Ordinary Thinking

Objective Questions

Carbohydrates

1. The change in optical rotation, with time, of freshly prepared solution of sugar is known as **[CPMT 1982, 85; BHU 1997]**
(a) Rotatory motion (b) Inversion
(c) Specific rotation (d) Mutarotation

2. Gun-cotton is
(a) Nitrosucrose (b) Nitrocellulose
(c) Nitroglucose (d) Nitropicrin

3. Which of the following monosaccharide is a pentose **[CPMT 1982, 87, 89, 93]**
(a) Galactose (b) Glucose
(c) Fructose (d) Arabinose

4. Amide group is present in
(a) Lipids (b) Carbohydrates
(c) Amino acids (d) Proteins

5. Which of the following is a carbohydrate
(a) Leucine (b) Albumin
(c) Inulin (d) Maltase

6. General formula for carbohydrates is
(a) $C_nH_{2n}O_{2n+2}$ (b) $C_x(H_2O)_{2x}$
(c) $C_x(H_2O)_y$ (d) None of these

7. Benedict solution provides **[CPMT 1983]**
(a) Ag^+ (b) Li^+
(c) Cu^{+2} (d) Ba^{+2}

8. Glucose gives silver mirror with Tollen's reagent. It shows the presence of **[MNR 1981; CPMT 1974, 81; MP PMT 1994]**
(a) An acidic group (b) An alcoholic group
(c) A ketonic group (d) An aldehydic group

9. A certain compound gives negative test with ninhydrin and positive test with Benedict's solution. The compound is **[NCERT 1978; KCET 2000]**
(a) A protein (b) A monosaccharide
(c) A lipid (d) An amino acid

10. An organic compound answers Molisch's test as well as Benedict's test. But it does not answer Scliwanoff's test. Most probably, it is **[KCET 2003]**
(a) Sucrose (b) Protein
(c) Fructose (d) Maltose

11. Glucose when heated with CH_3OH in presence of dry HCl gas gives α and $\beta-$methyl glucosides because it contains **[CPMT 1982, 85]**
(a) An aldehyde group (b) A $-CH_2OH$ group
(c) A ring structure (d) Five hydroxyl groups

12. Which one is a disaccharide **[CPMT 1981, 83]**
(a) Glucose (b) Fructose
(c) Xylose (d) Sucrose

13. Molecular formula $C_6H_{12}O_6$ is of
(a) Glucose (b) Fructose
(c) Both (a) and (b) (d) None of these

14. Hydrolysis of sucrose is called **[BHU 1979, 83; Pb. PMT 1999; Pb. CET 2000]**
(a) Esterification (b) Saponification
(c) Inversion (d) Hydration

15. In the '*glycolipids*', the two sugars known to occur are glucose and
(a) Fructose (b) Lactose
(c) Galactose (d) Sucrose

16. The '*epimerisation*' involves
(a) Change of configuration
(b) Addition of one more '*C*'
(c) Substration of a '*C*'
(d) Conversion of $-CHO$ to $-C=O$

17. The compound which does not contain an asymmetric carbon atom is
(a) Glycolaldehyde (b) Glyceraldehyde
(c) Glucose (d) Galactose

18. Which of the following sign indicate that the sugar is actually '*dextrorotatory*'
(a) – (b) +
(c) *R* – (d) All of these

19. The standard compound for determination of configuration in the '*sugar chemistry*' is
(a) Glycolaldehyde (b) Glyceraldehyde
(c) Glucose (d) Fructose

20. Sugars are
(a) Optically active polyhydroxy aldehydes
(b) Optically active polyhydroxy ketones
(c) Optically active polyhydroxy aldehydes or ketones
(d) Polyhydroxy aldehydes or ketones which may or may not be optically active

21. Molecular formula of pentahydroxy acid obtained when glucose is oxidised with Br_2 water is
(a) $C_6H_{12}O_7$ (b) $C_6H_{12}O_8$
(c) $C_6H_{12}O_6$ (d) $C_6H_{10}O_6$

22. The '*phosphoglycerides*' occur in
(a) The brain and the spinal chord
(b) Nails and hairs
(c) Oils and fats
(d) Waxes

23. Sucrose is a **[CPMT 1983]**
(a) Monosaccharide (b) Disaccharide

(c) Trisaccharide (d) Polysaccharide

24. The commonest disaccharide has the molecular formula **[CPMT 1982; Manipal MEE 1995; MP PET 1999; AIIMS 1999]**

(a) $C_{10}H_{18}O_9$ (b) $C_{10}H_{20}O_{10}$

(c) $C_{18}H_{22}O_{11}$ (d) $C_{12}H_{22}O_{11}$

25. On complete hydrolysis of starch, we finally get **[MNR 1982; DPMT 1979; CBSE PMT 1991; MP PMT 1987; MP PET 1993]**

(a) Glucose (b) Fructose

(c) Glucose and fructose (d) Sucrose

26. Which is monosaccharide

(a) Glucose (b) Fructose

(c) Galactose (d) All of these

27. Which is polysaccharide

(a) Starch (b) Cellulose

(c) Glycogen (d) All of these

28. The calorific values of fats, carbohydrates and proteins vary in the order

(a) Fats > Carbohydrates > Proteins

(b) Fats > Proteins > Carbohydrates

(c) Carbohydrates > Proteins > Fats

(d) Proteins > Carbohydrates > Fats

29. Gun-cotton is obtained when conc. nitric acid reacts with

(a) Glycerine (b) Glycol

(c) Cellulose (d) Starch

30. A carbohydrate consists of **[NCERT 1971]**

(a) *C* and *O* (b) *C*, *H* and *O*

(c) *C*, *H*, *N* and *O* (d) *C* and *H*

31. Glucose forms many derivatives. The derivative which will help to prove the furanose structure is **[AIIMS 1980; DPMT 1985]**

(a) Acetyl (b) Benzoyl

(c) Osazone (d) Isopropylidene

32. Glucose and fructose form **[MP PMT 1986]**

(a) Same osazone

(b) Same acid on oxidation

(c) Same alcohol when reduced

(d) Different osazone

33. On heating with conc. H_2SO_4, sucrose gives **[DPMT 1984]**

(a) *CO* and CO_2 (b) *CO* and SO_2

(c) *CO*, CO_2 and SO_2 (d) None of these

34. The letter '*D*' in carbohydrates represents

(a) Its direct synthesis (b) Its dextrorotation

(c) Its mutarotation (d) Its configuration

35. Starch can be used as an indicator for the detection of traces of **[CPMT 1986]**

(a) Glucose in aqueous solution

(b) Protein in blood

(c) Iodine in aqueous solution

(d) Urea in blood

36. It is best to carry out reactions with sugars in neutral or acid medium and not in alkaline medium. This is because in alkaline medium sugars undergo one of the following changes

(a) Racemisation (b) Decomposition

(c) Inversion (d) Rearrangement

37. Which one of the following compounds is found abundantly in nature **[BHU 1983; Manipal MEE 1995; DCE 20**

(a) Fructose (b) Starch

(c) Glucose (d) Cellulose

38. The substance that forms the plant cell walls is or Which carbohydrates is an essential constituents of plant cells **[KCET 1984; MP PET 1999; CPMT 2002]**

(a) Cellulose (b) Sucrose

(c) Vitamins (d) Starch

39. Sugar can be tested in urine by

(a) Molisch test (b) Dunstan's test

(c) Benedict's test (d) Legal's test

40. When sucrose is heated with conc. HNO_3 the product is **[CPMT 1979]**

(a) Sucrose nitrate (b) Formic acid

(c) Oxalic acid (d) Citric acid

41. Amylopectin is **[KCET 2005]**

(a) Water soluble

(b) Water insoluble

(c) Forms colloidal solution with water

(d) Both (b) and (c)

42. Which of the following statements about ribose is incorrect **[CPMT 1985]**

(a) It is a polyhydroxy compound

(b) It is an aldehyde sugar

(c) It has six carbon atoms

(d) It exhibits optical activity

43. Maltose contains how many oxygen atoms

(a) 6 (b) 10

(c) 11 (b) 22

44. The correct name of 'sucrose' is

(a) $\alpha - D - \text{glucopyranosyl} - \beta - D - \text{fructofuranoside}$

(b) $\beta - D - \text{glucopyranosyl} - \beta - D - \text{fructofuranoside}$

(c) $\alpha - D - \text{glucopyranosyl} - \alpha - D - \text{fructofuranoside}$

(d) $\beta - D - \text{glucopyranosyl} - \alpha - L - \text{fructofuranoside}$

45. Sucrose is

(a) Laevorotatory (b) Dextrorotatory

(c) Racemic mixture (d) Optically inactive

46. The hydrolysis of sucrose produces a mixture which is
(a) Laevorotatory
(b) Dextrorotatory
(c) Equally both (+) and (–) rotatory
(d) Optically inactive

47. Sucrose is
(a) A reducing sugar
(b) Not a reducing sugar
(c) Partial reducing sugar
(d) Mixed sugar

48. Sucrose contains which of the following groups
(a) $-CHO$ (b) $>C=O$
(c) Both (a) and (b) (d) None of these

49. The fructose molecule in sucrose exists as
(a) Furanose (b) Pyranose
(c) Open chain (d) All

50. Which one of the following is laevorotatory **[DPMT 1989]**
(a) Glucose (b) Sucrose
(c) Fructose (d) None of these

51. Chemically '*digestion*' is **[NCERT 1978]**
(a) Hydrolysis (b) Change in bacteria
(c) Hydrogenation (d) Dehydrogenation

52. Which one of the following is the reagent used to identify glucose **[MP PMT 1993]**
(a) Neutral ferric chloride
(b) Chloroform and alcoholic *KOH*
(c) Ammoniacal silver nitrate
(d) Sodium ethoxide

53. Sucrose on hydrolysis gives **[MP PMT 1993; Bihar MEE 1997]**
(a) Two molecules of glucose
(b) Two molecules of fructose
(c) One molecule each of glucose and fructose
(d) One molecule each of glucose and mannose

54. Which of the following is a disaccharide **[CPMT 1990, 94]**
(a) Lactose (b) Starch
(c) Cellulose (d) Glucose

55. Glucose cannot be classified as **[CPMT 1989]**
(a) A hexose (b) A carbohydrate
(c) An oligosaccharide (d) An aldose

56. The reagent which forms crystalline osazone derivative when reacted with glucose, is **[CPMT 1990]**
(a) Fehling solution (b) Phenylhydrazine
(c) Benedict solution (d) Hydroxylamine

57. An enzyme which brings about the conversion of starch into maltose is known as **[BHU 1979]**
(a) Maltase (b) Zymase
(c) Invertase (d) Diastase

58. Canesugar on hydrolysis gives **[MADT Bihar 1984; NCERT 1977; AMU 1985]**
(a) Glucose and maltose (b) Glucose and lactose
(c) Glucose and fructose (d) Only glucose

59. Glucose is a **[CPMT 1984]**
(a) Monosaccharide (b) Disaccharide
(c) Trisaccharide (d) Polysaccharide

60. Which carbohydrate is used in silvering of mirrors **[BHU 1973; CPMT 1991]**
(a) Sucrose (b) Starch
(c) Glucose (d) Fructose

61. A carbohydrate that cannot be hydrolysed to simpler forms is called
(a) Disaccharide (b) Monosaccharide
(c) Polysaccharide (d) Trisaccharide

62. If monosaccharide contains an aldehyde group, it is known as
(a) Epimer (b) Osones
(c) Osazone (d) Aldose

63. If a monosaccharide contains a ketogroup, it is known as
(a) Ketose (b) Osones
(c) Epimer (d) Osazone

64. The aqueous solution of a carbohydrate gives dark blue colour with iodine. It is
(a) Glucose (b) Fructose
(c) Sucrose (d) Starch

65. Which of the following carbohydrates is a disaccharide
(a) Glucose (b) Fructose
(c) Raffinose (d) Maltose

66. Optical activity is shown by
(a) Glucose (b) Fructose
(c) Sucrose (d) All of these

67. Which is a reducing sugar
(a) Glucose (b) Fructose
(c) Galactose (d) All of these

68. The ultimate product of oxidation of most of hydrogen and carbon in foodstuffs are **[CPMT 1981]**
(a) H_2O alone (b) CO_2 alone

(c) H_2O and CO_2 (d) None of these

69. Osazone formation involves only 2 carbon atoms of glucose because of **[MP PMT 1986]**

(a) Chelation (b) Oxidation

(c) Reduction (d) Hydrolysis

70. Glucose will show mutarotation when solvent is **[MP PMT 1986]**

(a) Acidic (b) Basic

(c) Neutral (d) Amphoteric

71. Glucose contains **[CPMT 1982]**

(a) One $-CHO$ group

(b) Five $-OH$ groups

(c) One primary alcoholic group

(d) Four secondary alcoholic groups

(e) All are correct

72. Carbohydrates are stored in human body as **[MP PMT 1999; Kerala PMT 2004]**

(a) Glucose (b) Glycogen

(c) Starch (d) Fructose

73. An example of a disaccharide made up of two units of the same monosaccharides is **[KCET 1989; MP PET 1996; AFMC 2005]**

(a) Sucrose (b) Maltose

(c) Lactose (d) None of these

74. The sugar present in fruits is **[KCET 1984]**

(a) Fructose (b) Glucose

(c) Sucrose (d) Galactose

75. Carbohydrates are **[MADT Bihar 1983]**

(a) Hydrates of carbon

(b) Polyhydroxy aldehydes or ketones

(c) Polyhydroxy acid compounds

(d) None of these

76. Glucose and fructose are **[Bihar MADT 1982]**

(a) Isotopes

(b) Isotones

(c) Isomers

(d) Homologues of each other

77. Hydrolytic conversion of sucrose into glucose and fructose is known as **[BHU 1979, 97]**

(a) Induction (b) Saponification

(c) Inversion (d) Esterification

78. Starch is a polymer of **[DPMT 1982; CPMT 1975, 80; MP PMT 1994]**

(a) Glucose (b) Fructose

(c) Both (a) and (b) (d) None of these

79. To become a carbohydrate a compound must contain at least **[AFMC 1991]**

(a) 2 carbons (b) 3 carbons

(c) 4 carbons (d) 6 carbons

80. Lactose on hydrolysis gives **[KCET 1983]**

(a) Two glucose molecules

(b) Two galactose molecules

(c) A galactose molecule and a fructose molecule

(d) A galactose molecule and a glucose molecule

81. An example of non-reducing sugar is **[KCET 1988]**

(a) Cane sugar (b) Fructose

(c) Lactose (d) Cellobiose

82. Cellulose is a polymer of **[KCET 1984]**

(a) L-fructose (b) D-mannose

(c) D-glucose (d) Amylose

83. The intermediate compound formed in the conversion of starch to glucose is **[KCET 1984]**

(a) Lactose (b) Sucrose

(c) Maltose (d) Fructose

84. Invertase brings about the conversion of **[KCET 1986]**

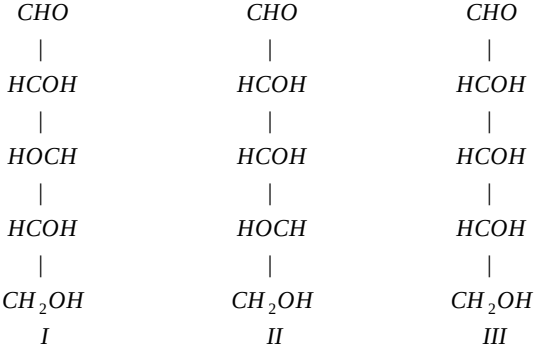
(a) Starch to glucose

(b) Sucrose to glucose and fructose

(c) Maltose to glucose

(d) Glucose to C_2H_5OH and CO_2

85. Which of the following pentoses will be optically active



[MP PET 1994]

(a) All (b) II and III

(c) I (d) II

86. $\alpha-D-$glucose and $\beta-D-$glucose differ from each other due to difference in one of the carbons with respect to its **[CBSE PMT 1995; AFMC 1999]**

(a) Size of hemiacetal ring (b)Number of OH groups

(c) Configuration (d) Conformation

87. Which carbohydrates has highest abundance in human blood **[MP PET 1995]**

(a) *d*-fructose (b) *d*-glucose

(c) Sucrose (d) Lactose

88. Formation of silver mirror by glucose shows that it is a/an

(a) Oxidising agent (b) Acid
(c) Reducing agent (d) A salt of silver

89. Which of the following statements is right
(a) Cellulose are linear polymers of $\beta-$glucose molecules with $\beta-1,4-$linkages
(b) Starches are polymers of $\alpha-$glucose molecules with $\beta-1,4-$linkages and some $\beta-1,6-$cross-linkages
(c) Proteins are polyamides of $\beta-$amino acids
(d) The structural information about their biosynthesis is contained in a class of compounds called nucleic acids, e.g. RNA and DNA

90. The number of atoms in the cyclic structure of D-fructose is **[MP PMT 1997]**
(a) 5 (b) 6
(c) 4 (d) 7

91. Which is used in motion picture films
(a) Cellulose acetate (b) Glucose acetate
(c) Starch acetate (d) Sucrose acetate

92. Glucose reacts with acetic anhydride to form **[KCET 1996]**
(a) Mono-acetate (b) Tetra-acetate
(c) Penta-acetate (d) Hexa-acetate

93. Which of the following does not show any reducing test of aldehyde **[CPMT 1996; Orissa JEE 2004]**
(a) Sucrose (b) Fructose
(c) Maltose (d) Lactose

94. When amylases catalyse the hydrolysis of starch, the final product obtained is chiefly **[Pb. PMT 1998]**
(a) Cellobiose (b) Glucose
(c) Maltose (d) Sucrose

95. Galactose is converted into glucose in **[AFMC 1998]**
(a) Mouth (b) Stomach
(c) Liver (d) Intestine

96. Which among the following is the simplest **[CPMT 1999]**
(a) Glucose (b) Cellulose
(c) Starch (d) None of these

97. Indigestible carbohydrate, which is also a constituent of our diet, is **[Kerala (Med.) 1999]**
(a) Cellulose (b) Galactose
(c) Maltose (d) Starch

98. Starch is converted into maltose by the **[DPMT 1979; CPMT 1982; BHU 1999]**
(a) Maltase (b) Invertase
(c) Zymase (d) Diastase

99. The disaccharide present in milk is **[CPMT 1982, 87, 91; MP PET 2001]**
(a) Maltose (b) Lactose
(c) Sucrose (d) Cellobiose

100. Carbohydrates are used by body mainly **[DCE 1999]**
(a) For obtaining vitamins
(b) As source of energy
(c) For all its developmental needs
(d) For building muscles

101. In the viscose process the solvent for cellulose consists of **[JIPMER 1999]**
(a) Ether and alcohol
(b) Copper sulphate and ammonia
(c) Sodium hydroxide and carbon disulphide
(d) Acetic acid and acetic anhydride

102. Which of the following does not reduce Benedict's solution **[KCET 2000]**
(a) Sucrose (b) Aldehyde
(c) Glucose (d) Fructose

103. In polysaccharides the linkage connecting monosaccharide units is called
(a) Glycoside linkage (b) Nucleoside linkage
(c) Glycogen linkage (d) Peptide linkage

104. Blood sugar is the same as **[DPMT 2000]**
(a) Glucose (b) Galactose
(c) Glycogen (d) Fructose

105. Glucose has functional group **[MH CET 2000]**
(a) Aldehydic
(b) Aldehydic and alcoholic
(c) Alcoholic
(d) Ketonic and alcoholic

106. Which of the following is an aldohexose **[KCET (Engg.) 2001]**
(a) Cellulose (b) Sucrose
(c) Glucose (d) Raffinose

107. The calorific value is maximum in case of **[Kerala (Med.) 2000]**
(a) Milk (b) Proteins
(c) Minerals (d) Carbohydrates

108. An invert sugar is **[AFMC 2000]**
(a) Isorotatory (b) Dextrorotatory
(c) Laevorotatory (d) Optically inactive

109. The change in optical rotation with time of freshly prepared solutions of sugar is known as **[JIPMER 2000]**
(a) Maturation (b) Rotatory motion
(c) Inversion (d) Specific rotation

110. Yeast cell derive their energy from glucose by **[AIIMS 2001]**

(a) Glycolysis (b) Respiration formation

(c) Formation (d) None of these

111. Which of the following is correct statement **[CBSE PMT 2001]**

(a) Troleins are amino acid

(b) α-hydrogen is present in fructose

(c) Starch is polymer of α-glucose

(d) Amylose is compound of cellulose

112. Which of the following is a aldohexose **[KCET 2001]**

(a) Cellulose (b) Sucrose

(c) Galactose (d) Raffinose

113. The ultimate product of the hydrolysis of starch is **[DPMT 2001]**

(a) Fructose (b) Glucose

(c) Sucrose (d) None of these

114. Raffinose is **[Pb. PMT 2001]**

(a) Trisaccharide (b) Monosaccharide

(c) Disaccharide (d) None of these

115. A sugar, that is not a disaccharide, among the following is **[KCET (Med./Engg.) 2002]**

(a) Lactose (b) Galactose

(c) Sucrose (d) Maltose

116. To detect the reducing and non reducing sugars, which of the following test is used **[MH CET 2002]**

(a) Molisch test (b) Biuret test

(c) Fehling's test (d) Millions test

117. Which of the following is a disaccharide **[MH CET 2002]**

(a) Glucose (b) Ribulose

(c) Lactose (d) Arabinose

118. On heating glucose with Fehling's solution we get a precipitate whose colour is **[CPMT 1979; CBSE PMT 1988; KCET 1992; DPMT 1983, 86; MP PMT 1996]**

(a) Yellow (b) Red

(c) Black (d) White

119. Glycolysis is **[CBSE PMT 2003]**

(a) Conversion of glucose to haem

(b) Oxidation of glucose to glutamate

(c) Conversion of pyruvate to citrate

(d) Oxidation of glucose to pyruvate

120. Which of the following is an example of ketohexose **[Orissa JEE 2003]**

(a) Mannose (b) Galactose

(c) Maltose (d) Fructose

121. The safest and the most common alternative of sugar is **[MP PMT 2003]**

(a) Glucose (b) Aspartame

(c) Saccharin (d) Cyclodextrin

122. The specific rotation of equilibrium mixture of α-*D*-glucose and β-*D*-glucose, is

(a) $+19^o$ (b) $+112^o$

(c) $+52^o$ (d) $+100^o$

123. The charring of sugar, when treated with conc. H_2SO_4, is due to **[Pb. CET 2002]**

(a) Oxidation (b) Reduction

(c) Dehydration (d) Hydrolysis

124. Which among the following is the simplest sugar **[Pb. CET 2002]**

(a) Glucose (b) Cellulose

(b) Starch (d) Glycogen

125. Glucose and mannose are

(a) Epimers (b) Anomers

(c) Ketohexoses (d) Disaccharides

126. On hydrolysis, which produces only glucose **[BVP 2004]**

(a) Galactose (b) Maltose

(c) Sucrose (d) None

127. Pick out the one which does not belong to the family **[KCET 2004]**

(a) Pepsin (b) Cellulose

(c) Ptyalin (d) Lipase

128. Which of the following is the sweetest sugar **[MP PMT 1997; CBSE PMT 1999; AIIMS 2000 Manipal MEE 1995; CPMT 1996; BHU 1997;]**

(a) Glucose (b) Fructose

(c) Lactose (d) Sucrose

129. Oxidation of glucose is one of the most important reactions in a living cell. What is the number of ATP molecules generated in cells from one molecule of glucose **[CBSE PMT 1995]**

(a) 38 (b) 12

(c) 18 (d) 28

130. Glucose has difference from fructose in that it **[BHU 2005]**

(a) Does not undergo hydrolysis

(b) Gives silver mirror with Tollen's reagent

(c) Monosaccharide

(d) None of these

131. In fructose, the possible optical isomers are **[Orissa JEE 2005]**

(a) 12 (b) 8
(c) 16 (d) 4

132. If an aqueous solution of glucoseis allowed to freeze than crystal of which will be separated out first **[DPMT 2005]**
(a) Glucose (b) Water
(c) Both of these (d) None of these

133. Which is false **[J & K 2005]**
(a) Glucose is a disaccharide
(b) Starch is a polysaccharide
(c) Glucose and fructose are not anomers
(d) Invert sugar consists of glucose and fructose

Proteins, Amino Acids and Enzymes

1. Insulin is **[CBSE PMT 1991]**
(a) An amino acid (b) Protein
(c) A carbohydrate (d) A lipid

2. Peptides are
(a) Esters (b) Salts
(c) Amides (d) Ketones

3. The proteins which are insoluble in water are
(a) Fibrous proteins (b) Globular proteins
(c) Both (a) and (b) (d) None of these

4. Irreversible precipitation of proteins is called
(a) Denaturation (b) Hydrolysis
(c) Rearrangement (d) Electrophoresis

5. The proteins with a prosthetic group are called
(a) Pseudo proteins (b) Complex proteins
(c) Conjugated proteins (d) Polypeptides

6. The prosthetic group of haemoglobin is
(a) Porphin (b) Haem
(c) Globin (d) Globulin

7. When collagen is boiled with water, it forms
(a) Precipitate (b) Solution
(c) Gelatin (d) Complex collagen

8. Which of the following is not essential amino acid
(a) Valine (b) Lysine
(c) Histidine (d) Glycine

9. Amino acids are
(a) Liquids
(b) Volatile solids
(c) Non-volatile crystalline compounds
(d) Mixture of amines and acids

10. Isoelectric point is a
(a) Specific temperature
(b) Suitable concentration of amino acid
(c) Hydrogen ion concentration that does not allow migration of amino acid under electric field
(d) Melting point of an amino acid under the influence of electric field

11. Proteins are hydrolysed by enzymes into **[CPMT 1981; BHU 1987; MP PMT 1994, 2002]**
(a) Dicarboxylic acids (b) Hydroxy acids
(c) Amino acids (d) Aromatic acids

12. Proteins when heated with conc. HNO_3 give a yellow colour. This is **[CPMT 1989]**
(a) Oxidising test (b) Xanthoprotic test
(c) Hoppe's test (d) Acid-base test

13. Enzymes are **[DPMT 1980; MP PMT 1993, 96]**
(a) Proteins (b) Minerals
(c) Oils (d) Fatty acids

14. Proteins are built up of **[CPMT 1981, 99; BHU 1987; CBSE PMT 2001; MP PMT 1987, 96; KCET 1984]**
(a) Dicarboxylic acids (b) Amino acids
(c) Alcohols (d) Hydroxy acids

15. The main structural feature of proteins is **[MNR 1987; MP PET 1993, 97, 2004]**
(a) The ester linkage (b) The ether linkage
(c) The peptide linkage (d) All of these

16. Pepsin enzyme hydrolyses **[NCERT 1984; MP PET 1999; MP PMT 2001]**
(a) Proteins to amino acids
(b) Fats to fatty acids
(c) Glucose to ethyl alcohol
(d) Polysaccharides to monosaccharides

17. Which one of the following proteins transports oxygen in the blood stream
(a) Myoglobin (b) Insulin
(c) Albumin (d) Haemoglobin

18. Enzymes are **[MP PET 1993]**
(a) Living organisms
(b) Dead organisms
(c) Complex nitrogenous substances produced in living cells
(d) None of these

19. Which is an essential constituent of diet **[AFMC 1980]**
(a) Starch (b) Glucose
(c) Carbohydrate (d) Protein

20. Proteins can be used
(a) As food (b) In textile
(c) As enzyme (d) All of these

21. Which of the following foodstuffs contains nitrogen **[DPMT 1986; MH CET 2002]**

(a) Carbohydrates (b) Fats

(c) Proteins (d) None of these

22. *pH* in stomach is approximately

(a) 7 (b) 2.0

(c) 6.5 (d) 10

23. The helical structure of proteins is established by **[CPMT 1988]**

(a) Peptide bonds (b) Dipeptide bond

(c) Hydrogen bond (d) Vander Waal's forces

24. Natural silk is a

(a) Polyester (b) Polyamide

(c) Polyacid (d) Polysaccharide

25. Protein contains **[CPMT 1975; MP PMT 2002]**

(a) C, H, O and N (b) Only C and H

(c) Cl, H and O (d) All of these

26. The end product of protein digestion is **[CPMT 1981; KCET 1984]**

(a) Amino acid (b) Glucose

(c) Glycerol (d) Oxalic acid

27. Protein can be most easily removed from **[MNR 1988]**

(a) Alkanes (b) Alkenes

(c) Alkynes (d) Benzene

28. Which of the following contains the highest percentage of protein **[CPMT 1984]**

(a) Groundnut (b) Cow's milk

(c) Egg (d) Wheat

29. The enzyme ptylin used for the digestion of food is present in **[CPMT 1981; Pb. PMT 2004]**

(a) Saliva (b) Blood

(c) Intestines (d) Adrenal glands

30. Which one of the following is an amino acid **[KCET 1984]**

(a) CH_3CONH_2 (b) $CH_3CONHCH_3$

(c) CH_3NHCHO (d) $NH_2CH_2.COOH$

31. Biuret test is used for the detection of **[KCET 1993]**

(a) Saturated oils (b) Sugars

(c) Proteins (d) Fats

32. Out of the following the best category of proteins is **[SCRA 1991]**

(a) Polyamides (b) Polythioethers

(c) Glycerides (d) Polysaccharides

33. The molecular weight of protein is **[KCET 1984]**

(a) < 10000 (b) > 10000

(c) > 1000 (d) > 1000 and < 10000

34. Which of the following is not a classification of proteins **[KCET 1984]**

(a) Enzymes (b) Antibodies

(c) Antigens (d) Hormones

35. The protein that is a structural material is **[KCET 1984]**

(a) Albumin (b) Oxytocin

(c) Haemoglobin (d) Keratin

36. For $\alpha-$amino acids having the structure

$$R-\underset{\displaystyle NH_2}{\overset{|}{CH}}-CO_2H$$

Which of the following statements are true

(A) Water solubility is maximum at a *pH* when concentrations of anions and cations are equal

(B) They give ninhydrin test

(C) On reacting with nitrous acid give off N_2 **[MP PET 1994]**

(a) All (b) B and C

(c) A and B (d) A

37. Which of the following reacts with haemoglobin in the blood to form carboxyhaemoglobin **[Manipal MEE 199**

(a) CO (b) CO_2

(c) $HCOOH$ (d) H_2CO_3

38. Secondary structure of a protein refers to **[CBSE PMT 1995]**

(a) Mainly denatured proteins and structures of prosthetic groups

(b) Three dimensional structure, specially the bond between amino acid residues that are distant from each other in the polypeptide chain

(c) Linear sequence of amino acid residues in the polypeptide chain

(d) Regular folding patterns of continuous portions of the polypeptide chain

39. 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 catalyzing their reactions

(iii) Enzymes catalyse chemical reactions by lowering the activation energy

(iv) Pepsin is a proteolytic enzyme

(a) (i) and (iv) (b) (i) and (iii)

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

40. Proteins are composed of **[MP PMT 1995; J & K 2005]**

(a) $\alpha-$amino acids (b) Carbohydrates

(c) Vitamins (d) Mineral salts

41. Read the following statements carefully

(A) Albumin is a simple protein

(B) The amino acid alanine contains an acidic side chain

(C) Insulin is a hormone

(D) Muscles contain the protein keratin

Point out the wrong statements in the above set of statements

(a) A, B (b) C, D

(c) A, C (d) B, D

42. Enzymes in the living systems **[CPMT 1999; AIIMS 2000; CBSE PMT 1997; MP PET 1999;]**

(a) Provide energy

(b) Provide immunity

(c) Transport oxygen

(d) Catalyse biological processes

43. Which of the following statements about proteins is not true **[MP PET 2001]**

(a) Amino acid residues join together to make a protein molecule

(b) Proteins are polymers with formula $(C_6H_{10}O_5)_n$

(c) Eggs are rich in protein

(d) Pulses are good source of proteins

44. Enzymes **[AIIMS 1996]**

(a) Accelerate biochemical reactions

(b) Have optimum activity at body temperature

(c) Consist of amino acids

(d) Have all these properties

45. The functional group which is found in amino acid is **[AFMC 1998; AIEEE 2002]**

(a) $-COOH$ group (b) $-NH_2$ group

(c) $-CH_3$ group (d) Both (a) and (b)

46. Amino acids are produced on hydrolysis of **[AIIMS 1996]**

(a) Nucleic acid (b) Carbohydrates

(c) Fats (d) Proteins

47. Enzymes belong to which class of compounds **[KCET 1996]**

(a) Polysaccharides

(b) Polypeptides

(c) Polynitrogen heterocyclic compounds

(d) Hydrocarbons

48. By the action of enzymes, the rate of biochemical reaction **[CBSE PMT 1994]**

(a) Decreases (b) Increases

(c) Does not change (d) Either (a) or (c)

49. Metal present in blood is **[CPMT 1997]**

(a) Al (b) Mg

(c) Cu (d) Fe

50. Which compound can exist in a dipolar (zwitter ion) state **[Pb. PMT 1998]**

(a) $C_6H_5CH_2CH(N=CH_2)COOH$

(b) $(CH_3)_2CH.CH(NH_2)COOH$

(c) $C_6H_5CONHCH_2COOH$

(d) $HOOC.CH_2CH_2COCOOH$

51. What is the monomer of polypeptide **[KCET 1998; JIPMER 1999; Pb. CET 2002]**

(a) Amino acid (b) Glucose

(c) Nucleoside (d) Nucleotide

52. Which of the following enzymes is not useful in the digestion of proteins **[KCET 1998]**

(a) Chymotrypsin (b) Pepsin

(c) Trypsin (d) Lipase

53. Haemoglobin is **[CBSE PMT 1997; BHU 2004]**

(a) An enzyme (b) A globular protein

(c) A vitamin (d) A carbohydrate

54. Albumin proteins are most abundant in **[BHU 1998]**

(a) Meat (b) Milk

(c) Egg (d) Soyabean

55. Dialysis can separate **[BHU 1998]**

(a) Glucose and fructose

(b) Glucose and sucrose

(c) Glucose and $NaCl$

(d) Glucose and proteins

56. Which one of the following is an example of a globular protein **[Orissa JEE 1997]**

(a) Keratin (b) Insulin

(c) Collagen (d) Myoglobin

57. Leucine amino acids is the **[Pb. PMT 1999]**

(a) Essential (b) Non-essential

(c) Aromatic (d) Basic

58. Which of the following tests is not used for testing proteins **[Kerala PMT 1999; KCET 1999]**

(a) Millon's test (b) Molisch's test

(c) Biuret test (d) Ninhydrin test

59. Amino acids usually exist in the form of Zwitter ions. This means that it consists of **[KCET 2000]**

(a) The basic group $-NH_2$ and the acidic group $-COOH$

(b) The basic group $-NH_3^+$ and the acidic group $-CO_2$

(c) The basic group $-CO_2^-$ and the acidic group NH_3^+

(d) No acidic or basic group

60. The most important energy carrier in all the living cells is **[MP PET 2000; KCET 2000]**

(a) AMP (b) ATP

(c) ADP (d) UDP

61. The 10% energy transfer law of food chain was given by **[BHU 2000]**

(a) Stanley (b) Weismann

(c) Lindemann (d) Tansley

62. Which of the following is a conjugated protein **[BHU 2000]**

(a) Glycoprotein (b) Phosphoprotein

(c) Chromoprotein (d) All of these

63. The number of essential amino acids in man is **[CBSE PMT 2000]**

(a) 8 (b) 10

(c) 18 (d) 20

64. Pick out wrong combination **[DCE 2000]**

(a) $Fe^{+2} \rightarrow$ Haemoglobin

(b) $Mg^{2+} \rightarrow$ Photosynthesis

(c) $Se^{2+} \rightarrow$ Kreb Cycle

(d) $CO^{+2} \rightarrow$ Vitamin B-12

65. The decomposition of complex organic compounds into simpler compound with the help of enzyme is known as **[Pb. PMT 2000]**

(a) Catabolism (b) Anabolism

(c) Fermentation (d) Metabolism

66. A biological catalyst is essentially **[Pb. PMT 2000; BHU 2004]**

(a) A carbohydrates (b) An amino acids

(c) A nitrogen molecule (d) Fats

67. The test used for identifying peptide linkage in proteins is **[KCET (Engg.) 2001]**

(a) Borsche's test (b) Molisch's test

(c) Ninhydrin test (d) Biuret test

68. Which of the following is not a function of proteins **[MP PMT 2001]**

(a) Nails formation

(b) Skin formation

(c) Muscle formation

(d) Providing energy for metabolism

69. The helical structure of proteins is stabilized by **[MP PMT 2001]**

(a) Peptide bonds (b) Dipeptide bond

(c) Hydrogen bond (d) Vander Waal's forces

70. The optically inactive amino acid is **[MP PMT 2001; BHU 2005]**

(a) Lysine (b) Glycine

(c) Arginine (d) Alanine

71. Which α amino acid can cross link peptide chains **[AIIMS 2001]**

(a) Serine (b) Cysteine

(c) Glutamine (d) Tyrosine

72. Amino acids are the building blocks of **[MH CET 2001]**

(a) Fat (b) Vitamin

(c) Protein (d) Carbohydrate

73. Which of the following protein destroys the antigen when it enters in body cell **[AIIMS 2001; Pb. PMT 20**

(a) Antibodies (b) Insulin

(c) Chromoprotein (d) Phosphoprotein

74. An antibiotic with a broad spectrum **[AFMC 2001]**

(a) Kills the antibodies

(b) Acts on a specific antigen

(c) Acts on different antigents

(d) Acts on both the antigens and antibodies

75. Antibodies are **[CBSE PMT 2001]**

(a) Carbohydrate (b) Globular protein

(c) Immunoglobulins (d) Cellulose compounds

76. Excess of Na^+ ions in our system causes **[BHU 2001]**

(a) High B.P. (b) Low B.P.

(c) Diabetes (d) Anaemia

77. The example of a protein is **[MP PET 2003]**

(a) Narvone (b) Lacithin

(c) Cellulose (d) Insulin

78. Enzymes are made up of **[CBSE PMT 2002]**

(a) Carbohydrates

(b) Edible proteins

(c) Nitrogen containing carbohydrates

(d) Proteins with specific structure

79. Chlorophyll contains **[RPMT 2002]**

(a) Fe (b) Na

(c) Mg (d) Zn

80. Which one of the following biomolecules is insoluble in water **[AIIMS 2005]**

(a) α- Keratin (b) Haemoglobin

(c) Ribonuclease (d) Adenine

81. A nanopeptide contains ..... peptide linkages **[KCET 2005]**

(a) 10 (b) 8

(c) 9 (d) 18

82. Identify the incorrect statement **[Kerala (Med.) 2003]**

(a) An octa deca peptide contains 18 amino acid residues and 17 peptide bonds

(b) Addition of an inert gas into a system in thermodynamic equilibrium for the dissociation of PCl_5 shifts the equilibrium to the left.

(c) When gold dissolves in aquaregia the complex formed is chloroauric acid

(d) In the extraction of aluminium purified bauxite is dissolved in molten fluorospar

(e) If the pH value of a solution is to be decreased from 5 to 3, the hydrogen ion concentration must be increased twice the initial value.

83. α-helix is found in **[Kerala (Engg.) 2002]**

(a) DNA (b) RNA

(c) Lipid (d) Protein

84. The main structural of protein is **[UPSEAT 2000, 02]**

(a) The ester linkage (b) The ether linkage

(c) The peptide linkage (d) All of these

85. Among the following, the achiral amino acid is **[AIIMS 2003]**

(a) 2-Ethylalanine

(b) 2-Methylglycine

(c) 2-Hydroxymethyl serine

(d) Tryptophan

86. Which of the following could act as a propellant or rockets **[CBSE PMT 2003]**

(a) Liquid hydrogen + liquid nitrogen

(b) Liquid oxygen + liquid argon

(c) Liquid hydrogen + liquid oxygen

(d) Liquid nitrogen +liquid oxygen

87. Which amino acid has aromatic ring **[CPMT 2003]**

(a) Alamine (b) Glycine

(c) Tyrosine (d) Lysine

88. The *pH* value of the solution in which a particular amino acid does not migrate under the influence of an electric field in called the **[Kerala (Med.) 2003]**

(a) Eutectic point (b) Yielding point

(c) Neutralisation point (d) Effusion

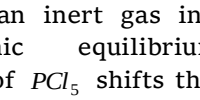
(e) Isoelectric point

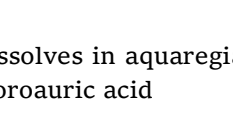
89. Which part of the protein molecule is responsible for function and activity of the proteins **[AMU 2002]**

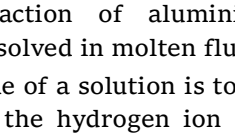
(a) Secondary structure (b) Peptide bond

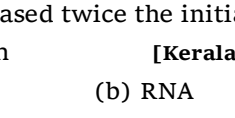
(c) Primary structure (d) Binding sites

90. The Structural formula of an amino acid, isoleucine is **[MP PMT 2003]**

(a) 

(b) 

(c) 

(d) 

91. The process by which synthesis of protein takes place based on the genetic information present in *m*-RNA is called **[KCET 2003; Kerala CET 2005]**

(a) Translation (b) Transcription

(c) Replication (d) Messenger hypothesis

92. Which of the following is used in our body as a fuel for muscles and nerves and to build and repair body tissues? **[DCE 2003]**

(a) Cane sugar (b) Fructose

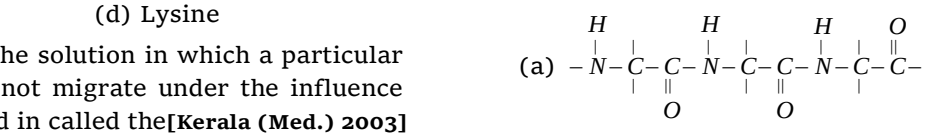
(c) Proteins (d) Glucose

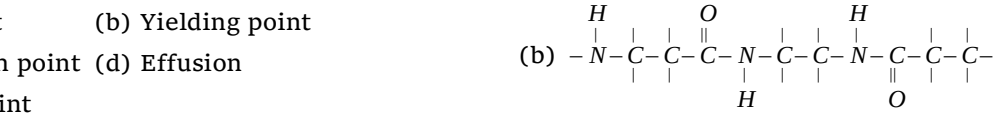
93. Which enzyme convert glucose into alcohol **[Pb. CET 2003]**

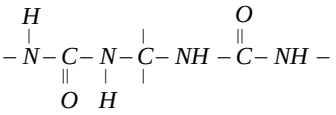
(a) Invertase (b) Zymase

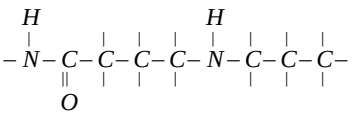
(c) Maltase (d) Diastase

94. Which one of the following structures represents the peptide chain **[CBSE PMT 2004; CPMT 2003; DCE 2002; MP PET 1994; Bihar MEE 1997; Orissa JEE 1997]**

(a) 

(b) 

(c) 

(d) 

95. The correct statement in respect of protein haemoglobin is that it **[CBSE PMT 2004]**

(a) Acts as an oxygen carrier in the blood

(b) Forms antibodies and offers resistance to diseases

(c) Functions as a catalyst for biological reactions

(d) Maintains blood sugar level

96. Identify the correct statement regarding enzymes **[AIEEE 2004]**

(a) Enzymes are specific biological catalysts that cannot be poisoned

(b) Enzymes are normally heterogeneous catalysts that are very specific in their action

(c) Enzymes are specific biological catalysts that can normally function at very high temperature ($T \sim 1000K$)

(d) Enzymes are specific biological catalysts that possess well-defined active sites

97. A biological catalyst is essentially

(a) An enzyme

(b) A carbohydrate

(c) An amino acid

(d) A nitrogen compound

98. Which synthesis was done by Stainley Millar **[CPMT 1979]**

(a) Amino acid (b) Protein

(c) Virus (d) Vitamin

99. The bond that determines the secondary structure of proteins is or secondary structure of protein is due to **[NCERT 1984; MP PET 1996; MP PMT 1997]**

(a) Coordinate bond

(b) Covalent bond

(c) Hydrogen bond

(d) Peptide bond

Fats and Lipids

1. Tripalmitin is

(a) A protein (b) An enzyme

(c) A lipid (d) A carbohydrate

2. On hydrolysis, all lipids yield

(a) Monocarboxylic acids (b)Monohydric alcohols

(c) Monohaloalkanes (d) Enzymes

3. Which of the following is not a lipid

(a) Oils (b) Fats

(c) Waxes (d) Proteins

4. The '*acid value*' of an oil or fat is measured in terms of weight of

(a) NH_4OH (b) $NaOH$

(c) KOH (d) CH_3COOH

5. The '*saponification value*' of an oil or fat is measured in terms of

(a) NH_4OH (b) $NaOH$

(c) KOH (d) C_6H_5OH

6. The '*iodine value*' of an oil indicates

(a) Its boiling point

(b) Inflammability

(c) Unsaturation present in acid contents

(d) Solubility of salt in oils

7. Hardening of oils is caused by

(a) H_2 (b) N_2

(c) O_2 (d) CO_2

8. Which of the following is obtained when an oil is hydrolysed with alkali

(a) Fat (b) Wax

[BHU 2004] (c) Soap (d) Vitamin

9. Which of the following indicates the number of free $-OH$ groups in an oil or fat

(a) Iodine value

(b) Acid value

(c) Acetyl value

(d) Saponification value

10. Which of the following is not glyceride

(a) Lipids (simple) (b) Phospholipids

(c) Sphingolipids (d) All

11. The most important food reserves of animals and plants are **[MP PET 1993]**

(a) Carbohydrates (b) Proteins

(c) Vitamins (d) Fats

12. Which of the following gives maximum energy in metabolic processes **[CPMT 1991; MP PET 1999]**

(a) Proteins (b) Carbohydrates

(c) Lipids (d) Vitamins

13. The energy change produced by the combustion of food is called the '*calorific value*'. The highest calorific value is given by **[NCERT 1984; AFMC 1988]**

(a) Proteins (b) Fats
(c) Carbohydrates (d) Vitamins

14. Cell membrane contains
(a) Alternate layers of phospholipid and coline
(b) Double layers of phospholipid
(c) Double layers of phospholipid with polar ends projected outside
(d) Double layers of phospholipid with polar ends projected inside

15. Which of the following compounds do not belong to lipids **[AFMC 1998]**
(a) Fats (b) Amino acids
(c) Phospholipids (d) Carbohydrates

16. Which is not a macromolecule **[BHU 1998]**
(a) *DNA* (b) Starch
(c) Palmitate (d) Insulin

17. A distinctive and characteristic functional group of fats is **[Kerala (Med.) 1999; AFMC 2005]**
(a) An ester group
(b) A peptide group
(c) A ketonic group
(d) An alcoholic group

18. The waxes are long chain compounds of fatty acids, which belong to the class of **[BHU 1999; AFMC 2005]**
(a) Esters (b) Ethers
(c) Alcohols (d) Acetic acid

19. Hydrolytic reaction of fats, with caustic soda, is known as **[Kerala (Med.) 2000; Pb. PMT 2004; MNR 1988]**
(a) Acetylation (b) Carboxylation
(c) Saponification (d) Esterification

20. Fat consists of **[MH CET 2002]**
(a) Monohydroxy carboxylic acid
(b) Monohydroxy aliphatic carboxylic acid
(c) Monohydroxy aliphatic, saturated carboxylic acid
(d) Dihydroxy aliphatic carboxylic acid

21. The alcohol obtained by the hydrolysis of oils and fats is **[KCET 2001]**
(a) Glycol (b) Glycerol
(c) Propanol (d) Pentanol

22. Iodine value is related to **[MP PET 2002]**
(a) Fats and oils (b) Alcohols
(c) Esters (d) Hydrocarbons

23. Phospholipids are esters of glycerol with **[CBSE PMT 2003]**
(a) Three phosphate groups
(b) Three carboxylic acid residues
(c) Two carboxylic acid residues and one phosphate group
(d) One carboxylic acid residue and two phosphate groups

24. Oils and fats are jointly called **[MP PET 2003]**
(a) Lipids (b) Soaps
(c) Proteins (d) Polymer

25.
$$\begin{array}{l} CH_2OOCR' \\ | \\ CHOOCR'' \\ | \\ CH_2OOCR''' \end{array} \xrightarrow[\text{Hydrolysis}]{\text{Enzyme}} \begin{array}{l} CH_2OH \\ | \\ CHOH \\ | \\ CH_2OH \end{array} + \begin{array}{l} R'COOH \\ + \\ R''COOH \\ + \\ R'''COOH \end{array}$$

The enzyme used in the above reaction is **[AMU 2003]**
(a) Amylase (b) Lactase
(c) Lipase (d) Invertase

26. Oleic, stearic and palmitic acids are **[Pb. CET 2002]**
(a) Fatty acid (b) Amino acid
(c) Nucleic acid (d) Essential acid

27. An example for a saturated fatty acid, present in nature is **[KCET 2005]**
(a) Oleic acid (b) linoleic acid
(c) Linolenic acid (d) Palmitic acid

Vitamin, Harmone and Nucleic acid

1. A nucleotide consists of
(a) Base and sugar (b) Base and phosphate
(c) Sugar and phosphate (d) Base, sugar and phosphate

2. Which of the following is responsible for heredity character
(a) DNA (b) RNA
(c) Proteins (d) Hormones

3. The base adenine occurs in **[MP PMT 1995]**
(a) DNA only (b) RNA only
(c) DNA and RNA both (d) Protein

4. The protein which maintains blood sugar level in the human body **[KCET 1993; MP PMT 1995]**
(a) Haemoglobin (b) Oxytocin
(c) Insulin (d) Ptyalin

5. Which of the following statements about the assembly of nucleotides in a molecule of deoxyribose nucleic acid (DNA) is correct
(a) A pentose of one unit connects to a pentose of another
(b) A pentose of one unit connects to the base of another
(c) A phosphate of one unit connects to a pentose of another

(d) A phosphate of one unit connects to the base of another

6. Vitamin *A* is present in **[MP PET 1995, 2000]**
(a) Cod liver oil (b) Carrot
(c) Milk (d) In all of these

7. Ascorbic acid is a **[Bihar CEE 1995; MP PET 1995]**
(a) Vitamin (b) Enzyme
(c) Protein (d) Carbohydrate

8. The chemical name of vitamin *C* is **[J & K 2005]**
(a) Ascorbic acid (b) Folic acid
(c) Nicotinic acid (d) Tartaric acid

9. Which of the following is not a constituent of *RNA* **[MP PET 1996]**
(a) Ribose (b) Phosphate
(c) Adenine (d) Pyridine

10. Which one is found in ATP ribonucleotide
(a) Guanine (b) Uracil
(c) Adenine (d) None of these

11. Which of the following proteins acts as a messenger in living system
(a) Harmone (b) Enzyme
(c) Protective protein (d) Transport protein

12. Which substance is not present in nucleic acid **[MP PET/PMT 1998]**
(a) Cytosine (b) Adenine
(c) Thymine (d) Guanidine

13. The deficiency of vitamin B_1 causes **[CPMT 1994; MP PMT 1999; BHU 2000]**
(a) Beri-beri (b) Scurvy
(c) Rickets (d) Anaemia

14. Which of the following is not present in nucleic acids **[MP PMT 1999]**
(a) Uracil (b) 2-aminopyridine
(c) Thymine (d) Adenine

15. In nucleic acids, the sequence is **[AIIMS 1996]**
(a) Base-phosphate-sugar (b)Phosphate-base-sugar
(c) Sugar-base-phosphate (d)Base-sugar-phosphate

16. The segment of DNA which acts as the instructional manual for the synthesis of the protein is **[Pb. PMT 1998]**
(a) Nucleoside (b) Nucleotide
(c) Ribose (d) Gene

17. The double helical structure of DNA was proposed by **[KCET 1998]**
(a) Watson and Crick (b) Meicher
(c) Emil Fischer (d) Khorana

18. A segment of DNA molecule which codes or specifies for one polypeptide chain is called **[KCET 1998]**
(a) Phosphate group (b) Adenine
(c) Gene (d) Amino acid

19. In DNA, the complementary bases are **[CBSE PMT 1998]**
(a) Uracil and adenine; cytosine and guanine
(b) Adenine and thymine; guanine and cytosine
(c) Adenine and thymine; guanine and uracil
(d) Adenine and guanine; thymine and cytosine

20. The structure of DNA is **[AFMC 1999]**
(a) Linear (b) Single helix
(c) Double helix (d) Triple helix

21. Vitamin B_1 is **[MP PMT 2000]**
(a) Riboflavin (b) Cobalamin
(c) Thiamine (d) Pyridoxine

22. A gene is a segment of a molecule of **[AIIMS 1999]**
(a) DNA (b) *m*-RNA
(c) *t*-RNA (d) Protein

23. The deficiency of vitamin-*C* causes **[MP PMT 2000; CPMT 2000]**
(a) Scurvy (b) Rickets
(c) Pyrrohea (d) Pernicious Anaemia

24. DNA contains the sugar **[MP PMT 2000]**
(a) Deoxyribose (b) Ribose
(c) *D*-Fructose (d) *D*-glucose

25. Which of the following is not a sex hormone **[MP PMT 2000]**
(a) Testosterone (b) Estrone
(c) Estradiol (d) Cortisone

26. Acquired immune deficiency syndroms (AIDS) is characterised **[AIIMS 2000]**
(a) Killer T-cells
(b) Reduction in number of helper T-cells
(c) An autoimmune disease
(d) Inability of body to produce interferons

27. The base present in DNA, but not in RNA is **[KCET (Engg.) 2001; NCERT 1978; Manipal MEE 1985; MP PMT 1994, MP PET 1995; DCE 2004]**
(a) Guanine (b) Adenine
(c) Uracil (d) Thymine

28. Mutation of DNA occurs due to changes in the sequence of one of the following **[MP PMT 2001]**
(a) Bases (b) Ribose units
(c) Phosphate units (d) Sugar units

29. Which of the following is not true about vitamins **[AFMC 2001]**
(a) They are vital for life
(b) They help in digestion
(c) They were named by "Funic"
(d) Their deficiency causes diseases

30. Blood calcium level can be increased by the administration of **[AFMC 2001]**
(a) Glucogon (b) Calcitonin
(c) Thyroxine (d) Paratharmone

31. The first harmone chemically synthesised in the laboratory is **[BHU 2002]**
(a) Cortisone (b) Insuline
(c) Adrenaline (d) Estrone

32. Purine derivative among the following bases is **[KCET (Med./Engg.) 2002; MPPET 2004]**
(a) Guanine (b) Cytosine
(c) Thymine (d) Uracil

33. RNA is different from DNA because RNA contains **[AIEEE 2002, 04]**
(a) Ribose sugar and thymine
(b) Ribose sugar and uracil
(c) Deoxyribose sugar and thymine
(d) Deoxyribose sugar and uracil

34. Deficiency of which vitamin causes rickets **[MP PET 2002]**
(a) Vitamin-*D* (b) Vitamin-*B*
(c) Vitamin-*A* (d) Vitamin-*K*

35. Which do the following vitamins has isoprene units in its structure **[JIPMER 2002]**
(a) Vitamin *A* (b) Vitamin C
(c) Vitamin B_2 (d) Vitamin *D*

36. The reason for double helical structure of DNA is operation of **[CBSE PMT 2003; DPMT 2004]**
(a) Vander Waal's forces
(b) Dipole-dipole interaction
(c) Hydrogen bonding
(d) Electrostatic attractions

37. The tripeptide harmone present in most living cells is... **[KCET 2003]**
(a) Glutathione (b) Glutamine
(c) Oxytocin (d) Ptyalin

38. The function of DNA in an organism is **[DCE 2003]**
(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

39. The harmone that helps in the conversion of glucose to glycogen in **[CBSE PMT 2004]**
(a) Adrenaline (b) Insulin
(c) Cortisone (d) Bile acids

40. Insulin production and its action in human body are responsible for the level of diabetes. This compound belongs to which of the following categories **[AIEEE 2004]**
(a) An enzyme (b) A harmone
(c) A co-enzyme (d) An antibiotic

41. Codon is present in **[Pb. PMT 2004]**
(a) *t*-RNA (b) *m*-RNA
(c) *r*-RNA (c) All of these

42. Energy is stored in our body in the form of **[CBSE PMT 2001; KCET 2003]**
(a) ATP (b) ADP
(c) Fats (d) Carbohydrates

43. Nucleic acid is a polymer of
(a) Nucleosides (b) α – amino acids
(c) Nucleotides (d) Glucose

44. A nucleoside on hydrolysis gives
(a) A heterocyclic base and orthophosphoric acid
(b) An aldopentose, a heterocyclic base and orthophosphoric acid
(c) An aldopentose and a heterocyclic base
(d) An aldopentose and orthophosphoric acid

45. An alternation in the base sequence of nucleic acid molecule is called **[Kerala PMT 2004]**
(a) Replication (b) Mutation
(c) Duplication (d) Dislocation
(e) Flocculation

46. Vitamin B_6 is known as **[DCE 2004]**
(a) Pyridoxin (b) Thiamine
(c) Tocopherol (d) Riboflavin

Critical Thinking

Objective Questions

1. Number of chiral carbons in $\beta - D - (+)$-glucose is **[CBSE PMT 2004; MHCET 2004]**
(a) Three (b) Four
(c) Five (d) Six

2. The nucleic acid base having two possible binding sites is **[AIIMS 2004]**
(a) Thymine (b) Cytosine
(c) Guanine (d) Adenine

3. Subunits present in haemoglobin are **[AIIMS 2003]**
(a) 2 (b) 3
(c) 4 (d) 5

4. A sequence of how many nucleotides in messenger RNA makes a codon for an amino acid
(a) One (b) Two
(c) Three (d) Four

5. Chargaff's rule states that in an organism **[CBSE PMT 2003]**
(a) Amounts of all bases are equal

(b) Amount of adenine (A) is equal to that of thymine (T) and the amount of guanine (G) is equal to that of cytosine (C)

(c) Amount of adenine (A) is equal to that of guanine (G) and the amount of thymine (T) is equal to that of cytosine (C)

(d) Amount of adenine (A) is equal to that of cytosine (C) and the amount of thymine (T) is equal to guanine (G)

6. DNA multiplication is called **[Kerala (Med.) 2000]**

(a) Translation (b) Transduction

(c) Transcription (d) Replication

7. Insulin is a protein which plays the role of **[KCET 1986]**

(a) An antibody (b) A harmone

(c) An enzyme (d) A transport agent

8. Proteins fulfil several functions in living systems. An example of a protein which acts as a hormone is **[KCET 1985]**

(a) Casein (b) Oxytocin

(c) Trypsin (d) Keratin

9. Pick out the unsaturated fatty acid from the following **[KCET 2004; MHCET 2002]**

(a) Stearic acid (b) Lauric acid

(c) Oleic acid (d) Palmitic acid

10. Vitamin B_{12} contains metal **[Bihar MEE 1997; RPET 1999; Pb. PMT 1999; AFMC 2002; CBSE PMT 2003; CPMT 2003; MP PMT 2003]**

(a) *Ca* (II) (b) *Zn* (II)

(c) *Fe* (II) (d) *Co* (III)

11. The number of molecules of ATP produced in the lipid metabolism of a molecule of palmitic acid is **[CBSE PMT 1998]**

(a) 130 (b) 36

(c) 56 (d) 86

12. Protein can be most easily removed from **[UPSEAT 2000, 02]**

(a) Alkanes (b) Alkenes

(c) Alkynes (d) Benzene

13. The enzyme which hydrolyses triglycerides to fatty acids and glycerol is called

(a) Zymase (b) Pepsin

(c) Maltase (d) Lipase

14. The helical structure of protein is stabilized by **[CBSE PMT 2004]**

(a) Ether bonds (b) Peptide bonds

(c) Dipeptide bonds (d) Hydrogen bonds

15. The cell membranes are mainly composed of **[CBSE PMT 2005]**

(a) Carbohydrates (b) Proteins

(c) Phospholipids (d) Fats

16. A compound of mol. wt. 180 is acetylated to give a compound of mol. wt. 390. The number of amino groups in the initial compound is

(a) 2 (b) 4

(c) 5 (d) 6

17. Starting with three different amino acid molecules, how many different tripeptide molecules are formed **[Kerala PMT 1999; KCET 1999]**

(a) 12 (b) 9

(c) 8 (d) 6

18. Which one of the following is a polysaccharide **[NDA 1999]**

(a) Nylon (b) Amylose

(c) Ribose (d) Polyethylene

19. Which of the following is not an acidic amino acid

(a) Lysine (b) Arginine

(c) Aspartic acid (d) Histidine

20. Proteins do not respond to

(a) Biuret test (b) Heller's ring test

(c) Ninhydrin test (d) Lucas test

21. Alkyl benzene sulphonates can be conductivity used as detergents in hard water, unlike soaps, as **[AMU 2002]**

(a) They are highly soluble in water

(b) Their Ca^{++}/Mg^{++} salts are water soluble

(c) They are non-ionic

(d) Their Ca^{++}/Mg^{++} salts are insoluble in water

22. When glucose reacts with bromine water, the main product is **[Pb. CET 2003; BHU 2004]**

(a) Acetic acid (b) Saccharic acid

(c) Glyceraldyhyde (d) Gluconic acid

23. A zwitter ion is **[KCET 1989]**

(a) A positively charged ion without a metal atom in it

(b) A negatively charged ion without metal atom in it

(c) An ion with positive and negative charges at different points on it

(d) A heavy ion with a small charge on it

24. Ribose is an example of **[KCET 1998]**

(a) Ketohexose (b) Aldopentose

(c) Disaccharide (d) Aldohexose

25. The two forms of *D*-glucopyranose obtained from the solution of *D*-glucose are called

(a) Isomer (b) Anomer

(c) Epimer (d) Enantiomer

26. Sucrose molecule is made up of **[KCET 2005]**

(a) A gluco pyranose and a fructo pyranose
(b) A gluco pyranose and a fructo furanose
(c) A gluco furanose and a fructo pyranose
(d) A gluco furanose and a fructo furanose

AR Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : Glycine is amphoteric in nature.
Reason : Glycine contains both acid and basic groups. **[AIIMS 1996]**

2. Assertion : Hydrolysis of sucrose is known as inversion of cane sugar.
Reason : Sucrose is a disaccharide. **[AIIMS 1997]**

3. Assertion : Proteins on hydrolysis produce amino acids.
Reason : Amino acids contain $-NH_2$ and $-COOH$ groups. **[AIIMS 1998]**

4. Assertion : Sucrose undergo mutarotation.
Reason : Sucrose is a disaccharide. **[AIIMS 2000]**

5. Assertion : DNA molecules and RNA molecules are found in the nucleus of a cell.
Reason : On heating the enzyme do not lose their specific activity. **[AIIMS 2002]**

6. Assertion : All Amino acids exist as Zwitter ions.
Reason : Amino acids have both $-NH_2$ and $-COOH$ group. **[AIIMS 2002]**

7. Assertion : Activity of an enzyme is *pH*-dependent.
Reason : Change in *pH* affects the solubility of the enzyme in water. **[AIIMS 2003]**

8. Assertion : Glycosides are hydrolyzed in acidic conditions.
Reason : Glycosides are acetals. **[AIIMS 2003]**

9. Assertion : Haemoglobin is an oxygen carrier.
Reason : Oxygen binds as O_2^- to *Fe* of haemoglobin. **[AIIMS 2003]**

10. Assertion : Carboxypeptidase is an exopeptidase.
Reason : It cleaves the *N*-terminal bond. **[AIIMS 2004]**

11. Assertion : Sucrose is a non-reducing sugar.
Reason : It has glycosidic linkage. **[AIIMS 2004]**

12. Assertion : Sucrose is a disaccharide.
Reason : Sucrose is dextro rotatory.

13. Assertion : Fructose reduces Fehling's solution and Tollen's reagent.
Reason : Fructose does not contain any aldehyde group.

14. Assertion : The specific rotation of a freshly prepared solution of $\alpha-$glucose decreases from + 112° to 52.7° while that of β glucose increase from + 19° to 52.7°.
Reason : The change in specific rotation of an optically active compound with time to an equilibrium value is called mutarotation.

15. Assertion : $\alpha-$amino acids exist as dipolar ions or zwitter ions.
Reason : $\alpha-$amino acids are the building blocks of proteins.

16. Assertion : Valine is an essential amino acid.
Reason : The lack of essential amino acids in the diet causes Kwashiorkor.

17. Assertion : Sequence of bases in DNA is TGAACCCTT and sequence of bases in *m*-RNA is CATTAAACC.
Reason : In DNA nitrogenous bases have hydrogen bonds.

18. Assertion : Millon's test is a test to identify carbohydrates.
Reason : Millon's reagent is solution of mercurous nitrate and mercuric nitrate in nitric acid containing little nitrous acid.

19. Assertion : ATP molecules are energy rich molecules.
Reason : ATP consists of a purine base adenine, pentose sugar ribose and a string of three phosphate groups.

20. Assertion : Solubilities of protein is minimum at the isoelectric point.
Reason : At isoelectric point, protein molecule behaves as a zwitter ion.

21. Assertion : Amino acids are soluble in benzene and ether.
Reason : Amino acids exist as zwitter ions.

22. Assertion : A solution of sucrose in water is dextrorotatory but on hydrolysis in presence of little hydrochloric acid, It becomes laevorotatory.
Reason : Sucrose on hydrolysis gives unequal amounts of glucose and fructose as.

23. Assertion : Treatment of *D*-glucose with alkali affords an equilibrium mixture consisting of *D*-mannose, *D*-fructose and starting substance *D*-glucose.

Reason : The reaction involves an intermediate in which hybridization of C_2 changes from sp^3 to sp^2.

Answers

Carbohydrates

1	d	2	b	3	d	4	d	5	c
6	c	7	c	8	d	9	b	10	d
11	c	12	d	13	c	14	c	15	c
16	a	17	a	18	b	19	b	20	d
21	a	22	a	23	b	24	d	25	a
26	d	27	d	28	a	29	c	30	b
31	c	32	a	33	d	34	d	35	c
36	cd	37	d	38	a	39	c	40	c
41	b	42	c	43	c	44	a	45	b
46	a	47	b	48	d	49	a	50	c
51	a	52	c	53	c	54	a	55	c
56	b	57	d	58	c	59	a	60	c
61	b	62	d	63	a	64	d	65	d
66	d	67	d	68	c	69	b	70	c
71	e	72	b	73	b	74	a	75	b
76	c	77	c	78	a	79	b	80	d
81	a	82	c	83	c	84	b	85	a
86	c	87	b	88	c	89	a	90	a
91	a	92	c	93	a	94	c	95	c
96	a	97	a	98	d	99	b	100	b
101	c	102	a	103	a	104	a	105	b
106	c	107	d	108	c	109	c	110	a
111	c	112	c	113	b	114	a	115	b
116	c	117	c	118	b	119	d	120	d
121	c	122	c	123	c	124	a	125	a
126	b	127	b	128	b	129	a	130	d
131	b	132	b	133	a				

Proteins, Amino Acids and Enzymes

1	b	2	c	3	a	4	a	5	c
6	b	7	c	8	d	9	c	10	c
11	c	12	b	13	a	14	b	15	c
16	a	17	d	18	c	19	d	20	d
21	c	22	b	23	c	24	b	25	a
26	a	27	d	28	a	29	a	30	d
31	c	32	a	33	b	34	c	35	d
36	b	37	a	38	d	39	c	40	a
41	d	42	d	43	b	44	d	45	d
46	d	47	b	48	b	49	d	50	b
51	a	52	d	53	b	54	c	55	d
56	d	57	a	58	b	59	c	60	b
61	c	62	d	63	b	64	c	65	c
66	b	67	d	68	d	69	c	70	b
71	b	72	c	73	a	74	c	75	c
76	a	77	d	78	d	79	c	80	a
81	b	82	e	83	d	84	c	85	c
86	c	87	c	88	e	89	b	90	c
91	a	92	c	93	b	94	a	95	a
96	d	97	a	98	a	99	c		

Fats and Lipids

1	c	2	a	3	d	4	c	5	c
6	c	7	a	8	c	9	b	10	c
11	d	12	c	13	d	14	c	15	bd
16	c	17	a	18	a	19	c	20	c
21	b	22	a	23	d	24	a	25	c
26	a	27	d						

Vitamins, Hormone and Nucleic Acid

1	d	2	a	3	c	4	c	5	c
6	d	7	a	8	a	9	d	10	c
11	a	12	d	13	a	14	b	15	d
16	b	17	a	18	c	19	b	20	c
21	c	22	a	23	a	24	a	25	d
26	b	27	d	28	a	29	b	30	d
31	b	32	a	33	b	34	a	35	a
36	c	37	a	38	d	39	b	40	b
41	b	42	a	43	c	44	c	45	b
46	a								

Critical Thinking Questions

1	b	2	c	3	c	4	c	5	b
6	d	7	b	8	b	9	c	10	d
11	a	12	d	13	d	14	d	15	b
16	a	17	d	18	b	19	c	20	d
21	d	22	d	23	c	24	b	25	b
26	b								

Assertion and Reason

1	a	2	b	3	b	4	e	5	d
6	a	7	b	8	d	9	c	10	c
11	a	12	b	13	b	14	b	15	b
16	b	17	e	18	e	19	b	20	e
21	e	22	c	23	a				

AS Answers and Solutions

Carbohydrates

1. (d) $\alpha - D - \text{Glucose} \underset{[\alpha]=+112^o \ (36\%)}{} \rightleftharpoons \underset{[\alpha]_D=+52^o \ (0.02\%)}{\text{Equilibrium mixture}} \rightleftharpoons \underset{[\alpha]_D=+19^o \ (64\%)}{\beta - D - \text{Glucose}}$

Glucose has two forms α and β. When either of these two is dissolved in water and allowed to stand, it gets converted to an equilibrium mixture of α and β forms.

2. (b) Gun-cotton is a nitrocellulose or cellulose trinitrate which is used in explosive and as a binder for solid rocket propellant.

3. (d) Arabinose is an aldopentose $HOCH_2 - (CHOH)_3 - CHO$

4. (d) In proteins amide group is present

$$(-NH - \underset{R}{CH} - \underbrace{\overset{O}{\overset{\|}{C}} - NH}_{\text{Amino or peptide bond}} - \underset{R}{CH} - \overset{O}{\overset{\|}{C}} -)_n$$

5. (c) Inulin is a carbohydrate which is stored in "Roots of Dahliya".

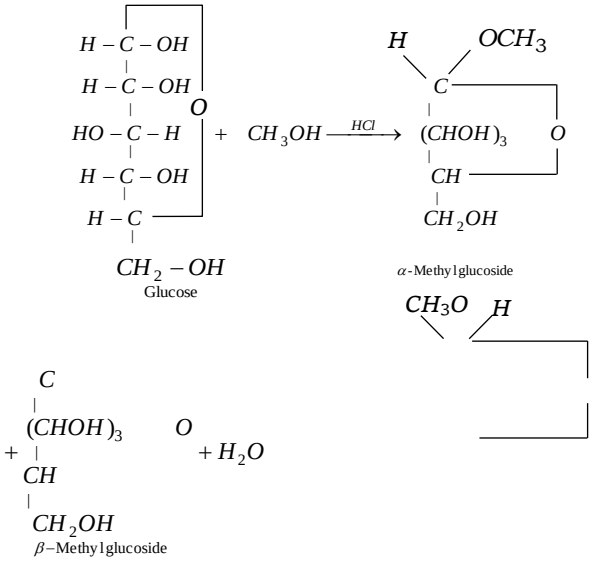
6. (c) Carbohydrates are hydrates of carbon. Their general formula is $C_x(H_2O)_y$.

8. (d) Glucose + Tollen's reagent $\rightarrow$ Gluconic acid + *Ag*-mirror.

9. (b) Protein gives blue-violet colour with ninhydrin

(2, 2-dihydroxyindane-1, 3-diene)
Carbohydrates gives brown red ppt. with benedict's solution (Alk. $CuSO_4$ + Citrate ions)

11. (c) A ring structure



39. (c) Glucose + Benedict's solution → Red colour (Cu_2O).

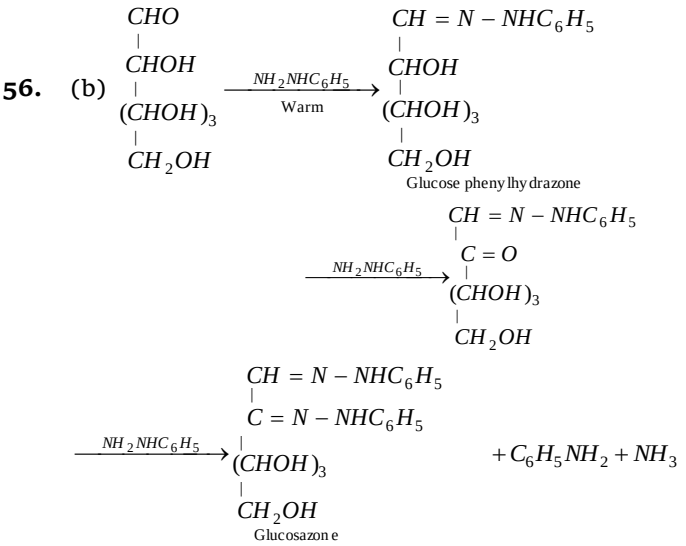
40. (c) Sucrose $\xrightarrow{\text{conc.}HNO_3}$ Oxalic acid.

41. (b) Amylopectin is not soluble in water.

43. (c) $\underset{\text{Maltose}}{C_{12}H_{22}O_{11}}$

47. (b) Sucrose is not a reducing sugar.

56. (b)



57. (d) Starch $\xrightarrow{\text{Diastase}}$ Maltose.

58. (c) $\underset{\text{Cane sugar}}{C_{12}H_{22}O_{11}} + H_2O \rightarrow \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$

61. (b) Monosaccharide cannot be hydrolysed to simple forms.

64. (d) Starch + I_2 → Blue colour.

66. (d) Glucose and sucrose are dextrorotatory Fructose is leavorotatory

68. (c) $\underset{(C \text{ and } H)}{\text{Food shift}} + O_2 \rightarrow CO_2 + H_2O$

70. (c) In neutral solvent, glucose shows mutarotation.

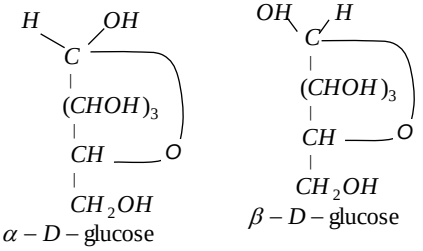
73. (b) Maltose $\xrightarrow[\text{Maltase}]{\text{Hydrolysis}}$ glucose + glucose.

79. (b) 3 carbons e.g. Glyceraldehyde $\begin{matrix} CH_2-CH-CHO \\ | \quad\quad | \\ OH \quad OH \end{matrix}$

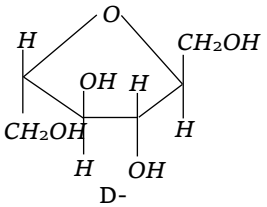
83. (c) Starch $\xrightarrow{\text{Diastage}}$ Maltose $\xrightarrow{\text{Maltase}}$ glucose.

85. (a) All are optically active.

86. (c)



90. (a)



5 atoms in the ring

93. (a) In sucrose the two monosaccharide units joined by α-1, 2 glycoside bond. Since sucrose does not have hemiacetal carbon. Therefore it is non- reducing sugar.

94. (c) Starch $\xrightarrow{\text{Amylase}}$ Maltose.

96. (a) Glucose is the simplest carbohydrate i.e. mono saccharide rest are polysaccharide.

97. (a) We can't digest cellulose which is a polysaccharide.

98. (d) Diastase enzyme converts starch into maltose.

99. (b) Lactose is present in milk (Glucose + Galactose).

100. (b) Carbohydrates are rich source of energy.

102. (a) Sucrose is a non reducing sugar it does not give any test with Benedict's solution.

103. (a) That is called glycosidic linkage.

108. (c) Invert sugar is laevo rotatory.

111. (c) Starch is polymer of alpha glucose.

114. (a) Raffinose ($C_{18}H_{32}O_{16}$) is a trisaccharide

$$C_{18}H_{32}O_{16} + H_2O \rightarrow \underset{\text{D glucose}}{C_6H_{12}O_6} + \underset{\text{D fructose}}{C_6H_{12}O_6} + \underset{\text{D mannose}}{C_6H_{12}O_6}$$

118. (b) Glucose + Fehling solution → Gluconic acid + $\underset{\text{(Red ppt)}}{Cu_2O}$

123. (c) Charring of sugar, when it is treated with sulphuric acid (H_2SO_4) is due to dehydration.

In this reaction water is removed from the sugar.

124. (a) Glucose is a monosaccharide while others are polysaccharide. So glucose is the simplest sugar.

125. (a) Glucose and mannose are epimers because they both differ in configuration at *C*–2 and the Isomer which differ at C_2 position known as epimers of each other.

126. (b) $\underset{\text{Maltose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[\text{Hydrolysis}]{} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Glucose}}{C_6H_{12}O_6}$

127. (b) Pepsin, ptyalin and lipase are enzyme while cellulose is not the enzyme.

128. (b)

Sugar	Relative sweetness
Sucrose	100
Glucose	74
Lactose	16
Fructose	173

129. (a) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38\,\text{ATP}$

131. (b) Fructose has three chiral centres and hence 23 = 8 optical isomers are possible.

132. (b) Freezing point is the temperature at which the liquid and the solid form of the same substance are in equilibrium and hence have the same vapour pressure. Due to lower vapour pressure of the solution, solid form of a solution separates out at a lower temperature. The decrease is called depression in freezing point.

When solid is the solute, it is solvent that freezes. Hence in the given question water will be separated out first.

133. (a) Glucose is a monosaccharide having chemical composition $C_6H_{12}O_6$.

Proteins, Amino Acids and Enzymes

1. (b) Insulin is a protein consists of 51 amino acids in two chains. α and β

α - 21 amino acids, β - 30 amino acids

It is secreted by pancreas for controlling the sugar level in blood.

3. (a) Fibrous proteins are insoluble in water.

4. (a) $\text{Protein} \xrightarrow[\text{or change in pH}]{\text{Heated}} \text{Denatured protein}$

5. (c) $\underset{\text{(Prosthetic group or co-factor)}}{\text{Simple protein} + \text{non - protein material}} \rightarrow$ Conjugated protein

6. (b) Heam $\rightarrow Fe^{+2}$ to which the porphyrine ring is attached to central atom by co-ordinate linkage.

7. (c) It is insoluble in water and used in food products capsules and photographic plates.

9. (c) Amino acids are non volatile crystalline compound.

10. (c) Isoelectric point is a pH at which zwitter ions do not migrate towards any of the electrode.

11. (c) $\text{Protein} \xrightarrow{\text{Enzyme}} \underset{\text{(Acidic medium in stomach)}}{\text{Amino acid}}$

12. (b) Protein + conc. $HNO_3 \rightarrow$ Yellow colour

[This test is given by a protein which consists of α-amino acids containing a benzene ring such as tyrosine, phenylalanine etc. The yellow colour is due to nitration of benzene ring.]

14. (b) Proteins are polymers of amino acids.

Amino acid → Dipeptide → Polypeptide → Protein.

21. (c) Proteins are nitrogenous compounds.

22. (b) In stomach medium is strongly acidic. Hence, $pH = 2$.

30. (d) Glycine $\rightarrow NH_2 - CH_2 - COOH$.

34. (c) Antigens are polysaccharides present on RBC's surface.

37. (a) $Hb + CO \rightarrow HbCO$

carboxy haemoglobin it is 20 times more stable then oxyhaemoglobin.

40. (a) Peptides are formed by condensation of α-amino acids.

$$H_2N - CH_2COOH + H_2N - CH_2 - COOH$$

$$\xrightarrow{-H_2O} \underset{\text{peptide bond}}{H_2N - CH_2 - CONH - CH_2COOH}$$

$$\xrightarrow{H_2N-CH_2COOH}$$ and so on.

41. (d) Muscles contain myoglobin $CH_3 - \underset{COOH}{\overset{NH_2}{\overset{|}{\underset{|}{CH}}}}$

alanine contain side chain of methyl group.

43. (b) It is the general formula for polysaccharides.

50. (b) $(CH_3)_2.\underset{NH_2}{\underset{|}{CH}}.CH - COOH \rightleftharpoons (CH_3)_2 - CH.\underset{NH_3^+}{\underset{|}{CH}} - COO^-$

52. (d) Lipase is used in lipid metabolism.

$$\text{Lipid} \xrightarrow{\text{Lipase}} \text{Fatty acid} + \text{Glycerol}$$

53. (b) Haemoglobin is a globular protein.

59. (c) Zwitter ion is a dipolar ion containing both a positive and negative charge in the following

form $R-\underset{\text{Zwitter ion}}{\overset{NH_3^+}{\overset{|}{CH}}}-COO^-$

The basic group CO_2^- and acidic group NH_3^+.

63. (b) The amino acids which can't be synthesised by human body so they are essential to take from diet. They are 10 in number.

66. (b) Biological catalysts are enzymes and all enzymes are nucleic acid.

68. (d) Protein is a body building substance not energy giving substance.

76. (a) Na^+ and K^+ controls blood pressure and heart beat so excess of Na^+ ion increases B.P.

80. (a) This protein is found in hair, nail, muscle etc.

81. (b) The peptide bond is formed between two amino acids by the elimination of a water molecule. A dipeptide contains one peptide linkage. A tripeptide contains two peptide linkages. Similarly, a nanopeptide contains 8 peptide linkages.

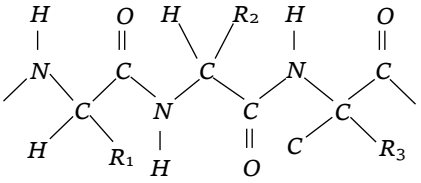
91. (a) Synthesis of polypeptide known as translation. For this process three type of RNA essential.

92. (c) Protein is used in our body as a fuel for muscles and nerves and to build and repair body tissues.

93. (b) Zymase enzyme convert glucose into alcohol. It is found in the yeast.

$$\underset{\text{glucose}}{C_6H_{12}O_6} \xrightarrow{\text{zymase}} 2\underset{\text{ethyl alcohol}}{C_2H_5OH} + 2CO_2$$

94. (a) In peptide linkage *i.e.*, $-CONH-$ group, the carboxyl group of one amino acid molecules forms an amide by combination with the amino group of the next amino acid molecule with the liberation of water molecule.



95. (a) Four Fe^{2+} ions of each haemoglobin can bind with 4 molecules of O_2 and it is carried as oxyhaemoglobin.

$Hb_4 + 4O_2 \rightarrow Hb_4O_8$

96. (d) Enzyme are shape selective specific biological catalyst which normally functions effectively at body temperature.

97. (a) An enzyme (protein) is a biological catalyst.

98. (a) Amino acid synthesis was done by stainley millar.

Fats and Lipids

4. (c) Acid value is the number of 1 mg of *KOH* required to neutralise 1 *gm* of the fat or oil.

5. (c) Saponification value is the number of mg of *KOH* required to neutralize the fatty acid resulting from the complete hydrolysis of 1gm. of oil or fat.

6. (c) Iodine number is the number of *gms* of I_2 which combine with 100 *gm* of oil or fat. It shows the degree of unsaturation of acids in fat or oil.

7. (a) $\text{Oil(unsaturated)} + H_2 \xrightarrow{Ni} \text{Fat (saturated)}$

8. (c) $\text{Oil} + NaOH\ \text{(alkali)} \xrightarrow{\text{Saponification}} \text{Glycerol} + \text{Soap}$

11. (d) Fats are called energy bank of the body. Stored below the dermis as subcutaneous fats.

12. (c)

13. (b) 1*gm* carbohydrate on oxidation gives 17 *kJ* of energy while 1 gm fat provide 37 *kJ* of energy.

18. (a) Waxes are esters of higher fatty acids.

19. (c) Oil/fat + Alkali $\xrightarrow{\text{Saponification}}$ Soap + Glycerol.

21. (b)
$$\underset{\substack{\text{Lipid or}\\ \text{Triglyceride}}}{\begin{matrix}CH_2OOCR\\ |\\ CHOOCR\\ |\\ CH_2OOCR\end{matrix}} + H_2O \rightarrow \underset{\substack{\text{Glycerolor}\\ \text{Trihydric alcohol}}}{\begin{matrix}CH_2OH\\ |\\ CHOH\\ |\\ CH_2OH\end{matrix}} + \underset{\text{Monocarboxylic acid}}{3R-COOH}$$

26. (a) Oleic acid, stearic acid and palmitic acids are produced by the hydrolysis of fats and the acid produced by hydrolysis of fats are called fatty acid.

27. (d) Oleic acid - $C_{17}H_{33}COOH$, linoleic acid- $C_{17}H_{31}COOH$, linolenic acid - $C_{17}H_{29}COOH$, palmitic acid - $C_{15}H_{31}COOH$.

Saturated monocarboxylic acids form a homologous series which has a general formula $C_nH_{2n+1}COOH$ or $C_nH_{2n}O_2$. Only palmitic acid follows this.

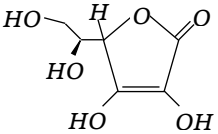
Vitamin, Hormone and Nucleic acid

1. (d) $\underbrace{\text{Nitrogenbase} + \text{Sugar}}_{\text{Nucleoside}} + \text{Phosphate}$

3. (c) Adenine is a purine base common in both RNA and DNA.

4. (c) Insulin hormone is secreted by pancreas.

8. (a)



Ascorbic acid

19. (b) $\underset{\text{2 hydrogen bonds}}{\text{Adenine}} = \text{Thymine}, \underset{\text{3 hydrogen bonds}}{\text{Guanine}} \equiv \text{Cytosine}$

21. (c) Vitamin B_1 is thiamine. Its main source is cereals.

22. (a) Gene is a part of the DNA molecule that codes for a specific protein.

25. (d) Cortisone is not a sex harmone, it regulates metabolism of fats, carbohydrates, proteins etc.

27. (d) Thymine is present in DNA while in RNA there is Uracil.

28. (a) Mutation is a chemical change in the sequence of Nitrogenous bases along the DNA strained which can lead to the synthesis of protein with altered amino acid sequence.

39. (b) Insulin is a hormones secreted by the pancreas that lower blood glucose level by promoting the uptake of glucose by cells and the conversion of glucose to glycogen by the liver and skeletal muscle.

40. (b) Insulin is a proteinaceous harmone secreted by β cells by islet of langerhans of pancreas in our body.

41. (b) Codon is present in *m*-RNA, which is responsible for translation.

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

43. (c) Nucleic acid is a polymer of nucleotides.

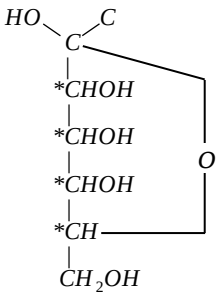
44. (c) Nucleoside on hydrolysis gives an aldopentose and a heterocyclic base purine and pyrimidine.

45. (b) An alternation in the base sequence of nucleic acid molecule is called mutation which can be by radioactive ray, by adaptation etc.

46. (a) Vitamin B_6 is called pyridoxin. It is found in fruits, green-vegetables, milk, etc. Due to its deficiency, anaemia disease is caused.

Critical Thinking Questions

1. (b)



This structure of β-D glucose has four asymmetric carbon atom

2. (c) It is Guanine having two possible binding site.

3. (c) Four sub units are present in haemoglobin.

4. (c) The four bases in *m*-RNA : adenine, cytosine, guanine and Uracil have been shown to act in the form of triplet; each triplet behaving as a code for the synthesis of a particular amino acid.

5. (b) According to Chargaff's rule amount of adenine(*A*) is equal to that of thymin(*T*) and the amount of guanine(*G*) is equal to that of cytosine(*C*).

6. (d) Multiplication of DNA is called replication.

7. (b) Insulin is a harmone which decreases sugar level in the blood.

8. (b) Oxytocin hormone secreted by posterior pituitary gland plays an important role in child birth and milk ejection for feeding baby.

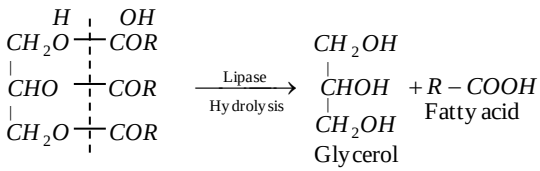
9. (c) Except oleic acid stearic acid, Lauric acid and Palmitic acid are saturated fatty acid. Oleic acid is unsaturated fatty acid.

10. (d) CO (III) Transition metal is present in vitamin B_{12} .

11. (a) 130 molecules of ATP produced in the lipid metabolism of a molecule of palmitic acid.

12. (d) Protein is insoluble in benzene.

13. (d)



14. (d) α–helix structure is formed when the chain of α–amino acid coil as a right handed screw 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 *H*–bonding is responsible for holding helix in a position.

15. (b) Three types of chemicals enter the composition of all membranes proteins, lipids and carbohydrates, proteins content varies from 46–76% lipids 20–53%, while Carbohydrate content is 1–8%

16. (c) Difference in mass of compound

= 390 – 180 = 210

wt. of CH_3CO – group is = 43

Therefore no. of $-NH_2$ group = $\frac{210}{43} = 4.88 = 5$.

17. (d) Six type of tripeptide molecules are formed.

18. (b) Amylose is a polysaccharide.

19. (c) Aspartic acid is an amino acid with acidic side chain.

$$HOOC - CH_2 - CH \begin{matrix} NH_2 \\ COOH \end{matrix}$$

Lysine, Arginine and Histidine all are basic amino acids.

20. (d) Lucas test is used for the distinction of alcohols.

21. (d) Because their Ca^{++}/Mg^{++} salts are insoluble in water.

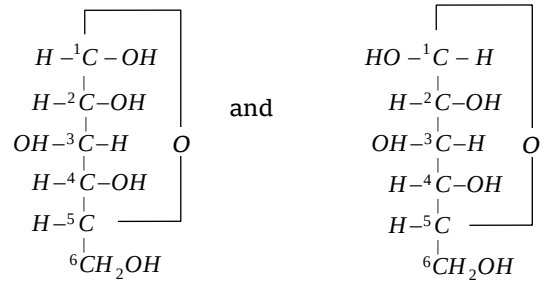
22. (d) Glucose on reaction with bromine water followed by oxidation gives gluconic acid

$$\underset{\text{Glucose}}{C_6H_{12}O_6}+(O)\xrightarrow{Br_2/H_2O}\underset{\text{Gluconic acid}}{CH_2OH(CHOH)_4COOH}$$

23. (c) $\underset{\substack{\text{dipolar ion}\\(\text{Zwitter ion or internal salt})}}{NH_3^+-CH_2-COO^-}$

24. (b) Ribose is an example of aldopentose.

25. (b)



α - D(+) - Glucopyranose and β- D(+) - Glucopyranose

Two form of *D*–Glucopyranose are α–D(+)–Glucopyranose and β–D(+)–Glucopyranose. These are anomers (a pair of stereoisomers which differ in configuration only around C_1 are called anomers).

26. (b) Surcrose is composed of α-*D*-glucopyranose unit and a β–D-fructofuranose unit. These units are joined by $\alpha-\beta$-glycosidic linkage between *C*–1 of the glucose unit and *C*–2 of the fructose unit.

Assertion and Reason

1. (a) Glycine is an amino acid, it contains both NH_2 as well as –*COOH* groups and therefore, its aqueous solution form Zwitter ion which is amphoteric in nature.

$$\underset{\text{Glycine}}{NH_2CH_2COOH} \qquad \underset{\text{Zwitter ion}}{NH_3^+CH_2COO^-}$$

Therefore, both assertion and reason are true.

2. (b) Hydrolysis of sucrose is known as inversion of canesugar because sucrose produce equimolecular mixture of glucose and fructose. Sucrose is dextro-rotatory which glucose and fructose mixture is laevorotatory. Sucrose is disaccharide.

3. (b) Proteins on hydrolysis gives α–amino acid because amino acids are the building block of proteins. It is also fact that amino acids contain both $-NH_2$ and $-COOH$ group.

Here assertion and reason both are correct but reason is not a correct explanation of assertion.

4. (e) Sucrose does not undergo mutarotation. Glucose and fructose shows mutarotation because they have two forms α and β. It is fact that sucrose is a disaccharide. Therefore, assertion is false but reason is true.

5. (d) Here, both the reason and assertion are false, DNA occurs in nucleus of the cell while RNA is found mainly in cytoplasm of the cell. On heating, enzymes lose their specific activity.

6. (a) All amino acid posses amino as well as carboxylic group. $-NH_2$ group is basic while $-COOH$ group is acidic. Therefore, they behave as zwitter ion (dipolar ion). Here, both assertion and reason are true and reason is a correct explanation.

7. (b) The assertion that activity of an enzyme is *pH* dependent is correct. The reason that change in *pH* affects the solubility of enzyme in water is also true but the reason is not the correct explanation of assertion. Change in *pH* cause denaturation of enzyme.

8. (d) Glycosides are formed by treating glucose with methanol in presence of dry *HCl* gas. They cannot be hydrolysed in acidic conditions. They are not acetals but they are hemiacetals.

9. (c) The assertion is correct that haemoglobin is an oxygen carrier and the reason that oxygen binds as O_2^- to *Fe* of haemoglobin is incorrect, because oxygen binds as O_2 to *Fe* of haeme part.

10. (c) Carboxypeptidase is an exopeptidase because it breaks the peptide chain at terminal ends.

Carboxypeptidase cleaves carboxy-terminal amino acids that have aromatic or branched aliphatic side chains.

11. (a) Sucrose is a non reducing sugar as it does not reduce Tollen's or Fehling's reagent, due to absence of free aldehyde of ketone group. It contains stable acetal or ketal structure which cannot be opened into a free carboxyl group.

Sugar is composed of α-D-glucopyranose unit and β-D-fructo furanose unit. These units are joined by α-β-glycosidic linkage between *C*- 1 of the glucose unit and *C*- 2 of the fructose unit.

12. (b) Carbohydrates which upon hydrolysis yield two molecules of the same or different monosaccharides are called disaccharides. For example, sucrose on acid hydrolysis give one molecule of glucose and fructose.

13. (b) Fructose on warming with dilute alkali, gives rise to an equilibrium mixture of glucose, fructose and mannose. The ability of fructose to reduce Fehling solution and Tollen's reagent is probably due to the isomerisation of fructose to glucose and mannose (this is called Lobry de Bruyn and Elkenstein rearrangement).

14. (b) Glucose exists in two forms, *i.e.,* α-D-glucose with a specific rotation of +112° and β-D-glucose with a specific rotation of +19°. However, when either of these two forms is dissolved in water and allowed to stand. it gets converted into the same equilibrium mixture of both the α- and β-forms with a small amount of open chain form. As a result of this equilibrium, the specific rotation of a freshly prepared solution of α-glucose decreases from +112° to 52.7° while that of β glucose increases from +19° to 52.7°.

15. (b) In acidic medium $-COOH$ group acts as the base and accepts a proton. As a result, α-amino acids exist as cations in acidic medium and migrate towards cathode under the influence of an electric field. In alkaline medium $\overset{+}{N}H_3$ group acts as the acid and thus loses a proton. As a result, α-amino acids exist as anion and migrate towards anode under the influence of an electric field. However at some intermediate value of *pH*, the concentration of cationic form and anionic form will become equal and hence there is no net migration of α-amino acid under the influence of an electric field.

16. (b) Valine is an essential amino acid. The amino acids which the body cannot synthesize are called essential amino acid.

17. (e) Sequence of bases in DNA is TGAACCCTT. Since according to base-pairing principle, *T* in DNA faces *A* in *m*-RNA, while *G* faces *C* and *A* faces *U*. Therefore, sequence of bases in *m*-RNA is ACUUGGGAA.

18. (e) Millons test is a test for proteins. When Millon's reagent is added to the aqueous solution of a protein, a white precipitate is formed.

19. (b) ATP has four negatively charged oxygen atoms very close to each other. So the repulsive forces between them is high. On hydrolysis of ATP, a $H_2PO_4^-$ ion is eliminated and the number of negatively charged oxygen atoms decreases. Thus, repulsive forces decreases and a large amount of energy is set free. When ATP changes to ADP, which in turn changes into AMP, energy is released at each step. This is how ATP can act as a source of energy.

20. (e) Solubility of protein is maximum at the isoelectric point.

21. (e) Amino acids are soluble in polar solvents like H_2O, $NaOH$ and HCl and insoluble in non-polar solvents like benzene, ether etc.

22. (c) Sucrose on hydrolysis gives equal amounts of glucose and fructose. Since glucose has less positive and fructose has more negative magnitude of rotation, therefore, change in the sign of rotation is observed.