SECTION – A

1. Mr. X, Mr. Y and Mr. Z went to a fruit shop to purchase apples and oranges at a fixed price for each orange and apple. The transaction amount for each purchase was noted. (I) Mr. X purchased 8 oranges and 4 apples (II) Mr. Y purchased 16 oranges and 8 apples (III) Mr. Z purchased 6 oranges and 5 apples. The individual prices of oranges and apples can be obtained by which one of the following?
   (a) (I) and (II)
   (b) (I) and (III) or (II) and (III)
   (c) (I), (II) and (III)
   (d) Insufficient data.

2. A watch repair man noticed that the clock under repair showed 12 minutes slow at 10:00 PM. He made an adjustment and went home. Next day at 10:00 AM, the clock showed 10:12 AM. At what time the clock would have shown the CORRECT time?
   (a) 3:48 AM
   (b) 4:00 AM
   (c) 4:12 AM
   (d) 5.00 AM

3. In a class of 15, the mean marks for a unit examination was 25 with a standard deviation 0. The CORRECT interpretation is:
   (a) Half the class had scores less than 25.
   (b) There was a high correlation between ability and grade.
   (c) Everyone had a score of exactly 25.
   (d) Half the class had 0's and half had 25s.

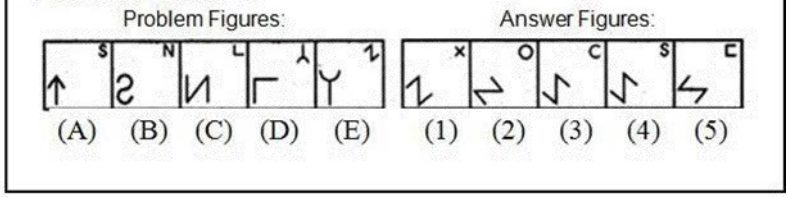
4. A person travelled 3 km towards west and continued walking 4 km towards north. The shortest distance from the point of starting to current position is:
   (a) 7 km
   (b) 5 km
   (c) 1 km
   (d) 2 km

5. Mohan is 18th from either end of a row of boys? How many boys are there in that row ?
   (a) 26
   (b) 32
   (c) 37
   (d) 35

6. 'Soldier' is related to 'Army' in the same way as 'Pupil' is related to _____:
   (a) Education
   (b) Teacher
   (c) Student
   (d) Class

7. What should come in the place of 'X' in the following series: 3, 8, 6, 14, X, 20?
   (a) 11
   (b) 10
   (c) 8
   (d) 9

8. Select a figure from amongst the Answer Figures which will continue the same series as established by the five Problem Figures.



(a) 1
(b) 2
(c) 3
(d) 4

9. Based on the following assumptions:
I. Conveyance allowance will not help in bringing punctuality.
II. Discipline and reward should always go hand in hand.
The CEO of a company issues the following statement: "In order to bring punctuality in our office, we must provide conveyance allowance to our employees." Which of the above assumptions is implied?
(a) Only I
(b) Only II
(c) Either I or II
(d) Neither I nor II

10. A man has some buffaloes and ducks. If the number of heads is 70 and the number of legs is 200, then the number of buffaloes is:
(a) 30
(b) 40
(c) 20
(d) 70

11. Identify the pair that best expresses the relationship similar to that expressed in Day: Week:
(a) Foot: Inch
(b) Second: Time
(c) Time: Duration
(d) Acre: Hectare

12. A 300 bp long B- form of plasmid DNA has 20 complete turns. This DNA molecule is:
(a) Positively supercoiled
(b) Negatively supercoiled
(c) Relaxed
(d) Cannot be predicted

13. Which one of the following sequences is a palindrome?
(a) 5' ACGGATTCGC 3'
(b) 5' ATGCCG 3'
(c) 5' CCATT 3'
(d) 5'AGGCCT3'

14. The nucleotide sequence in an mRNA is 5' UAA AUG ACC CAU UGG UCU CGU UAG AAA AAA 3'. Assuming that ribosomes could translate this mRNA, how many amino acids long would you expect the resulting polypeptide chain to be?
(a) 6
(b) 7
(c) 10
(d) 5

15. The difference between two numbers is 4 and the difference of their squares is 152. The sum of these two numbers is:
(a) 44
(b) 38
(c) 30
(d) 40

16. One ml of NADH solution gave absorbance of 0.31 O.D. at 340 nm wavelength with 1 cm cuvette path length. Calculate the molarity of NADH in this solution. ($\varepsilon 340=6220\ M^{-1}\ cm^{-1}$, mol wt. of NADH = 663 Da):
(a) 50 µM
(b) 50 nM
(c) 5µM
(d) 500 Nm

17. Number of molecules present in 1 ml of 250 µg per ml solution of 10 kDa protein will be - (Avogadro's number is 6.022×10^{23} molecules per mole):
(a) 1.50×10^{16}
(b) 15.0×10^{16}
(c) 0.15×10^{16}
(d) 150×10^{16}

18. A producer must select a pair consisting of one lead actor and one supporting actor from 6 candidates. The number of possible pairs that could be selected are:
(a) 15
(b) 30
(c) 12
(d) 36

19. Read the following passage and answer questions given at the end of the passage: Although the schooling of fish is a familiar form of animal social behavior, how the school is formed and maintained is only beginning to be understood in detail. It had been thought that each fish maintains its position chiefly by means of vision. Our work has shown that, as each fish maintains its position, the lateral line, an organ sensitive to transitory changes in water displacement, is as important as vision. In each species a fish has a "preferred" distance and angle from its nearest neighbor. The ideal separation and bearing, however, are **NOT** maintained rigidly. The result is a probabilistic arrangement that appears like a random aggregation. The tendency of the fish to remain at the preferred distance and angle, however, serves to maintain the structure. Each fish having established its position uses its eyes and its lateral lines simultaneously to measure the speed of all the other fish in the school. It then adjusts its own speed to match a weighted average that emphasizes the contribution of nearby fish. According to the above passage, the structure of a fish school is dependent on which of the following?
(a) Rigidly formed random aggregations.
(b) Measurements of a weighted average by individual fish.
(c) Instructions from a "leader fish" usually found to be swimming at the head of the school.
(d) The answer is not clear at present.

20. Read the following passage and answer questions given at the end of the passage: Although the schooling of fish is a familiar form of animal social behavior, how the school is formed and maintained is only beginning to be understood in detail. It had been thought that each fish maintains its position chiefly by means of vision. Our work has shown that, as each fish maintains its position, the lateral line, an organ sensitive to transitory changes in water displacement, is as important as vision. In each species a fish has a "preferred" distance and angle from its nearest neighbor. The ideal separation and bearing, however, are not maintained rigidly. The result is a probabilistic arrangement that appears like a random aggregation. The tendency of the fish to remain at the preferred distance and angle, however, serves to maintain the structure. Each fish having established its position uses its eyes and its lateral lines simultaneously to measure the speed of all the other fish in the school. It then adjusts its own speed to match a weighted average that emphasizes the contribution of nearby fish. The passage suggests that, after establishing its position in the school formation, an individual fish will subsequently?
(a) Maintain its preferred position primarily by visual and auditory means.
(b) Rigorously avoid changes that would interfere with the overall structure of the school.
(c) Make continuous sensory readjustments to its position within the school.
(d) Surrender its ability to make quick instinctive judgements

.

21. The Budh International circuit length is 5.1 km. One Formula 1 driver made 61.5 rounds and stopped the race. What is the net displacement from start light?
(a) 313.65
(b) 311.1
(c) 2.55
(d) 0

22. On a bright sunny day, a healthy person (with perfect eyesight) walking on a tar road saw the legs of a deer were "blurred or wavy" on the surface, far ahead of him. This unusual image formation is because of:
(a) Total internal reflection of the light.
(b) Total external reflection of the light into the medium.
(c) Total absorption of the light into the surface because of black surface.
(d) Total emission of light from the surface.

23. In which one of the following situations, the entropy may be maximum?
(a) A class full of students without the teacher being present.
(b) A class full of students with teacher being present.
(c) A class full of students answering an annual examination monitored by video camera.
(d) An empty class room.

24. What is the pH of 10^{-8} M solution of HCl?
(a) 6.959
(b) 8.121
(c) 5.876
(d) 6.367

25. You have induced a rare mutation in a microbe which in special media has 50% higher specific growth rate (2/3rd the doubling time) of the normal cells. If the mutation frequency is $1X10^{-6}$, how many generations of the normal culture are needed for the populations of mutant and normal cells to be equal?
1. 20
2. 40
3. 60
4. 80

26. The two most common processes that lead to production of multiple functional proteins from same DNA sequences are:
(a) RNA editing and alternative splicing.
(b) Differential protein folding and protein splicing.
(c) Differential poly adenylation of 3' UTR and capping.
(d) Differential usage of enhancers and suppressors.

27. Which of the following statements is **FALSE**?
(a) The potassium channel allows potassium ions through the plasma membrane.
(b) Porin allows chloride ions to pass through the plasma membrane.
(c) Thermogenin allows H+ to pass from the inner mitochondrial membrane to the matrix.
(d) The gap junction channel allows ions to pass from the cytosol of one cell to that of the other.

28. Which of the following statements about the glycolysis pathway in the cytosol is **INCORRECT**?
(a) It makes ATP.
(b) It makes acetyl-CoA.
(c) It interacts with the pentose phosphate pathway.
(d) It can feed to gluconeogenesis.

29. The trp operon is transcribed when:
(a) Tryptophan concentration in the cell is high.
(b) The trp repressor is bound to tryptophan or a similar shaped molecule.
(c) Tryptophan is bound to its aporepressor.
(d) The appropriate corepressor is absent.

30. Glycosylation of protein occurs in the:
(a) Peroxisome
(b) Mitochondrion.
(c) Lysosome
(d) Endoplasmic reticulum

31. PMSF (a serine protease inhibitor) inhibits which of the following:
(a) Chymotrypsin
(b) Pepsins
(c) Papain
(d) Renins

32. Innate immunity is mediated by:
(a) Toll like receptors
(b) G protein coupled receptors
(c) Integrins
(d) FGF receptor

33. Humans have 23 pairs of chromosomes, while our closest relatives, chimpanzees, have 24. Chromosome

studies indicate that at some point early in human evolution, two chromosomes simultaneously broke into a large portion and a small portion. The large parts combined to form a large chromosome, and the small parts combined to form a much smaller chromosome (which was subsequently lost). This important chromosomal change could best be described as?
(a) Nondisjunction followed by deletion.
(b) Translocation followed by deletion.
(c) Duplication followed by deletion.
(d) Translocation followed by inversion.

34. Transgenic organisms carry the transgene in:
(a) Gametes only
(b) Somatic cells only
(c) Both gametes and somatic cells
(d) The recipient cell only

35. What is a pseudogene?
(a) An unidentified gene located within a gene family.
(b) Mobile genetic elements that act like real genes.
(c) A gene with the same sequence as another gene in the same organism.
(d) A coding region that cannot be translated into a functional protein.

36. An operon is a:
(a) Regulatory molecule that turns genes on and off.
(b) Cluster of regulatory sequences controlling transcription of protein-coding genes.
(c) Cluster of genes that are coordinately regulated.
(d) Promoter, an operator, and a group of linked structural genes.

37. Pyrosequencing uses which of the following?
(a) Emulsion PCR
(b) Ligation based PCR
(c) Nick translation
(d) Inverse PCR

38. Necrotrophic plant pathogens:
(a) Are Pathogens which kill cells of the host plants
(b) Cause minimum cellular damage
(c) Keep the cells alive
(d) cause mildews and rusts

39. Transgenic crops occupying the largest cultivated area in the world are tolerant to:
(a) Herbicide
(b) Insect
(c) Viral disease
(d) Drought

40. Which one of the following techniques is used to detect SNPs?
(a) SSCP
(b) SSR
(c) RT-PCR
(d) DAF

41. Which one of the following phytochrome genes in Arabidopsis thaliana is responsible for hypocotyl elongation, flowering and seed germination?
(a) PHYB
(b) PHYC
(c) PHYD
(d) PHYE

42. Bread wheat Triticum aestivium is:
(a) An Autohexaploid
(b) An Allohexaploid
(c) An Allotetetraploid
(d) A Diploid

43. The Cytokinin receptor is:
(a) A G-protein coupled receptor.
(b) A tyrosine kinase.
(c) An acidic cytosolic protein.
(d) A two component histidine kinase.

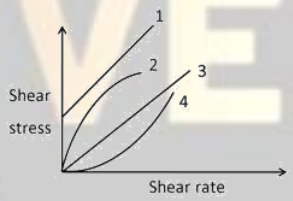
44. The br2 (Brachytic 2) gene encodes a P-glycoprotein required for normal auxin transport in corn. Which one of the following describes the phenotype of br2 mutants?
(a) Long internodes
(b) Short internodes
(c) Broad leaves
(d) Tapering leaves

45. A pipe having an outside diameter do and an inside diameter dI is used to transport a hot fluid. Heat transfer occurs radially outwards. The area for heat transfer per unit length of the pipe in given by:
(a) π (dI + do)/2
(b) $2\pi\sqrt{(do\ dI)}$
(c) π (do − dI) / ln(do/ dI)
(d) do/Di

46. What is the generation time of a bacterial population that increases from 100 cells to 100,000 cells in 3 hours of growth?
(a) 22 min
(b) 18 min
(c) 60 min
(d) 40 min

47.

Based on the flow behavior of fluids depicted in the following figure, choose the correct option.



(a) Bingham , 2- Newtonian , 4- Dilatant
(b) Bingham, 2- Pseudoplastic, 4- Dilatant
(c) Newtonian , 2- Pseudoplastic, 4- Newtonian
(d) Newtonian, 2- Bingham, 4- Pseudoplastic

48. Cells are grown in a CSTR at Steady state at two dilution rates $0.1h^{-1}$ and $0.5h^{-1}$ and the steady state concentration are as follows:

Dilution rate (h^{-1})	Cell mass conc. X (g/l)	Substrate conc. S (g/l)	Product conc. P (g/l)
0.1	5	0.22	1
0.5	5	2.0	0.2

If the in let substrate concentration is 20g/I, the cells follow Monod growth kinetics and product formation kinetics is modelled as both growth associated and non-growth associated kinetics given by the equation: $q_P = \alpha\mu + \beta$ then answer the following questions:
(a) 0.6
(b) 1
(c) 1.4
(d) 2

49. Which transparent bioplastic is produced by fermentation?

(a) Polyhydroxybutyrate
(b) Starch
(c) Polylactate
(d) Polyvinyl chloride

50. In any centrifugal separator, the separation efficiency is a function of:
(a) Radius of the rotor.
(b) Rotational speed of rotor.
(c) Both the radius and speed of the rotor.
(d) Both the load and radius of the rotor.

51. A green process of solvent extraction of biomolecules is:
(a) Solvent–solvent extraction
(b) Reactive extraction
(c) Supercritical fluid extraction
(d) Solid-liquid extraction

52. For a given fluid, as the pipe diameter increases, the pumping cost:
(a) Decreases.
(b) Increases.
(c) Remains the same.
(d) May increase or decrease, depending upon whether the fluid is Newtonian or non-Newtonian.

53. The critical regulatory site in the circuit of emotions is:
(a) Hippocampus
(b) Cingulate gyrus
(c) Amygdala
(d) Fornix

54. Which one of the following is the most populous in the CNS?
(a) Pyramidal neurons
(b) Motor neurons
(c) Granule cells
(d) Purkinje neurons

55. Huntington's disease (HD) is caused by degeneration of neurons in the, leading clinically to involuntary movements (chorea), psychiatric symptoms and dementia:
(a) Basal ganglia followed by cortical regions.
(b) Cortical regions followed by basal ganglia.
(c) Cortical regions alone.
(d) Basal ganglia alone.

56. The function of the pyloric sphincter is to prevent the backflow of material from the:
(a) Esophagus to the mouth.
(b) Duodenum to the stomach.
(c) Stomach to the esophagus.
(d) Colon to the small intestine.

57. Which of the following types of stem cells have a highest risk of teratoma formation?
(a) Hematopoietic stem cells
(b) Embryonic stem cells
(c) Spermatogonial stem cells
(d) Mesenchymal stem cells

58. Which one of the following cell types is the most characteristic component of the early stages of acute inflammatory reaction?
(a) Eosinophils
(b) Neutrophils
(c) Basophils
(d) Monocytes

59. Severe combined immunodeficiency mice and nude mice differ in which of the following cellular components?
(a) B lymphocytes
(b) T lymphocytes
(c) Macrophages
(d) Natural killer cells

60. Smallest lipid containing enveloped animal virus belongs to:
(a) Coronaviridae
(b) Togaviridae
(c) Flaviviridae
(d) Bunyaviridae

61. Which one of the following characteristic cells is found in granulomatous inflammation?
(a) Myofibroblast
(b) Plasma cell
(c) Histocyte
(d) Epithelioid cell

62. Role of diatoms in the oceans is:
(a) Primary production
(b) Secondary production
(c) Tertiary production
(d) Nitrification

63. One of the free living aerobic nitrogen fixing bacterium in the Oceans is:
(a) Rhizobium
(b) Azotobacter
(c) Clostridium
(d) Bacillus

64. The prominent group of microorganism involved in marine bio-corrosion is:
(a) Sulphate reducing bacteria
(b) Sulphur oxidizing bacteria
(c) Iron oxidizing bacteria
(d) Sulphide oxidizing bacteria

65. "Green house effect" with respect to global warming refers to:
(a) Cooling and moist condition
(b) Warming effect
(c) Increased rainfall and greenery
(d) Desertification

66. A high BOD value in aquatic environment is indicative of:
(a) A pollution free system.
(b) A highly polluted system due to excess of nutrients.
(c) A highly polluted system due to abundant heterotrophs.
(d) A highly pure water with abundance of autotrophs.

67. Primary productivity at the climax stage of a succession is:
(a) Higher than consumption
(b) Lower than the consumption
(c) Equal to consumption
(d) Not related to consumption

68. You have isolated an Indian strain of a phage Φx174. You measure the nucleotide base content of the phage and find the following result: A- 40%, G- 10%. What are the likely percentage contents of T and C?
(a) It cannot be predicted from the given data.
(b) T-40% and C-10%.
(c) C-40% and T-10%.
(d) Both 25% each

69. Cluster analysis in DNA microarray experiments refers to:
(a) Genes that are clustered together in the genome.
(b) Cluster of probes that are used to monitor gene expression.
(c) Genes that are likely to work in concert in the cell.
(d) Clusters of cDNAs printed on microarray chip.

70. A sample of a homo-multimeric protein containing one atom of iron per polypeptide which amounts to 0.56% by weight. Gel filtration indicates that the molecular weight of the multimer is 20 kDa. The maximum number of subunits that the protein may have is (Assume that the atomic weight of Fe is 56):
(a) 2
(b) 3
(c) 4
(d) 5

71. A tri-peptide has an amino acid composition (Lys, Phe, Pro). Dansyl chloride treatment produces Dns-Phe. The peptide is not cleaved by trypsin. The primary structure of the peptide is:
(a) Phe-Pro-Lys
(b) Lys-Pro-Phe
(c) Pro-Lys-Phe
(d) Pro-Phe-Lys

72. You have been given two unlabelled samples of PTH-Lysine which has been derivatized either in the α-NH2 or in the ε-NH2 group. Which one of the following techniques may be used to distinguish between these two?
(a) pH titrations
(b) UV absorption spectroscopy
(c) Fluorescence spectroscopy
(d) Osmotic pressure measurements

73. Polytene chromosome is generated due to:
(a) Extensive transcription.
(b) Pairing of homologous chromosome.
(c) Repeated DNA replication in DNA without segregation.
(d) Failure of DNA replication.

74. If a man of blood group AB marries a woman of blood group A whose father was of blood group O, to what different blood groups can this man and woman expect their children to belong?
(a) A, AB, B
(b) A, AB
(c) AB, O
(d) A, O, B

75. A human male (XY) carrying an allele for a trait on the X chromosome is:
(a) Hemizygous
(b) Homozygous
(c) Heterozygous
(d) Monozygous

SECTION – B

76. Positive feedback is operating:
(a) When adenosine monophosphate activates phosphofructokinase.
(b) When cAMP activates transcription of the lac operon.
(c) When tryptophan inhibits transcription of the trp operon.
(d) When N-acyl-HSL promotes transcription of the lux operon.

77. Consider a typical hepatocyte, the major cell type in the liver. It is roughly a cube of 15 μm on a side. Assume the density of cell is 1.03gm/ml and 20% of total weight of which is occupied by protein which is having 400 amino acids (mol wt=50,000g/mol). The total no. of molecules of that protein present in the hepatocyte will be:
(a) 8.3x109
(b) 7.3 x109

(c) $6.3x10^9$
(d) $5.3x10^9$

78. Process of formation of ATP from ADP while harvesting the photon is referred as:
(a) Photophosphorylation
(b) Photorespiration
(c) Phosphorylation
(d) Respiration

79. Match the Enzyme from group A with the respective Class in group B

	Group A		Group B
A	Cytochrome P-450	i	Hydrolase
B	Alkaline phosphatise	ii	Oxido-reductase
C	Phosphglicomutase	iii	Tranferase
D	hexokinase	iv	Isomerses

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

80. Match the Cofactor in group A with appropriate' group carried in activated from' in Group B:

	Group A		Group B
A	FMNH2	i	Acyl
B	Lipoamide	ii	Methyl
C	Thiamine pyrophosphate	iii	Aldehyde
D	S- Adenosylmethionine	iv	Electron

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

81. There are four conserved homologous motifs within the Bcl-2 family: BH1, BH2, BH3, and BH4; which among these is critical for Bcl-2 family heterodimerization?
(a) BH-1
(b) BH-2
(c) BH-3
(d) BH-4

82. What will be the charge of the protein having pH less than its pI value,?
(a) Positive
(b) Negative
(c) One
(d) Zero

83. Ammonium sulfate is the most suitable salt for protein precipitation, because:
(a) It is kosmotropic and falls on the left side of Hofmeister series.
(b) It is chaotropic and falls on the right side of Hofmeister series.
(c) 0It is kosmotropic and falls on right side of Hofmeister series.
(d) It is chaotropic and falls on left side of Hofmeister series.

84. There are two protein molecules S and M. They have the same molecular weight, same charge and are structurally very similar but vary in certain domains. How will you separate S and M?
(a) Affinity Chromatography.
(b) Ion-exchange Chromatography.
(c) Thin Layer Chromatography.
(d) Poly-acrylamide Gel Electrophoresis.

85. What provides the information necessary to specify the three-dimensional shape of a protein?
(a) The protein's peptide bonds.
(b) The protein's interactions with other polypeptides.
(c) The protein's amino acid sequence.

(d) The protein's interaction with molecular chaperones.

86. Those portions of a transmembrane protein that cross the lipid bilayer usually consist of which secondary structures?
(a) A beta sheet with mostly polar side chains.
(b) A beta sheet with mostly nonpolar side chains.
(c) A helix with mostly polar side chains.
(d) A helix with mostly nonpolar side chains.

87. Which one among the following suits to protein families?
(a) Proteins found in organisms of the same taxonomic family.
(b) Groups of proteins with the same functions.
(c) Evolutionarily related proteins that are similar in amino acid sequence and three-dimensional conformation.
(d) The amino acid sequence is highly homologous but must perform different functions.

88. Which of the following determines the specificity of an antibody towards an antigen?
(a) The amino acid loops in its variable domain.
(b) The amino acid loops in its constant domain.
(c) Its Y-shaped structure.
(d) The concentration of antibodies and antigens.

89. An allosteric inhibitor affects the active site of an enzyme by which of the following?
(a) It binds to the active site, preventing substrate molecules from binding there.
(b) It binds to a second site, resulting in a conformational change which makes the active site of the enzyme less accommodating to the substrate.
(c) It modifies the substrate in such a way that it cannot bind to the enzyme.
(d) It carries a chemical modification to the enzyme, which prevents the progress of further reaction.

90. Phosphorylation controls the protein activity by which one of the following reasons?
(a) It adds energy to a protein.
(b) It can induce conformational changes in target protein.
(c) Two negative charges of phosphate group prevents other negatively charged molecules from interacting with the protein.
(d) Phosphate group degrades the target proteins.

91. Which of the following classes of enzymes add a phosphate group to another protein?
(a) Oxido-reductase
(b) Isomerase
(c) Transferase
(d) Ligase

92. The reaction between dihydroxyacetone phosphate and glyceraldehyde 3-phosphate to form fructose 1,6-bisphosphate is best described as:
(a) An aldol condensation reaction
(b) Grignard reaction
(c) Free radical reaction
(d) Hydrolytic reaction

93. In the following options which has the most reduced form of carbon atom:
(a) R-CH3
(b) R-COOH
(c) R-CHO
(d) R-CH2OH

94. The similarities between mitogenic stimulation by EGF and depolarization of the membrane of skeletal muscle cell by acetylcholine are:
(a) Essential early step, an ion flux across the plasma membrane receptor
(b) Ligand mediated coformational change in the receptor of responding cell
(c) Occurs independently without ligand or simulation.
(d) Mainly dependent on regulatory RNA binding sequences.

95. The KDEL sequence of the ER luminal proteins is responsible for:

(a) Translocation of the proteins into the ER lumen.
(b) Insertion of proteins into the membrane of the ER.
(c) Quality control in the ER.
(d) Retrieval of ER luminal proteins from the golgi.

96. The direction of a chemical reaction is best predicted by:
(a) Entrophy change
(b) Enthalphy Change
(c) Energy of activation change
(d) Free energy change

97. 1g of rice flour from 1kg pack is mixed in 100 ml of sterile water. Aliquot from this solution was dispensed in test tube in order to make dilution of 5X to make final volume of 10 ml.1 ml of this solution was then poured on sterile nutrient agar plate. 5 colonies were observed after 24 hours of incubation. What is the viable count of bacterial cell in the rice flour sample?
(a) 2,500 cells per kg
(b) 25, 00, 000 cells per kg
(c) 250 cells per kg
(d) 25,000 cells per kg

98. Which of the following is **FALSE** about the E. Coli Lac operon?
(a) It is polycistronic.
(b) It is an example of negative control.
(c) The presence of lactose acts as an inducer.
(d) The repressor binds to the promoter.

99. A substance exists in protonated form with a pKa 4.7. The percentage of the protonated form at pH 5.7 will be close to:
(a) 10
(b) 9
(c) 99
(d) 50

100. Most of the dry mass in a tree trunk is originally derived from:
(a) The soil
(b) CO_2
(c) Light energy
(d) Glucose

101. You have examined 10000 cells in a culture and found that only 2 cells were in mitosis. Therefore, the mitotic index is:
(a) 20000
(b) 0.0002
(c) 0.0001
(d) 10000

102. In vitro coupled transcription and translation systems have been developed that use reticulocyte or wheat germ lysates to specifically translate a defined cDNA. Using this technique, you have translated a gene of your interest. However, when you run SDS-PAGE to check for the translated product, you see many bands from the top to the bottom of the gel. This could be due to the following reasons?
(a) The translated protein got degraded.
(b) Since it is an in vitro system, it could read the cDNA in all the frames.
(c) There are a number of endogenous proteins present in the wheat germ and reticulocyte lysates.
(d) Reticulocyte lysates and wheat germ lysates have lysosomes that have taken up many proteins by endocytosis that show up on the gel.

103. Cell cycle controller is robust and adaptable. Additionally, it functions like a switch to ensure unidirectional cell cycle. This switch like behavior can be achieved by which one of the following mechanisms
(a) Gradual increase in cyclin-dependent kinase activities in different phases of the cell cycle.
(b) Gradual increase in cyclin-dependent kinase synthesis in different phases of the cell cycle.
(c) Negative feedback loops to regulate the activity of cyclin-dependent kinases.
(d) Positive feedback loops to regulate the activity of cyclin-dependent kinases.

104. Colchicine treatment blocks the polymerization of microtubules whereas Taxol blocks the depolymerization of microtubules. Treatment with either colchicine or taxol ultimately results in cell death. It is possible to achieve the same result even though the actions of both agents are opposite because they?
(a) Block signaling from microtubules.
(b) Block transcription of microtubules.
(c) Block translation of microtubules.
(d) Block mitosis.

105. In mammals, average lengths of transcription factor binding sequences are quite short i.e., ~7 base pairs. Hence, the frequency of occurrence of such sites in the entire genome is very high vis-a-vis the total number of genes present therein. However, the specificity of transcription is still achieved?
(a) As specificity of those target sequences are further defined by their adjoining sequences.
(b) Because of pair wise occurrence of those target sites in the promoters.
(c)As mammalian transcription factors are highly evolved with built in capability of recognizing only the promoter associated target sites.
(d) As the recognition of target sequences in mammals is guided by auxiliary factors that ensures their target specificity.

106. Cell division cycle is divided into 4 phases G1, S, G2 and M. Standard eukaryotic cell cycles are of 12 hr or longer duration. Early embryonic cell cycles are extremely rapid having time duration of less than an hour. Which of the following phases are drastically reduced in embryonic cell cycles?
(a) G1 & G2
(b) G1 & S
(c) M & S
(d) 2 & M

107. Recognition of intracellular pathogens in innate immune cells involves:
(a) Toll-like receptors
(b) Antibody
(c) NOD-like receptors (NLRs)
(d) Natural killer T cells

108. In complementation tests, Benzer simultaneously infected E.coli cells with two phages, each of which carried a different mutation. What conclusion did he make when the progeny phage produced normal plaques?
(a) The mutations occurred at the same locus.
(b) The mutations occurred at different loci.
(c) The mutations occurred close together on the chromosome.
(d) The genes were in the cis configuration.

109. Discontinuous replication is a result of which property of DNA?
(a) Complementary bases
(b) Charged phosphate group
(c) Antiparallel nucleotide strands
(d) Five- carbon sugar

110. Primers are synthesized where on the lagging strand?
(a) At the 5' end of the newly synthesized strand.
(b) At the 3' end of the newly synthesized strand.
(c) At the beginning of every Okazaki fragment.
(d) At multiple places within an Okazaki fragment.

111. Which one of the following is the difference between the core promoter and the regulatory promoter?
(a) Only the core promoter has consensus sequences.
(b) The regulatory promoter is farther upstream of the gene.
(c) Transcription factors bind to the core promoter; transcriptional activator proteins bind to the regulatory promoter.
(d) Both 2 and 3.

112. In the trp operon, what happens to the trp repressor in the absence of tryptophan?
(a) It binds to the operator and represses transcription.
(b) It cannot bind to the operator and transcription takes place.
(c) It binds to the regulator gene and represses transcription.

(d) It cannot bind to the regulator gene and transcription takes place.

113. Which one of the following is the CORRECT order of mutagenesis screen?
(a) Positional cloning, mutagenesis, identify mutants, verify genetic basis.
(b) Mutagenesis, positional cloning, identify mutants, verify genetic basis.
(c) Mutagenesis, identify mutants, verify genetic basis, positional cloning.
(d) Identify mutants, positional cloning, mutagenesis, verify genetic basis.

114. In area of high GC content of the human genome:
(a) Gene density tends to be low.
(b) Gene density tends to be high.
(c) Gene density is variable.
(d) Genes tends to have fewer introns.

115. The bases A,G,U,C,I (inosine) all occur at 5' position of anticodons in tRNAs. What is the minimum number of tRNAs required to recognize all codons of amino acids specified by codons with complete degeneracy?
(a) One
(b) Two
(c) Three
(d) Four

116. Which of the following cell surface markers is used to identify the B cells from blood samples?
(a) CD3
(b) CD4
(c) CD25
(d) CD19

117. Administration of the DPT vaccine (diphtheria toxoid, pertussis products, and tetanus toxoid) would stimulate which of the following types of immunity?
(a) Artificial active
(b) Artificial passive
(c) Natural active
(d) Natural passive

118. Loss of which of the following classes of molecules on the surface of a tumor cell target would result in reduced susceptibility to killing by host immune cells?
(a) CD3
(b) CD4
(c) MHC class I
(d) MHC class II

119. Genes for 16S and 28S rRNA are transcribed by:
(a) DNA polymerase
(b) RNA polymerase II
(c) RNA polymerase I
(d) RNA polymerase III

120. In cancer condition, genes can be either repressed or over-expressed. Repression of genes by DNA methylation depends on:
(a) High CpG density
(b) Promoter strength
(c) High CpG density and Promoter strength
(d) Low CpG density

121. Which type of inhibition requires binding of one or more substrates to enzyme before the inhibitor can bind?
(a) Uncompetitive inhibition
(b) Noncompetitive inhibition
(c) Mixed inhibition
(d) competitive inhibition

122. The genes, which remain confined to differential region of Y-chromosome, are:

(a) Autosomal genes
(b) Holandric genes
(c) Completely sex-linked genes
(d) Mutant genes.

123. Blastopore is:
(a) Opening of neural tube
(b) Opening of gastrocoel
(c) Future anterior end of embryo
(d) Found in blastula

124. Arp, profilin, and villin are all:
(a) Cell adhesion molecules.
(b) Molecular motors.
(c) Actin-binding proteins.
(d) Intermediate filament proteins.

125. Cdk1 can only be fully active when
(a) It is phosphorylated on threonine 14.
(b) It is phosphorylated on tyrosine 15.
(c) It is bound to cyclin A.
(d) It is dephosphorylated by Cdc25.

126. Which one of following statements about Bt cotton cultivation in India is **NOT** TRUE?
(a) Farmers cultivating Bt cotton are benefitted from higher return.
(b) Pesticide consumption on cotton is significantly reduced.
(c) India became an exporter of cotton.
(d) The cotton cultivation in India is free from bollworm menace.

127. Which one of following statements about Bt cotton cultivation in India is **NOT** TRUE?
(a) Farmers cultivating Bt cotton are benefitted from higher return.
(b) Pesticide consumption on cotton is significantly reduced.
(c) India became an exporter of cotton.
(d) The cotton cultivation in India is free from bollworm menace.

128. Which one of the following studies is **NOT** needed for the biosafety assessment of GM crops?
(a) Human and animal safety studies.
(b) Gene flow analysis.
(c) Soil microflora, natural enemies of the pest.
(d) Micronutrient uptake by plants.

129. Which one of the following steps is **NOT** TRUE for production of artificial seeds by desiccated system?
(a) Somatic embryos are first hardened to withstand desiccation.
(b) Hardened somatic embryos are encapsulated in a suitable coating material.
(c) Somatic embryos may be hardened by either coating/treating mature somatic embryos with a suitable polymer, followed by drying during their maturation phase.
(d) 4. Somatic embryos can be planted directly in the field.

130. Absorption of which one of the following nutrients in human intestine is interfered by phytate present in seeds?
(a) Nitrate
(b) Sulphur
(c) Iron
(d) Phosphate

131. The following are the key resources needed for efficient marker-assisted germplasm enhancement:
(i) Suitable characterised genetic markers and the necessary information for multiplexing.
(ii) High-density molecular maps and densely spread markers.
(iii) Established marker–trait associations for traits of agronomic importance.
(iv) High-throughput genotyping systems.
Now rank the key resources in the right order of requirement.
(a) iii, i, ii, iv
(b) i, ii, iii, iv

(c) iv, iii, ii, i
(d) iv, i, ii, iii

132. Which one of the following methods is highly amenable for automation in most of the genotyping studies?
(a) RFLP
(b) AFLP
(c) ISSR
(d) SNPs

133. A patch clamp device is used to:
(a) Measure the strength of an electrochemical gradient.
(b) Study the properties of individual neurotransmitters.
(c) Infuse different kinds of ions into exons.
(d) Study the properties of individual membrane channels.

134. Which one of the following is a component in the signaling pathway stimulated by receptor tyrosine kinases?
(a) Adenylate cyclase
(b) Janus kinase
(c) Autophosphorylating receptor
(d) Ras activating protein

135. A mutation that inactivates the cytochrome b/f complex would:
(a) Inhibit movement of electrons from PSII to PSI
(b) Inhibit movement of electrons from PSI to PSII
(c) Inhibit reduction of quinone
(d) Promote formation of NADPH

136. How many ATP molecules are required for the conversion of one N_2 to $2NH_4^+$ during biological nitrogen fixation?
(a) 8
(b) 10
(c) 12
(d) 16

137. Which of the following bacterial gene can be used for increasing starch content in potato?
(a) Sucrose phosphate synthase
(b) ADP Glucose pyrophosphorylase
(c) Polygalactouranase
(d) Aspartate kinase

138. Which one of the following options describe the term "Transplastomics" CORRECTLY?
(a) Targeting genes into the chloroplast.
(b) Providing exceptionally low yield of protein products.
(c) Targeting genes expressed in pollens.
(d) Generating transgenic plants resistant to viral infections.

139. The electrons from excited chlorophyll molecule of photosystem II are accepted first by:
(a) Ferredoxin
(b) Cytochrome-b
(c) Cytochrome- f
(d) Quinone

140. Which one of the following agents stimulates direct DNA uptake by protoplasts?
(a) Polyethylene glycol
(b) Lipofectamine
(c) Calcium chloride
(d) Mannitol

141. Transgenic plants expressing barnase or barstar genes are used for:
(a) Insect resistance
(b) Hybrid seed production
(c) Stress tolerance
(d) Inhibit pollen flow

142. The presence of polyadenylation signals in the wild type CRY1Ac gene from Bacillus thuringiensis prevented expression of appropriate amount of CRY1Ac protein in transgenic plants. What was done to overcome this problem?
(a) The CRY1Ac gene was expressed under a strong promoter like CaMV 35S.
(b) The CRY1Ac protein was targeted to the chloroplast.
(c) The CRY1Ac gene sequence was modified taking help of codon degeneracy.
(d) The CRY1Ac gene was fused to CRY1Ac gene.

143. The following are some of the genes and DNA sequences important for Agrobacterium-mediated transformation of plants:
i. Qene conferring resistance to an antibiotic under a promoter expressed in plants.
ii. T-DNA border sequences.
iii. vir genes.
iv. a reporter gene like β-glucuronidase under CaMV 35S promoter.
Which of the above features in combination given below are present on a binary vector and minimally required for transfer of T-DNA from Agrobacterium to plant cell and positive selection of the transformants?
(a) (i) and (ii)
(b) (i), (ii) and (iii)
(c)(iii) and (iv)
(d) (ii), (iii) and (iv)

144. Which one of the following hormone ratios usually promote shoot formation from callus?
(a) High abscisic acid to auxin.
(b) Low auxin to cytokinin.
(c) High auxin to cytokinin.
(d) Low abscisic acid to auxin.

145. Which one of the following dyes can be used to test the viability of cultured plant cells?
(a) Fluorescein diacetate
(b) Acetocarmine
(c) Aceto-orcein
(d) Giemsa stain

146. The two Vir proteins with nuclear localization signals which help in movement of T-DNA to plant nucleus are:
1. VirA and VirG
2. VirD1 and VirE1
3. VirD2 and VirE2
4. VirD1 and VirD2

147. Which one of the following statements is **NOT** TRUE for Agrobacterium mediated plant transformation?
(a) Vir genes are essential for gene transfer.
(b) T-DNA border are essential for gene transfer.
(c) Genes for hormone and opine synthesis are essential for gene transfer.
(d) Plant exudates from wounded region acts as positive chemotaxis during gene transfer.

148. The breeding method for conventionally transferring cytoplasm from one genotype to the other is:
(a) Pedigree
(b) Recurrent selection
(c) Back cross
(d) Bulk selection

149. Detaselling is a method of emasculation followed in _____
(a) Cotton
(b) Sorghum
(c) Bajra
(d) Maize

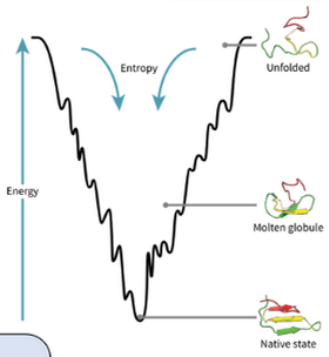
150. A mechanism where stamens and pistils of hermaphrodite flowers may mature at different times leading to cross pollination is _____
(a) Dicliny
(b) Dichogamy

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	**RaHuL** 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

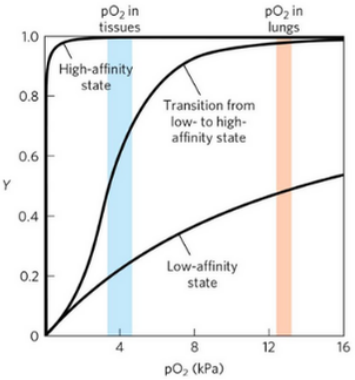
State of Hb – MOLD

- **O**xy Hb — Less acidic (Tensed state)
- **L**ess acidic (Tensed state) — More acidic (Relaxed state)
- **M**ore acidic (Relaxed state) — Deoxy Hb
- **D**eoxy Hb — Oxy Hb

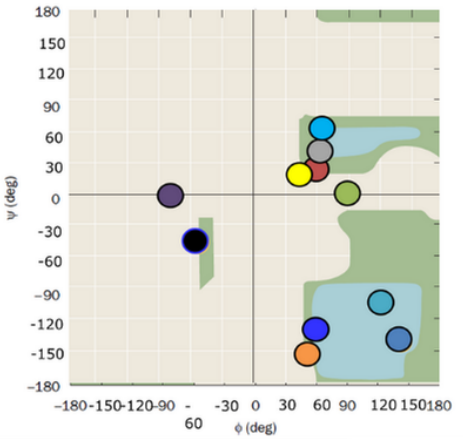
Affinity of Curve – DRIL

H^+, Temp. BPG, CO_2

- **D**ecrease — Right shift
- **R**ight shift — Left shift
- **I**ncrease — Left shift
- **L**eft shift — Increase

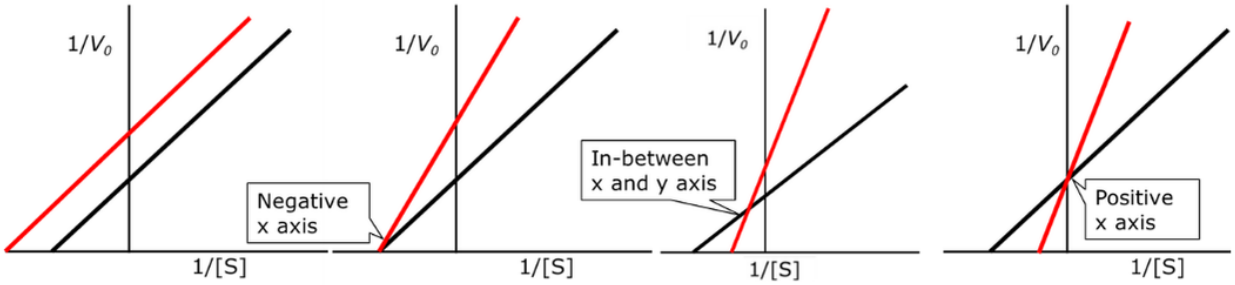


Ramachandran plot



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

JOIN US FOR MORE AMAZING VEDEMY'S CAPSULE

info@vedemy.com 75 18 35 43 95 www.vedemy.com
पता: 2nd फ्लोर , SBI बिल्डिंग, क्राइस्ट नगर, बड़ालालपुर , चांदमारी, सिंधोरा रोड, वाराणसी, 221003

(c) Protogamy
(d) Heterogamy

151. Which one of the following amino acids is an example of a compatible osmolyte in response to a range of environmental stresses?
(a) Lysine
(b) Glycine
(c) Proline
(d) Leucine

152. The principal signal molecule involved in induced systemic resistance in plants is:
(a) Malic acid
(b) Salicylic acid
(c) Jasmonic acid
(d) Benzoic acid

153. International treaty in the field of the protection of the new variety of plants and rights of the breeders is:
(a) PPV & FR act
(b) UPOV
(c) Cartagena protocol
(d) Suigeneris system

154. The revised Genebank Standards for Plant Genetic Resources for Food and Agriculture were endorsed at the 14th Regular Session of the CGRFA, at:
(a) Rome, in 2013
(b) Geneva , in 2010
(c) Indonesia, 2004
(d) Brazil, 2002

155. Gluconoacetobacter diazotrophicus is predominantly found in:
(a) Rhizosphere
(b) Phyllosphere
(c) Endorhizosphere
(d) Spermosphere

156. A system in which there is exchange of energy but **NOT** of mass, is called a/an _____system.
(a) Open
(b) Isolated
(c) Insulated
(d) Closed

157. The second law of thermodynamics is concerned with:
(a) Non-cyclic processes only.
(b) Amount of energy transferred.
(c) Irreversible processes only.
(d) Direction of energy transfer.

158. The oxygen transfer rate in an aerobic fermentation process does not depend on the:
(a) Driving force [difference of DO concentration (C* - CL)] in the system.
(b) Interfacial transfer area of bubbles.
(c) Temperature of the fermentation broth.
(d) Volume of the fermentation broth.

159. A culture is grown in a flask and after 120 h there were 1.0 $x10^6$cells/ml. After 270 h there were 1.0 $x10^9$ cells/ml, the specific growth rate of the organisms is:
(a) 2.0 h^{-1}
(b) 0.69 h^{-1}
(c) 0.14 h^{-1}
(d) 3.0 h^{-1}

160. In a CSTR at steady state of volume 1L, the feed rate of a compound A is 1L/h. The exit concentration of A is

50% of the inlet concentration and the rate of conversion of A to products is a first order reaction given by dCA/dt= k CA . The value of k is
(a) 0.5 h^{-1}
(b) 1.0 h-1
(c) 1.5 h^{-1}
(d) 2.0 h^{-1}

161. Which of the following processes provides the best effluent quality for water reuse?
(a) Conventional activated sludge process with media filters.
(b) Trickling filters.
(c) Membrane bioreactor.
(d) Aerated lagoons.

162. In any centrifugal separator the separation efficiency is a……..
(a) Linear function of agitation.
(b) Square function of radius.
(c) Linear function of radius and square function of the rotor speed.
(d) Square function of radius and linear function of the rotor speed.

163. In aqueous two phase separation systems, a phase diagram is prepared at constant:
(a) Pressure and volumes
(b) pH and temperature
(c) Viscosity and mass
(d) Volumes and density

164. For preparative chromatography, a simple scale up principle which can be used without significantly affecting resolution by?
(a) Increasing length of the column.
(b) Decreasing length of the column.
(c) Increasing diameter of the column.
(d) Decreasing diameter of the column.

165. Penicillin is extracted using isoamylacetate in a counter current extractor. Before the extraction, pH of the aqueous solution is adjusted to pH 2.5. This is done as penicillin:
(a) Is more soluble at pH 2.5 in its ionic from.
(b) Is more soluble at pH 2.5 in its non-ionic form.
(c) Is more stable at pH 2.5.
(d) Isoamylacetate is stable at pH 2.5.

166. In an adsorption column for the separation of antibiotics, a sharp break through curve indicates:
(a) More unused bed capacity.
(b) Less unused bed capacity.
(c) Unused bed capacity does not change at all with sharpness of the peak.
(d) A high affinity of the antibiotic to the column matrix.

167. Which of the following is **NOT** a desired property of the membranes used for separation?
(a) Selectivity
(b) Mechanical Strength
(c) High porosity
(d) Resistance to fouling

168. Identify which of the following is **NOT** considered as a criterion for scale up of fermentation processes:
(a) Power input/unit volume
(b) KLa
(c) Impeller tip velocity
(d) Aeration rate

169. If agitator energy input per unit volume of the fermentor is kept constant during scale up, the factor that would always decrease upon increasing size of the fermenter is:
(a) rpm
(b) aeration rate
(c) tip velocity

(d) KLa

170. For a given thickness of the head closing the end of cylindrical vessel, which of the following can withstand the highest pressure?
(a) Hemispherical
(b) Torispherical
(c) Ellipsoidal
(d) Flat plate

171. A mechanical seal is used for:
(a) Pipelines handling large pressure drops.
(b) Prevention of fluid leakage around moving parts.
(c) Used in machinery to prevent leakage of current.
(d) Used in joints of pipe lines to prevent leakage of fluids.

172. Which of the following elements is **NOT** included in the scope of market analysis?
(a) Competition from other manufactures.
(b) Product distribution.
(c) Opportunities.
(d) Economics.

173. "Break-even point" is the point of intersection of:
(a) Fixed cost and total cost.
(b) Total cost and sales revenue.
(c) Fixed cost and sales revenue.
(d) Fixed cost and variable cost

174. Fumaric acid is produced from Malic acid using Fumarase. Calculate standard heat of reaction for the following transformation: $C_4H_6O_5 \rightarrow C_4H_4O_4 + H_2O$ Given: $(\Delta hc°)$malic acid= -1328.8 kJ/gmol $(\Delta hc°)$Fumaric acid= -1334.0 kJ/gmol:
(a) -8.2kJ /gmol
(b) 8.2 kJ/gmol
(c) 5.2 kJ /gmol
(d) -5.2 kJ/gmol

175. Air at 104.2 kPa at 37°C with a relative humidity of 60% is cooled at the same pressure to 29°C. The cooled air has a higher_____:
(a) Dew point.
(b) Absolute humidity.
(c) Relative humidity
(d) Wet bulb temperature.

176. An enzyme having Km values of $2.5x10^{-5}$M and $2.5x10^{-7}$M for the substrates S1 and S2, respectively, is added to a solution consisting of 100 nano moles of both S1 and S2. Which of the following statement is CORRECT?
(a) Most of the active sites of the enzyme will be occupied by S1
(b) Most of the active sites of the enzyme will be occupied by S2
(c) The active sites of the enzyme will be occupied equally by S1 & S2
(d) Occupation of active sites has no relation to the value of Km

177. Which of the following only permits uni-directional fluid flow?
(a) Gate valve
(b) Butterfly valve
(c) Globe valve
(d) Ball valve

178. The internal temperature in the refrigerator is 280 K and the external temperature is 300K. The theoretical maximum value of coefficient of performance is:
(a) 0.933
(b) 1.071
(c) 14
(d) 25

179. Concentrated feeding in a Fed batch system is used to get
(a) Higher product concentration in the reactor
(b) Higher product yield/unit substrate
(c) Higher product yield/unit cell mass
(d) Reduced by product formation

180. A digestible linear polysaccharide abundantly found in cereals having α-1,4 linkages in its structure is:
(a) Pectin
(b) Amylopectin
(c) Amylose
(d) Inulin

181. A prominent prebiotic substance is:
(a) Starch
(b) Pectin
(c) Fructo oligosaccharide
(d) Cellulose

182. Considering the importance of moisture content of food in promoting microbial growth, which one of the following statements is TRUE:
(a) Gram negative bacteria are more sensitive to low aw values than Gram positive bacteria.
(b) Gram positive bacteria are more sensitive to low aw values than Gram negative bacteria.
(c) Both are equally sensitive to low aw values.
(d) Both are unaffected by aw values.

183. The rate of cell disintegration in high pressure homogenizer primarily depends on the:
(a) Number of cycles.
(b) Pressure drop across the homogenizer.
(c) Both on the number of cycles and pressure drop.
(d) Temperature.

184. Which one of the following statements is FALSE?
(a) For incompressible cakes, resistance in the cake is assumed to be directly proportional to the amount of cake deposited.
(b) For constant pressure filtration with compressible cake, the specific cake resistance is constant.
(c) Compared to the cake resistance, the filter membrane resistance is usually negligible for broth filtration.
(d) The mass of cake deposited per unit area is a function of time in batch operation and concentration of solids in the broth.

185. In a counter current single pass heat exchanger, cooling water enter at 0°C and leaves at 20°C. Hot water enters from the other side at 60°C at a flow rate which is half of the cooling water flow rate. Assuming there is no heat loss, what is the Log Mean Temperature Difference?
(a) 20.7
(b) 30.2
(c) 34.8
(d) 40.4

186. The Pyramidal neurons in the cerebral cortex are found in:
(a) Layer V & VI
(b) Layer II & IV
(c) Layer III & V
(d) Layer III & VI

187. Which one of the following types of glial cells participate in the re-uptake mechanism of neurotransmitter from the synaptic cleft?
(a) Microglia
(b) Oligodendroglia
(c) Radial Glia
(d) Astroglia

188. Cerebrospinal fluid is produced by:

(a) Astrocytes and ependymal cells.
(b) Chroid plexus and ependymal cells.
(c) Radial glial cells.
(d) Spinal cord.

189. Saccadic eye movement:
(a) Shifts fovea rapidly to a new visual target.
(b) Keeps the image of the moving target on the foves.
(c) Moves the eyes in opposite direction to position the image on both fovea.
(d) Holds image stationary during head rotation or transfer.

190. Which part of the brain integrates autonomic, endocrine and behavioral responses?
(a) Cerebellum
(b) Brain stem
(c) Hypothalamus
(d) Cerebrum

191. The patterning of the nervous system along the anterior-posterior axis in embryo is controlled by:
(a) Pax genes
(b) Hox genes
(c) Segment polarity genes
(d) Pair rule genes

192. All the neurons in the basal ganglionic nuclei are inhibitory except in:
(a) Globus pallidus external segment
(b) Globus pallidus internal segment
(c) Sub-thalamic nucleus
(d) Lentiform nucleus

193. Tay–Sachs disease is due to a defect in the enzyme _____and _____as its substrate:
(a) GM2-ganglioside (and) Hexosaminidase A.
(b) GM2-ganglioside, asialo-GM2-ganglioside, globoside (and) Hexosaminidases A and B.
(c) Glucosylceramidase (and) Glucosylceramide.
(d) GM2-ganglioside (and) Hexosaminidase A and B.

194. Which one of the following causes stunted growth and severe fasting hypoglycemia with ketonuria?
(a) Glycogen synthetase deficiency
(b) Phosphoglycerate kinase deficiency
(c) pyruvate-carboxylase deficiency
(d) protein malnutrition

195. Which one of the following techniques is of highest resolution for detection of chromosomal alterations?
(a) PCR
(b) CGH
(c) G-banding
(d) C-banding

196. E. coli bacteria are beneficial to humans because they:
(a) Convert pepsinogen to pepsin.
(b) Produce vitamins and amino acids.
(c) Absorb water from the large intestine.
(d) Synthesize urea from the breakdown of amino acids.

197. Which of the following reporters can be used for magnetic resonance imaging?
(a) Luciferase.
(b) Herpes Simplex Virus-1 thymidine kinase.
(c) Green fluorescence protein (GFP).
(d) Transferrin receptor.

198. Which one of the following statements forms the basis for the increased circulatory life time for a sialylated recombinant therapeutic protein?

(a) Increased molecular size due to post translational modification reduces the movement of the glycoproteins
(b) Sialic acid terminated glycans are not recognized by asialoglycoprotein receptors of hepatocytes.
(c) Sialylation increases the structural stability of the glycoprotein.
(d) Sialylation blocks the enzyme cleavage sites of the glycoprotein.

199. Which one of the following plays a role in changing the antigen binding site of a B cell after antigenic stimulation?
(a) Junctional diversity
(b) Combinatorial diversity
(c) Germline diversity
(d) Somatic hypermutation

200. Rostral is an anatomical term meaning towards the:
(a) Nose
(b) Forehead
(c) Chest
(d) Foot

201. Phlebitis is the inflammation of:
(a) Lung
(b) Vein
(c) Liver
(d) Lip

202. Mucosal immunity is preferentially stimulated if an immunogen is administered:
(a) Intravenously
(b) Intramuscularly
(c) Intradermally
(d) Orally

203. An example of lysogeny in animals could be:
(a) Slow viral infections
(b) Latent viral infections
(c) T-even bacteriophages
(d) Infections resulting in cell death

204. Which one of the following is the earliest site of hematopoiesis in the embryo?
(a) Bone Marrow
(b) Liver
(c) Yolk Sac
(d) Thymus

205. Which one of the following viruses contains single stranded DNA as the genome?
(a) Parvo virus
(b) Herpes virus
(c) Adeno virus
(d) Pox virus

206. Which of the following is TRUE regarding the drugs that affect the stability of microtubules used in cancer chemotherapy
(a) Immune system is detatched from functioning.
(b) They prevent chromatin condensation.
(c) They interfere with mitosis.
(d) They stop the movement of cancer cells into other tissues.

207. Therapies of lysosomal and peroxisomal disorders that have shown success in clinical trials with enzyme replacement therapy exclude:
(a) Gaucher's disease type I
(b) Fabry's disease
(c) Pompe's disease
(d) Refsum's disease

208. Lysosomes are thought to play an important role in which of the following processes?
(a) Class I MHC-restricted antigen presentation.
(b) Class II MHC-restricted antigen presentation.
(c) T cell receptor alpha chain rearrangement.
(d) T cell receptor beta chain rearrangement.

209. COFAL test is used for the diagnosis of:
(a) Equine infectious anemia
(b) Human immunodeficiency virus
(c) Avian leukosis
(d) Bovine leukosis

210. Which one of the following animals has a cheek pouch in their mouth and used as an animal model for studying oral cancer?
(a) Guinea pig
(b) Hamster
(c) Swiss mice
(d) Wistar rat

211. Which one of the following protozoan is transmitted by ingestion of ticks?
(a) Haemoproteus columbae
(b) Ehrlichia canis
(c) Hepatozoon canis
(d) Histomonas meleagridis

212. The demyelination of the central nervous system white matter produced by the canine distemper virus is an example of:
(a) Fat necrosis
(b) Coagulation necrosis
(c) Zenker's necrosis
(d) Liquefactive necrosis

213. Which one of the following clinical conditions does not have exudates?
(a) Pus
(b) Catarrhal inflammation
(c) Serous inflammation
(d) Granulomatous inflammation

214. Bio Steel is a trademark name for a high-strength based fiber material which was made from the recombinant spider silk-like protein extracted from the milk of transgenic?
(a) Goats
(b) Sheep
(c) Cow
(d) Buffalo

215. Which of the following protozoan parasites replicates inside a non nucleated human cell?
(a) Entamoeba
(b) Leishmania
(c) Trypanosoma
(d) Plasmodium

216. Hypophysation refers to:
(a) Injection of growth hormone
(b) Injection of gonadotropins
(c) Injection of pituitary gland extract
(d) Injection of leutinizing hormone

217. The term "Mitotic gynogen" refers to:
(a) A fish that has only a female parent whose diploidy status is restored by preventing the first mitosis of oocytes.
(b) A fish that has only a male parent whose diploidy status is restored by preventing the first mitosis of oocytes.

(c) A fish that has only a female parent whose diploidy status is restored by preventing the first meiosis of oocytes.
(d) A fish that has only a male parent whose diploidy status is restored by preventing the first meiosis of oocytes.

218. In animal cell culture, CO_2 incubator is used for maintaining open culture system. What is the function of CO_2?
(a) It serves as a Carbon source to the cells.
(b) It maintains the temperature via green house effect.
(c) It dissolves in the medium and generates carbonic acid and regulates the pH to neutrality.
(d) It dissolves in the medium and generates carbonic acid and regulates the pH to alkaline side.

219. Which one of the following is a fish cell line?
(a) VERO
(b) HeLa
(c) RTG -2
(d) HepG2

220. Photosynthetic sulphur bacteria get hydrogen ions for CO_2 reduction from:
(a) Water
(b) Hydrogen sulphide
(c) Molecular hydrogen
(d) Hydrogen peroxide

221. White spot syndrome virus is transmitted:
(a) Vertically
(b) Horizontally
(c) Both vertically and horizontally
(d) Through a vector

222. Ziconotide, a synthetic bioactive peptide originally isolated from the marine snail Conus magus is used as an:
(a) Analgesic agent
(b) Anticancer agent
(c) Antiviral agent
(d) Anti inflammatory agent

223. Which of the following is a bioluminescent bacterium?
(a) Vibrio harveyi
(b) Vibrio parahaemolyticus
(c) Vibrio choleara
(d) Vibrio splendidus

224. The site of production of Gonad Inhibiting Hormone (GIH) in crustaceans is:
(a) Thoracic ganglion
(b) X-organ
(c) Hepatopancreas
(d) Y-organ

225. In bony fishes, Immunoglobulin IgM is secreted as a:
(a) Monomer
(b) Dimer
(c) Tetramer
(d) Pentamer

226. Which one of the following electron acceptors used by the bacteria is mainly responsible for microbial induction of marine corrosion?
(a) O_2
(b) NO_3^-
(c) SO_4^{2-}
(d) CO_2

227. Which one of the following methods is used to identify the sites in a genome that are occupied in vivo by a gene regulatory protein?

(a) Chromatin immunoprecipitation (ChIP).
(b) Gel mobility shift assay.
(c) Methylation interference assay.
(d) Phage display library.

228. The class of immunoglobulin found in fish is:
(a) IgD
(b) IgA
(c) IgM
(d) IgG

229. Besides nitrogen fixation the heterocysts of cyanobacteria also contribute to:
(a) Photosynthesis and ATP production.
(b) The functioning of photosystem II.
(c) ATP production.
(d) Generation of oxygen.

230. The enzyme involved in hydrogen production from biophotolysis in green algae is:
(a) Nitrogenase.
(b) Fe-Fe hydrogenase.
(c) Ni-Fe hydorgenase.
(d) Both Ni-Fe and Fe-Fe hydrogenases.

231. The compound used for the preferential removal of diatoms from microalgal cultures is:
(a) Penicillin
(b) Copper sulfate
(c) Germanium dioxide
(d) Potassium tellurite

232.

The overall reaction for microbial conversion of glucose to L-glutamic acid is:

$C_6H_{12}O_6 + NH_3 + 3/2O_2 \rightarrow C_5H_9NO_4 + CO_2 + 3\,H_2O.$
(glucose) (glutamic acid)

What mass of oxygen is required to produce 49 g glutamic acid?

Molecular weight of glutamic acid=147

(a) 16 g
(b) 8.15 g
(c) 10.45g
(d) 20 g

233. Which one of the following databases allows users to search marine species datasets from all of the world's oceans?
(a) KEGG
(b) OBIS
(c) PDB
(d) Uniprot

234. N2 fixation requires large amounts of energy, since there is high activation energy for breaking the triple bond of the N2. If so, how many molecules of ATP are required for reducing one molecule of nitrogen?
(a) 12
(b) 18
(c) 16
(d) 24

235. Marine environment has abundance of osmotrophs. Osmotrophs are defined as organisms which obtains nutrients and energy via passive or active transport of?

(a) Low molecular weight substrates across cell membrane
(b) High molecular weight substrates across cell membrane
(c) Dissolved organic matter across cell membrane
(d) Particulate organic matter across cell membrane

236. Most endangered species are victims of:
(a) Qreenhouse warming.
(b) Habitat destruction.
(c) Overhunting.
(d) Competition with introduced species.

237. The Ozone layer saves from lethal UV. It mainly absorbs-:
(a) UV-A
(b) UV-B
(c) UV-A & B
(d) UV-A & C

238. Total energy available for work at equilibrium is termed as:
(a) Free energy
(b) Entropy
(c) Activation energy
(d) Enthalpy

239. Global warming is due to:
(a) Absorption of UV by Ozone
(b) Absorption of IR by CO_2
(c) Absorption of IR by ozone
(d) Absorption of UV by CO_2

240. In a pond ecosystem, net productivity by zooplankton is 'p' and biomass consumed by small fishes is 'c', then the ratio of c/p is termed as:
(a) Assimilation efficiency
(b) Net secondary productivity
(c) Consumption efficiency
(d) Conversion efficiency

241. Two species or populations are competing for the exact same resources, and one will eventually exclude the other. What is the technical term for this?
(a) Predation
(b) Competitive exclusion
(c) Coevolution
(d) Mutualism

242. Which of the following processes is most capable of slowing global warming?
(a) Decomposition
(b) Respiration
(c) Photosynthesis
(d) Chemosynthesis

243. Ecosytem is mainly concerned with:
(a) Energy flow and nutrient recycling
(b) Population
(c) Community
(d) Species

244. An organism with the ability to withstand changes to biotic and a biotic environmental factors is said to have _____:
(a) Tolerance
(b) a pioneer community
(c) limiting factors
(d) secondary succession

245. An undersea volcano in the Hawaiian Islands chain erupts, forming a new island in the Pacific Ocean. Over the course of time, which of these would most likely be the first species to survive on the new island?
(a) Lichens
(b) Grasses
(c) Mammals
(d) Birds

246. A certain membrane protein is known to contain a single membrane spanning α-helix of length 72 amino acids. A scientist makes deletion mutants of this protein by reducing the length of this α-helix. What would be the minimum length of the α-helix that will still keep the membrane protein active?
(a) 18
(b) 36
(c) 72
(d) 64

247. A compound X inhibits an enzyme A competitively. A small concentration of X increases the enzyme's activity while higher concentration inhibits the activity significantly. This indicates that the enzyme:
(a) Is allosteric.
(b) Is made up of more than one subunit.
(c) Contains disulfide bonds.
(d) Is a hetero-oligomer.

248. It is observed that in a multiple sequence alignment of homologous proteins, there is an absolutely conserved Glycine residue at a particular position. Crystal structure analysis of a representative protein shows that the **Φ** and **Ψ** angles of this residue occurs in the bottom right quadrant of the Ramachandran map. What is the evolutionary basis of conservation of this Glycine residue?
(a) No other amino acid can occupy this position in the Ramachandran map and hence mutation at this position can be structurally destabilizing.
(b) Change of Gly into any other amino acid, changes the chirality of the enzyme, which can functionally deleterious.
(c) Gly does not prefer any particular secondary structure, and change into any other amino acid will change the overall secondary structure of the enzyme.
(d) Replacement of Gly by any other amino acid changes the overall charge of the protein.

249. Which of the following terms will have to be taken into consideration for developing a potential function for docking simulation?
(a) Hydrogen bonding, van der Waal's and electrostatic interaction terms.
(b) Bond, angle and dihedral terms.
(c) Dihedral and hydrogen bonding terms.
(d) Bond, angle and hydrogen bonding terms.

250. You are interested in a particular enzyme that is expressed in various human tissues. You have isolated the protein from the brain, liver and kidneys. After a lot of experimentation you determine that the liver protein has three domains A, B and C occurring in sequential order. Domain B is the catalytic domain and the other two have regulatory function. The kidney protein has only domains A and B in that order and the brain protein has domains B and C. You then proceed to determine the primary structure of the proteins using chemical methods and find that the amino acid sequence of the three domains are completely identical regardless of the source from which they were isolated. You then ask the question whether the three?
different proteins have all originated from the same gene by means of alternative splicing, or they could be products of different genes. Having the experimentally determined protein sequences and knowing the sequence of the human genome, which one of the following bioinformatic method you will use to answer the question above:
(a) TBLASTN using the protein sequence as query and the human genome sequence as database.
(b) TBLASTX using the protein sequence as query and the human genome sequence as database.
(c) BLASTN using the protein sequence as query and the human genome sequence as reference.
(d) BLASTP using the protein sequence as query and the human genome sequence as reference.

251. When p and q are lengths of sequences, the computational complexity of the Needleman and Wunsch algorithm is?
(a) O(pq)
(b) O(p+q)
(c) O(q log p)

(d) O(pq)

252.

Given the following Table of joint and marginal probabilities:

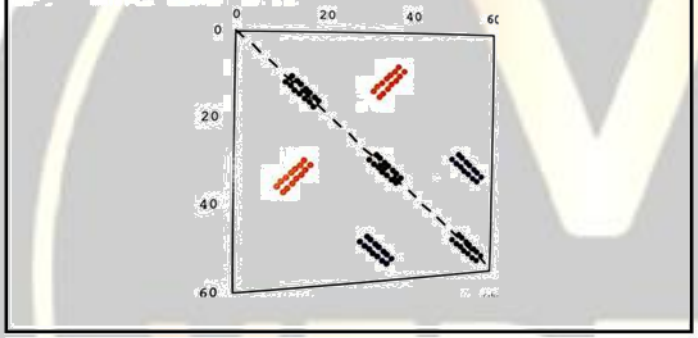
	A1	A2
B1	0.24	0.06
B2	0.21	0.49

What is the value of P(B2|A1)?

(a) 0.467
(b) 0.533
(c) 0
(d) 1

253.

In the following figure, identify the parallel and anti-parallel β-strands in a protein structure



(a) Residues 30-40 in anti-parallel beta strands and residues 50-60 in parallel beta strands.
(b) Residues 30-40 in parallel beta strands and residues 50-60 in anti-parallel beta strands.
(c) Residues 10-20 in parallel beta strands and residues 30-40 in anti-parallel beta strands.
(d) Residues 10-20 in anti-parallel beta strands and residues 30-40 in parallel beta strands.

254. The E. coli ribosomal release factor gene has an in-frame stop codon in the middle of the protein coding sequence. Mutating the stop codon in this gene makes the protein non-functional. Which one of the following is an adequate explanation for this observation?
(a) When the intracellular concentration of this protein is low, ribosomes jump over the stop codon and synthesize the full length protein. When it is high, the protein itself facilitates release of its mRNA from the ribosomes at the stop codon.
(b) The gene is a pseudo gene.
(c) In this case, the stop codon is not a real stop codon, but codes for an unnatural amino acid essential for the function of the protein.
(d) The stop codon is involved in secondary structure of the Mrna.

255. A protein has three domains P, Q, and R, whereas another protein has three domains R, S and Q in that order. The preferred alignment algorithm for these two proteins will be:
(a) Local alignment.
(b) Global alignment.
(c) Both algorithms will give the same results.
(d) None of the methods are suitable in this case.

256. PAM120, PAM80 and PAM60 scoring matrices are most suitable for aligning sequences with:
(a) 40%, 50% and 60% similarity respectively.
(b) 60%, 50% and 40% similarity respectively.
(c) 60%, 40% and 50% similarity respectively.
(d) The usefulness of PAM matrices have no relationship with similarities of sequences to be aligned.

257. Which of the following descriptors would be a suitable set for QSAR analysis?
(a) LogP, molecular volume, Hammet σ and π constants, molar refractivity, polar surface area.
(b) LogP, number of synthetic steps, polar surface area, molar refractivity.
(c) LogP, number of nitrogen atoms, Hammet σ and π constants, molar refractivity, polar surface area.
(d) Molecular weight, molecular volume, molecular surface area.

258. A closed circular plasmid of length 5000 base pairs is completely relaxed in aqueous buffer. If the plasmid is put in 80% ethanol so that it transforms to A-form DNA, what will be the status of its superhelicity?
(a) It will become positively supercoiled.
(b) It will become negatively supercoiled.
(c) It will remain relaxed without any change in supercoiling.
(d) Exactly half the molecules will become positively supercoiled and the other half will become negatively supercoiled, so that there is no net change in supercoiling.

259. How many edges meet at every branch node in a phylogenetic tree?
(a) 1
(b) 2
(c) 3
(d) 4

260. Which one of the following proteins can be used as a template for structure prediction by homology modelling?
(a) pdb|1TLH|B: Identities = 39/66 (59%), Positives = 51/66 (77%), Expect = 3e-16.
(b) pdb|1DQL|H: Identities = 9/15 (60%), Positives = 12/15 (80%), Expect = 9.9.
(c) pdb|1L9U|H:Identities = 173/333(51%), Positives = 233/333(69%), Expect = 2e-89.
(d) pdb|1RP3|A: Identities = 56/206 (27%), Positives = 98/206 (47%), Expect = 2e-05.

261. In a pairwise alignment, an optimal alignment is the one that:
(a) Either minimizes the implied number of evolutionary changes or minimizes a particular scoring function.
(b) Either maximizes the implied number of evolutionary changes or minimizes a particular scoring function.
(c) Either minimizes the implied number of evolutionary changes or maximizes a particular scoring function.
(d) E ither maximizes the implied number of evolutionary changes or maximizes a particular scoring function.

262. Which one of the following CORRECTLY specifies the order of helices according to their radius?
(a) pi helix > alpha helix >310 helix.
(b) 310 helix > alpha helix > pi helix.
(c) 310helix > pi helix > alpha helix.
(d) alpha helix > 310helix > pi helix.

263. In protein sequence analysis, Twilight zone refers to the evolutionary distance corresponding to about:
(a) 60% identity between two proteins.
(b) 90% identity between two proteins.
(c) 30% identity between two proteins.
(d) 85% identity between two proteins.

264. The double-helical structure of DNA was first obtained using:
(a) Fiber diffraction only.
(b) Fiber diffraction and molecular modeling.
(c)X-ray diffraction from single crystals.
(d) Diffraction from single crystals and molecular modeling.

265. Molecular dynamics differs from molecular mechanics by taking account of the:
(a) Velocities of the constituent particles.
(b) Effect of the solvent medium.
(c) Non-bonded interactions.
(d) Periodic boundary condition.

266. An organism has 10 pairs of chromosomes. If all the genes in this organism were mapped how many linkage groups would be observed?
(a) 10
(b) 20
(c) 40
(d) Cannot be predicted

267. In a genetic map two genes A and B are 60 cM apart. If an individual heterozygous for the two genes (AaBb) is test-crossed, what percentage of the progeny will have the genotype aabb?
(a) 60
(b) 30
(c) 25
(d) 12.5

268. The following can be used as DNA markers: a. Restriction Fragment Length Polymorphism b. Amplified Fragment Length Polymorphism c. Randomly Amplified Polymorphic DNA d. Microsatellites. Which of the above can be used to distinguish a heterozygote from a homozygote?
(a) and (c)
(b) and (c)
(c) and (d)
(d) and (d)

269. The following events lead to changes in the DNA: a. Inversion b. Recombination c. Translocation d. Transition. Which of the above can lead to changes in the linkage map of an organism?
(a) Only (b)
(b) (a) and (c)
(c) (b) and (d)
(d) (a), (b) and (c)

270. The following are terms which are used to describe sequence identities a. Homologs b. Paralogs c. Orthologs d. Analogs. Which of the above can be used to describe the relationship between a myoglobin gene from human and that from a mouse?
(a) Only (b)
(b) Only (c)
(c) (a) and (b)
(d) (a) and (c)

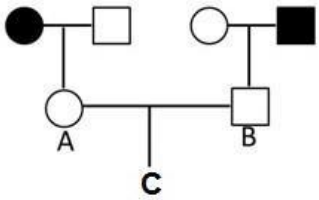
271. To make a linkage map in Drosophila, a three-point test cross was carried out. The parental cross was between homozygous flies of genotype a+c and +b+. The double crossovers obtained after the test cross had the genotype a++ and +cb. What is the order of the three genes?
(a) c a b
(b) a b c
(c) a c b
(d) a b c or a c b

272. Mouse-human somatic cell hybridization led to a number of cell clones in which all mouse chromosomes are present, but only certain human chromosomes are retained. The results are summarized below. The table indicates three such clones. '+'indicates presence of human chromosomes and -'for those that are absent. All other human chromosomes are absent:

Hybrid clone	Human chromosomes							
	1	2	3	4	5	6	7	8
A	+	+	+	+	-	-	-	-
B	+	+	-	-	+	+	-	-
C	+	-	+	-	+	-	+	-

If an anzyme activity was present only in clone C, the allele encoding the enzyme is present on chrosome:
(a) 2
(b) 3
(c) 6
(d) 7

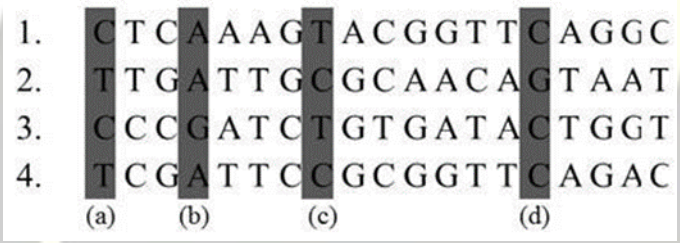
273. The following pedigree shows the inheritance of an autosomal recessive trait what is the probability that a child (C) born to individuals A and B will show the trait?



(a) 1/2
(b) 1/4
(c) 1/9
(d) 1/16

274. Assume a population in Hardy-Weinberg equilibrium for alleles at an autosomal recessive disease locus. The frequency of mutant allele 'q' is 1/50. The fraction of the population representing carriers of the disease is closest to:
(a) $(1/50)^2$
(b) 1/25
(c) (1/25)2
(d) 1/50

275. A subset of informative SNPs that may be used as good representative of the rest of the SNPs is called as tag-SNPS The following is a set of SNPs representing four haplotypes. Of the four shaded SNPs (a to d) which of the following combinations can be used as a tag-SNP for the four haplotypes?



(a) (a) and (b)
(b) (c) and (d)
(c) (a), (b) and (c)
(d) (b), (c) and (d)

DBT-BET-JRF 2014 ANSWER KEY

DBT-BET-JRF 2014 ANSWER KEY																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	b	c	b	d	d	d	c	b	a	a	b	d	a	b	a	a	b	b	c
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
c	a	a	a	b	a	b	b	d	d	a	a	b	c	d	d	a	a	a	a
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
a	b	d	b	c	b	b	b	c	c	c	a	c	c	a	b	b	b	a	c
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
b	a	b	a	b	b	c	a	c	a	a	a	c	a	a	d	a	a	c	a
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
c	a	a	a	c	d	c	a	b	b	c	a	a	b	d	d	d	d	c	b
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
c	c	d	b	b	a	c	b	c	c	d	b	c	b	b	d	a	c	c	c
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
a	b	b	c	d	d	c	d	d	c	a	d	d	d	a	d	b	a	d	a
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
b	c	a	b	a	c	c	c	d	b	c	c	b	a	c	d	d	d	c	b
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
c	c	b	c	b	b	c	d	c	c	b	d	b	c	c	b	b	c	a	c
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
c	a	c	b	c	c	d	b	a	c	b	c	a	a	b	b	d	b	d	a
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
b	d	b	c	a	c	d	b	c	b	c	d	d	a	d	c	a	c	c	b
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
c	a	a	b	c	c	a	c	c	b	c	a	b	c	a	b	b	a	b	c
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
b	c	a	a	a	a	a	a	a	a	a	a	a	a	a	b	a	a	c	c
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275					
c	a	c	b	a	a	c	d	b	d	c	d	c	d	d					