CHAPTER
28
BIOMOLECULES

FACT/DEFINITION TYPE QUESTIONS

1. Biomolecules are
(a) aldehydes and ketones
(b) acids and esters
(c) carbohydrates, proteins and fats
(d) alcohols and phenols

2. Which of the following is a disaccharide ?
(a) Lactose (b) Starch
(c) Cellulose (d) Fructose

3. The sugar that is characteristic of milk is
(a) maltose (b) ribose
(c) lactose (d) galactose

4. Which one is a disaccharide ?
(a) Glucose (b) Fructose
(c) Xylose (d) Sucrose

5. Which of the following monosaccharide is pentose ?
(a) Glucose (b) Fructose
(c) Arabinose (d) Galactose

6. The commonest disaccharide has the molecular formula
(a) $C_{10}H_{18}O_9$ (b) $C_{10}H_{20}O_{10}$
(c) $C_{18}H_{22}O_{11}$ (d) $C_{12}H_{22}O_{11}$

7. Monosaccharides usually contains ... carbon atoms.
(a) C_3 to C_{10} (b) C_1 to C_6
(c) C_4 to C_{10} (d) C_5 to C_8

8. Which one of the following compounds is found abudnantly in nature?
(a) Fructose (b) Starch
(c) Glucose (d) Cellulose

9. A carbohydrate that cannot be hydrolysed into simpler units is called
(a) polysaccharides (b) trisaccharides
(c) disachharides (d) monosaccharides

10. Which of the following statements is incorrect ?
(a) Maltose gives two molecules of glucose only.
(b) Cellulose and sucrose are polysaccharide.
(c) Polysaccharides are not sweet in taste.
(d) Polysaccharides are also known as non-sugars.

11. Reducing sugars reduce.
(a) only Fehling's solution
(b) only Tollen's solution.
(c) both (a) & (b)
(d) neither (a) nor (b)

12. Which among the following is the simplest sugar?
(a) Glucose (b) Starch
(c) Cellulose (d) None of these

13. Glucose can't be classified as
(a) hexose (b) carbohydrate
(c) aldose (d) oligosaccharide

14. Which of the following properties of glucose cannot be explained by its open chain structure?
(i) Glucose does not form hydrogen sulphite with $NaHSO_3$
(ii) On oxidation with HNO_3 glucose gives saccharic acid.
(iii) Glucose is found to exist in two different crystalline forms which are named as α and β.
(a) (ii) only (b) (i) and (iii)
(c) (ii) and (iii) (d) (i) and (ii)

15. Which of the following gives positive Fehling solution test?
(a) Protein (b) Sucrose
(c) Glucose (d) Fats

16. Which of the following statements is incorrect regarding glucose?
(a) It is an aldohexose.
(b) It is also known as dextrose
(c) It is monomer of cellulose.
(d) It is the least abundant organic compound on earth.

17. Glucose gives silver mirror test with Tollen's reagent. It shows the presence of
(a) acidic group (b) alcoholic group
(c) ketonic group (d) aldehyde group

18. The symbols D and L represents
(a) the optical activity of compounds.
(b) the relative configuration of a particular stereoisomer.
(c) the dextrorotatory nature of molecule.
(d) the levorotatory nature of molecule

19. Glucose is found to exist in two different α and β crystalline forms. These forms can be obtained by.
(i) The α form of glucose is obtained by crystallisation from concentrated solution of glucose at 303 K.
(ii) The β form of glucose is obtained by crystallisation from concentrated solution of glucose at 303 K.
(iii) The β form is obtained by crystallisation from hot and saturated aqueous solution at 371 K.
(iv) The α form is obtained by crystallisation from hot and saturated aqueous solution at 371 K.
(a) (i) and (iii) (b) (ii) and (iv)
(c) (ii) and (iii) (d) (i) only

20. The function of glucose is to
(a) provides energy (b) promote growth
(c) prevent diseases (d) perform all above

21. Which one of the following compounds is different from the rest?
(a) Sucrose (b) Maltose
(c) Lactose (d) Glucose

22. The two functional groups present in a typical carbohydrate are:
(a) – CHO and – COOH (b) > C = O and – OH
(c) – OH and – CHO (d) – OH and – COOH

23. When glucose reacts with bromine water, the main product is
(a) gluconic acid (b) glyceraldehyde
(c) saccharic acid (d) acetic acid

24. Glucose does not react with
(a) Br_2/H_2O (b) H_2NOH
(c) HI (d) $NaHSO_3$

25. Glucose reacts with acetic anhydride to form
(a) monoacetate (b) tetra-acetate
(c) penta-acetate (d) hexa-acetate

26. Reduction of glucose by HI suggest that
(a) presence of OH groups
(b) presence of –CHO group
(c) cyclic structure of glucose
(d) six carbon atoms are arranged in straight chain

27. The reaction of glucose with red P + HI is called
(a) Sandmeyer's reaction (b) Reformatsky reaction
(c) Gattermann's reaction (d) Reduction

28. Which of the following reactions of glucose can be explained only by its cyclic structure?
(a) Glucose forms pentaacetate
(b) Glucose reacts with hydroxylamine to form an oxime
(c) Pentaacetate of glucose does not react with hydroxylamine
(d) Glucose is oxidised by nitric acid to gluconic acid

29. Which is the least stable form of glucose ?
(a) α-D-Glucose (b) β-D-Glucose
(c) Open chain structure (d) All are equally stable

30. Isomerization of glucose produces
(a) galactose (b) fructose
(c) mannose (d) allose

31. A solution of D-glucose in water rotates the plane polarised light
(a) to the right (b) to the left
(c) to either side (d) None of these

32. The number of chiral carbon atoms present in cyclic structure α-D(+) glucose
(a) 3 (b) 4
(c) 5 (d) 6

33. The α-D glucose and β-D glucose differ from each other due to difference in carbon atom with respect to its
(a) conformation (b) configuration
(c) number of OH groups (d) size of hemiacetal ring

34. The two forms of D–glucopyranose obtained from the solution of D–glucose are called
(a) isomers (b) anomers
(c) epimers (d) enantiomers

35. Which of the following carbohydrates are branched polymer of glucose?
(i) Amylose (ii) Amylopectin
(iii) Cellulose (iv) Glycogen
(a) (i) and (ii) (b) (ii) and (iv)
(c) (iii) and (iv) (d) (i), (ii) and (iii)

36. The number of chiral carbon atoms present in cyclic structure α-D(+) glucose
(a) 3 (b) 4
(c) 6 (d) 5

37. Which of the following reagent cannot distinguish between glucose and fructose?
(a) Fehling's solution (b) Tollen's reagent
(c) Benedict's solution (d) All of these

38. Maltose and glucose are
(a) oxidising sugar
(b) reducing sugar
(c) first is oxidising and second is reducing sugar
(d) both are non-reducing sugar

39. Choose the correct relationship for glucose and fructose
(a) these are functional isomers
(b) these are chain isomers
(c) these are position isomers
(d) All of these

40. The pair of compounds in which both the compounds give positive test with Tollen's reagent is
(a) Glucose and Sucrose
(b) Fructose and Sucrose
(c) Acetophenone and Hexanal
(d) Glucose and Fructose

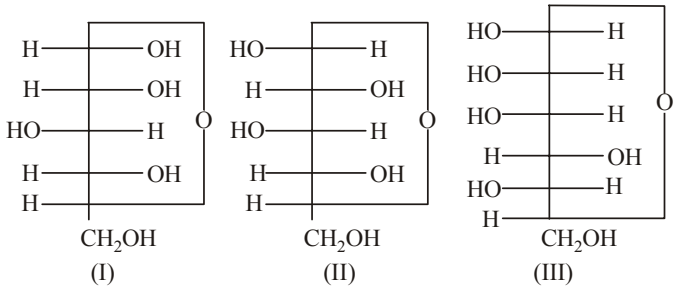
41. The letter D and L in carbohydrates represent
(a) its optical rotation (b) its mutarotation
(c) its direct synthesis (d) its configuration

42. Which of the following statement is correct about fructose?
(a) It is dextrorotatory compound
(b) It exists in the two cyclic forms which is obtained by the addition of OH at C-5 to the >C=O group
(c) It exists as six membered ring
(d) It is named as furanose as it contain one oxygen and six carbon atom

43. Fructose is
(a) a hemiacetal (b) an acetal
(c) a hemiketal (d) a ketal

44. The sugar present in fruits is
(a) fructose (b) glucose
(c) sucrose (d) galactose

45. Three cyclic structures of monosaccharides are given below which of these are anomers



(a) I and II (b) II and III
(c) I and III (d) III is anomer of I and II

46. The sugar present in honey is
(a) sucrose (b) glucose
(c) fructose (d) maltose

47. Which of the following is the sweetest sugar?
(a) Sucrose (b) Glucose
(c) Fructose (d) Maltose

48. Cellulose is a polymer of
(a) Glucose (b) Fructose
(c) Ribose (d) Sucrose

49. Sucrose on hydrolysis gives
(a) fructose+ribose (b) glucose + fructose
(c) glucose+glucose (d) fructose + fructose

50. The presence or absence of hydroxyl group on which carbon atom of sugar differentiates RNA and DNA?
(a) 1^{st} (b) 2^{nd}
(c) 3^{rd} (d) 4^{th}

51. Carbohydrates are stored in the body as
(a) sugars (b) starch
(c) glucose (d) glycogen

52. A carbohydrate insoluble in water is
(a) glucose (b) fructose
(c) cellulose (d) sucrose

53. Which of the following carbohydrate does not correspond to the general formula $C_x(H_2O)_y$?
(a) Glucose (b) 2-Deoxyribose
(c) Fructose (d) Arabinose

54. Lactose is made of
(a) α-D-glucose only
(b) α-D-glucose and β-D-glucose
(c) α-D-galactose and β-D-glucose
(d) β-D-galactose and β-D-glucose

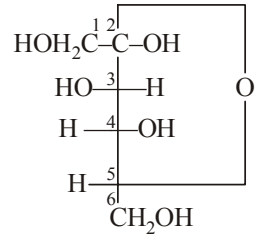
55. Which of the following monosaccharides are present as five membered cyclic structure (furanose structure)?
(i) Ribose (ii) Glucose
(iii) Fructose (iv) Galactose
(a) (i) and (ii) (b) (i) and (iii)
(c) (iii) and (iv) (d) (ii) and (iii)

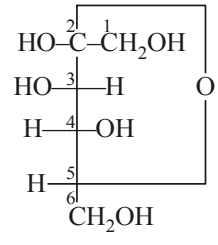
56. Invert sugar is
(a) chemically inactive form of sugar
(b) equimolecular mixture of glucose and fructose
(c) mixture of glucose and sucrose
(d) a variety of cane sugar

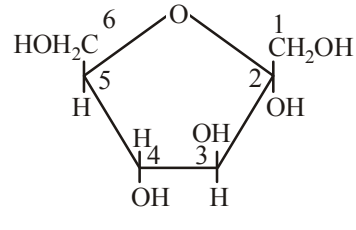
57. Which one of the following does not exhibit the phenomenon of mutarotation ?
(a) (+) – Sucrose (b) (+) – Lactose
(c) (+) – Maltose (d) (–) – Fructose

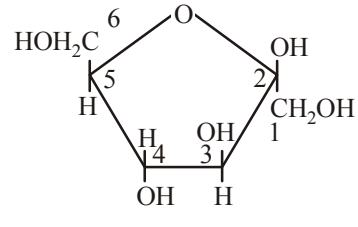
58. Glycogen is a branched chain polymer of α-D-glucose units in which chain is formed by C1–C4 glycosidic linkage whereas branching occurs by the formation of C1-C6 glycosidic linkage. Structure of glycogen is similar to _____.
(a) Amylose (b) Amylopectin
(c) Cellulose (d) Glucose

59. Which of the following correctly represents the cyclic structure of β–D–(–)– fructo furanose.

(a)


(b)


(c)


(d)


60. Sucrose which is dextrorotatory in nature after hydrolysis gives glucose and fructose, among which
(i) Glucose is laevorotatory and fructose is dextrorotatory.
(ii) Glucose is dextrorotatory and fructose is laevorotatory
(iii) The mixture is laevorotatory.
(iv) Both are dextrorotatory.
(a) (i) and (iii) (b) (ii) and (iii)
(b) (iii) and (iv) (d) (iii) only

61. Chemically amylose is a _____ with 200–1000 α-D-(+)-glucose units held by _____ glycosidic linkage
(a) long unbranched chain, C1– C6.
(b) branched chain, C1 – C4.
(c) long unbranched chain, C1– C4.
(d) branched chain, C1– C6.

62. Amylopectin is a _____ polymer of α-D-glucose units in which chain is formed by _____ glycosidic linkage whereas branching occurs by _____ glycosidic linkage.
(a) branched chain, C1– C6, C1– C4.
(b) branched chain, C1– C4, C1– C6.
(c) unbranched chain, C1– C4, C1– C6.
(d) unbranched chain, C1– C6, C1– C4.

63. Which of the following is incorrect about cellulose?
(a) It is a major constituent of cell wall of plant cells.
(b) It is a branched chain disaccharide
(c) It is composed of only β-D-glucose units.
(d) The glycosidic linkage between two units is found between C1 of one unit and C4 of next unit.

64. Which of the following is also known as animal starch?
(a) Glycine (b) Glycogen
(c) Amylose (d) Cellulose

65. Select the uses of carbohydrates.
(a) Honey is used as instant source of energy by vaids in ayurvedic system of medicine
(b) These are used as storage molecules
(c) They are used in furniture, cotton fibre, lacquers
(d) All of the above

66. The number of essential amino acids in man is
(a) 8 (b) 10
(c) 18 (d) 20

67. An acidic amino acid among the following is
(a) glycine (b) valine
(c) proline (d) leucine

68. Amino acids are the building blocks of
(a) fats (b) proteins
(c) vitamins (d) carbohydrates

69. Which one of the amino acids can be synthesised in the body?
(a) Alanine (b) Lysine
(c) Valine (d) Histidine

70. One of essential α-amino acid is
(a) lysin (b) serine
(c) glycine (d) proline

71. Two functional group that are present in all amino acids are the
(a) hydroxy, amine (b) hydroxy, amide
(c) carboxyl, amino (d) carboxyl, amide

72. Which of the following is not an optically active amino acid?
(a) Valine (b) Glycine
(c) Leucine (d) Arginine

73. In aqueous solution, an amino acid exists as
(a) cation (b) anion
(c) dianion (d) zwitter ion

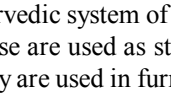
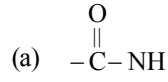
74. Which one of the following statements is correct?
(a) All amino acids except lysine are optically active
(b) All amino acids are optically active
(c) All amino acids except glycine are optically active
(d) All amino acids except glutamic acids are optically active

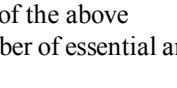
75. Amino acids generally exist in the form of Zwitter ions. This means they contain
(a) basic—NH_2 group and acidic —COOH group
(b) the basic— $\overset{+}{N}H_3$ group and acidic —COO^- group
(c) basic—NH_2 and acidic —H^+ group
(d) basic–COO^- group and acidic — $\overset{+}{N}H_3$ group

76. Which of the following molecules is capable of forming Zwitter ion?
(a) NH_2CH_2COOH (b) $CH_3CH_2NH_2$
(c) CH_3CH_2COOH (d) All of these

77. The structural feature which distinguishes proline from natural α-amino acids?
(a) Proline is optically inactive
(b) Proline contains aromatic group
(c) Proline is a dicarboxylic acid
(d) Proline is a secondary amine

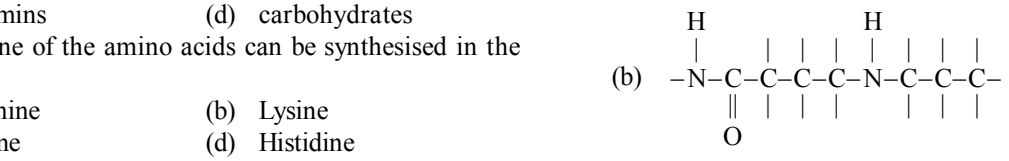
78. The linkage present in proteins and peptides is

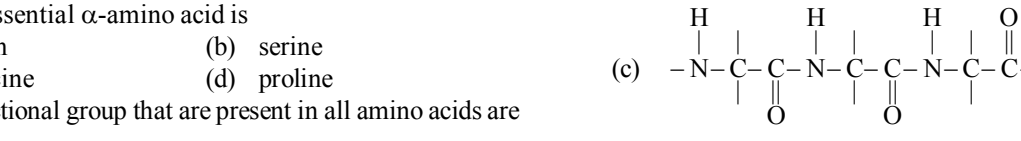
(a)  (b) 

(c)  (d) – NH –

79. Which one of the following structures represents the peptide chain?

(a) 

(b) 

(c) 

(d) 

80. Simplest proteins has one peptide linkage. It is
(a) tripeptide (b) dipeptide
(c) tetrapeptide (d) oligopeptide

81. A nanopeptide contain how many peptide bond
(a) 7 (b) 9
(c) 8 (d) 10

82. Proteins are polypeptide of
(a) β-amino acid (b) α-hydroxy acid
(c) D-α-amino acid (d) L-α-amino acid

83. Globular proteins are present in
(a) blood (b) eggs
(c) milk (d) all of these

84. In fibrous proteins, polypeptide chains are held together by
(a) van der waals forces
(b) electrostatic forces of attraction
(c) hydrogen bonds
(d) covalent bonds

85. Which of the following is not a function of proteins?
(a) Formation of hair, wool, skin and nails
(b) As a biological catalysts in the form of enzymes.
(c) As food in the form of meat, eggs
(d) As energy provider for metabolism

86. Which of the following is not a fibrous protein?
(a) Keratin (b) Myosin
(c) Insulin (d) Both (a) and (b)

87. A polypeptide with more than hundred amino acid residues, having molecular mass higher than 10,000 u is called_____.
(a) nucleic acid (b) hormone
(c) protein (d) enzyme

88. An insulin is a _____ which contains _____ amino acids.
(a) protein, 74 (b) protein, 51
(c) hormone, 51 (d) hormone, 74

89. Which of the following is an example of globular proteins?
(a) Glycine (b) Albumin
(c) Alanine (d) Both (a) and (b)

90. Which of the following is not a characteristics of fibrous proteins?
(a) In the fibrous proteins polypeptide chains are held together by hydrogen and disulphide bonds.
(b) These have fibre like structure.
(c) These are generally soluble in water.
(d) These have elongated shape.

91. Which of the following statements is true about a peptide bond (RCONHR)?
(a) It is non planar.
(b) It is capable of forming a hydrogen bond.
(c) The *cis* configuration is favoured over the *trans* configuration.
(d) Single bond rotation is permitted between nitrogen and the carbonyl group.

92. Proteins are condensation polymers of
(a) α-amino acids (b) β-amino acids
(c) α-hydroxy acids (d) β-hydroxy acids

93. Primary structure of a protein is
(a) sequence in which α-amino acid are linked to one another
(b) sequence in which amino acids of one polypeptide chain are joined to other chain
(c) the folding patterns of polypeptide chains
(d) the pattern in which the polypeptide chain are arranged

94. The protein that transport oxygen in the blood stream is
(a) haemoglobin (b) insulin
(c) collagen (d) albumin

95. The helical structure of protein is stabilized by
(a) dipeptide bonds (b) hydrogen bonds
(c) ether bonds (d) peptide bonds

96. Which of the following statements is incorrect?
(a) In α-helix structure a polypeptide chain forms all possible hydrogen bonds by twisting into a right handed screw.
(b) In β-structure of proteins all peptide chains are stretched out to nearly maximum extension.
(c) During denaturation 1° and 2° structures are destroyed but 3° structure remains intact.
(d) All the above statements are incorrect.

97. Which of the following indicates the order in which amino acids are linked together in a protein ?
(a) Primary structure (b) Secondary structure
(c) Tertiary structure (d) Quaternary structure

98. Which of the following statement is not true about secondary structure of protein ?
(a) The alpha helix, beta pleated sheet and beta turns are examples of secondary structure of protein.
(b) The ability of peptide bonds to form intramolecular hydrogen bonds is important to secondary structure.
(c) The steric influence of amino acid residues is important to secondary structure.
(d) The hydrophilic/ hydrophobic character of amino acid residues is important to secondary structure.

99. Which of the following terms indicates to the arrangement of different protein subunits in a multiprotein complex ?
(a) primary structure (b) secondary structure
(c) tertiary structure (d) quaternary structure

100. Secondary structure of protein is mainly governed by
(a) hydrogen bonds (b) covalent bonds
(c) ionic bonds (d) disulphide bonds

101. The secondary structure of a protein refers to
(a) fixed configuration of the polypeptide backbone
(b) α – helical backbone
(c) hydrophobic interactions
(d) sequence of α – amino acids

102. Tertiary structure of protein arises due to
(a) folding of polypeptide chain
(b) folding, coiling and bonding of polypeptide chain
(c) linear sequence of amino acid in polypeptide chain
(d) denatured proteins

103. Denaturation of proteins leads to loss of its biological activity by
(a) Formation of amino acids
(b) Loss of primary structure
(c) Loss of both primary and secondary structures
(d) Loss of both secondary and tertiary structures

104. Coagulation of protein is known as
(a) dehydration (b) decay
(c) deamination (d) denaturing

105. Which of the following terms refers to the overall three dimensional shape of a protein.
(a) Primary structure (b) Secondary structure
(c) Tertiary structure (d) Quaternary structure

106. Which of the following indicates to 'regions of ordered structure within a protein'.
(a) Primary structure (b) Secondary structure
(c) Tertiary structure (d) Quaternary structure

107. The strongest form of intermolecular bonding that could be formed involving the residue of the amino acid serine is.
(a) ionic bond
(b) hydrogen bond
(c) van der Waals interactions
(d) None of the above

108. Which of the following protein destroy the antigen when it enters in body cell?
(a) Antibodies (b) Insulin
(c) Chromoprotein (d) Phosphoprotein

109. Which of the following is incorrect regarding enzymes?
(a) Most of them are globular proteins.
(b) They are very specific for a particular reaction but not for a particular substrate.
(c) They are generally named after the compound or class of compounds upon which they work.
(d) All the above statements are incorrect.

110. Enzymes take part in a reaction and
(a) decrease the rate of a chemical reaction
(b) increase the rate of a chemical reaction
(c) both (a) and (b)
(d) None of these

111. Enzymes are made up of
(a) Edible proteins
(b) Proteins with specific structure
(c) Nitrogen containing carbohydrates
(d) Carbohydrates

112. The enzyme which hydrolyses triglycerides to fatty acids and glycerol is called
(a) Maltase (b) Lipase
(c) Zymase (d) Pepsin

113. Which one of the following, statements is incorrect about enzyme catalysis?
(a) Enzymes are mostly proteinous in nature.
(b) Enzyme action is specific.
(c) Enzymes are denaturated by ultraviolet rays and at high temperature.
(d) Enzymes are least reactive at optimum temperature.

114. Insulin production and its action in human body are responsible for the level of diabetes. This compound belongs to which of the following categories?
(a) An enzyme (b) A hormone
(c) A co-enzyme (d) An antibiotic

115. Enzymes are essential as biocatalysts. They function in
(a) aqueous medium, temp = 30–35ºC; pH=7
(b) organic medium
(c) aqueous medium under extreme pH conditions
(d) None of these

116. Which of the following statements is incorrect?
(a) Enzymes are organic catalysts
(b) Enzymes have a very large turnover number
(c) Enzymes action is specific
(d) Enzymes always require a coenzyme in their catalytic action.

117. Among the following vitamins the one whose deficiency causes rickets (bone deficiency) is :
(a) Vitamin A (b) Vitamin B
(c) Vitamin D (d) Vitamin C

118. The vitamin that is not soluble in water is
(a) Vitamin B_1 (b) Vitamin B_2
(c) Vitamin B_6 (d) Vitamin D

119. Deficiency of vitamin B_1 causes the disease
(a) Convulsions (b) Beri-Beri
(c) Cheilosis (d) Sterility

120. Anaemia is caused by the deficiency of vitamin
(a) B_6 (b) B_1
(c) B_2 (d) B_{12}

121. Vegetable oils like wheat gram oil, sunflower oil etc. are the good source of
(a) vitamin K (b) vitamin E
(c) vitamin D (d) vitamin A

122. Which is a fat soluble vitamin?
(a) Vitamin A (b) Vitamin B_6
(c) Vitamin C (d) Vitamin B_2

123. Vitamin B_2, a water soluble vitamin is also known as
(a) ascorbic acid (b) riboflavin
(c) thiamine (d) pyridoxine

124. Which of the following statements about vitamin B_{12} is incorrect ?
(a) It has a cobalt atom
(b) It also occurs in plants
(c) It is also present in rain water
(d) It is needed for human body in very small amounts

125. The couplings between base units of DNA is through :
(a) Hydrogen bonding (b) Electrostatic bonding
(c) Covalent bonding (d) van der Waals forces

126. Which of the following is correct about H-bonding in nucleotide?
(a) A --- A and T --- T (b) G --- T and A --- C
(c) A --- G and T --- C (d) A --- T and G --- C

127. In DNA, the complimentary bases are:
(a) Adenine and thymine; guanine and cytosine
(b) Adenine and thymine ; guanine and uracil
(c) Adenine and guanine; thymine and cytosine
(d) Uracil and adenine; cytosine and guanine

128. The segment of DNA which acts as the instrumental manual for the synthesis of the protein is:
(a) ribose (b) gene
(c) nucleoside (d) nucleotide

129. In DNA the linkages between different nitrogenous bases are :
(a) peptide linkage (b) phosphate linkage
(c) H-bonding (d) glycosidic linkage

130. DNA multiplication is called as
(a) translation (b) transduction
(c) transcription (d) replication

131. Chromosomes are made from
(a) proteins
(b) nucleic acids
(c) proteins and nucleic acids
(d) carbohydrates and nucleic acids

132. The double helical structure of DNA was proposed by
(a) Watson and Crick (b) Meichers
(c) Emil Fischer (d) Khorana

133. α - Helix is found in
(a) DNA (b) RNA
(c) lipid (d) carbohydrates

134. Which of the following compounds is responsible for the transmission of heredity characters?
(a) RNA (b) DNA
(c) Glucose (d) Haemoglobin

135. The latest discovery in cytology is that of
(a) respiration (b) genetic code
(c) enzyme (d) None of these

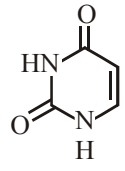
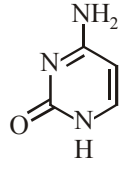
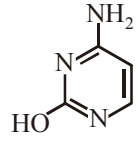
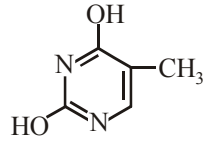
136. Energy is stored in our body in the form of
(a) ATP (b) ADP
(c) fats (d) carbohydrates

137. The chemical change in DNA molecule that could lead to synthesis of protein with an altered amino acid sequence is called
(a) replication (b) lipid formation
(c) cellular membrane (d) mutation

138. DNA has deoxyribose, a base and the third component which is
(a) phosphoric acid (b) ribose
(c) adenine (d) thymine

139. The process by which synthesis of protein takes place based on the genetic information present in m-RNA is called
(a) Translation (b) Transcription
(c) Replication (d) Messenger hypothesis

140. Which of the following structures represents thymine ?

(a) 
(b) 
(c) 
(d) 

141. When adenine is attached to ribose sugar, it is called adenosine. To make a nucleotide from it, it would require
(a) oxygenation (b) addition of a base
(c) addition of phosphate (d) hydrogenation

142. Which of the following is not present in a nucleotide?
(a) Guanine (b) Cytosine
(c) Adenine (d) Tyrosine

143. The function of DNA in an organism is
(a) to assist in the synthesis of RNA molecule
(b) to store information of heredity characteristics
(c) to assist in the synthesis of proteins and polypeptides
(d) All of these

144. Which of the following statements regarding DNA fingerprinting is incorrect?
(a) It is used in forensic laboratories for identification of criminals.
(b) It cannot be altered by surgery.
(c) It is different for every cell and cannot be altered by any known treatment.
(d) It is used to determine paternity of an individual.

STATEMENT TYPE QUESTIONS

145. Read the following statements and choose the correct answer?
(i) All monosaccharides are reducing sugars.
(ii) All monosaccharides are not reducing sugars.
(iii) In disaccharides if aldehydic or ketonic groups are bonded, these are non– reducing sugars.
(iv) In disaccharides if aldehydic or ketonic groups are free, these are reducing sugars.
(a) (i), (iii) and (iv) (b) (ii), (iii) and (iv)
(c) (i) and (iv) (d) (ii) and (iv)

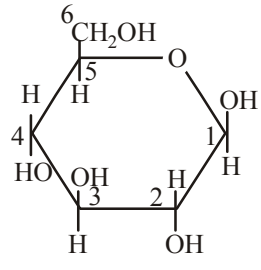
146. Which of the following statement(s) is/are correct?
(i) Glucose is reducing sugar
(ii) Sucrose is reducing sugar
(iii) Maltose is non reducing sugar
(iv) Lactose is reducing sugar
(a) (i) and (ii) only (b) (i) and (iii) only
(c) (i) and (iv) only (d) All of these

147. Which of the following statements regarding carbohydrates are correct?
(i) Lactose is the carbohydrate found in milk.
(ii) More than 25 monosaccharides occur naturally.
(iii) Sucrose on hydrolysis gives one molecule each of glucose and fructose.
(iv) Maltose is a non-reducing sugar whereas sucrose is a reducing disaccharide sugar.
(a) (i), (ii) and (iii) (b) (i) and (iii)
(c) (ii), (iii) and (iv) (d) (iii) and (iv)

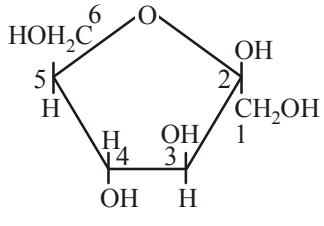
148. Read the following statements.
(i) Pyran is a cyclic organic compound with one oxygen atom and five carbon atom.
(ii) The cyclic structure of glucose is correctly represented by Haworth strucure.
(iii) Five membered cyclic structure of glucose is called pyranose structure.
Which of the following statement(s) is/are true?
(a) (i) and (iii) (b) (i) and (ii)
(c) Only (iii) (d) (i), (ii) and (iii)

149. Consider the following statements.
(i) Linkage between two monosaccharide units through oxygen atom is called glycosidic linkage.
(ii) Sucrose on hydrolysis gives an equimolar mixture of fructose and glucose which is dextrorotatory.
(iii) Lactose consists of linkage between C_1 of galactose and C_4 of glucose.
(iv) Out of two components of starch the component present in greater proportion is insoluble in water.
(v) Glycogen is also known as animal starch because it is structurally similar to amylose a component of starch.
Which of the following is the correct code for statements above?
(a) FFFTT (b) FTTTF
(c) TFTFT (d) TFTTF

150. Read the following statements.
(i) Haworth structure of α–D– glucose will be .



(ii) Fructose belongs to D–series and is a laevorotatory compound.
(iii) Haworth structure for β–D–fructose will be.



(iv) Fructose contains a ketonic functional group at C–2 carbon atom.
Which of the following is the correct code for the statements above?
(a) FTTT (b) FFTT
(c) TFFT (d) FTFT

151. Read the following statements and choose the correct–option?
(i) Starch is a polymer of α – glucose.
(ii) Starch consists of amylose and amylopectin.
(iii) Amylose is insoluble in water.
(iv) Amylopectin is soluble in water.
(a) (i) (iii) and (iv) (b) (i), (ii) and (iii)
(c) (i) and (ii) (d) (iii) and (iv)

152. Which among the following statements are true for glycine?
(i) It exists in crystalline form
(ii) It is optically active
(iii) It is soluble in water
(iv) It can form Zwitter ions
(a) (i), (ii) and (iii) (b) (i), (ii) and (iv)
(c) (i), (iii) and (iv) (d) (ii), (iii) and (iv)

153. Which of the following statements are correct?
(i) Proteins on hydrolysis gives only α-amino acids.
(ii) Gln stands for glutamic acid.
(iii) Amino acids with equal number of amino and carboxyl groups are neutral.
(iv) All naturally occuring α-amino acids are optically active.
(a) (i) and (iii) (b) (i), (ii) and (iv)
(c) (iii) and (iv) (d) (ii), (iii) and (iv)

154. Which of the statements about "Denaturation" given below are correct ?
(i) Denaturation of proteins causes loss of secondary and tertiary structures of the protein.
(ii) Denaturation leads to the conversion of double strand of DNA into single strand
(iii) Denaturation affects primary strucrture which gets distorted
(a) (ii) and (iii) (b) (i) and (iii)
(c) (i) and (ii) (d) (i), (ii) and (iii)

155. Of the following statements about enzymes which ones are true?
(i) Enzymes lack in nucleophilic groups
(ii) Enzymes are highly specific both in binding chiral substrates and in catalysing their reactions
(iii) Enzymes catalyse chemical reactions by lowering the energy of activation
(iv) Pepsin is a proteolytic enzyme
(a) (i) and (iv) (b) (i) and (iii)
(c) (ii), (iii) and (iv) (d) (i)

156. Which of the following statements are correct ?
(i) Vitamins A, D, E and K are insoluble in water.
(ii) Vitamins A, D, E and K are stored in liver and adipose tissues.
(iii) Vitamin B and vitamin C are water soluble.
(iv) Water soluble vitamins should not be supplied regularly in diet.
(a) (i), (ii) and (iv) (b) (i), (ii) and (iii)
(c) (i) and (iv) (d) (ii) and (iv)

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

(i) Information regarding the sequence of nucleotides in the chain of a nucleic acid is called its primary structure.

(ii) In secondary structure of DNA adenine forms hydrogen bonds with guanine whereas cytosine forms hydrogen bonds with thymine.

(iii) RNA molecules are of three types m-RNA, r-RNA and t-RNA and they all perform different functions.

(a) (ii) only (b) (i) and (iii)

(c) (ii) and (iii) (d) (iii) only

158. Consider the following statements.

(i) Nucleic acids are long chain polymers of nucleotides.

(ii) Sugar moiety in DNA molecules is β-D-ribose whereas in RNA molecules it is β-D-2-deoxyribose.

(iii) RNA contains four bases viz. adenine (A), guanine (G), cytosine (C) and uracil (U)

(iv) Nucleotide is a nucleoside linked to phosphoric acid at 4 – position of sugar moiety.

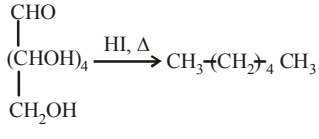
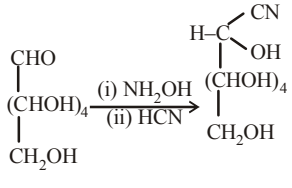
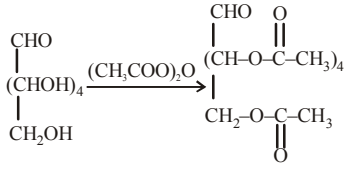
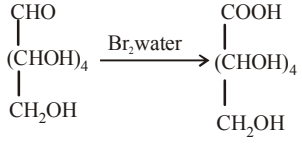
Which of the following is the correct code for the statements above?

(a) TFFT (b) TFTF

(c) FFTT (d) FTFF

MATCHING TYPE QUESTIONS

159. Match the columns.

Column - I Reaction of glucose	**Column - II Characteristic of glucose molecule**
(A) 	(p) Presence of $>C=O$ group
(B) 	(q) Presence of aldehydic group
(C) 	(r) All six carbon atoms are linked in a straight chain.
(D) 	(s) Presence of five —OH groups

(a) A – (p), B – (r), C – (s), D – (q)

(b) A – (r), B – (s), C – (p), D – (q)

(c) A – (r), B – (p), C – (s), D – (q)

(d) A – (r), B – (p), C – (q), D – (s)

160. Match the columns

Column - I (Enzymes)	**Column - II (Reactions)**
(A) Invertase	(p) Decomposition of urea into NH_3 and CO_2
(B) Maltase	(q) Conversion of glucose into ethyl alcohol
(C) Pepsin	(r) Hydrolysis of maltose into glucose
(D) Urease	(s) Hydrolysis of cane sugar
(E) Zymase	(t) Hydrolysis of proteins into peptides

(a) A – (s), B – (r), C – (t), D – (p), E – (q)

(b) A – (r), B – (q), C – (s), D – (p), E – (t)

(c) A – (q), B – (p), C – (r), D – (s), E – (t)

(d) A – (s), B – (p), C – (t), D – (q), E – (r)

161. Match the columns

Column - I	**Column - II**
(A) Vitamin B6	(p) Fat soluble
(B) Vitamin K	(q) Xerophthalmia
(C) Vitamin D	(r) Convulsions
(D) Vitamin A	(s) Delayed blood clotting

(a) A – (p,q), B – (p,s), C – (p), D – (r)

(b) A – (r), B – (p,s), C – (p), D – (p, q)

(c) A – (p,s), B – (r), C – (p), D – (p,q)

(d) A – (r), B – (p,s), C – (p,q), D – (p)

162. Match the columns

Column - I	**Column - II**
(A) Vitamin A	(p) Scurvy
(B) Vitamin B_{12}	(q) Hemorrhagic condition
(C) Vitamin C	(r) Sterility
(D) Vitamin E	(s) Xerophthalmia
(E) Vitamin K	(t) Pernicious anaemia

(a) A – (t), B – (s), C – (p), D – (r), E – (r)

(b) A – (s), B – (t), C – (p), D – (q), E – (r)

(c) A – (s), B – (t), C – (p), D – (r), E – (q)

(d) A – (t), B – (s), C – (p), D – (r), E – (q)

ASSERTION-REASON TYPE QUESTIONS

Directions : Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.

(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion

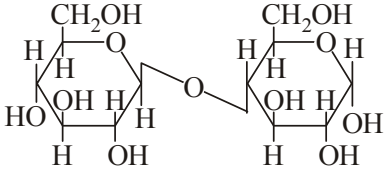
(c) Assertion is correct, reason is incorrect

(d) Assertion is incorrect, reason is correct.

163. Assertion : D(+)– Glucose is dextrorotatory in nature.
Reason : 'D' represents its dextrorotatory nature.

164. Assertion : Sucrose is called an invert sugar.
Reason : On hydrolysis, sucrose bring the change in the sign of rotation from dextro (+) to laevo(–).

165. Assertion : β-glycosidic linkage is present in maltose,



Reason : Maltose is composed of two glucose units in which C–1 of one glucose unit is linked to C–4 of another glucose unit.

166. Assertion : At isoelectric point, the amino group does not migrate under the influence of electric field.
Reason : At isoelectric point, amino acid exists as a zwitterion.

167. Assertion : Vitamin D cannot be stored in our body
Reason : Vitamin D is fat soluble vitamin and is excreted from the body in urine.

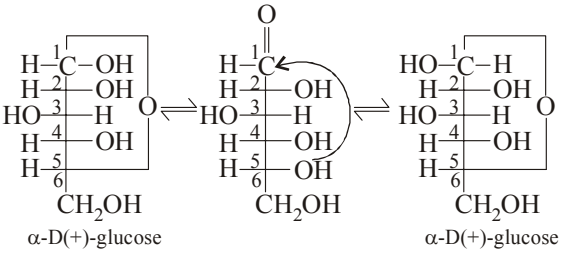
CRITICAL THINKING TYPE QUESTIONS

168. Which one of the following is the reagent used to identify glucose?
(a) Neutral ferric chloride
(b) Chloroform and alcoholic KOH
(c) Ammoniacal silver nitrate
(d) Sodium ethoxide

169. Glucose molecule reacts with 'X' number of molecules of phenylhydrazine to yield osazone. The value of 'X' is
(a) four (b) one
(c) two (d) three

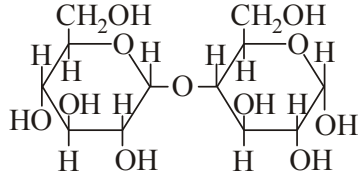
170. In the acetylation of glucose, which group is involved in the reaction
(a) CHO group (b) >C = O group
(c) alcoholic OH group (d) all of these

171. Select the false statement about the cyclic glucose.
(a) If the OH group is added to CHO group it will form cyclic hemiacetal structure
(b) Glucose form six-membered ring in which –OH is at C–5 position
(c) Melting point of α-glucose is 423 K and of β-glucose is 419 K
(d)

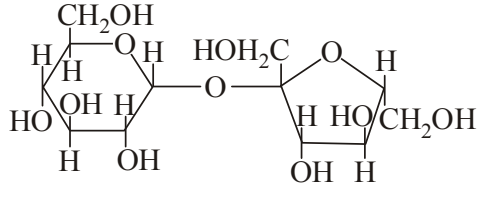


172. When α-D-glucose and β-D-glucose are dissolved in water in two separate beakers I and II respectively and allowed to stand, then –
(a) specific rotation in beaker I will decrease while in II will increase upto a constant value
(b) the specific rotation of equilibrium mixture in two beakers will be different
(c) the equilibrium mixture in both beakers will be leavorotatory
(d) the equilibrium mixture in both beakers will contain only cyclic form of glucose

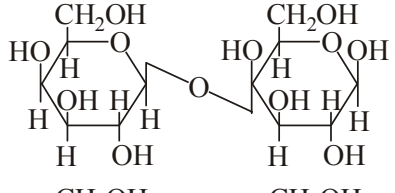
173. In disaccharides, if the reducing groups of monosaccharides *i.e.*, aldehydic or ketonic groups are bonded, these are non-reducing sugars. Which of the following disaccharide is a non-reducing sugar?
(a)



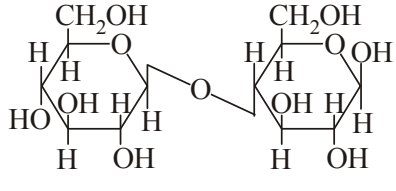
(b)



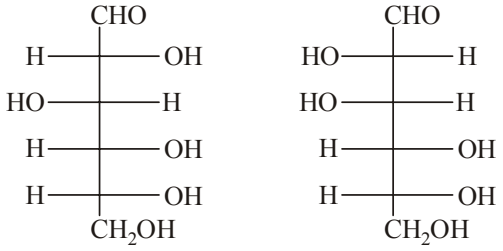
(c)

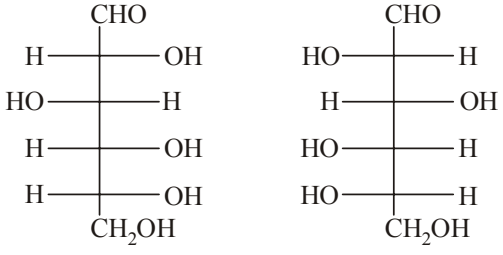


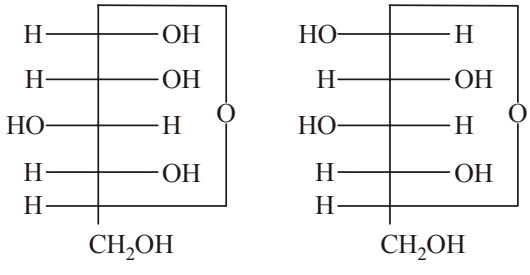
(d)

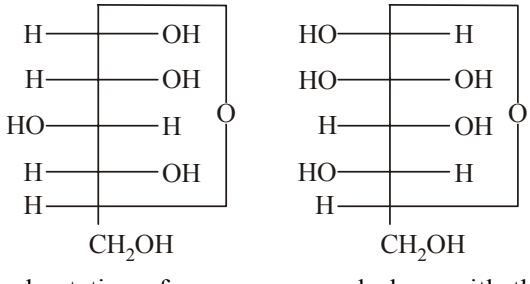


174. Which of the following pairs represents anomers?

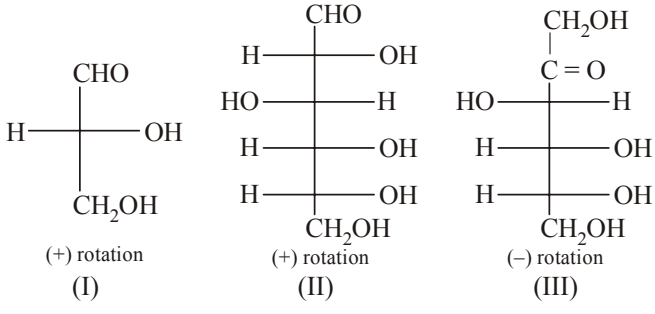
(a)


(b)


(c)


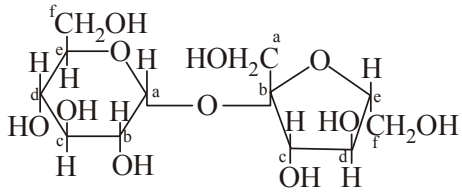
(d)


175. Optical rotation of some compound along with their structures are given below which of them have D configuration.



(a) I, II, III (b) II, III
(c) I, II (d) III

176. Structure of a disaccharide formed by glucose and fructose is given below. Identify anomeric carbon atoms in monosaccharide units.



(a) 'a' carbon of glucose and 'a' carbon of fructose.
(b) 'a' carbon of glucose and 'e' carbon of fructose.
(c) 'a' carbon of glucose and 'b' carbon of fructose.
(d) 'f' carbon of glucose and 'f' carbon of fructose.

177. Cyclic structure of fructose resembles with
(a) pyran (b) furan
(c) pyridine (d) oxiran

178. Sucrose in water is dextro-rotatory, $[\alpha]_D = +66.4^\circ$. When boiled with dilute HCl, the solution becomes leavo-rotatory, $[\alpha]_D = -20^\circ$. In this process the sucrose molecule breaks into
(a) L-glucose + D-fructose
(b) L-glucose + L-fructose
(c) D-glucose + D-fructose
(d) D-glucose + L-fructose

179. Which one of the following statements is not true regarding (+) Lactose ?
(a) On hydrolysis (+) Lactose gives equal amount of D(+) glucose and D(+) galactose.
(b) (+) Lactose is a β-glycoside formed by the union of a molecule of D(+) glucose and a molecule of D(+) galactose.
(c) (+) Lactose is a reducing sugar and does not exhibit mutarotation.
(d) (+) Lactose, $C_{12}H_{22}O_{11}$ contains 8-OH groups.

180. Which one of the following sets of monosaccharides forms sucrose?
(a) α–D-Galactopyranose and α–D-Glucopyranose
(b) α–D-Glucopyranose and β–D-Fructofuranose
(c) β–D-Glucopyranose and α–D- Fructofuranose
(d) α–D-Glucopyranose and β–D-Fructopyranose

181. Which of the following statements is correct?
(a) Only the compounds following general formula $C_x(H_2O)_y$ are carbohydrates.
(b) Acetic acid (CH_3COOH) having general formula $C_2(H_2O)_2$ falls in this category.
(c) Rhamnose having formula $C_6H_{12}O_5$ is a carbohydrate. Though this is not according to general formula of carbohydrates.
(d) Chemically the carbohydrates may be defined as optically inactive polyhydroxy aldehydes or ketones.

182. The strongest form of intermolecular bonding that could be formed involving the residue of the amino acid valine is
(a) ionic bond
(b) hydrogen bond
(c) van der Waals interactions
(d) none of the above

183. Which functional group participates in disulphide bond formation in proteins?

(a) Thioester (b) Thioether

(c) Thiol (d) Thiolactone

184. Glycosidic linkage is actually an

(a) Carbonyl bond (b) Ether bond

(c) Ester bond (d) Amide bond

185. For $-\overset{\overset{O}{\|}}{C}-\ddot{N}H-$ (peptide bond)

Which statement is incorrect about peptide bond?

(a) C — N bond length in proteins is longer than usual bond length of the C — N bond

(b) Spectroscopic analysis shows planar structure of the

$$-\overset{\overset{O}{\|}}{C}-NH-\text{ group}$$

(c) C — N bond length in proteins is smaller than usual bond length of the C—N bond

(d) None of the above

186. The function of enzymes in the living system is to

(a) transport oxygen

(b) provide energy

(c) provide immunity

(d) catalyse biochemical reactions

187. Vitamin C must be supplied regularly in diet because

(a) it is water soluble hence excreted in urine and can't be stored in the body

(b) it is fat soluble hence stored in the body and cannot be used on regular basis

(c) it is required in a large amount by the body hence supplied regularly

(d) it is water soluble hence used by the body on daily basis and is to be supplied regularly.

188. In both DNA and RNA, heterocylic base and phosphate ester linkages are at –

(a) C_5' and C_1' respectively of the sugar molecule

(b) C_1' and C_5' respectively of the sugar molecule

(c) C_2' and C_5' respectively of the sugar molecule

(d) C_5' and C_2' respectively of the sugar molecule

HINTS AND SOLUTIONS

FACT/DEFINITION TYPE QUESTIONS

1. (c) Carbohydrates, proteins and fats are biomolecules.

2. (a) Lactose is a disaccharide.

3. (c) It is found in the milk of all animals and imparts sweetness to milk (hence named milk sugar).

4. (d) The disaccharides are sugars which on hydrolysis give two moles of the same or different monosaccharides. Sucrose, maltose and lactose ($C_{12}H_{22}O_{11}$) are the common examples.

5. (c) Aldo-(keto) pentoses having 5 carbon
Aldo-(keto) hexoses having 6 carbon
is an example of Pentose Sugar, arabinose (aldopentose) glucose, galactose and fructose are important examples of hexose sugar.

6. (d) The most common disaccharide, Lactose has the molecular formula $C_{12}H_{22}O_{11}$.

7. (a) **8. (d)**

9. (d) Monosaccharides cannot be hydrolysed to simpler molecules.

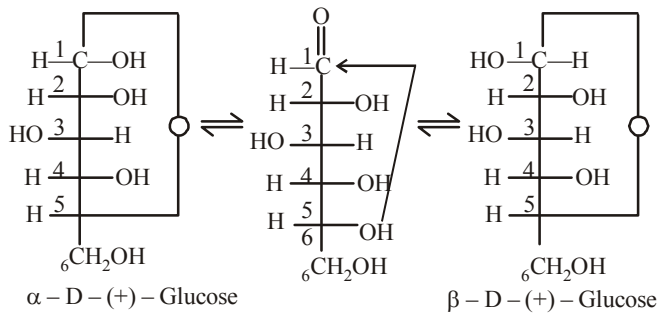
10. (b) Sucrose is an oligosaccharide and cellulose is a polysaccharide.

11. (c) All those carbohydrates which reduce Fehling's solution and Tollens' reagent are referred to as reducing sugars.

12. (a) Glucose ($C_6H_{12}O_6$) is the simplest molecule which is monosaccharide while others are polysaccharides which on hydrolysis give monosaccharides.
Option (a) is correct.

13. (d) Glucose is aldohexose. Glucose is a monosaccharide, i.e. it can not be hydrolysed further to simple sugars. Oligosaccharides on hydrolysis give 2-10 molecules of monosaccharides.

14. (b) To explain the properties which can not be explained by open chain structure of glucose it was proposed that one of the –OH groups may add to the –CHO group and form a cyclic hemiacetal structure as shown below.



15. (c) Glucose contain aldehyde group. Hence it give positive Fehling solution test.

16. (d) It is the most abundant organic compound on earth.

17. (d) Tollen's reagent is reduced by glucose due to aldehydic group and gives grey colour as silver metal.

18. (b) The letter 'D' or 'L' before the name of any compound indicate the relative configuration of a particular stereoisomer.

19. (a) **20. (a)**

21. (d) Glucose is a monosaccharide, others are disaccharides. Sucrose is a combination of glucose and fructose. Maltose is a combination of two glucose units. Lactose (or milk sugar) is a combination of glucose and galactose (a hexose sugar).

22. (c) Glucose is considered as a typical carbohydrate which contains –CHO and –OH group.

23. (a) Glucose contains an aldehyde group. It is oxidised into acidic group by bromine water and gluconic acid is formed

$$CH_2OH-(CHOH)_4-CHO \xrightarrow{(O)} CH_2OH-(CHOH)_4-COOH$$

$$Br_2 + H_2O \longrightarrow 2HBr + O$$

24. (d) Weak reagent like $NaHSO_3$ is unable to open the chain and can't react with glucose. This explains the inability of glucose to form aldehyde bisulphite compound.

25. (c) Glucose has 5 hydroxyl groups, hence it reacts with acetic anhydride to form a penta-acetate

26. (d)

27. (d) Red P + HI is reducing agent.

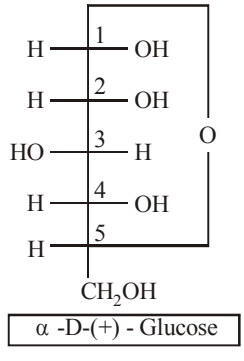
28. (c) Pentaacetate of glucose does not react with hydroxylamine

29. (c) Open chain structure is unstable and converted to cyclic.

30. (b)

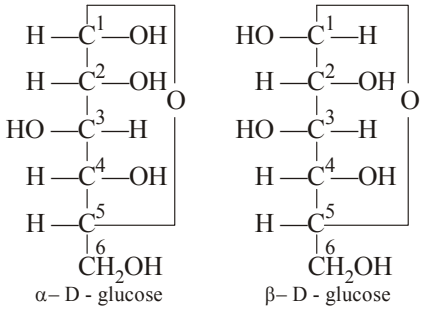
31. (a) Natural glucose is dextrorotatory and thus, glucose is also known as dextrose.

32. (c)



(Fischer formula)

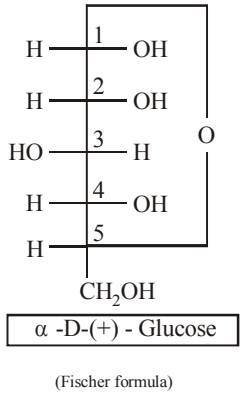
33. (b) α -D glucose and β–D glucose are the isomers which differ in the orientation (configuration) of H and OH groups around C_1 atom.



34. (b) The two isomeric forms (α – and β –) of D-glucopyranose differ in configuration only at C–1; hence these are called anomers.

35. (b)

36. (d)



37. (b) Glucose and fructose both are reduced by Fehling's solution, Tollen's reagent and Bendict's solution. Therefore, these three reagents can not be used to distinguish between glucose and fructose.

38. (b) Maltose and glucose are reducing sugars.

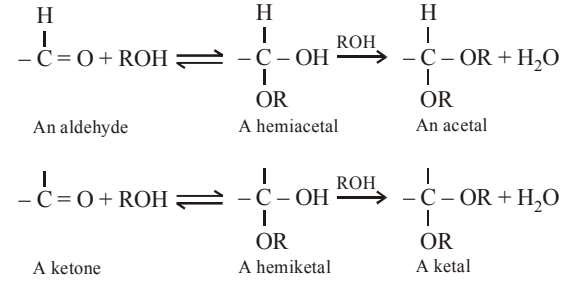
39. (a) Glucose contains -CHO group and fructose contains > C = O group,. Hence these are functional isomers.

40. (d) Glucose being an aldose responds to Tollen's test while fructose, although a ketose, undergoes rearrangement in presence of basic medium (provided by Tollen's reagent) to form glucose, which then responds to Tollen's test.

41. (d)

42. (b) Fructose has the molecular formula $C_6H_{12}O_6$. It belongs to D-series and is laevorotatory compound. It also exists in two cyclic forms which are obtained by the addition of –OH at C-5 to the >C=O group. The ring thus formed is a five membered ring and is named as furanose with analogy to the compund Furan. Furan is a five membered cyclic compound with one oxygen and four carbon atoms.

43. (c)



In cyclic structure of fructose, ketonic group has reacted with an alcoholic group, it is said to be an example of an intramolecular cyclic hemiketal.

44. (a) Sweet taste of fruits is due to fructose.

45. (a)

46. (c) Honey is collected from flowers by honey bee which contains fructose.

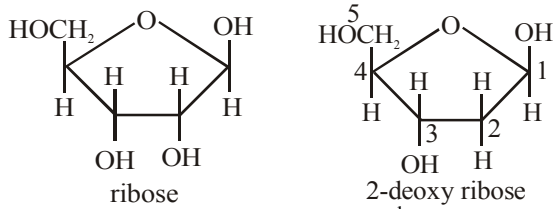
47. (c) Fructose is the sweetest sugar.

48. (a) We know that cellulose $(C_6H_{12}O_6)_n$ is the chief constituent of cell walls of plants. It is the most abundant organic substance found in nature. It is a polymer of glucose with 3500 repeat units in a chain.

49. (b) Sucrose is a disaccharide which on hydrolysis gives one molecule of glucose (monosaccharide) and fructose (monosaccharide).

$$\underset{\text{sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{glucose}}{C_6H_{12}O_6} + \underset{\text{fructose}}{C_6H_{12}O_6}$$

50. (b) RNA has D (–) – Ribose and the DNA has 2–Deoxy D (–) – ribose as the carbohydrate unit.



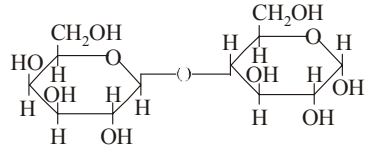
From the structures it is clear that 2nd carbon in DNA do not have OH group.

51. (d) Carbohydrates are stored in the body as glycogen.

52. (c)

53. (b) $CH_2OHCH_2CHOHCHOHCH_2OH$ does not correspond to $C_x(H_2O)_y$.

54. (d) Lactose (milk sugar) is a disaccharide, it is made of β-D-galactose and β-D-glucose



55. (b) **56. (b)**

57. (a) Sucrose does not have free — CHO or CO group, hence it does not undergo mutarotation.

58. (b) **59. (d)**

60. (b) Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since the laevorotation of fructose (–92.4°) is more than dextrorotation of glucose (+52.5°), the mixture is laevororatory.

61. (c) Chemically amylose is a long unbranched chain with 200-1000 α-D-(+ -glucose units held by C1-C4 glycosidic linkage.

62. (b) It is a branched chain polymer of α-D-glucose units in which chain is formed by C1-C4 glycosidic linkage whereas branching occurs by C1-C6 glycosidic linkage.

63. (b) Cellulose is a straight chain polysaccharide.

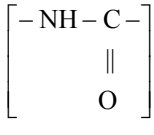
64. (b) The carbohydrates are stored in animal body as glycogen. It is also known as animal starch because its structure is similar to amylopectin and is rather more highly branched.

65. (d) Carbohydrates are essential for life in both plants and animals. Honey has been used for a long time as an instant source of energy by 'Vaids' in ayurvedic system of medicine. Carbohydrates are used as storage molecules as starch in plants and glycogen in animals. Cell wall of bacteria and plants is made up of cellulose. We build furniture etc., from cellulose in the form of wood and cloth ourselves with cellulose in the form of cotton fibre. They provide raw materials for many important industries like textiles, paper lacquers and breweries.

66. (b) There are 20 amino acids in man out of which 10 amino acids are essential amino acids. These essential amino acids are supplied to our bodies by food which we take because they cannot be synthesised in the body. These are (1) valine (2) leucine (3) Isoleucine (4) Phenyl alanine (5) Threonine (6) Methionine (7) Lysine (8) Trypto phone (9) Arginine (10) Histidine.

67. (N) All the given options are example of neutral amino acids.

68. (b) α- Amino acid is the building block unit of protein which is formed by polymerisation of amino acid through peptide linkage.



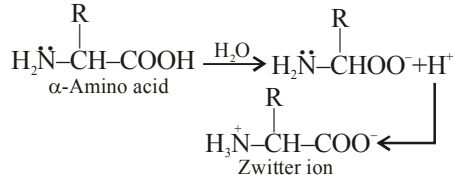
69. (a) Except alanine, all amino acids are essential amino acids which cannot be synthesised in the body and must be obtained through diet.

70. (a)

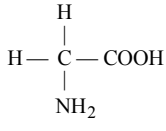
71. (c) Amino acids are the compounds having one or more amino groups and one or more carboxyl groups in the same molecule.

72. (b) Except glycine, all other naturally occurring α- amino acids are optically active, since the α-carbon atom is asymmetric.

73. (d) In neutral solution, amino acids exists as dipolar ion (also known as zwitter ions or inner salts) where the proton of –COOH group is transferred to the – NH_2 group to form inner salt, known as dipolar ion.



74. (c) With the exception of glycine all the 19 other common amino acids have a uniquely different functional group on the central tetrahedral alpha carbon.

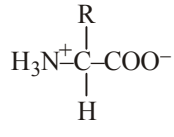


glycine

75. (d) Zwitter ion contains both +ve and –ve charge. Proton of –COOH group is transferred to the $–NH_2$ group.— NH_3^+ group is acidic since it can donate a proton and —COO^- group is basic since it can accept a proton.

76. (a) Amino Acids are amphoteric in nature. So for it a special term is coined called **Zwitter ion**.

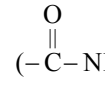
They have following structure in solution



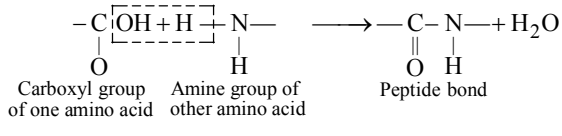
[Zwitter Ion]

77. (d) Proline is a secondary amine

78. (a) Proteins and peptides are linked by peptide linkages



79. (c) The bond formed between two amino acids by the elimination of a water molecule is called a peptide linkage or bond. The peptide bond is simply another name for amide bond.



The product formed by linking amino acid molecules through peptide linkages. —CO—NH—, is called a peptide.

80. (b) **81. (c)**

82. (d) Proteins are highly complex, natural compounds, composed of a large number of different α-amino-acids joined together with peptide linkage, i.e., they are naturally occuring polypeptides.

83. (d) All these are the examples of globular proteins. These are soluble in water.

84. (c) Polypeptide chains in fibrous proteins are held together by disulphide and hydrogen bonds.

85. (d) Proteins are building blocks of the body but they do not provide energy for metabolism.

86. (c) Insulin is an example of globular protein.

87. (c) **88. (b)** **89. (b)**

90. (c) These are generally insoluble in water.

91. (b) The NH of the amide can act as a hydrogen bond donor and the carbonyl group can act as a hydrogen bond acceptor. Statements (a), (c) and (d) are false. The peptide bond has double bond character due to the interaction of the nitrogen lone pair with the carbonyl group. This prevents bond rotation and makes the bond planar. The *trans* isomer is favoured over the *cis* isomer.

92. (a)

93. (a) The sequence in which the α-amino acids are linked to one another in a protein molecule is called its primary structure.

94. (a)

95. (b) The α-helix structure is formed when the chain of α-amino acids coils as a right handed screw (called α-helix) because of the formation of hydrogen bonds between amide groups of the same peptide chain, i.e., NH group in one unit is linked to carbonyl oxygen of the third unit by hydrogen bonding. This hydrogen bonding between different units is responsible for holding helix in a position.

96. (c) During denaturation 2° and 3° structures are destroyed but 1° structure remains intact.

97. (a) Primary structure refers to the order of the amino acids in a protein.

98. (d) The hydrophilic/ hydrophobic character of amino acid residues is important to tertiary structure of protein rather than to secondary structure. In secondary structure, it is the steric size of the residues that is important and residues are positioned to minimise interactions between each other and the peptide chain.

99. (d) Quaternary structure refers to the overall structure of a multiprotein complex where as primary, secondary and tertiary structure refer to the different structural levels of a single protein.

100. (a) The arrangement of polypeptide chains formed as a result of hydrogen bonding is called secondary structure of proteins.
α-helix is formed by intramolecular H-bonding. β-pleated sheet is formed by intermolecular H-bonding.

101. (b) The secondary structure of a protein refers to the shape in which a long peptide chain can exist. There are two different conformations of the peptide linkage present in protein, these are α-helix and β-conformation. The α-helix always has a right handed arrangement. In β-conformation all peptide chains are streched out to nearly maximum extension and then laid side by side and held together by intermolecular hydrogen bonds. The structure resembles the pleated folds of drapery and therefore is known as β-pleated sheet.

102. (b) In this structure of protein atoms are highly coiled and form a spherical form.

103. (d)

104. (d) When a protein, in its native form, is subjected to a physical change like change in temperature, or a chemical change like change in pH, the native conformation of the molecule is disrupted and proteins so formed are called **denaturated proteins**.
The denaturation may be reversible or irreversible. The coagulation of egg on boiling is an example of irreversible protein denaturation.
However, it has been shown now that in some cases, the process is actually reversible. The reverse process is called **renaturation**.

105. (c) Tertiary structure indicates the overall structure of the protein.

106. (b)

107. (b) Serine contains a hydroxyl functional group on its side chain and so the strongest possible interaction will be hydrogen bonding where the hydroxyl group could act as a hydrogen bond donor or hydrogen bond acceptor.

108. (a) When antigens enter in to the body cells and destroy them, then antibodies being proteins are synthesised in the body and combine with antigens and destroy these antigens by forming inactive complexes. Therefore antibodies protein destroy antigens.

109. (b) Enzymes are highly specific for a particular reaction and also for a particular substrate.

110. (b) Enzymes being biocatalyst can increase the rate of a reaction upto 10 million times. Even very small amount can accelerate a reaction.

111. (b) Enzymes are made up of protein with specific structure.

112. (b) Triglycerides are lipids, hence these are hydrolysed by *lipases* to glycerol and fatty acids.

113. (d) Enzymes are most reactive at optimum temperature. The optimum temperature for enzyme activity lies between 40°C to 60°C.

114. (b) Insulin is a biochemically active peptide harmone secreted by pancreas.

115. (a)

116. (d) Enzymes may or may not require a coenzyme for their catalytic action.

117. (c) Deficiency of vitamin D causes rickets.

118. (d) Vitamin D is a fat soluble vitamin.

119. (b) Beri-Beri.

120. (d)

Vitamin	Disease caused by deficiency
B_6	Dermatitis
B_1	Beri-beri
B_2	Photophobia, glossitis
B_{12}	Pernicious anaemia

121. (b) Vitamin E is mainly present in vegetable oils like wheat gram oil, sunflower oil, etc.

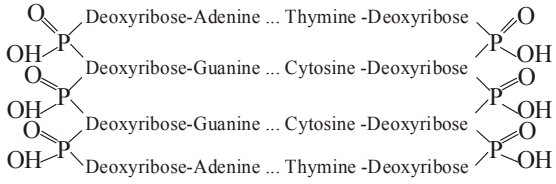
122. (a) Vitamin A or retinol.

123. (b)

124. (c) It is found in liver, egg, milk, meat, and fish. Minute amounts are probably present in all animal cells. Peculiarly, unlike other vitamins, B_{12} is not found in significant amounts in green plants.

125. (a) DNA consists of two polynucleotide chains, each chain forms a right handed helical spiral with ten bases in one turn of the spiral. The two chains coil to double helix and run in opposite direction held together by hydrogen bonding.

126. (d)



The hydrogen bonds are formed between the base (shown by dotted lines). Because of size and geometrics of the bases, the only possible pairing in DNA and between G(Guanine) and C(Cytosine) through three H-bonds and between A (Adenosine) and T (Thymine) through two H-bonds.

127. (a) In DNA the complimentary base are Adenine and thymine.
Guanine and cytosine
The genetic information for cell is contained in the sequence of bases A, T, G and C in **DNA** molecule.

128. (b) The DNA sequence that codes for a specific protein is called a Gene and thus every protein in a cell has a corrosponding gene.

129. (c) The base pairs of the two strands of DNA are linked together through H-bonds.

130. (d) DNA has the property of self - replication . It is therefore a reproducing molecule. This unique property of DNA is at the root of all reproduction. Through its replication, **DNA acts as the key to heredity**. In the replication of DNA, the two strands of a double helix unwind and separate as a template for the formation of a new complementary strand.

131. (c) Each chromosome is made up of DNA tightly coiled many times around proteins called histones that supports its structure.

132. (a)

133. (a) DNA has double stranded α-helical structure.

134. (b) DNA is responsible for transmission of heredity character.

135. (b)

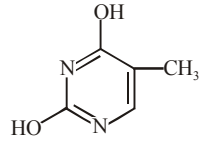
136. (a) Energy is stored in our body in the form of A.T.P.

137. (d)

138. (a) Phosphoric acid is the third component in DNA.

139. (a) Synthesis of polypeptide is known as translation. For this process three type of RNA are essential.

140. (d) The correct structure of thymine is



Thymine (T)

141. (c)

142. (d) Tyrosine is an α-amino acid, and not a purine

143. (d)

144. (c) DNA fingerprinting is same for every cell and cannot be altered by any known treatment.

STATEMENT TYPE QUESTIONS

145. (a)

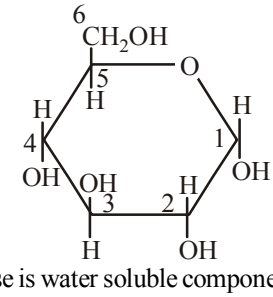
146. (c) Sucrose is non-reducing in nature. It does not contain a free aldehydic or ketonic group. Maltose is a reducing sugar.

147. (b) Naturally occurring monosaccharides are 20 only.
Sucrose is a non–reducing sugar whereas maltose is a reducing sugar.

148. (b) The six membered cyclic structure of glucose is called pyranose structure (α or β), in analogy with pyran. Pyran is a cyclic organic compound with one oxygen atom and five carbon atoms in the ring. The cyclic structure of glucose is correctly represented by Haworth structure.

149. (d) Sucrose is a dextrorotatory but on hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since the laevorotation of fructose (–92.4°) is more than dextrorotation of glucose (+52.5°), thus the resulting mixture is laevorotatory. Glycogen is structurally similar to amylopectin not amylose.

150. (a) For statement (i) correct Haworth structure for α–D glucose will be.



151. (c) Amylose is water soluble component which constitutes about 15-20% of strach. Amylopectin is insoluble in and constitutes about 80-85% of starch.

152. (c) Glycine is optically inactive.

153. (a) Gln stands for glutamine. Except glycine, all other naturally occurring α–amino acids are optically active.

154. (c) When the proteins are subjected to the action of heat, mineral acids or alkali, the water soluble form of globular protein changes to water insoluble fibrous protein. This is called denaturation of proteins. During denaturation secondary and tertiary structures of protein destroyed but primary structures remains intact.

155. (c)

156. (b) Water soluble vitamins must be supplied regularly in diet because they are readily excreted in urine and cannot be stored (except vitamin B_{12}) in our body.

157. (b) In secondary structure of DNA adenine forms hydrogen bonds with thymine whereas cytosine forms hydrogen bonds with guanine.

158. (b) The sugar moiety in DNA molecule is β-D-2-deoxyribose whereas in RNA molecule, it is β-D-ribose. Nucleotide is a nucleoside linked to phosphoric acid at 5^1– position of sugar moiety.

MATCHING TYPE QUESTIONS

159. (c) **160. (a)** **161. (b)**

162. (c)

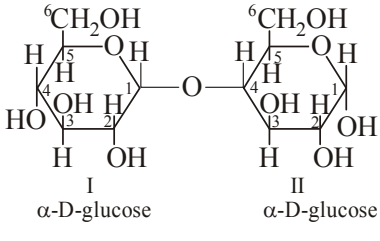
Vitamin A	-	Xerophthalmia
Vitamin B_{12}	-	Pernicious anaemia
Vitamin C	-	Scurvy
Vitamin E	-	Sterility
Vitamin K	-	Haemorrhage

ASSERTION-REASON TYPE QUESTIONS

163. (c)

164. (a) The hydrolysis of sucrose brings about a change in the sign of rotation from dextro (+) to laevo (–) and the product is named as invert sugar.

165. (d) Maltose is compound of two α-D - glucose units in which C1 of one glucose is linked to C4 of another glucose unit.



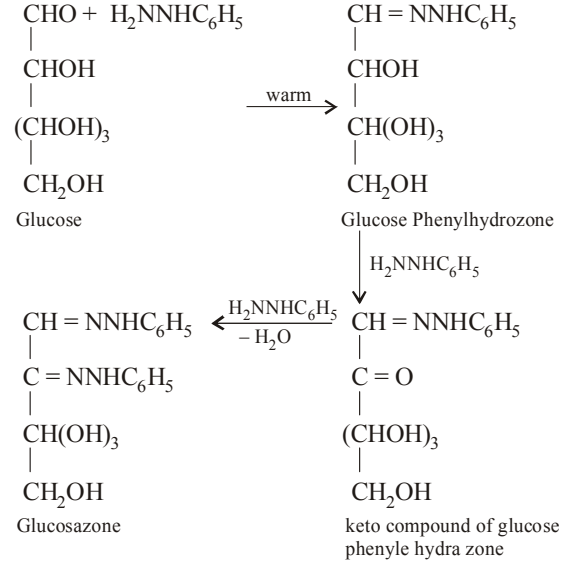
166. (a) **R** is the correct explanation of **A**.

167. (d) Vitamin D is a fat soluble vitamin and can be stored in the body since it is not excreted out of the body.

CRITICAL THINKING TYPE QUESTIONS

168. (c) Glucose contains aldehyde group due to which it gives positive test with ammoniacal silver nitrate.

169. (d) We know that glucose reacts with one molecule of phenyl hydrazine to give phenyl hydrazone. When warmed with excess of phenylhydrazine, the secondary alcoholic group adjacent to the aldehyde group is oxidised by another molecule of phenylhydrazine to a ketonic group. With this ketonic group, the third molecule of phenylhydrazine condenses to glucosazone. Therefore the value of X is 3



170. (c) $OHC.(CHOH)_4.CH_2OH + 5Ac_2O \xrightarrow{Au.ZnCl_2}$

Glucose Acetic anhydride

$OHC.(CHOAc)_4.CH_2OAc$

Glucose penta-acetate

or penta-acetyl Glucose

171. (c) Melting point of α-glucose→ 419 K and β-glucose is 323 K.

172. (a) α-D-glucose or β-D-glucose when dissolved in water and allowed to stand, following equilibrium is stablished, which is called mutarotation.

α-D-glucose ⇌ Open chain form ⇌ β-D-glucose

(+111°) (+19°)

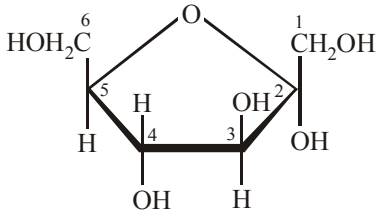
Specific rotation of α-form falls until a constant value of +52.5° is reached. On the other hand, specific rotation of β form increases. Specific rotation of equilibrium mixture is 52.5°.

173. (b) The two monosoccharides are held together by a glycosidic linkage between C1 of α-glucose and C2 of β-fructose. Since the reducing groups and glucose and fructose are involved in glycosidic bond formed. Sucrose is non-reducing sugar.

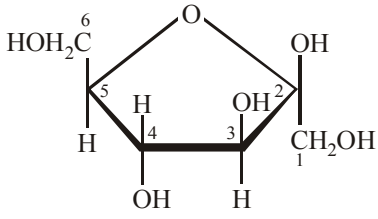
174. (c) Cyclic hemiacetal forms of monosaccharide which differ only in the configuration of the hydroxyl group at C1 are anomers.

175. (a) **176. (c)**

177. (b)



α-D-(–)-Fructofuranose

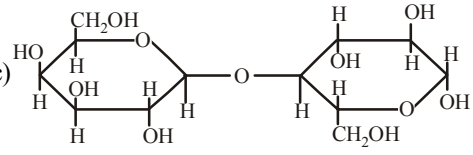


β-D-(–)-Fructofuranose

178. (c) The hydrolysis of sucrose by boiling with mineral acid or by enzyme invertase or sucrase produces a mixture of equal molecules of D(+) glucose and D(–) Fructose.

$$\underset{\text{sucrose}}{C_{12}H_{22}O_{11}}\ (+66.5^\circ) + H_2O \xrightarrow{HCl} \underbrace{\underset{\text{D-glucose}}{C_6H_{12}O_6}\ (+52.5^\circ) + \underset{\text{D-Fructose}}{C_6H_{12}O_6}\ (-92^\circ)}_{\text{Invert sugar, } [\alpha_D] = -20^\circ}$$

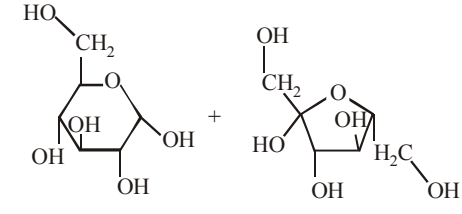
179. (c)



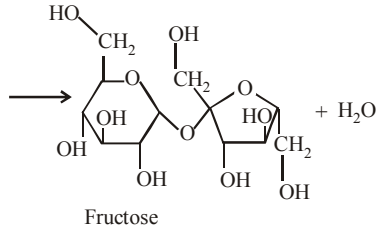
(Lactose)

All reducing sugar shows mutarotation.

180. (b)



α-D-Glucopyranose β-D-Fructofuranose



Fructose

Sucrose is a disaccharide of α–D-Glucopyranose and β–D-Fructofuranose.

181. (c) Most of the carbohydrates have a general formula, $C_x(H_2O)_y$, and were considered as hydrates of carbon. All the compounds which fit into this formula may not be classified as carbohydrates. Acetic acid (CH_3COOH) fits into this general formula, $C_2(H_2O)_2$ but is not a carbohydrate. Similarly, rhamnose, $C_6H_{12}O_5$ is a carbohydrate but does not fit in this definition. A large number of their reactions have shown that they contain specific functional groups. Chemically, the carbohydrates may be defined as optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis.

182. (c) Valine has no functional groups on its side chain. There is only an alkyl group and so only van der Waals interactions are possible.

183. (c)

$$\underset{\text{Thiol}}{2R-S-H} \rightleftharpoons \underset{\text{Disulphide}}{R-S-S-R}$$

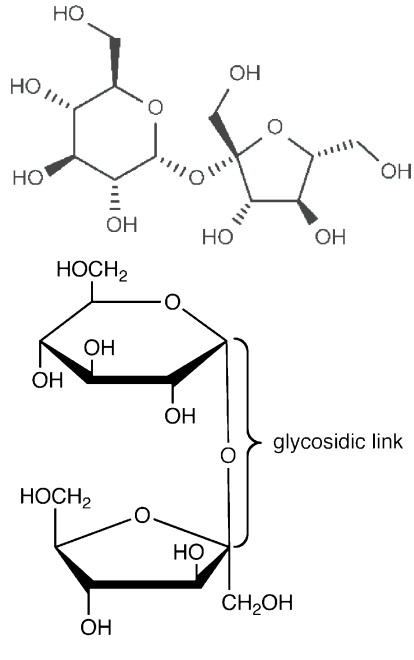
Example :

$$2HO_2CCHCH_2SH \underset{[H]}{\overset{[O]}{\rightleftharpoons}} \underset{\text{Cystine}}{HO_2CCHCH_2S-SCH_2CHCO_2H}$$

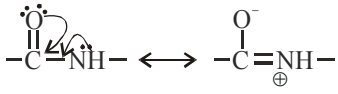
NH_2 NH_2

Cystine

184. (b) Glycosidic linkage is actually an ether bond as the linkage forming the rings in an oligosaccharide or polysaccharide is not just one bond, but the two bonds sharing an oxygen atom e.g. sucrose



185. (a) Due to resonance C — N bond in protein acquires double bond character and is smaller than usual C — N bond.



186. (d) The function of enzymes in the living system is to catalyse biochemical reactions which occur in living systems. e.g. invertase, pepsin, amylase.

$$\underset{\text{(polymer)}}{\text{Sucrose}} \xrightarrow{\text{Invertase}} \underset{\text{(monomer)}}{\text{glucose + fructose}}$$

$$\underset{\text{(polymer)}}{\text{Starch}} \xrightarrow{\text{amylase}} \underset{\text{(monomer)}}{\text{glucose}}$$

187. (a) Vitamin C is water soluble. Therefore, it is readily excreted in urine and cannot be stored in our body and is supplied regularly in diet.

188. (b) In DNA and RNA heterocyclic base and phosphate ester are at C_1' and C_5' respectively of the sugar molecule.