circulation.
(c) They differentiate only during bacterial infection.
(d) They are recruited to the site of infection in response to chemokines.

93. Generation of a DNA probe using random primer technique uses a combination of oligonucleotides 6 bp in length. How many number of distinct oligonucleotides are possible if all four nucleotides are randomly incorporated?
(a) 4096
(b) 1296
(c) 1024
(d) 24576

94. Which one of the following is likely to happen when a double-stranded DNA solution is heated?
(a) The absorbance of DNA at 260 nm increases.
(b) The absorbance of DNA at 260 nm decreases.
(c) The absorbance of DNA at 260 nm remains the same.
(d) The absorbance of DNA dt 260 nm first decreases and then increases.

95. Which one of the following is **NOT** primarily a microtubule-based structure?
(a) Centriole
(b) Centrosome
(c) Basal Body
(d) Filopodia

96. There are twenty amino acids. How many different polypeptide chains of 'N' number of amino acids are possible?
(a) N^4
(b) 4^N
(c) N^{20}
(d) 20^N

97. Which one of the following organisms requires a Biosafety level 3 facility for culture and manipulation as per extant biosafety regulations?
(a) Leishmania donovani
(b) Streptococcus pneumoniae
(c) Plasmodium falciparum
(d) Candida albicans

98. The process by which the genetic material can be transferred from one bacterium to another by a virus is known as:
(a) Transformation
(b) Conjugation
(c) Transduction
(d) Transfection

99. In a newly discovered type of genetic material (with similar properties to our own DNA) there were four nucleotides, L M, N and O. L and M were complementary and paired with one hydrogen bond between them and N and O were complementary and paired with 2 hydrogen bonds between them. Given this. Which one of following sequences would have the highest melting temperature in their double-stranded form?
(a) LMMLLLMLON
(b) LLLMMMMLML
(c) ONONNMLMLL
(d) NNOONONOML

100. DNA polymerase 1 from Escherichia coli lacks which one of the following enzyme activities?
(a) 5' to 3' exonuclease activity.
(b) 3' to 5' exonuclease activity.
(c) 5' to 3' DNA-dependent DNA polymerase activity.
(d) 5' to 3' RNA-dependent DNA polymerase activity.

101. Transmission of organisms from mother to fetus or new born child is known as Vertical transmission of infection. Which one of the following is most likely to transmit vertically?
(a) Clostridium tetani
(b) Chlamydia trachomatis
(c) Shigella dysenteriae
(d) Streptococcus pneumoniae

102. Which one of the following combinations of the drugs acts to inhibit the same metabolic pathway?
(a) Sulfonamide and Trimethoprim.
(b) Amphotericin and Flucytosine.
(c) Isoniazid and Rifampicin.
(d) Penicillin G and Gentamicin.

103. Which one of the following statements is **NOT** CORRECT about human immunodeficiency virus (HIV)?
(a) HIV is an enveloped RNA virus.
(b) Acyclovir inhibits HIV replication.
(c) A DNA copy of the HIV genome may integrate into host cell DNA.
(d) The virion contains an RNA-dependent DNA polymerase.

104. India has major burden of tuberculosis (TB) which is caused by Mycobacterium tuberculosis. Efforts are on to eliminate TB by 2025 and effective prophylaxis against the disease can be achieved with the BCG vaccine. Which has been developed from:
(a) Mycobacterium tuberculosis.
(b) Mycobacterium avium.
(c) Mycobacterium bovis.
(d) Mycobacterium smegmatis.

105. Flow cytometry is an analytical technique that quantifies the frequencies of cells binding to fluorescent antibodies and scattering light in characteristic ways. When a flow cytometer is used to sort cell subpopulations on the basis of florescence and light scattering it is referred to as Fluorescence Activated Cell Sorting (FACS). Which one of the following statement is **NOT** CORRECT regarding FACS?
(a) Every time a cell passes in front of the laser beam, light is scattered, and this scattering of the laser signal is recorded.
(b) The more forward light scatter, the larger the cell, and so the amount of light scattered in the forward direction can be used as a rough measure of the range of sizes of the cells in the stream.
(c) The amount of side scattered light offers an indication of the extent of size of the scattering cells.
(d) Cells in suspension are hydrodynamically focused into a narrow stream by being introduced inside a rapidly moving column of sheath fluid.

106. While running in the 200 meter race in National Games, the required ATP generation in the athlete is primarily facilitated by:
(a) Contraction of Actin and myosin proteins.
(b) Hydrolysis of stored ATP polymer.
(c) Creatine phosphate in the muscle.
(d) Ketone bodies in the muscles.

107. A slide of macrophages was stained by immunofluorescence using a monoclonal antibody for the TAP1/TAP2 complex. Which one of the following intracellular compartments would exhibit positive staining with this antibody?
(a) Mitochondria
(b) Endoplasmic Reticulum
(c) Golgi apparatus
(d) Nucleus

108. Given below are statements:
Statement I : Agglutination is a simple. inexpensive, rapid and highly specific immunological test that is widely performed in diagnostic laboratories For example, it is often used for human blood typing based on the presence of specific antigens on the surface of red blood cells, Which vary among individuals.
Statement II : Agglutination is routinely used on clinical laboratories for determining HIV-infected $CD4^+$ cells.
In light of the above statements, the CORRECT answer from the options given below:

(a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

109. The vaccine for cervical cancer is composed of:
(a) Human Papilloma Virus -like-particles (VIPs).
(b) Inactivated Human Papilloma Virus.
(c) Live attenuated Human Papilloma Virus.
(d) Recombinant adenovirus.

110. Match the items in List I with the items in List II :

	List I		List II
A	Cystic Fibrosis	i	Hypoxanthine-guanine phosphoribosyl transferase
B	Lesch-Nyhan syndrome	ii	CETR
C	Severe combined immunodeficiency	iii	SMN1/2
D	Spinal muscle atrophy	iv	Adenosine Deaminase

Choose the CORRECT answer from the options given below:
(a) A-vi, B-i, C-iii, D-ii
(b) A-ii, B-iii, C-i, D-iv
(c) A-iv, B-iii, C-i, D-ii
(d) A-ii, B-i, C-iv, D-iii

111. Which one of the following antibiotic specifically inhibits RNA synthesis?
(a) Isoniazid
(b) Penicillin
(c) Rifampicin
(d) Streptomycin

112. Given below are two statements:
Statement I: If one parent carries the defective Huntington disease gene, his or her offspring have a 100% chance of inheriting the disease
Statement II: Huntington disease is an autosomal inheriting genetic disorder
In light of the above statements. choose the CORRECT answer from the options given below:
(a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

113. Functional magnetic resonance imaging (fMRI) is one of the most powerful methods for examining brain function. This method is based on the changes in the magnetic properties of:
(a) Neurotransmitters
(b) Neurons
(c) Myelin
(d) Hemoglobin

114. Which one of the following diseases is due to severe defici81cy of proteins in diet?
(a) Kwashiorkor
(b) Tay-Sach's disease
(c) Scurvy
(d) Myasthenia gravis

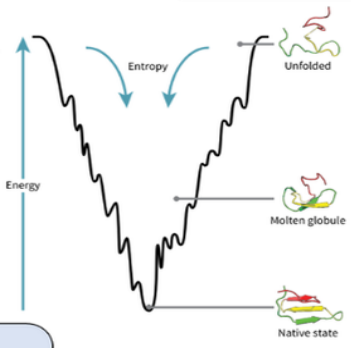
115. Given are two statements: One is labelled as Assertion (A) and the other is labelled as Reason: (R)
Assertion (A): Mycoplasma stains negative in Gram staining.
Reason (R): Mycoplasma's cell wall is devoid of teichoic acid.
In light of the above statements, choose the CORRECT answer from the options given below:

VEDEMY'S CAPSULE (VEDEMY'S SPECIAL NOTES)

Amino acid Classes

Essential	**M**y **V**ery **T**alented **F**riend **I**s **W**aiting **F**or **K**ajo**L**
Semi-essential	**R**ahu**L**
Non-Polar	**GAV** के लोग **PILW** लेकर **FM** सुन रहे थे
Polar Uncharged	**CN**(कार्टून नेटवर्क) pe **STY**(सत्य) **Q**ues पूछते है
Negative charged	Ye **DE**kh
Positive charged	**R**a**H**u**L** bola
Gluco-ketogenic	**I**tni **T**alented **WYF** (wife)
Ketogenic	**K**ajo**L**

Protein Folding Curve



Energy profile-
High
- **U**- Unstructured
- **M**- molten globule
- **D**- discrete structure
- **N**- native
- **A**- amorphous
- **A**- amyloid

Low

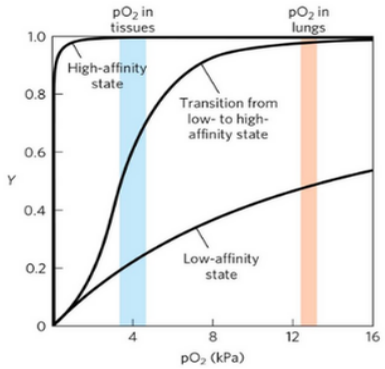
Urmila **M**atoldkar ka **DNA** **A**chha hai

Hemoglobin

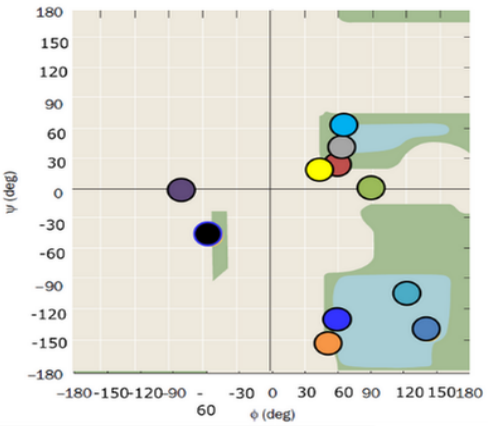
State of Hb – MOLD
- **O**xy Hb — Less acidic (Tensed state)
- **M**ore acidic (Relaxed state)
- **D**eoxy Hb

Affinity of Curve – DRIL

H+, Temp. BPG, CO_2
- Increase — Left shift
- Decrease — Right shift

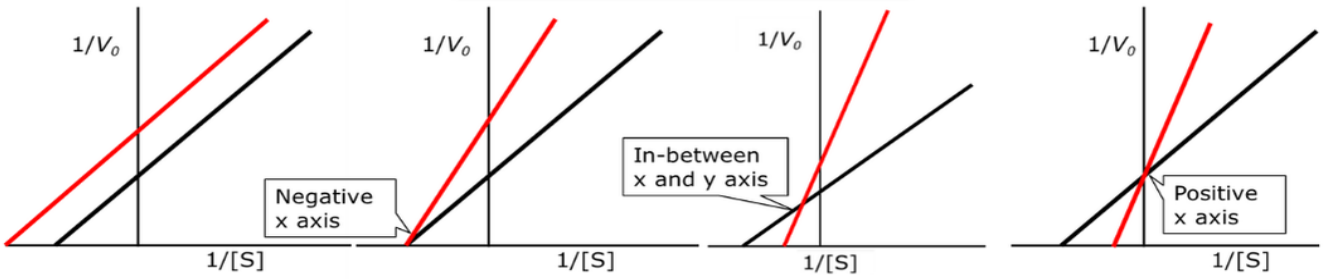


Ramachandran plot



Secondary Structure	Phi	Psi
AP β Sheet	+140⁰	-135⁰
P β Sheet	+120⁰	-115⁰
CTH	+50⁰	-150⁰
L-α-H	-60⁰	-50⁰
R-α-H	+60⁰	+50⁰
Type-I i+1	+60⁰	+30⁰
Type-I i+2	+90⁰	0⁰
Type-II i+1	+60⁰	-120⁰
Type-II i+2	-80⁰	0⁰

Enzyme Inhibition Curve



Uncompetitive Inhibition
Decrease K_m = increased $1/K_m$
Decreased V_{max}= increased $1/V_{max}$

Noncompetitive Inhibition
Decreased V_{max}= increased $1/V_{max}$

Mixed Inhibition
K_m increase
V_{max} decrease

Competitive Inhibition
Increase K_m = decreased $1/K_m$

Parallel — **UP** ke **N**a**N**a patekar — Negative x axis
Uncompetitive — Non-competitive

In-between x and y axis — **MI** ka **PC** lekar aaye — Positive x axis
Mixed — Competitive

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(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

116. Which one of the following is responsible is for development of myelin sheath in the central nervous system?
(a) Astrocytes
(b) Oligodendrocyte
(c) Microglia
(d) Dendritic cells

117. Which one of following brain regions are **NOT** involved in eye movement control?
(a) Premotor cortex
(b) Parietal cortex
(c) Interior temporal gyrus
(d) Frontal eye field

118. Which one of the following disorders leads to hallucinations?
(a) Anxiety
(b) Schizophrenia
(c) Alzheimer's
(d) Epilepsy

119. In absolute refractory period of neurons:
(a) Na^+ channels are open.
(b) Na^+ channels are dosed.
(c) K^+ channels are open.
(d) K^+ channels are closed.

120. Phagocytosis in the central nervous system involves:
(a) Recovering excess Ca^{2+} from synapse.
(b) Specialized ability of some neurons to divide.
(c) Bridging the blood brain barrier.
(d) Clearing of dead cells.

121. What attribute do DREB transcription factors impart to higher plants?
(a) Insect resistance
(b) Pathogen resistance
(c) Drought resistance
(d) Virus resistance

122. Quantitative Trait Loci (QTL) can be mopped using:
(a) Transgenic approach
(b) SSR markets
(c) Gene editing
(d) Tissue culture

123. Given below are two statements:
Statement I: Heterologous expression of prokaryotic genes in plants can be used to to render resistance insects.
Statement II Expression of BtCry1Ac gene in cotton improves resistance against aphids.
In light of the above statements, choose the CORRECT answer from the options given below :
(a) Both Statement I and Statement II are Correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

124. Targeted disruption **CANNOT** achieved by:
(a) Cre/Lox system
(b) CRISPR system
(c) Zinc-Finger nucleases

(d) T- DNA integration

125. Centimorgan (cM) is &tined as the genetic distance between two loci with a statistically corrected recombination frequency of:
(a) 10%
(b) 0.1%
(c) 1%
(d) 0.01%

126. Upon entering the cells, Cauliflower Mosaic Virus (CaMV) accumulates in inclusion bodies in which part of the cells?
(a) Nucleus
(b) Chloroplast
(c) Cytoplasm
(d) Mitochondria

127. Which one of the following genes provide herbicide tolerance?
(a) Neomycin phosphotransferase
(b) Phosphinothricin acetyltransferase
(c) Hygromycin phosphotransferase
(d) Gentamycin acetyltransferase

128. During cell cycle. genome replication occurs in:
(a) M Phase
(b) G1 phase
(c) G2 phase
(d) S phase

129. Plant transformation that uses tungsten or gold particle coated with DNA accelerated at a high velocity is called:
(a) Agrobacterium mediated particle delivery method.
(b) Particle bombardment method.
(c) High velocity gene delivery method.
(d) Accelerated gene delivery method.

130. Which one of the following chemicals enhances vir gene expression in Agrobacterium?
(a) Dextran
(b) Acetosyringone
(c) Acetyl carboxylic acid
(d) Acetyl salicylic acid

131. In monocot seedlings the highest concentration of auxin is found in the:
(a) Stem
(b) Bud
(c) Coleoptile
(d) Trichome

132. In plants. Which stage of somatic embryo development requires ABA in culture medium?
(a) Formation of embryogenic cells.
(b) Globular embryogenesis.
(c) Torpedo stage.
(d) Maturing embryo

133. A classical plant breeder wants to develop a disease resistant variety. What is the first step?
(a) Development of Recombinant Inbred Lines (RILs).
(b) Section of a naturally resistant landrace.
(c) Hybridization of contrasting parents.
(d) Production of Near Isogenic Lines (NILs).

134. Which class of enzymes catalyzes the formation of oxalo-acetic acid from phosphoenol pyruvic acid in the chloroplasts of mesophyll cell?

(a) Dehydrogenases
(b) Carboxylases
(c) Decarboxylases
(d) Isomerases

135. Given below are two statements: One is labelled as Assertion A and the other is labelled As Reason R:
Assertion (A): The major factors influencing the water potential in plants are solute concentration pressure and Gravity.
Reason: Turgot pressure in xylem vessel is responsible for generating the water potential.
in light of the above statements, choose the most answer from the options given below:
(a) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(b) goth (A) and (R) are correct (R) is NOT the correct explanation f (A).
(c) (A) is correct but (R) is not correct.
(d) (A) is not correct but (R) is correct.

136. Which ono of the following is the CORRECT sequence of electron transfer in the thylakoid membrane during light cycle of photosynthesis?
(a) p680- Cytochrome b_6f - PC - PO - P700.
(b) P680- PQ-cytochrome b_6f - PC – P700.
(c) P680- Cytochrome b_6f – PQ- PC – 700.
(d) P680 -Cytochrome bd- P_6f- PQ- P700.

137. Vinblastine and vincristine, the potent anticancer metabolites present in Catharanthus roseus accumulate in which one of the following?
(a) Middle Lamella
(b) Primary cell walls
(c) Schlerenchyma
(d) Idioblasts

138. Which one of the following is the immediate effect of ABA-dependent stomatal closure in plants?
(a) Enhanced transpiration and enhanced photosynthesis.
(b) Reduced transpiration and enhanced photosynthesis.
(c) Enhanced transpiration and reduced photosynthesis.
(d) Reduced transpiration and reduced photosynthesis.

139. The ABC model of flower development determines organ arrangement in the sequence sepal, petal, stamen and carpel. Due to the loss of Class A gene functions, the observed phenotype will be:
(a) Sepal. Sepal, Carpel. Carpel.
(b) Stamen, Carpel, Carpel, Carpel.
(c) Sepal, Petal, Petal, Sepal.
(d) Carpel, Stamen, Stamen. Carpel.

140. Which one of the following enzymes is administered to dissolve blood clots during heart attack Treatment?
(a) Amylase
(b) Laccase
(c) Streptokinase
(d) Acylase

141. Which one of the following anti-diabetic drugs is produced by coupling of GLP-1 peptide with IgG-FC?
(a) Semaglutide
(b) Liraglutide
(c) Dulaglutide
(d) Insulin

142. Match the enzymes in List I with their products items in List II :

	List I		List II
A	Penicillin Acylase	i	Bioactive peptides
B	Alkalase	ii	6-APA

C	Thermolysin	iii	Lactose free milk
D	β—galactosidase	iv	Aspartame

Choose the CORRECT answer from the options given below:
(a) A-ii, B-iv, C-iii, D-i
(b) A-iii, B-iv, C-i, D-ii
(c) A-iii, B-i, C-ii, D-iv
(d) A-ii, B-i, C-iv, D-iii

143. Given below are two statements:
Statement I: Both aspirin and paracetamol belong to non-narcotic analgesics.
Statement II: The synthesis of prostaglandins, which stimulate inflammation in the tissue causing pain, is inhibited by aspirin.
In light of the above statements, choose the CORRECT answer from the options:
(a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

144. Given below are two statements :
Statement: The manufacturing process of SARS-CoV-2 mRNA vaccine requires synthesis of mRNA from DNA using in vitro transcription.
Statement II: The naked mRNA is administered intramuscularly to the vaccine recipients to generate a protective immune response.
In light of the abwe statements, choose the CORRECT answer from the options given below:
(a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct but Statement II is incorrect
(d) Statement I is incorrect but Statement II is correct

145. Saccharomyces cerevisiae was grown in batch fermentation mode to produce ethane, The rate of ethanol production in the exponential phase was 2g/L/h which decreased to 1 g/L/h after sometime. Which of these is least likely to be responsible for this?
(a) Nutrient depletion
(b) Mineral salt depletion
(c) Oxygen depletion
(d) Accumulation of waste

146. The aspect ratio (based on height & diameter) of a tower reactor is:
(a) 6/1 - 10/1
(b) 2/1 -3/1
(c) 2/1-4/1
(d) 1-1/2

147. The average molecular weight of a nucleotide base in oligonucleotides is 330 What would be the amount required to prepare 100 μL Of 1 μM solution Of a 20 bp long single- stranded DNA?
(a) 660 μg
(b) 66 μg
(c) 6.6 μg
(d) 0.66 μg

148. Yeast are facultative anaerobes — they can grow anaerobically alcoholic fermentation and aerobically using oxygen for cellular respiration, Interestingly, wild type yeast cannot live anaerobically using glycerol as their only fuel source_ Which one of the following is the CORRECT explanation?
(a) Glycerol inactivates alcohol dehydrogenase in yeast.
(b) Yeast lacks functional glycerol transporter.
(c) Yeast cannot regener ate NAD+ in the presence of glycerol.
(d) Yeast is unable to catabolize glycerol.

149. The pelleting of microsomal fraction from liver homogenate sample was performed using a centrifuge operated at 15000 rpm. What is the angular velocity of centrifuge in rad/s?

(a) 785
(b) 1570
(c) 3140
(d) 6280

150. Which one among the following **CANNOT** induce cell flocculation?
(a) Neutralization of anionic charges on the surface of microbial cells.
(b) Reduction in surface hydrophobicity.
(c) Use of high molecular weight polymer bridges.
(d) Alteration of pH.

151. Which one of the following is the Del factor value for sterilizing a culture medium containing viable bacterial cells?
(a) 14.1
(b) 4.2
(c) 32.2
(d) 16.1

152. Exponential growth of bacterial culture in batch mode is usually defined by the equation dX/dt =μ X, where μ is:
(a) Exponential fermentation rate.
(b) Specific growth rate.
(c) Specific batch rate.
(d) Relative growth rate.

153. During a fermentation process, the feed is sterilized using wet-heat sterilization method. What will happen to D-value, if the solute concentration in the feed increases by four- fold?
(a) Increases.
(b) Decreases.
(c) Remains constant.
(d) First decreases and then increases.

154. You have mixed 100 ml of 0.5 M solution of glucose and 200 ml of 0.5 M solution of glucose. The resultant solution will contain:
(a) 0.25 M glucose.
(b) 0.5 M glucose.
(c) 0.33 M glucose.
(d) 0.25 M maltose.

155. The penicillin extraction process involves the following steps:
(a) Extraction from the organic solvent into an aqueous buffer.
(b) Extraction from the aqueous buffer into an organic solvent.
(c) Extraction of penicillin from the filtered broth into organic solvent.
(d) Extraction of solvent to obtain penicillin salt.

156. Suppose that an obligate anaerobe suffered a mutation that resulted in the loss of triose phosphate isomerase activity. What will be the net ATP yield under anaerobic condition?
(a) 0
(b) 1
(c) 2
(d) 4

157. Which of the following processes can be utilized for sterilization of medium with heat- sensitive components?
(a) Short sterilization
(b) Batch sterilization
(c) Dry sterilization
(d) Microfiltration

158. Bacillus polymyxa strain was cultivated under anaerobic condition in a media containing 10 g/L glucose as the sole carbon source. The glucose was completely utilized in 10 h producing 2, 3-ButanediоI with

productivity of 5 g/L/h. What is the yield of 2, 3- Butanediol produced per gram of glucose consumed (g/g)?
(a) 5
(b) 10
(c) 50
(d) 100

159. If the partitioning coefficient (K) of a solute is 20 when it is extracted by an organic solvent from culture medium, what is the amount of solvent required per litre of culture medium to extract 90% of the solute in a single equilibrium stage?
(a) 0.45 litre
(b) 4.5 litre
(c) 0.043 litre
(d) 45 litre

160. With respect to Good Manufacturing Practices and Process Safety. HACCP stands for:
(a) Help and Awareness in Critical Care Processes.
(b) Human Awareness in Commercial Critical Processes.
(c) Hazard Analysis and Critical Care Point.
(d) Hazard Analysis and Critical Control Point.

161. Which of the following ISO standards is designed for Food Safety Management?
(a) ISO series
(b) ISO 14000 series
(c) ISO 18000 series
(d) ISO 22000 series

162. Which of the following methods is used for rapid and accurate detection of toxic Organisms in food?
(a) Staining
(b) ATP estimation
(c) PCR
(d) MPN counting

163. An investigation of an outbreak of food poisoning following consumption of cultivated mussels showed the presence of d glutamate antagonist known as domoic acid in the body of the affected persons. What is the source of the domoic acid?
(a) Escherichia Coli contamination.
(b) Gambierdiscus toxicus contamination.
(c) Nitzschia pungens contamination.
(d) Salmonella species contamination.

164. Which among the following bacteria is the most heat tolerant?
(a) Clostridium botulinum type E
(b) Bacillus coagulans
(c) Clostridium pasteurianum
(d) Bacillus polymyza

165. The recent advancements in computing that has exponentially enhanced computing power for bioinformatics include:
(a) Logical and High-Performance Computing.
(b) BIT and Graphic Processing Units aided Computing.
(c) Graphic Processing Units and High-Performance Computing.
(d) High Performance Serial Computing.

166. The researchers are looking for a possible DNA-binding groove in a protein structure, It is Most likely to be a:

(a) Negatively charged region.
(b) Positively charged region.
(c) Hydropbhobic region.
(d) Unstructured region.

167. Which one of the following **CANNOT** be used to determine the atomic structure of proteins?
(a) Cryo Electron Microscopy.
(b) Nuclear Magnetic Resonance Spectroscopy.
(c) X-ray Crystallography.
(d) Atomic Absorption Spectroscopy.

168. Which one of the following represents the structure of silk protein fibroin?
(a) Antiparallel -sheets.
(b) α- helical filament.
(c) Mixture of α-helices and β -sheets.
(d) Parallel β -sheets.

169. Which one of the following amino acid residue pairs can disruptα -helices?
(a) Glutamine and Proline.
(b) Lysine and Arginine.
(c) Glycine and proline.
(d) Alanine and Leucine.

170. Organic solvent acetone denatures proteins by:
(a) Disrupting hydrophobic core.
(b) Altering net charge of protein.
(c) Breaking covalent bonds.
(d) Disrupting inherent symmetry.

171. The Levinthal paradox is related to:
(a) Enzyme kinetics
(b) Metabolic pathways
(c) Protein folding
(d) Protein transport

172. Which one of the following DOES **NOT** assist protein folding?
(a) GroEL/GroES
(b) DnaJ/DnaK
(c) Protein disulfide Isomerase
(d) Topoisomerase

173. The amino acid glycine is always present in:
(a) Type 1 β-turn
(b) Type 2 β-turn
(c) a—helix
(d) Random coil

174. In α—helices, hydrogen bonds are formed in the polypeptide backbone between the —C=O group of the first amino acid and the:
(a) —NH group of the fifth amino acid.
(b) —NH group of the fourth amino acid.
(c) —C= O group of the fifth amino acid.
(d) —C= O group of the fourth amino acid.

175. The number of base pairs present per helical turn in a-DNA is:
(a) 12
(b) 14.8
(c) 10.5
(d) 16

176. Molecular Dynamics DOES **NOT** involve calculations of:

(a) Interatomic charges
(b) Force constants for bonded atoms.
(c) Quantum mechanics.
(d) Lennard-Jones potential.

177. Alphafold is a protein folding algorithm based on:
(a) Ab initio methods
(b) Statistical linear regression
(c) Threading
(d) Machine learning

178. For phylogenetic analysis, which of the following is CORRECT?
(a) BLAST alignments are necessary for performing phylogenetic analysis.
(b) The multiple sequence alignments should ideally be trimmed to edit out the non- aligning regions before phylogenetic analysis.
(c) Phylogenetic analysis is not effective for highly similar protein sequences.
(d) Phylogenetic analysis can only be done for proteins from organisms within the same phyla.

179. The following BLAST statistic DOES **NOT** change for same pair-wise alignments with different query databases:
(a) E-value
(b) BIT-score
(c) E-value and BIT-score
(d) E-value and identity

180. Which one of the following statements is CORRECT?
(a) T-COFFEE is a multiple sequence alignment tool.
(b) In a multiple sequence alignment, single columns in the alignments can be insertions
(c) Phylogenetic algorithms do not need multiple sequence alignments before drawing phylogeny
(d) BLAST is the most accurate multiple sequence alignment algorithm.

181. Which one of the following is an example of a global alignment algorithm?
(a) Smith-Waterman
(b) Needleman-Wunsch
(c) BLAST
(d) PSI-8LAST

182. Which one of the following statements is CORRECT?
(a) Artificial Intelligence is a type of Machine Learning.
(b) Machine Learning is a type of Deep Learning.
(c) Neural Networks are a type of Machine Learning.
(d) Machine Learning is a type of Artificial Neural Networks.

183. The researchers are interested in solving the structure of a given protein through X-ray diffraction crystallography. Which one of the following types of proteins is likely to be more difficult to crystallize?
(a) Protein with positively charged residues on the surface.
(b) Protein with hydrophobic patches on the surface.
(c) Protein with intrinsically disordered regions.
(d) Protein with no post-translational modifications.

184. BLAST is popular tool to search for sequences similar to a given sequence (query) against a given database, and it often sorts resulting matches according to the e-value. Which one of the following statements is **INCORRECT** with respect to this e-value?
(a) Its value depends on the length of the query sequence.
(b) Its value depends on the size of the database.
(c) It reduces exponentially as the pairwise alignment score increases.
(d) If the e-value approaches zero, the probability that the alignment occurred by chance is greater.

185. Johne's disease in ruminants is caused by:
(a) Mycobacterium bovis
(b) Mycobacterium tuberculosis

(c) Mycobacterium avium paratuberculosis
(d) Mycobacterium orygis

186. Prolactin, the hormone that controls milk production is secreted by:
(a) Anterior pituitary gland
(b) Mammary gland
(c) Thyroid
(d) Ovary

187. One health approach to address the challenge of Anti-microbial resistance involves addressing:
(a) One disease at d time
(b) Metabolic disorder
(c) Nosocomial iefections
(d) Zoonotic infections

188. Somatic cell cloning involves transfer of:
(a) Nucleus from ovum to somatic cell.
(b) Nucleus from somatic cell to ovum.
(c) cytoplasm from somatic cell to ovum.
(d) mitochondria from somatic cell to ovum.

189. Sperm production is regulated by which one of the following cells of the seminiferous Tubules:
(a) Basal lamina propria
(b) Leydig cells
(c) Beta cells
(d) Sertoli cells

190. Ozone depletion is caused by increase in the level of:
(a) H_2O Vapors
(b) Oxygen (O_2)
(c) Chlorofluorocarbon (CFC)
(d) Carbon mono-oxide (CO)

191. The efficiency of an organic sludge composting method can be improved by various physicochemical options. Which one of the following is **NOT** a recommended option for the same?
(a) Mixing
(b) Forcing air through the biomass.
(c) Shredding the material to enhance the surface area.
(d) Adding water to the biomass to increase the water activity (a_w) > 1.

192. A bacterium useful in bioleaching of low-grade mineral ores is:
(a) Bacillus megaterium
(b) Thiobacillus ferrooxidans
(c) Thermus aquaticus
(d) Rhodopseudomonas capsulatus

193. Which of the following is **NOT** a ground water remediation technology?
(a) Pump- and-Treat systems.
(b) Soil Vapour Extraction.
(c) Permeable Reactive Barriers.
(d) Sludge Treatment.

194. Find the theoretical oxygen demand to completely oxidize 167 x 10^{-3} M glucose solution ($C_6H_{12}O_6$) to $C0_2$ and H_20:
(a) 321 mg/L O_2
(b) 642 mg/L O_2
(c) 162 mg/ O_2
(d) 321 g/L O_2

195. What mass of CO_2 would be produced if 100 gm of butane (C_4H_{10}} is completely oxidized to CO_2 and H_2O?
(a) 606 gm

(b) 303 mg
(c) 303 gm
(d) 303 kg

196. In India, which one of the following parameters is **NOT** a part of day-to-day Air Quality Monitoring?
(a) pM10
(b) SO_2
(c) Pollen grains
(d) NO_2

197. Which of the following is **NOT** a part of Integrated Solid Waste Management?
(a) Source Reduction
(b) Recycling
(c) Disposal
(d) Crop Stubble Burning

198. Naupilus is a larval stage of:
(a) Shark
(b) Fish
(c) Shrimp
(d) Tortoise

199. Collagen is source of:
(a) Gelatin
(b) Agar
(c) Glucosamine
(d) Carbohydrate

200. Which of the following bioactive metabolites can be isolated from sea cucumbers?
(a) Acrydine
(b) Quinone
(c) Saponine
(d) Saffranin

DBT-BET-JRF 2024 ANSWER KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
c	c	c	c	b	a	d	d	c	a	b	c	a	a	d	a	b	b	c	b
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
c	d	d	d	a	c	a	d	b	c	a	a	b	c	d	a	c	b	b	d
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	b	c	a	d	c	b	c	b	b	b	a	b	b	c	c	b	c	a	c
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
c	b	b	a	a	a	d	b	a	b,d	c	b	c	a	a	d	c	c	b	a
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
c	a	c	b,c	a	a	b	a	a	b	b	c	a	a	d	d	b	c	d	d
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
b	a	b	c	c	c	b	c	a	d	c	d	d	a	b	b	c	b	a	d
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
c	b	c	d	c	c	b	d	b	b	c	d	b	b	c	b	d	d	d	c
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
c	d	a	c	c	a	d	c	b	b	c	b	a	b	b	a	d	a	a	d
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
d	c	c	b	c	b	d	a	c	a	c	d	b	a	c	c	d	b	b	a
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
b	c	c	d	c	a	d	b	d	c	d	b	d	a	c	c	d	c	a	c