1. The two heavy chains of a human antibody are linked to each other by
(1) hydrogen bond
(2) glycosidic bond
(3) phosphodiester bond
(4) disulfide bond

2. Which one of the following modifications is NOT a natural N-terminal modification of proteins ?
(1) Acetylation
(2) Benzylation
(3) Myristoylation
(4) Sumoylation

3. Match the items of List I with the items in List II

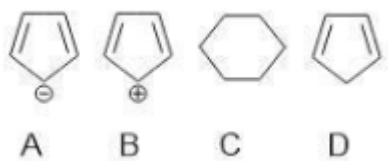
| List - I | List II |
|---|---|
| A. Diabetes insipidus | I. Dysregulation of glucagon |
| B. Exophthalmic goiter | II. Water loss and dehydration |
| C. Acromegaly | III. Grave's disease |
| D. Hyperglycemia | IV. Disfigurement of face |

Choose the correct answer form the options given below:
(1) A-I, B-III, C-IV, D-II
(2) A-IV, B-III, C-II, D-I
(3) A-II, B-I, C-III, D-IV
(4) A-II, B-III, C-IV, D-I

4. Bacillus thurinigiensis CryA controls certain caterpillar pests by
(1) turning toxic in the acidic pH of their gut medium
(2) turning toxic in the alkaline medium of their gut
(3) repelling them from the crops
(4) inducing satiation in them

5. The salary of a worker is first increased by 5% and then it is decreased by 5%. What is the change in his salary?
(1) Decrease in salary 0-25%
(2) Increase in salary 0-50%
(3) No change in salary
(4) Decrease in salary 0-50%

6. Which one of the following is an aromatic compound?




(1) A

(2) B
(3) C
(4) D

7. Identify which of the following statements regarding significant figures are correct
A. 6.405 has four significant figures
B. 12300 has five significant figures
C. 0.00421 has five significant figures
D. 4.500 has four significant figures
Choose the most appropriate answer from the options given below.
(1) A, B and C only
(2) A and D only
(3) C and D only
(4) B and D only

8. The cross product of vector $\vec{A}$ and vector $\vec{B}$ has a magnitude of 50 unit, where vector $\vec{A}$ has a magnitude of 10. The angle between vector $\vec{A}$ and $\vec{B}$ is 60 degrees. What is the magnitude of vector $\vec{B}$ ?
(1) $\frac{5}{\sqrt{2}}$
(2) $\frac{10}{\sqrt{2}}$
(3) $\frac{10}{\sqrt{3}}$
(4) $\frac{5}{\sqrt{3}}$

9. It is possible to separate o-nitrophenol and p-nitrophenol using steam distillation because o-nitrophenol has
(1) Van der Waals force
(2) Steric hindrance
(3) Intermolecular H-bonding
(4) Intramolecular H-bonding

10. The sum of four consecutive even numbers is 107 more than the sum of three consecutive odd numbers. If the sum of smallest odd number and the smallest even number is 55, then what is the smallest even number?
(1) 36
(2) 40
(3) 32
(4) 38

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

| List I (Type of thermodynamic process) | List II (Work done) |
|---|---|
| A. Isotermal | I. Zero |
| B. Adiabatic | II. $\mu R(T_2 - T_1)$ |
| C. Isochoric | III. $\mu RT \ln V_2/V_1$ |

| | |
|---|---|
| D. Isobaric | IV. $\frac{\mu R(T_1-T_2)}{(\gamma-1)}$ |

Choose the correct answer from the options given below:
(1) A-III, B-IV, C-I, D-II
(2) A-IV, B-III, C-I, D-II
(3) A-III, B-IV, C-II, D-I
(4) A-III, B-I, C-IV, D-II

12. A resistor R dissipates power P when connected to a generator. If another resistor Q is put in series with R, the power dissipated by R will
(1) Increase
(2) Decrease
(3) Remain the same
(4) Increase or decrease depending on the values of R and Q

13. An equilateral triangle of side 6 cm has its corners cut-off to form a regular hexagon. The area of regular hexagon is
(1) $2\sqrt{3}\ cm^2$
(2) $3\sqrt{2}\ cm^2$
(3) $6\sqrt{3}\ cm^2$
(4) $3\sqrt{6}\ cm^2$

14. Which one of the following drugs contains $\beta$-lactam structure?
(1) Penicillin
(2) Sulphanilamide
(3) Erythromycin
(4) Chloramphenicol

15. Sanger reaction (Sequencing) is an example of
(1) electrophilic substitution
(2) hydrolysis
(3) esterification
(4) nucleophilic substitution

16. Which one of the following statements about AIDS caused by HIV is correct?
(1) The time lag between the HIV infection and AIDS manifestation varies from 2-3 weeks.
(2) After entering the body, HIV enter B-lymphocytes.
(3) The AIDS-affected individuals are more susceptible to Tuberculosis.
(4) HIV infection depletes only the CD8 lymphocytes in the body.

17. Choose the option that correctly matches for an immunosuppressant and its origin
(1) Cholesterol - Palm Oil
(2) Cyclosporin A - Trichoderma polysporum
(3) Streptokinase - Streptococcus

(4) Botulinum toxin - Clostridium botulinum

18. Which one of the following is caused by point mutation?
(1) Turner's syndrome
(2) Down's syndrome
(3) Sickle cell anemia
(4) Kleinefelter's syndrome

19. Given below are two statements
Statement: Precision refers to the closeness of various measurements for the same quantity.
Statement II: Accuracy is the agreement of the obtained value with the known or true value of the quantity.
In light of the above statements, choose the correct answer from the options given below:
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are NOT correct
(3) Statement I is correct, but Statement II is not correct
(4) Statement I is not correct, but Statement II is correct

20. For $x > 0$, if variable takes discrete values $x + 4, x - 3.5, x - 2.5, x - 3, x - 2, x + 0.5, x - 0.5, x + 5$, then the value of median is
(1) $x - 1.25$
(2) $x - 0.5$
(3) $x + 0.5$
(4) $x + 1.25$

21. Respiratory pathway is considered as a _____ pathway
(1) Catabolic
(2) Anabolic
(3) Amphibolic
(4) Fermentative

22. Many enzymes catalyze both forward and reverse reactions. Which one of the following statement is NOT correct?
(1) An equilibrium is established after some time.
(2) It is possible to control the directions of the reaction by suitably removing the formed product.
(3) These reactions are both temperature and concentration dependent.
(4) The forward and reverse reactions proceed via different activation complexes.

23. A train passes a standing man in 6 seconds and 210 m long platform in 16 seconds. The length and speed of the train, respectively, is
(1) 126 m, 21 m/s
(2) 120 m, 20 m/s
(3) 110 m, 20 m/s
(4) 63 m, 21 m/s

24. A boy sitting on a surface inside a satellite moving around the earth feels weightless because
(1) the earth does not attract the object in a satellite
(2) the reaction on the person balances the gravitational force
(3) a person sitting in the satellite is not accelerated
(4) the normal force (reaction) is zero

25. Which statement is true with respect to meiosis?
(1) Meiosis involves two sequential cycles of nuclear and cell division but only a single cycle of DNA replication.
(2) Meiosis involves one cycle of nuclear and cell division but two cycles of DNA replication.
(3) Four diploid cells are formed at the end of meiosis.
(4) Two haploid cells are formed at the end of meiosis.

26. Aldosterone regulates the water and electrolyte balance in human body by
(1) Stimulating the $H_2O$ and $Na^+$ reabsorption, while $K^+$ and $PO_4^{3-}$ excretion
(2) Stimulating the $Na^+$ and $K^+$ reabsorption, while $H_2O$ and $PO_4^{3-}$ excretion
(3) Stimulating the $H_2O$ reabsorption and $Na^+$ excretion
(4) Stimulating the $Na^+$ and $PO_4^{3-}$ reabsorption, while $K^+$ excretion

27. The diagonals of a rhombus are 16 cm and 12 cm. The side of the rhombus would be
(1) 10 cm
(2) 11 cm
(3) 8 cm
(4) 9 cm

28. Which law of thermodynamics states that "energy of an isolated system is constant" ?
(1) First
(2) Second
(3) Third
(4) Zeroth

29. At G2/M checkpoint the cell cycle will arrest if
(1) The cell has not achieved an adequate size
(2) The spindle fibre formation has not occurred
(3) The DNA replication or repair of DNA damage has not been completed
(4) The attachment of the spindle fibres to the kinetochore of centromeres is not adequate

30. In an election contested by two candidates, one candidate got 30% of total votes and lost by 500 votes. The total number of votes polled is
(1) 1350
(2) 1450
(3) 1150
(4) 1250

31. Assume that a narrow tunnel is dug between two diametrically opposite points on the earth's surface. If a particle is released in this tunnel, it will execute a simple harmonic motion. What will be the time period of SHM of this particle ?

(1) $\frac{1}{2\pi}\sqrt{\frac{R^3}{GM}}$

(2) $\frac{1}{2\pi}\sqrt{\frac{GM}{R^3}}$

(3) $2\pi\sqrt{\frac{R^3}{GM}}$

(4) $2\pi R\sqrt{\frac{1}{GM}}$

32. Natural rubber is a polymer of _____ while synthetic rubber neoprene is formed by polymerization of _____.

(1) 1,3-butadiene; acrylonitrile

(2) 2-chloro-1,3-butadiene; 1,3-butadiene

(3) 2-methyl-1,3-butadiene;2-chloro-1,3-butadiene

(4) Acrylonitrile;2-methyl-1,3-butadiene

33. The acute angle between hour and minute hands of a wall clock when the time shown by it is 02:15 is equal to

(1) $30°$

(2) $26.25°$

(3) $22.5°$

(4) $37.5°$

34. $x^2 + ax + 1 = 0$ has no real root. Which one of the following is correct?

(1) $a \leq 2$

(2) $a \geq 2$

(3) $-2 \leq a < 2$

(4) $-2 < a < 2$

35. There are 30 boys and 60 girls in a class. If the average age of boys is 12 years and average age of girls is 10 years, what is the average age of the whole class?

(1) $10.11$ years

(2) 10.66 years

(3) 11.66 years

(4) 11.11 years

36. A bullet of mass 20 g, moving at 50 m/s penetrates 20 cm into a wooden block. What is the magnitude of the force exerted on the wooden block?

(1) 625 N

(2) 225 N

(3) 125 N

(4) 725 N

37. The principle driving force behind movement of water in plants is known as
(1) Ionic potential
(2) Membrane potential
(3) Soil temperature
(4) Water potential

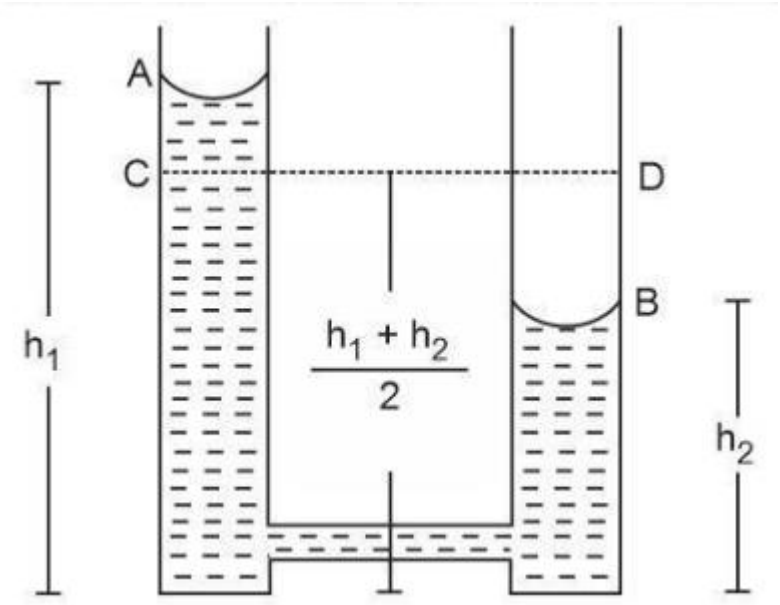
38. $9.6 \times 3.6 \div 7.2 + 10.8$ of $\frac{1}{18} - \frac{1}{10} = ?$
(1) $15.56$
(2) $10.56$
(3) $5.3$
(4) $15.36$

39. Which statement is true with respect to colostrum ?
(1) It is a yellowish fluid secreted by the mother during later days of lactation.
(2) Colostrum provides passive immunity to the infant.
(3) Colostrum is rich in carbohydrates and has no antibodies.
(4) Colostrum provides active immunity to the infant.

40. Which one of the following transition metals is present in Vitamin B12?
(1) Mn
(2) Co
(3) Zn
(4) Cu

41. Identify the statement which in NOT true for a 'conservative force'
(1) The work done by the conservative force depends only on the end points.
(2) The work done by a conservative force in a closed path is zero.
(3) Spring force and frictional force are conservative.
(4) The total mechanical energy of a system is conserved if forces doing work on it are conservative.

42. Two cylindrical vessels of equal cross-sectional area A contain water up to height $h_1$ and $h_2$. The vessels are interconnected so that the levels in them become equal. What is the work done during this process if $\rho$ is the density of water?




(1) $\rho . A . (h_1 - h_2)$
(2) $\rho . A . (h_1 - h_2)/2$
(3) $\rho . A . (h_1 - h_2)^2 . g$
(4) $\rho . A . \left[\frac{(h_1 - h_2)}{2}\right]^2 . g$

43. The traffic lights at three different road crossings change after every 48 s, 72 s and 108 s, respectively. If they all change simultaneously at 8:20:00 h, when will they change again simultaneously?
(1) 8:27:12 h
(2) 8:25:10 h
(3) 8:26:12 h
(4) 8:24:10 h

44. A nucleic acid chain comprises of
A. Phosphate group
B. Nitrogen base
C. Pentose sugar
D. Thiol group
E. $\beta$ (1-4) linkage
Choose the correct answer from the options given below:
(1) B and C only
(2) B, D and E only
(3) A, D and E only
(4) A, B and C only

45. If a body is performing uniform circular motion with velocity v and radius R, then identify the true statements from the following:
A. Its velocity v is constant.
B. Acceleration is always directed towards the centre and its magnitude is $a = v^2/R$.

C. Angular momentum is constant in magnitude but its direction keeps changing.
D. Angular velocity of the body = v/R.
Choose the most appropriate answer from the options given below.
(1) A and C only
(2) B and D only
(3) A, B and D only
(4) A and D only

46. Which one of the following categories of methods CANNOT be used for animal virus detection ?
(1) Serology
(2) Nucleic acid hybridization
(3) Hematology
(4) Hemagglutination

47. Two parallel rail tracks run east-west. Train P moves in east direction with a speed of 36 $kmh^{-1}$ and train Q moves with a speed of 72 $kmh^{-1}$ in west direction. What is the velocity of Q with respect to P?
(1) 30 m/s from east to west
(2) 30 m/s from west to east
(3) 36 m/s from west to east
(4) 10 m/s from east to west

48. Match the items in List I with items in List II

| List - I | List II |
|---|---|
| A. Enzymes | I. Amino acid |
| B. Glucose | II. Biocatalysts |
| C. Lactose | III. Aldohexose |
| D. Methionine | IV. Disaccharide |

Choose the correct answer from the options given below:
(1) A - I, B - II, C - III, D - IV
(2) A - II, B - III, C - IV, D - I
(3) A - II, B - IV, C - III, D - I
(4) A - I, B - III, C - IV, D – II

49. Two parrallel plate capacitors each of $15\ uF$ capacity are connected in series. The space between the plates of one capacitor is filled with a dielectric material of dielectric constant $K = 2$. The equivalent capacitance of the system will be
(1) 45 µF
(2) 30 µF
(3) 10 µF
(4) 15 µF

50. Which of the following elements readily react with oxygen to form their oxides ?
(1) Au and Pt

(2) Ne and Ar
(3) Al and Cu
(4) Cu and Pt

51. Arrange the following in decreasing order of their acidic strength
A. $CH_3COOH$
B. $ClCH_2COOH$
C. $Cl_2CHCOOH$
D. $Cl_3CHOOH$
E. $F_3CCOOH$
Choose the correct answer from the options given below:
(1) A > B > C > D > E
(2) E > D > C > B > A
(3) A > E > D > C > B
(4) B > C > D > A > E

52. Maximum distance between any two points inside or on cube of side 1 cm is equal to
(1) 1 cm
(2) $\sqrt{2}\ cm$
(3) $\sqrt{3}\ cm$
(4) 6 cm

53. A big oil droplet of radius 10 cm is broken into a thousand equal droplets. What will be the gain in surface energy? (Surface tension of the oil is 0.1 $Nm^{-1}$)
(1)5 J
(2) 10 J
(3) 0.11 J
(4) 0.25 J

54. A proton and a deuteron moving with equal kinetic energy enter perpendicularly into a magnetic field. What will be the ratio of radii of the circular path of the proton to that of the deuteron ?
(1) 1
(2) 2
(3) $\frac{1}{2}$
(4) $\frac{1}{\sqrt{2}}$

55. Which is NOT the function of placenta ?
(1) Supply of oxygen and nutrients to the embryo
(2) Removal of excretory waste products produced by embryo
(3) Production of hCG and HPL
(4) Supply all types of antibodies to the embryo

56. Which of the following options correctly match the name of gene and its function in cloning vector pBR322?

(1) Cla I - Acts as selectable marker to identify non-transformants
(2) $amp^r$ - Codes for plasmid amplifying enzymes
(3) rop - Codes proteins required for plasmid replication
(4) ori Controls plasmid size

57. Number of natural numbers that can be formed using digits 1, 2, 3, 4, 5, 6, 7 each exactly once so that digits 3, 4 and 5 are always in the middle is equal to
(1) 24
(2) 144
(3) 5040
(4) 720

58. The electric charge on a body is always an integral multiple of 'e' where 'e' is the charge that an electron or proton carries. This concept is known as
(1) Additivity of charges
(2) Quantization of charges
(3) Conservation of charges
(4) Principle of superposition

59. According to the molecular orbital theory, which of the following molecules should exhibit paramagnetism?
(1) $O_2$
(2) $N_2$
(3) $F_2$
(4) $C_2$

60. Number of squares in a chess-board is equal to
(1) 64
(2) 81
(3) 204
(4) 284

61. Lipid Rafts are composed of the
(1) cholesterol and cardiolipin
(2) sphingolipid and cardiolipin
(3) sphingolipid and cholesterol
(4) cholesterol but no sphingolipid

62. For an imaginary Martian species with three nucleotides (X, Y and Z), how many 3-letter codons are possible?
(1) 64
(2) 27
(3) 9
(4) 4

63. Which one of the following is derived from the ectoderm?
(1) Muscle
(2) Bone
(3) Nerve
(4) Blood

64. The indigenous vaccine, Covaxin against SARS Coronavirus-2 contains
(1) the mRNA expressing viral spike protein
(2) inactivated whole virions
(3) the purified viral envelope protein
(4) the DNA coding for viral spike protein

65. Hepatitis B virus genome is
(1) ssDNA
(2) dsDNA
(3) ssRNA
(4) partially dsDNA

66. A biochemist is pelleting down the microsomal fraction from a sample using ultracentrifuge at a speed of 20000 rpm. What would be RCF if the diameter of the rotor is 7 cm ?
(1) 15680
(2) 31360
(3) 7840
(4) 3920

67. Which one the following statements is correct about various microbial culture media?
(1) Mannitol salt agar is an enriched and differential media.
(2) Selective components in MacConkey (MAC) agar are eosin Y and methylene blue which inhibits the growth of gram positive bacteria.
(3) Blood agar is a differential media which is differentiated on the basis of bacterial ability to produce hemolysins.
(4) Bile salts and crystal violet present in the EMB agar media inhibits the gram positive bacteria growth and hence helps to differentiate between gram positive and gram negative.

68. Pattern of inheritance of flower colour in Mirabilis jalapa is similar to that of
(1) ABO blood group in human beings
(2) Flower colour in snapdragon
(3) Fur colour in rabbit
(4) Skin colour in human beings

69. DNA conformation is left handed in
(1) DNA B
(2) DNA C
(3) DNA Z
(4) DNA A

70. Which one of the following amino acids is coded by a single codon ?
(1) Valine
(2) Threonine
(3) Tryptophan
(4) Isoleucine

71. In N-linked glycoproteins, carbohydrate moiety is attached to which of the following amino acids ?
(1) Valine
(2) Asparagine
(3) Serine
(4) Threonine

72. A zero order liquid phase reaction $A \xrightarrow{K} B$, is being carried out in a batch with $k = 10$ moles/min. Reactor volume is 100 L. Initial concentration of A is 0.1 moles/L. What is the earliest time at which A is completely exhausted in the system?
(1) 100 min
(2) 200 min
(3) 300 min
(4) 40 min

73. Calcium alginate based synthetic seeds tend to lose water rapidly and become hard pellet. This problem can be overcome by
(1) Coating the capsule with polyethylene glycol
(2) Preserving the seeds in the airtight packaging till sowing
(3) Treating the somatic embryos with sterile water for 3 hours before encapsulation
(4) Coating the capsules with Elvax 4260

74. Which of the following pair of monosaccharides contains epimers of each other?
(1) D-Mannose and D-Glucose
(2) D-Gulose and D-Glucose
(3) D-Arabinose and L-Arabinose
(4) D-Glucose and D-Fructose

75. Which of the following continent is the driest one?
(1) Africa
(2) Antarctica
(3) Australia
(4) Europe

76. What will happen to immune cell development if we remove thymus from neonatal mice ?
(1) B-cell maturation will be impaired
(2) Both B- and T-cell maturation will be impaired
(3) T-cell maturation will be impaired
(4) No effect on B- and T-cell maturation

77. The catalytic triad of Chymotrypsin is composed of
(1) Asp, Ser, His
(2) Arg, Ser, His
(3) Glu, Thr, Lys
(4) Glu, Asp, Tyr

78. A suicide plasmid vector lacks the following
(1) antibiotic marker
(2) origin of replication
(3) multiple cloning sites
(4) site for integration

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

| List I | List II |
|---|---|
| A. mRNA | I. inhibits gene expression |
| B. tRNA | II. carries amino acids for translation |
| C. snRNA | III. provides template for translation |
| D. siRNA | IV. involved in RNA splicing |

(1) A - III, B - II, C - IV, D - I
(2) A - II, B - III, C - I, D - IV
(3) A - IV, B - III, C - II, D - I
(4) A - II, B - IV, C - I, D - III

80. In which one of the following compartments of the cell, carbohydrates are added to a protein during glycoprotein synthesis?
(1) Mitochondria
(2) Lysosome
(3) Nucleus
(4) Golgi complex

81. For a normal (Gaussian) distribution, decreasing the spread and increasing the height would lead to a
(1) smaller value of standard deviation
(2) higher value of standard deviation
(3) smaller value of mean
(4) higher value of mean

82. Given below are two statement - one is labelled as Assertion A and the other is labelled as Reason R:
Assertion A: Bacterial lipoplysaccharide (LPS) on its own does not induce memory B-cell in humans.
Reason R: LPS does not activate T-cell.
In light of the above statements, choose the most appropriate answer from the options given below.
(1) Both A and R are correct and R is the correct explanation of A
(2) Both A and R are correct, but R is NOT the correct explanation of A

(3) A is correct but R is not correct
(4) A is not correct but R is correct

83. What is the common feature of the following peptides ?
GKWLY, YLWKG, WGKLY, WLKGY
(1) Same sequence
(2) Same amino acid composition
(3) Same conformation
(4) Same interactome

84. Match the items in List I with the items in List II

| List I (Organelle) | List II (Function) |
|---|---|
| A. Mitochondria | I. Protein processing and transport |
| B. Nucleolus | II. Protein synthesis |
| C. Golgi complex | III. Energy production |
| D. Endoplasmic reticulum | IV. Ribosomal RNA synthesis |

(1) A - I, B - III, C - II, D - IV
(2) A - II, B - III, C - I, D - IV
(3) A - III, B - II, C - I, D - IV
(4) A - III, B - IV, C – I , D - II

85. Rancidity in spoiled foods is mainly due to
(1) Proteolytic enzymes
(2) Photosynthetic microbes
(3) Saccharolytic microbes
(4) Lipolytic microbes

86. Francis & Crick proposed the scheme called Central Dogma in 1958. Which of the following processes was NOT covered in this scheme?
(1) Replication
(2) Transcription
(3) Reverse transcription
(4) Translation

87. Which one of the following is NOT an auxin ?
(1) Indole acetic acid (IAA)
(2) Indole butyric acid (IBA)
(3) 2,4-dichlorophenoxy acetic acid (2,4-D)
(4) 6-Benzylaminopurine (BAP)

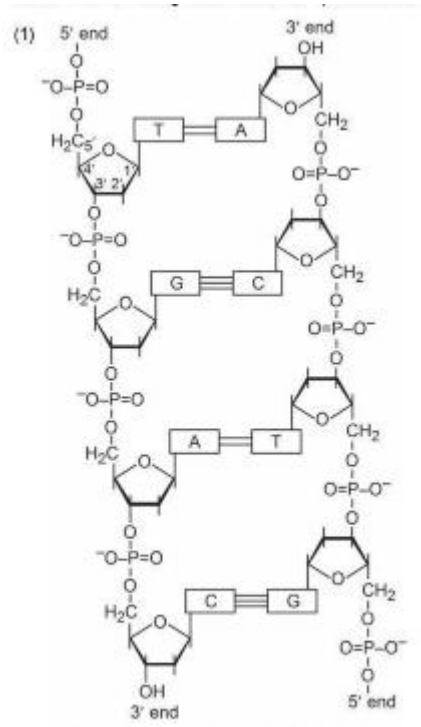
88. Leptin receptor is primarily present in the following tissue
(1) Hepatic
(2) Muscle
(3) Adipose

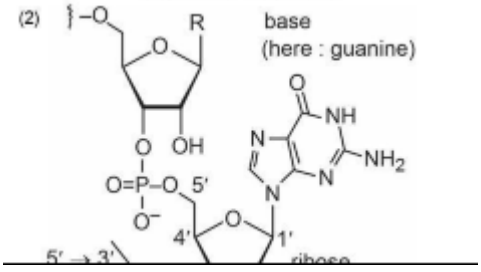
(4) Neuronal

89. A mixture of proteins (A, B, C and D) is separated on a Sephadex G-200 column. The proteins elute in the order of A, B, C and D. Assuming that all proteins are globular and monomeric, the protein with minimum electrophoretic mobility on SDS-PAGE will be
(1) A
(2) B
(3) C
(4) D

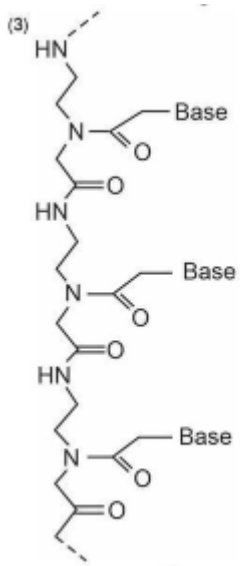
90. Which one of the following cell types is involved in retaining the tattoo ink?
(1) Macrophages
(2) Melanocytes
(3) Keratinocytes
(4) Lymphocytes

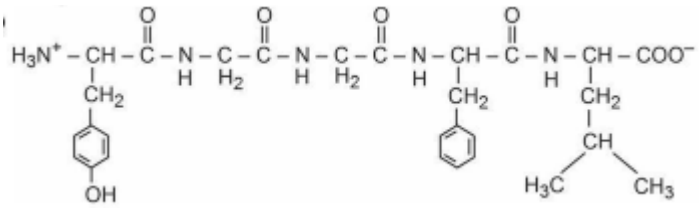
91. Which of the following molecules is a Peptide Nucleic Acid (PNA)?



(3)




92. Match the items in List I with items in List II

| List I | List II |
|---|---|
| A. $\beta$-Oxidation | 1. Ribulose Bisphosphate Carboxylase |
| B. Glycolysis | II. Phosphofructo kinase-l |
| C. Gluconeogenesis | III. Phosphoenolpyruvate carboxylase |
| D. Calvin cycle | IV. Thiolase |

(1) A - III, B - IV, C - II, D - I
(2) A - II, B - IV, C - I, D - III
(3) A - IV, B - II, C - III, D - I
(4) A - III, B - II, C - IV, D - I

93. Which one of the following tissue culture approaches is most appropriate for production of double halploid plants?
(1) Protoplast fusion
(2) Embryo rescue
(3) Anther culture
(4) Meristem culture

94. Given below are two statements one is labelled as Assertion (A) and the other is labelled as Reason (R):
Assertion (A): Human adeno-associated virus is used to deliver single-stranded DNA as a vaccine that does not require multiple booster doses.
Reason (R): Such vaccines are generally administered along with an adenovirus or a herpesvirus to avoid multiple booster doses.

In light of the above statements, choose the most appropriate answer from the options given below.
(1) Both A and R are correct and R is the correct explanation of A.
(2) Both A and R are correct, but R is NOT the correct explanation of A.
(3) A is correct, but R is not correct.
(4) A is not correct, but R is correct.

95. Which one of the following plant tissue culture techniques can be most effectively used for production of virus-free plants ?
(1) Protoplast culture
(2) Culture of shoot apical meristem
(3) Somatic embryogenesis from calli of leaf explants
(4) Production of cybrids

96. Herpes simplex virus maintains latency in
(1) Neuronal cells
(2) Liver cells
(3) Epithelial cells
(4) Kidney cells

97. In case of prokaryotes, the start codon is usually preceded by a sequence complementary to the
(1) 16S rRNA
(2) 5S rRNA
(3) 28S rRNA
(4) 18S rRNA

98. Match the items in List I with items in List II

| List I | List II |
|---|---|
| A. Prophase | 1. Reformation of the nuclear envelope around daughter chromosomes |
| B. Metaphase | II. Separation of the two daughter chromosomes |
| C. Anaphase | III. Condensation of DNA into chromatids |
| D. Telophase | IV. Chromatids line up along an axis |

(1) A - III, B - II, C - IV, D - I
(2) A - III, B - IV, C - II, D - I
(3) A - IV, B - III, C - II, D - I
(4) A - II, B - IV, C - I, D - III

99. Beggiatoa, a bacterium depends on organic carbon, inorganic chemicals and inorganic electron donor for its nutrition. On the basis of its nutritional type, it is classified as
(1) Photoorganoheterograph
(2) Chemolithoautotroph
(3) Chemolithoheterotroph
(4) Chemoorganoheterotroph

100. Complete the following statement with the correct option

Agrobacterium-mediated plant transformation in the laboratory
(1) is not influenced by the genotype of the host plant.
(2) always leads to integration of a single copy of the T-DNA in the host cell.
(3) is faciliated by the use of selection marker genes to allow preferential growth of transformed cells.
(4) requires the expression of opine genes for the production of transgenic plants.

101. Which of the following cell types has the highest surface area to volume ratio?
(1) RBC
(2) Fibroblast
(3) Keratinocyte
(4) Hepatocyte

102. CD4 antigen is absent on
(1) B-cells
(2) T-cells
(3) macrophage cells
(4) gamma-delta T cells

103. Which one of the following statements most appropriately describes the concept of 'Codon Bias'?
(1) Some codons for a particular amino acid are used more frequently.
(2) There has been an element of human bias for assigning specific codons to an amino acid.
(3) There is no codon bias in plants.
(4) The usage of codons varies for different proteins in an organism.

104. In plant mycorrhizal fungi association, what is the most appropriate exchange between two organisms or partners?
(1) Plant provides carbon to fungi and in return gets minerals
(2) Fungi provides protein to plant and in return gets water
(3) Plant provides minerals to fungi and in return gets carbon
(4) Plant and fungi do not exchange anything

105. Which of the following viruses is a plus-sense single-stranded RNA virus ?
(1) Dengue virus
(2) Rotavirus
(3) Adenovirus
(4) Influenza virus

106. Starting with a single cell, what will be number of cells after 'n' cycles of cell division, given that in each cycle every cell divides into two cells?
(1) $2^2$
(2) $n^n$
(3) $n^2$
(4) $2^n$

107. Animal gut does NOT possess the enzymes required for digesting

(1) glycogen
(2) starch
(3) cellulose
(4) proteins

108. The presence of excess nutrients in aquatic system will lead to
(1) Crustacean bloom
(2) Algal bloom
(3) Coral bloom
(4) Lotus bloom

109. Of the amino acids listed below, which three amino acids can undergo posttranslational modification?
(1) Glycine, Leucine, Trypotophan
(2) Serine, Threonine, Tyrosine
(3) Cysteine, Glutamine, Proline
(4) Glutamic acid, Arginine, Methionine

110. Which of the following immunoglobulins primarily pass through the placenta to provide passive immunity to the fetus?
(1) IgM only
(2) IgM and IgG
(3) IgA and IgG
(4) IgG only

111. Myasthenia gravis is an autoimmune disease where patient makes antibodies for its own
(1) Acetylcholine receptor protein
(2) NOD1 protein
(3) TLR11 protein
(4) RIG-I protein

112. Given below are two statements:
Statement I: In general, a higher auxin cytokinin ratio will induce root formation under in vitro culture conditions in plants.
Statement II: NAA is a cytokinin and BAP is an auxin.
In light of the above statements, choose the most appropriate answer from the options given below.
(1) Both Statement I and Statement II are correct.
(2) Both Statement I and Statement II are NOT correct.
(3) Statement I is correct but Statement II is not correct.
(4) Statement I is not correct but Statement II is correct.

113. What is the likely number of amino acids in a 11 KDa protein ?
(1)90
(2) 100
(3) 110

(4) 120

114. Foreign DNA can NOT be transferred into a zygote by which one of the following methods?
(1) Transduction
(2) Microinjection
(3) Electroporation
(4) Conjugation

115. Match the items in List I with items in List II

| List I (Pollutant) | List II (Impact on environment) |
|---|---|
| A. Carbon monoxide | I. Greenhouse effect |
| B. Hydrocarbons | II. Photochemical smog |
| C. Oxides of nitrogen | III. Acid rain |
| D. Ozone near earth's surface | IV. Impaired plant growth |

(1) A - II, B - III, C - IV, D - I
(2) A - III, B - II, C - I, D - IV
(3) A - II, B - III, C - I, D - IV
(4) A - I, B - II, C - III, D - IV

116. Regulatory B cells (Bregs) are important mediators of adaptive immunity and function mainly via the secretion of
(1) IL-10
(2) IL-2
(3) TNF-alpha
(4) IFN-gamma

117. Which one of the following hormones transmit their signal via nuclear receptors?
(1) Thyroid hormone
(2) Follicle Stimulating hormone
(3) Insulin
(4) Luteinizing hormone

118. Neoschizomers are the restriction endonucleases with
(1) identical recognition site but different cleavage sites
(2) different recognition sites but same cleavage site
(3) different recognition site but producing same sticky ends
(4) identical recognition and cleavage sites

119. Tuberculosis (TB) is caused by Mycobacterium tuberculosis. The TB vaccine is made using
(1) Mycobacterium tuberculosis
(2) Mycobacterium bovis
(3) Tuberculin
(4) Mycobacterial DNA

120. Which of the following statement is NOT correct?
(1) Transcription takes place in the nucleus of eukaryotic cells.
(2) In prokaryotes mRNA is not capped.
(3) Translation in eukaryotes takes place in the nucleus.
(4) In prokaryotes, DNA is replicated in the cytoplasm.

121. The helical content of a protein can be directly determined using
(1) infrared spectrometer
(2) fluorescence
(3) circular dichroism
(4) UV-visible spectrophotometer

122. If a single base in the middle of a protein coding open reading frame is replaced with another base, which statement from the following is NOT a likely possibility?
(1) It may not make any difference to the protein sequence.
(2) It may cause a single amino acid mutation.
(3) It may create a premature stop codon.
(4) The mRNA will not be recruited for translation.

123. The microscope which uses lasers to scan the specimen at a specific depth, illuminates one area at a time and blocks stray light to give an image with excellent contrast and resolution is
(1) Differential Interference Contrast (DIC) Microscope
(2) Confocal Microscope
(3) Scanning Electron Microscope
(4) Phase Contrast Microscope

124. The most widely used method for removing of particulate matter from gas is
(1) Electrostatic precipitation
(2) Chemo-osmotic precipitation
(3) Magnetostatic precipitation
(4) Chemo-electrostatic precipitation

125. What is the final concentration of NaCl upon mixing 10 ml of 10 mM NaCl with 990 ml of 10 mM NaCl ?
(1) 0-1 mM
(2) 0.1 M
(3) 0.01 M
(4) 1.0 mM

126. Match the items in List I with items in List II

| List I | List II |
|---|---|
| A. Beriberi | I. Cobalamin |
| B. Megaloblastic Anemia | II. Thiamin |
| C. Scurvy | III. Folic acid |
| D. Pernicious Anemia | IV. Ascorbic Acid |

(1) A - II, B - IV, C - III, D - I
(2) A - III, B - II, C - IV, D - I
(3) A - 1, B - III, C - IV, D - II
(4) A - II, B - III, C - IV, D - I

127. Enhanced $CO_2$ concentration in environment would lead to _____ in plants.
(1) increased water uptake and reduced photosynthesis
(2) increased photosynthesis and increased water demand
(3) decreased photosynthesis and decreased water demand
(4) decreased $O_2$ emission and no change in photosynthesis

128. Which one of the following waste treatment system is devoid of any packing material, and it recycles internal biomass based on gravity?
(1) UASB
(2) FSSB
(3) RBC
(4) Trickling filter

129. The allergic immune response is characterized by the increased levels of
(1) IgE
(2) IgA
(3) IgG
(4) IgM

130. The presence of antibody in infected patients serum can be detected by
(1) ELISPOT
(2) PCR
(3) Northern blot
(4) Western blot

131. Match the items in List I with items in List II

| List I | List II |
|---|---|
| A. HIV | I. RNA-dependent RNA polymerase |
| B. Influenza virus | II. dsDNA virus |
| C. Hepatitis C virus | III. Segmented RNA genome |
| D. Pox virus | IV. Reverse Transcriptase |

(1) A - III, B - I, C - IV, D - II
(2) A - IV, B - I, C - II, D - III
(3) A - II, B - I, C - III, D - IV
(4) A - IV, B - III, C - I, D - II

132. Which of the following is a method to conduct phylogeny of protein and DNA sequences?
(1) BLAST
(2) OMNIBUS

(3) Maximum likelihood
(4) DAVID

133. An enzymatic reaction exhibits Michaelis-Menten Kinetics. What will happen if the concentration of enzyme is doubled keeping $[S_0] \gg [E]$ ?
(1) Both $K_m$ and $V_{max}$ will remain same
(2) Both $K_m$ and $V_{max}$ will increase
(3) $V_{max}$ will increase; $K_m$ will remain same
(4) $K_m$ will increase; $V_{max}$ will remain same

134. A series of spontaneous point mutations that occur gradually resulting in changes in Influenza virus surface antigens over a time is called
(1) genomic instability
(2) antigenic shift
(3) antigenic drift
(4) chromosome translocation

135. Which one the following is NOT true for Quantum dots as fluorescent probes in fluorescence microscopy?
(1) They are highly resistant to photobleaching.
(2) They can generate fluorescence of different emission wavelengths.
(3) They are nanocrystals of different sizes.
(4) Their flurorescence properties do not depend on the size of the Quantum dots.

136. Which one of the following does NOT refer to secondary structures in protein?
(1) Beta sheet
(2) Twist
(3) Alpha helix
(4) Loop

137. Match the items in List I with items in List II

| List I | List II |
|---|---|
| A. Toll like receptor 9 | 1. Recognition of unmethylated CpG dinucleotide |
| B. T-helper cells | II. Recognition of antigen with MCH II complex |
| C. T-cytotoxic cells | III. Recongnition of antigen with MCHI complex |
| D. Plasmacytoid dendritic cells (pDCs) | IV. Type I interferon (IFN) production |

(1) A - II, B - III, C - I, D - IV
(2) A - I, B - III, C - IV, D - II
(3) A - IV, B - II, C - III, D - I
(4) A - I, B - II, C - III, D - IV

138. Which of the following is NOT true for the layers of gastrula?
(1) The linning of the digestive tract will be formed by the endoderm.
(2) The bones will be formed by the mesoderm.

(3) The nerves will be formed by the ectoderm.
(4) The skin will be formed by the mesoderm.

139. The specificity in an antibody molecule is provided by the
(1) Light chain variable region
(2) Light chain constant region
(3) Heavy chain constant region-l
(4) Hinge region

140. Antibody diversity is an example of
(1) Gene rearrangement
(2) Domain swapping
(3) Post-translational modification
(4) Proteolytic processing

141. Which of the following is a heuristic algorithm that works faster than those driven by dynamic programming?
(1) Needleman-Wunsch
(2) Smith-Waterman
(3) BLAST
(4) Gradient Descent

142. The biocide DDT (a chlorinated hydrocarbon) has a half-life of around
(1) $< 1$ year
(2) $2 - 15$ years
(3) $16 - 30$ years
(4) $> 30$ years

143. Given below are two statements - one is labelled as Assertion (A) and the other is labelled as Reason (R):
Assertion (A): In the eukaryotic genes, TATA box aids in transcription.
Reason (R): The TATA box facilitates formation of pre-initiation complex for transcription initiation.
In light of the above statements, choose the most appropriate answer from the options given below.
(1) Both A and R are correct and R is the correct explanation of A
(2) Both A and R are correct, but R is NOT the correct explanation of A
(3) A is correct but R is not correct
(4) A is not correct but R is correct

144. Among Wheat, Moong Dal, Rice and Bajra, the one with the highest protein content is
(1) Bajra
(2) Wheat
(3) Moong dal
(4) Rice

145. Which of the following is true for a water sample with a BOD value of more than 50 ppm ?

(1) The DO content would be less than 6 ppm
(2) The water is clean and potable
(3) Aquatic life will thrive
(4) The COD of the sample is 25 ppm

146. What is the length of peptides binding to Major Histocompatibility Complex (MHC) class II molecule ?
(1) $8-11$ amino acids
(2) $21-27$ amino acids
(3) $15-20$ amino acids
(4) 507 amino acids

147. The process of nuclear envelope breakdown during prophase is NOT aided by which one of the following?
(1) Extension of the filopodia
(2) Phosphorylation of nuclear membrane proteins
(3) Cytoplasmic microtubule dynamics
(4) Nuclear lamina disassembly

148. If the average diameter of air bubbles in a bioreactor is 2 mm and the gas hold up is 10% then the surface area of gas bubbles per liter of reactor is
(1) 30 $cm^2$
(2) 300 $cm^2$
(3) 3000 $cm^2$
(4) 30000 $cm^2$

149. A good resolution in ion exchange chromatography is obtained when the two proteins have a
(1) large difference in binding affinity and large dispersion
(2) small difference in binding affinity and large dispersion
(3) large difference in binding affinity and small dispersion
(4) small difference in binding affinity and small dispersion

150. The degree of inhibition for an enzyme catalyzed reaction at a particular inhibitor concentration is independent of the intitial substrate concentration. This is
(1) Un-competitive inhibition
(2) Non-competitive inhibition
(3) Competitive inhibition
(4) Mixed inhibition

151. Which one of the following is the most effective strategy in delivering a gene of interest in non-proliferating terminally differentiated cells?
(1) Adeno-associated viral particle
(2) Retroviral particle
(3) Calcium chloride
(4) Lipofectamine

152. The acid involved in ocean acidification is
(1) Carbonic acid
(2) Sulphuric acid
(3) Phosphoric acid
(4) Nitric acid

153. In which of the given centrifuge rotors the value of $r_{min}$ (radius minimum), $r_{max}$ and $r_{av}$ have the minimum deviation?
(1) Fixed-angle rotor only
(2) Vertical rotor only
(3) Swing rotor only
(4) Fixed-angle and Vertical rotors

154. Pox virus replicates in the
(1) Cytoplasm
(2) Nucleus
(3) Golgi
(4) Mitochondria

155. Which one of the following statements is NOT correct?
(1) Glucose is stored in animals as glycogen.
(2) Glucose is stored in plants as starch.
(3) Cellulose is a polymer of only glucose.
(4) Hemicellulose is a polymer of only glucose.

156. Which one of the following is commonly used for converting cellulose raw materials into glucose?
(1) Saccharomyces cerevisiae
(2) Acinetobacter radioresistens
(3) Trichoderma viride
(4) Bacillus amyloliquifaciens

157. A polymerase chain reaction yields 1-2 billion copies of DNA in 30 cycles. How many cycles would be needed to obtain its 300 million copies ?
(1)7 cycles
(2) 8 cycles
(3) 15 cycles
(4) 28 cycles

158. Which one of the following antibody types protects against inhaled and ingested pathogens ?
(1) IgG
(2) IgD
(3) IgM
(4) IgA

159. Telomerase, an RNA-protein complex adds telomeres at the end of chromosomes. What kind of enzymatic activity does it possess?
(1) DNA-dependent DNA polymerase
(2) DNA-dependent RNA polymerase
(3) RNA-dependent DNA polymerase
(4) RNA-dependent RNA polymerase

160. How many grams of Albumin and Aspirin will be required to set a reaction between one millimole of Albumin and 0.5 millimole of Aspirin ? Given the molecular weight of Albumin is 67,000 Da and that of Aspirin is 180 Da
(1) 1 g, 1 mg
(2) 67 g, 90 mg
(3) 0-1 g, 70 mg
(4) 67 $\mu g$, 90 mg