

CHAPTER

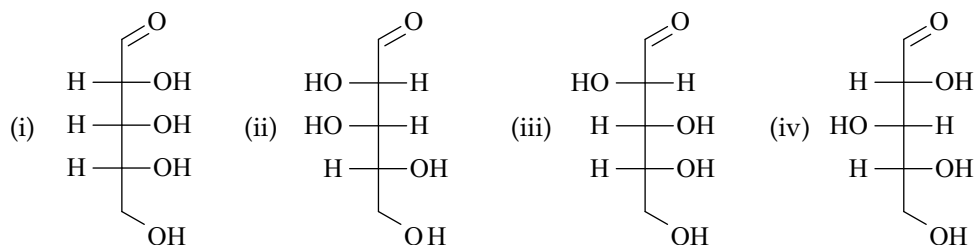
7

Biomolecules

Question Bank

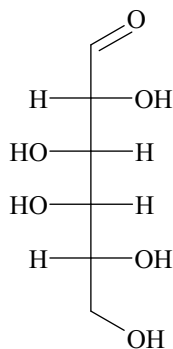
LEVEL 1

- Which of the following statements is correct?
 - The Ruff procedure lengthens an aldose chain and gives a single product.
 -
 - The Kiliani-Fischer procedure shortens an aldose chain and gives a single product.
 - The Kiliani-Fischer procedure lengthens an aldose chain and gives two epimers.
- Which of the following is not a disaccharide?
 - sucrose
 - mannose
 - lactose
 - maltose
- Which statement about the pyranose form of mannose is not correct?
 - it exists as two anomeric stereoisomers.
 - it reacts with Tollen's reagent to give a silver mirror (i.e., it is a reducing sugar).
 - reaction with excess CH_3I and AgOH gives a non-reducing penta-O-methyl derivative.
 - it resists reduction with aqueous sodium borohydride.
- Two aldopentoses X and Y give the same osazone derivative. X is oxidised to an optically active aldaric acid by dilute nitric acid. Ruff degradation of Y gave a tetrose which was similarly oxidised to an optically active aldaric acid. Assign the structures of X and Y from the following list.

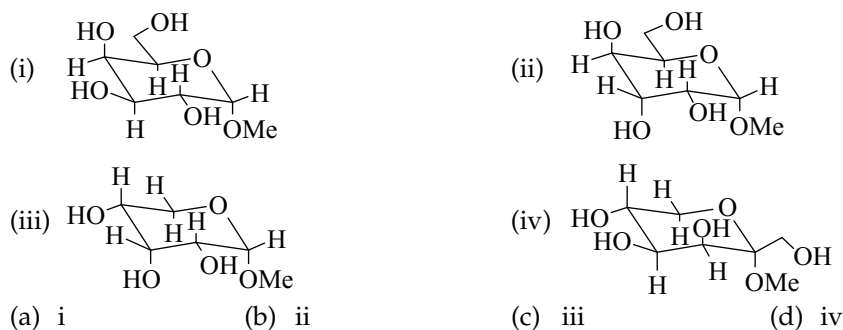


- (a) X = i and Y = iii
 (b) X = iv and Y = ii
 (c) X = v and Y = iv
 (d) X = iii and Y = i

5. Which of the structures 1 through 4 is methyl-D-galactopyranoside?



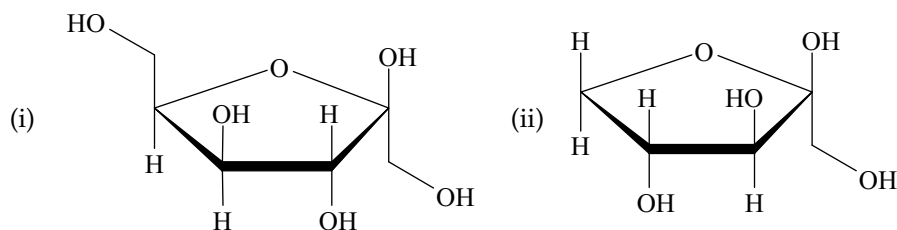
D-Galactose

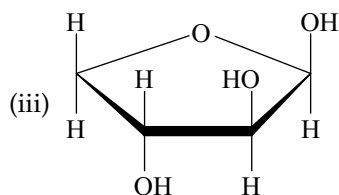


6. What is invert sugar, and why is it so named?

- (a) the sugar mixture from hydrolysis of sucrose; fructose is isomerised to glucose.
 (b) the sugar mixture from hydrolysis of sucrose; the optical rotation changes from (+) to (-).
 (c) the sugar mixture from hydrolysis of starch; α -glycosidic bonds are changed to β -glycosidic bonds.
 (d) the sugar mixture from hydrolysis of starch; glucose is isomerised to fructose.

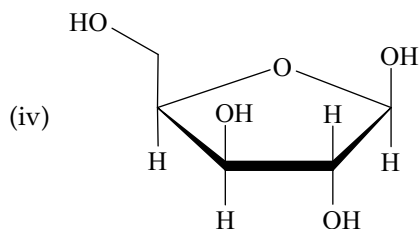
7. Which of the following compounds is a β -aldopentafuranose?





(a) i

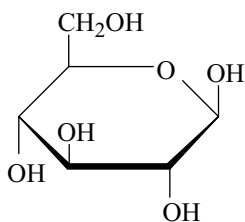
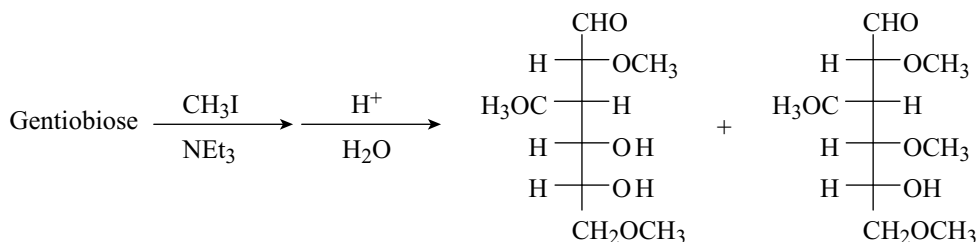
(b) ii



(c) iii

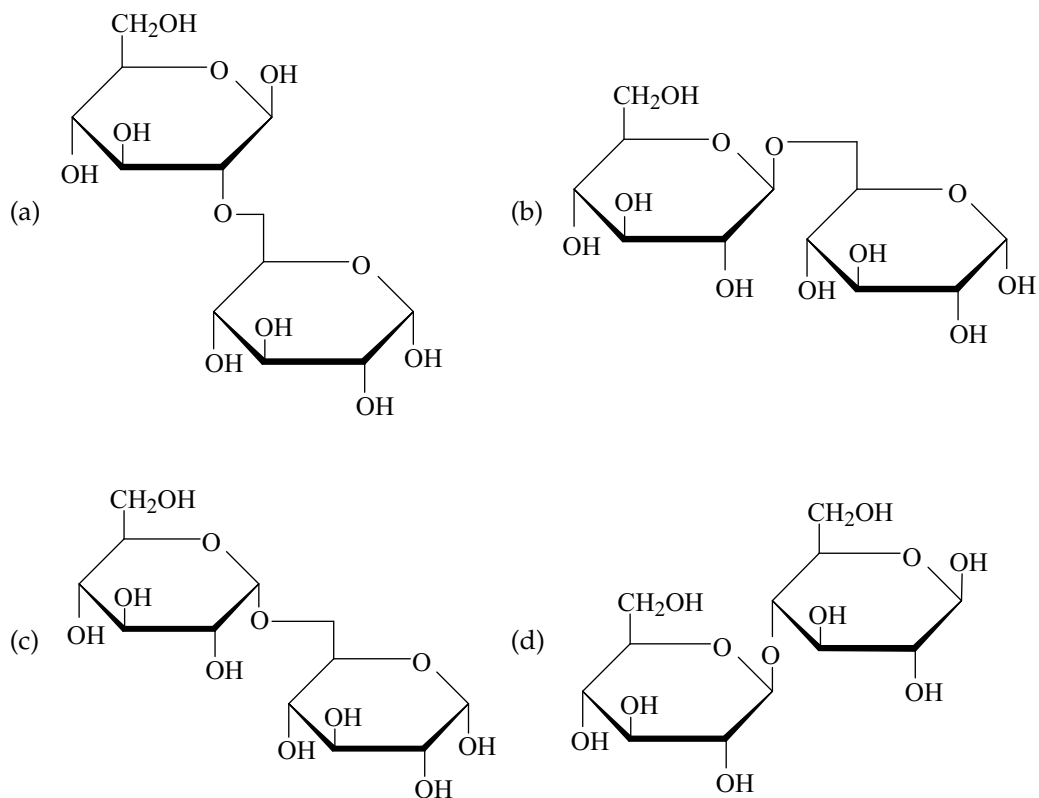
(d) iv

8. When octa-O-methyl D-cellobiose is hydrolysed by an aqueous acid, two O-methylated glucose derivatives are formed. One is a tetramethyl derivative, and the other is a trimethyl derivative. Why is a single methyl substituent lost in this process?
- (a) one methoxy group is lost by β -elimination.
 (b) one methoxy group is an ester and the others are all ethers.
 (c) one methoxy group is part of an acetal, the others are all ethers.
 (d) one glucose is an α -methyl glycoside; the other is a β -methyl glycoside.
9. Acid-catalysed reaction of D-glucose with benzaldehyde produces the 4,6-O-benzylidene derivative. Reduction with NaBH_4 , followed by excess HIO_4 cleavage and acid hydrolysis yields a $\text{C}_4\text{H}_8\text{O}_4$ tetrose and benzaldehyde. What is the configuration of this tetrose?
- (a) 2S, 3S (b) 2R, 3S (c) 2R, 3R (d) 2S, 3R
10. Gentiobiose is a disaccharide incorporated into the chemical structure of crocin, the chemical compound that gives saffron its colour. Deduce the structure of gentiobiose from the following information.
- (i) Acid hydrolysis of gentiobiose yields only D-glucose.
 (ii) Gentiobiose is hydrolysed by β -glucosidase enzymes, but not by α -glucosidase enzymes.
 (iii) Gentiobiose is a reducing sugar and reacts with sodium borohydride.
 (iv) Methylation of gentiobiose followed by hydrolysis of the glycosidic bonds yields the two D-glucose derivatives shown below.

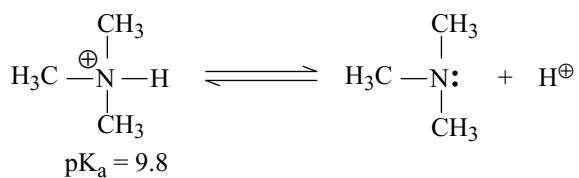


β - glucose

What is the structure of gentiobiose?

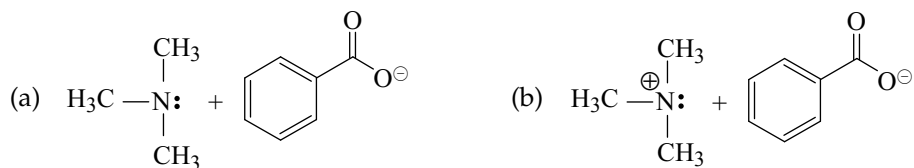
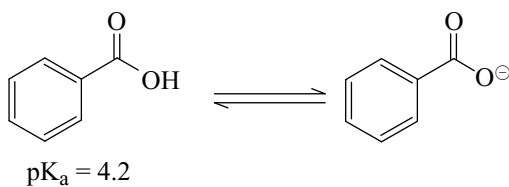


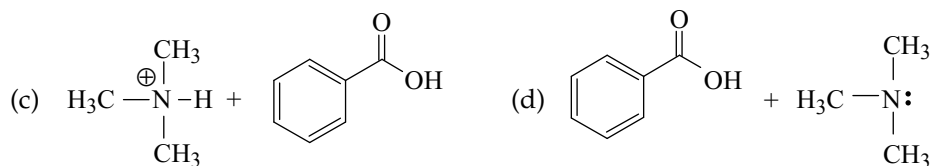
11. Choose the answer that has correctly selected the major species of the following two acids to be present in blood naturally buffered at pH = 7.2.



Acids

Conjugate bases

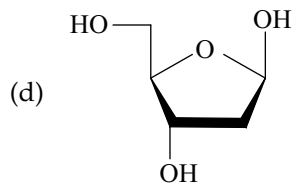
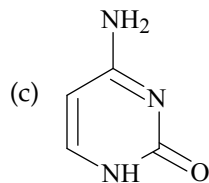
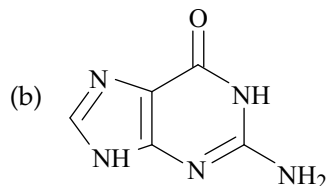
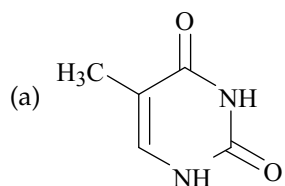




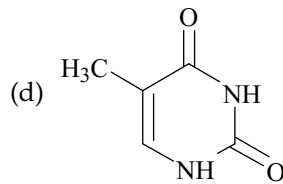
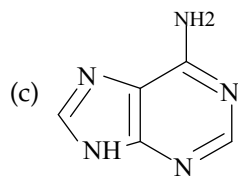
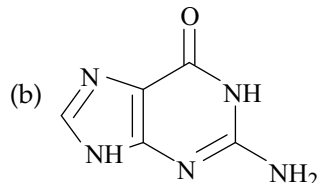
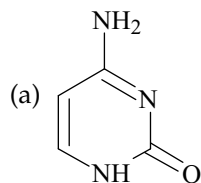
[Possible species in blood buffered at pH = 7.2]

12. Which one of the following is a non-reducing sugar?
 (a) Glucose (b) Mannose (c) Fructose (d) Sucrose
13. Which of the following compounds will not show mutarotation?
 (a) Methyl- α -D-glucopyranoside
 (b) α -D (+) glucopyranose
 (c) β -D (+) glucopyranose
 (d) β -D (+) galactopyranose
14. α -D-glucose and β -D-glucose are
 (a) anomers (b) C_2 -epimers (c) C_3 -epimers (d) enantiomers
15. At isoelectric point, the amino acid has
 (a) Least viscosity
 (b) Maximum surface tension
 (c) Minimum solubility
 (d) All of these
16. Which one of the following is not correct for monosaccharides?
 (a) They are optically active polyhydroxy carbonyl compounds
 (b) Fructose is ketose sugar and hence it does not give red precipitate with Fehling's solution
 (c) α -D (+) glucose and β -D (+) glucose are anomers
 (d) Glucose and mannose are epimers
17. Which of the following is not a surfactant?
 (a) $\text{CH}_3-(\text{CH}_2)_{15}-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{N}^+}}-\text{CH}_3\text{Br}^-$ (b) $\text{CH}_3-(\text{CH}_2)_{14}-\text{CH}_2-\text{NH}_2$
 (c) $\text{CH}_3-(\text{CH}_2)_{16}-\text{CH}_2\text{OSO}_2^-\text{Na}^+$ (d) $\text{OHC}-(\text{CH}_2)_{14}-\text{CH}_2-\text{COO}^-\text{Na}^+$
18. Tertiary structure of protein contains which type of forces?
 (a) Electrostatic forces only
 (b) Electrostatic as well as hydrogen bonds
 (c) Electrostatic, hydrogen bonds and Vander waal forces
 (d) Electrostatic, hydrogen bonds, Vander waal forces, dipole-dipole attractions and disulphide crosslinkage.
19. Which of the following is an addition and homopolymer?
 (i) Neoprene (ii) Polystyrene (iii) Nylon-6,6 (iv) Nylon-6
 (a) only i (b) i, ii and iv
 (c) i and ii (d) i, ii, iii and iv

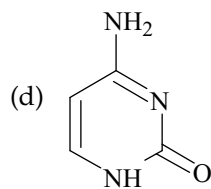
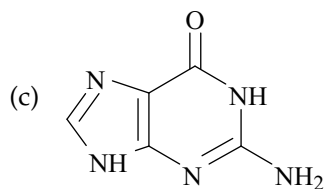
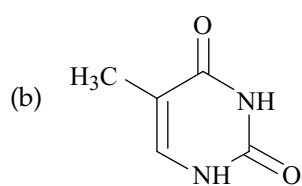
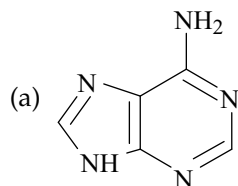
20. Identify structure of thymine



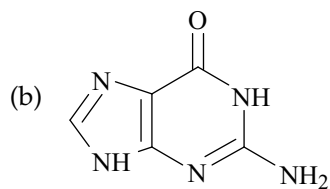
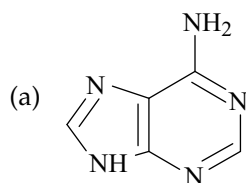
21. Identify structure of adenine

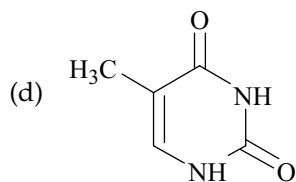
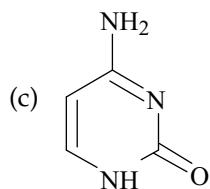


22. Identify structure of cytosine

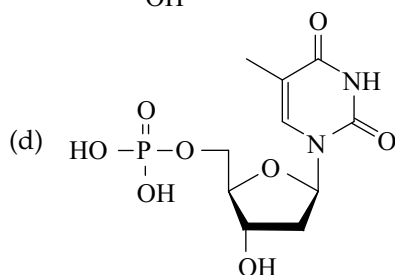
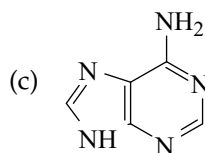
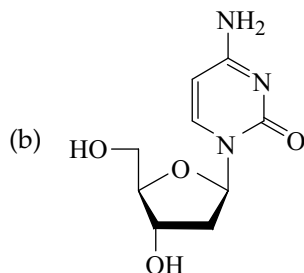
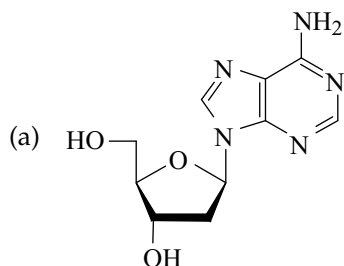


23. Identify structure of guanine

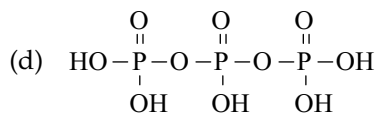
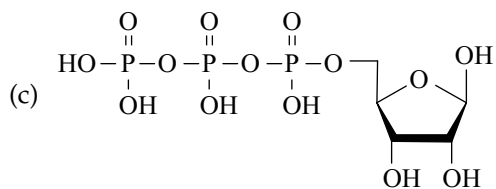
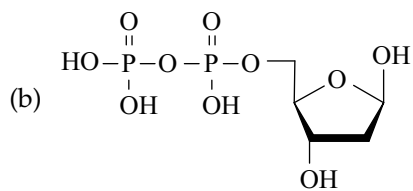
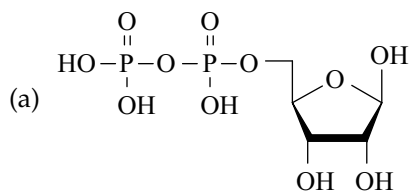




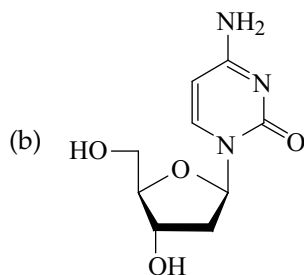
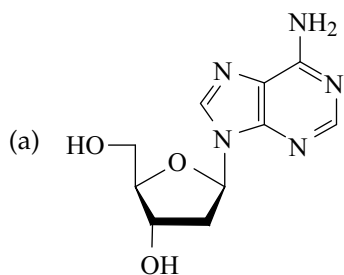
24. Identify structure of adenine deoxyribo-nucleoside

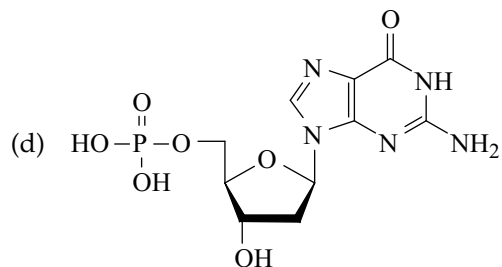
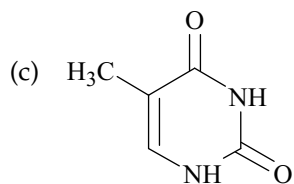


25. Identify structure of Riboso-5-triphosphate

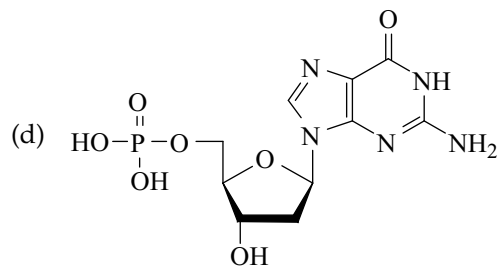
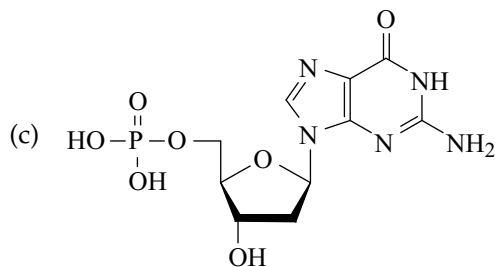
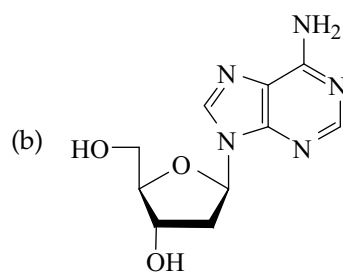
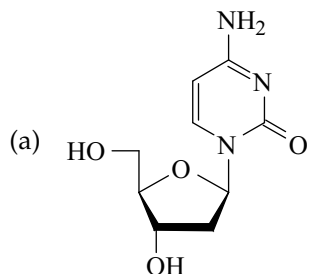


26. Identify structure of Guanine deoxyribo-nucleotide

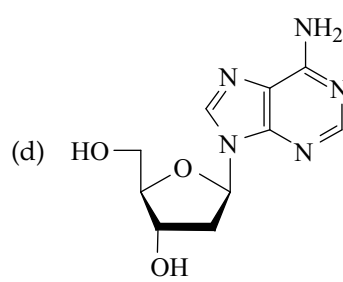
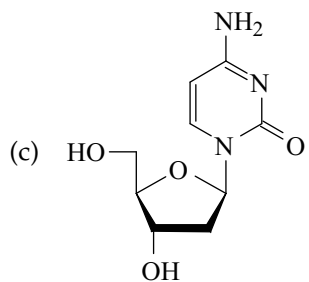
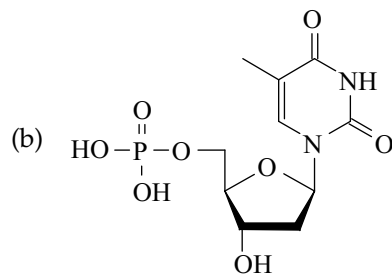
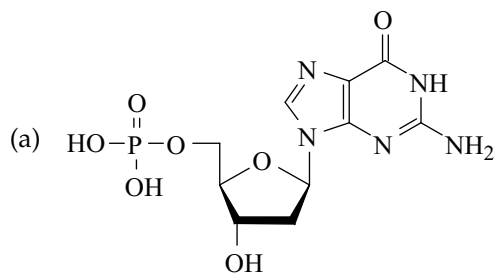




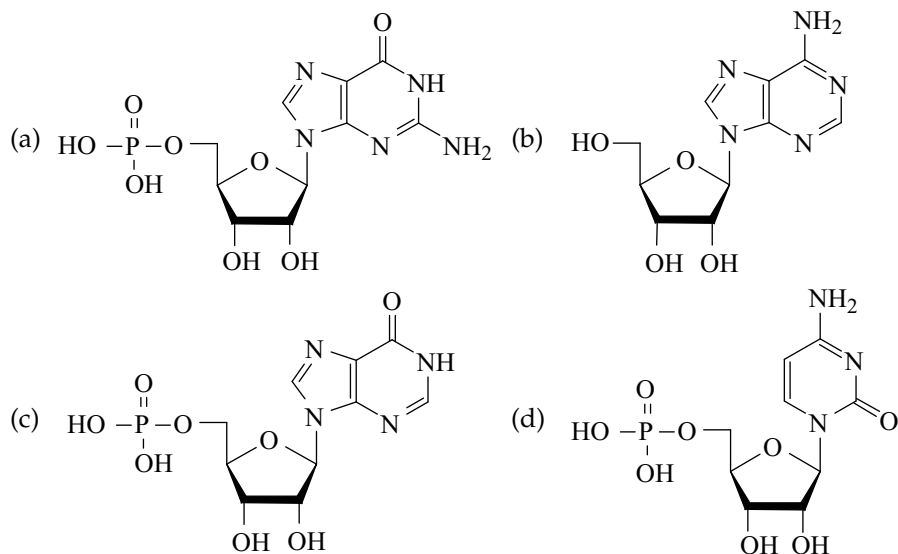
27. Identify structure of Cytosine deoxyribo-nucleoside



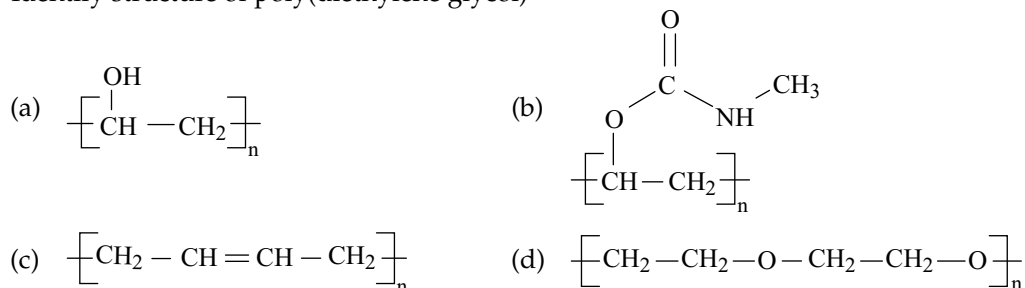
28. Identify structure of Thymine deoxyribo-nucleotide



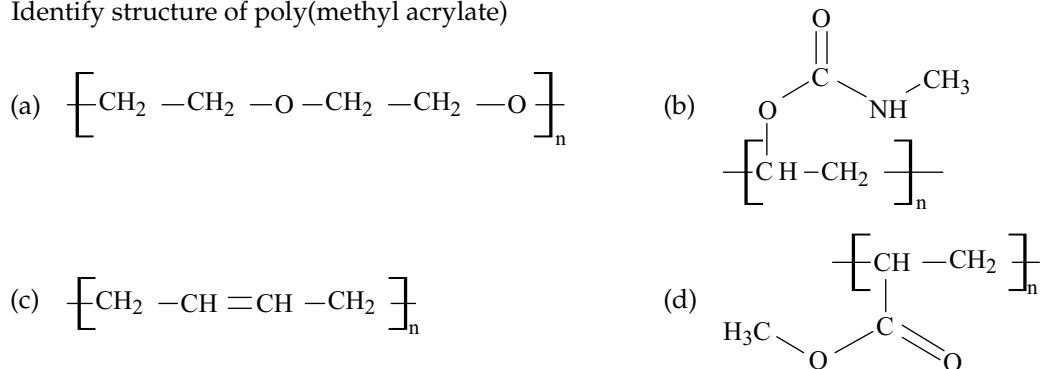
29. Identify structure of Guanine ribonucleotide



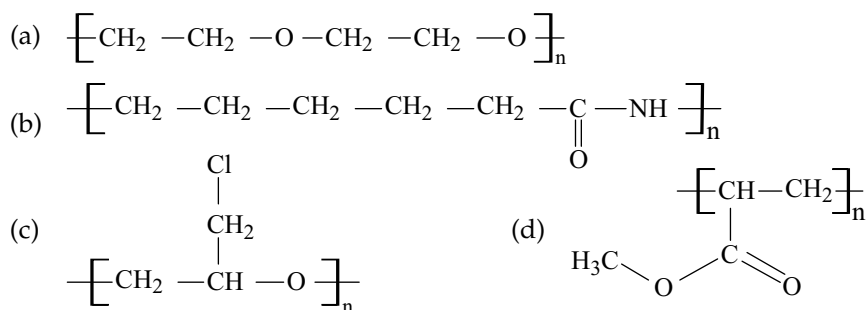
30. Identify structure of poly(diethylene glycol)



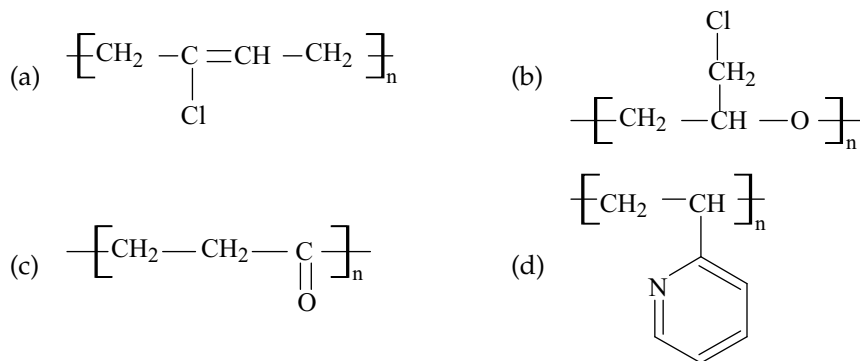
31. Identify structure of poly(methyl acrylate)



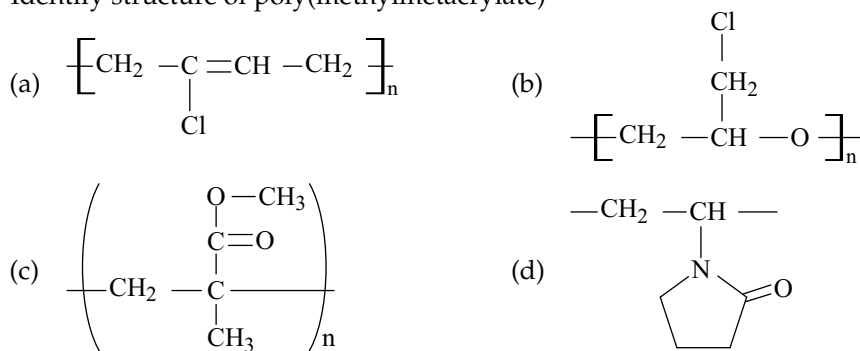
32. Identify structure of Nylon-6



33. Identify structure of neoprene



34. Identify structure of poly(methylmetacrylate)



35. Among the following polymer identify homopolymer

- (a) Nylon-6 (b) Buna-N (c) Buna-S (d) Polyethylene

36. Among the following polymers, identify the copolymer

- (a) Nylon-6 (b) Starch (c) PVC (d) Protein

37. Which of these is a hypnotic?

- (a) Metaldehyde (b) Acetaldehyde (c) Paraldehyde (d) None of these

38. An ester used as medicine is

- (a) ethyl acetate (b) methyl acetate (c) methyl salicylate (d) ethyl benzoate

39. Nylon threads are made of

- (a) polyvinyl polymer (b) polyester polymer
(c) polyamide polymer (d) polyethylene polymer

40. Paracetamol is an

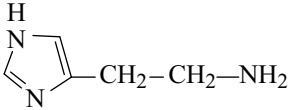
- (a) antibiotic (b) antipyretic (c) antimalarial (d) analgesic

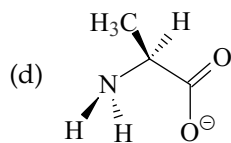
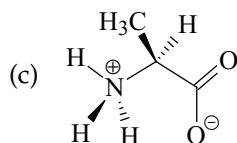
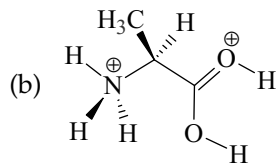
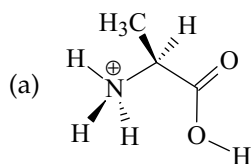
41. Antiseptic, chloroxylenol is

- (a) 4-chloro-3,5-dimethyl phenol (b) 3-chloro-4,5-dimethyl phenol
(c) 4-chloro-2,5-dimethyl phenol (d) 5-chloro-3,4-dimethyl phenol

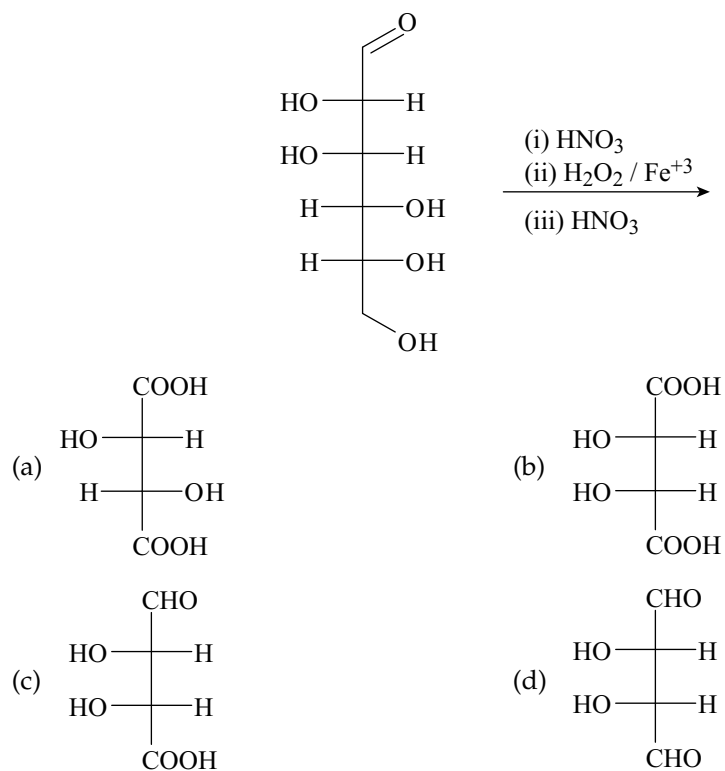
42. Phenacetin is used as on

- (a) antipyretic (b) antiseptic (c) analgesic (d) antimalarial

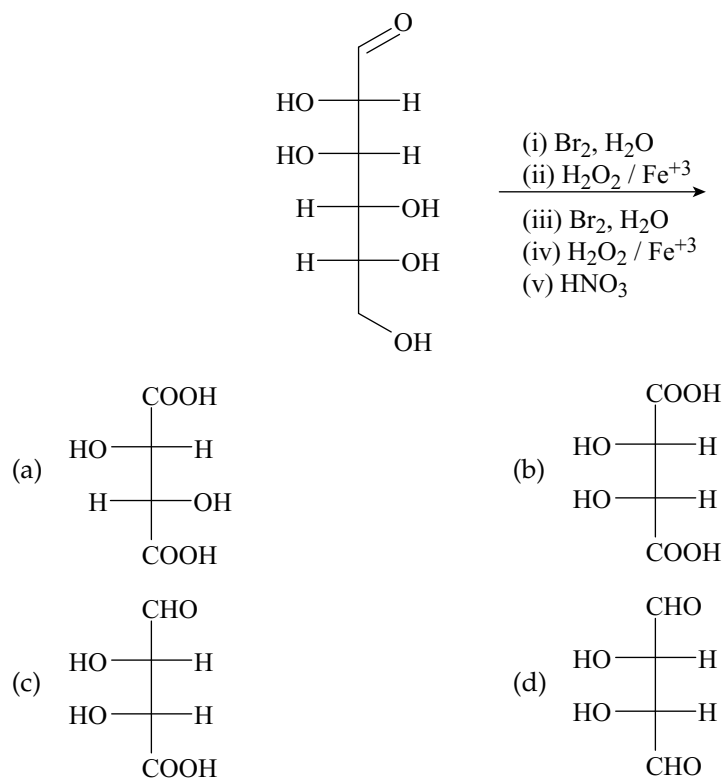
43. Which of the following colours is imparted by alizarin dye in the presence of Cr^{3+} ion?
 (a) Violet (b) Brown-red (c) Pink (d) Red
44. Which of the following polymers can be used for lubrication and as an insulator?
 (a) SBR (b) PVC (c) PTFE (d) PAN
45. A hybrid rocket propellant uses
 (a) a liquid oxidiser and a solid fuel (b) a composite solid propellant
 (c) a biliquid propellant (d) a solid liquid and gas as a propellant
46. Buna-N synthetic rubber is a copolymer of
 (a) $\text{H}_2\text{C}=\text{CH}-\underset{\text{C}}{\overset{\text{Cl}}{|}}=\text{CH}_2$ and $\text{H}_2\text{C}=\text{CH}-\text{CH}=\text{CH}_2$
 (b) $\text{H}_2\text{C}=\text{CH}-\text{CH}=\text{CH}_2$ and $\text{H}_5\text{C}_6-\text{CH}=\text{CH}_2$
 (c) $\text{H}_2\text{C}=\text{CH}-\text{CN}$ and $\text{H}_2\text{C}=\text{CH}-\text{CH}=\text{CH}_2$
 (d) $\text{H}_2\text{C}=\text{CH}-\text{CN}$ and $\text{H}_2\text{C}=\text{CH}-\underset{\text{C}}{\overset{\text{Cl}}{|}}=\text{CH}_2$
47. Among cellulose, polyvinyl chloride, nylon and natural rubber, the polymer in which the intermolecular force of attraction is weakest is
 (a) nylon (b) polyvinyl chloride
 (c) cellulose (d) natural rubber
48. The drug  is used as an
 (a) antacid (b) analgesic (c) antimicrobial (d) antiseptic
49. What is the complementary RNA sequence for the DNA segment AATCAGTT?
 (a) AAUCAGUU (b) CCAUCGAA (c) AACUGAUU (d) UUAGUCA
50. In DNA replication the complementary nucleotide sequence for 5'-ACGT-3' is which of the following?
 (a) 3'-ACGT-5' (b) 3'-TGCA-5' (c) 5'-AGCT-3' (d) 5'-TCGA-3'
51. Which of the following is not a disaccharide?
 (a) sucrose (b) mannose (c) lactose (d) maltose
52. Shown below are five representations of the molecule alanine. Which one best represents the structure of alanine in the blood stream (a buffered solution of about pH 7.4)?
 The pK_a values for alanine are 2.3 ($-\text{CO}_2\text{H}$) and 9.7 ($-\text{NH}_3^+$).



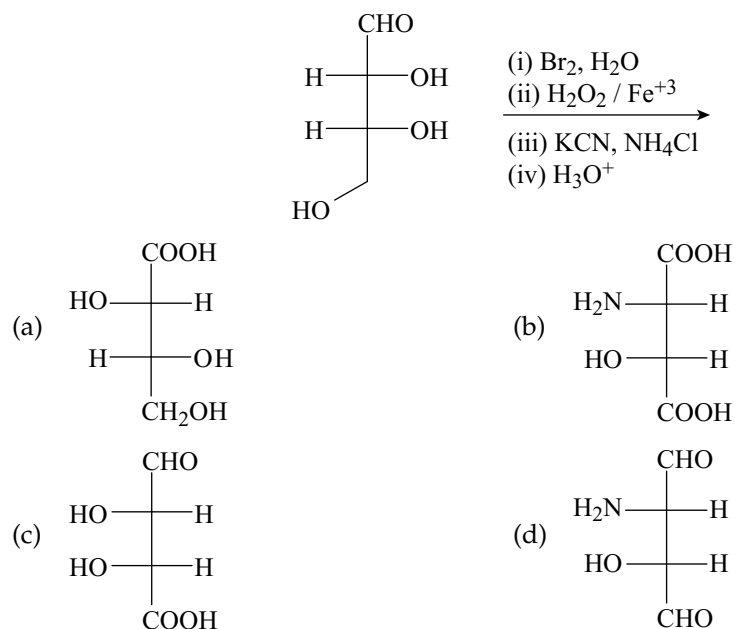
53. Identify the final product of the reaction



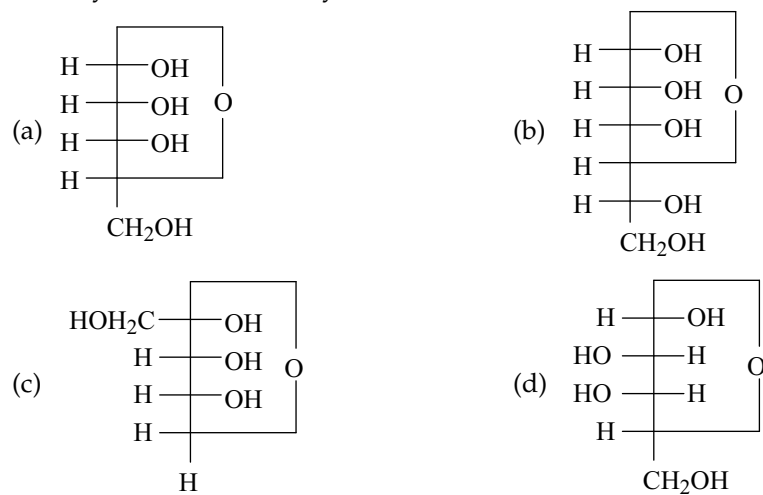
54. Identify the final product of the reaction



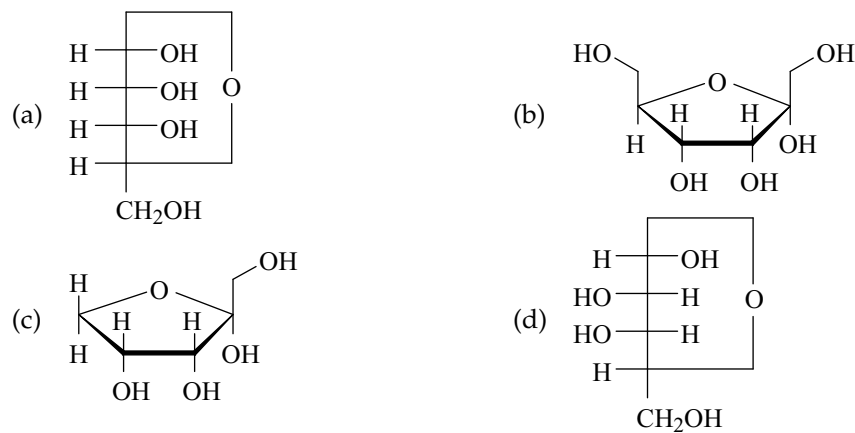
55. Identify the final product of the reaction



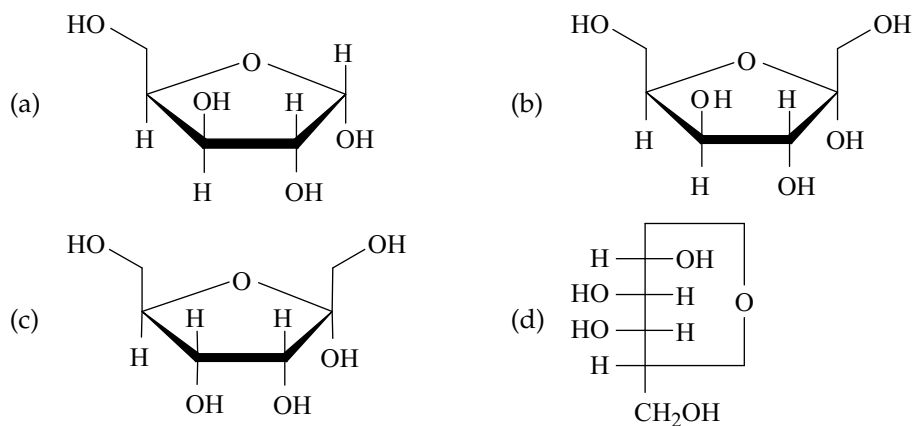
56. Identify structure of α -D-Lyxofuranose



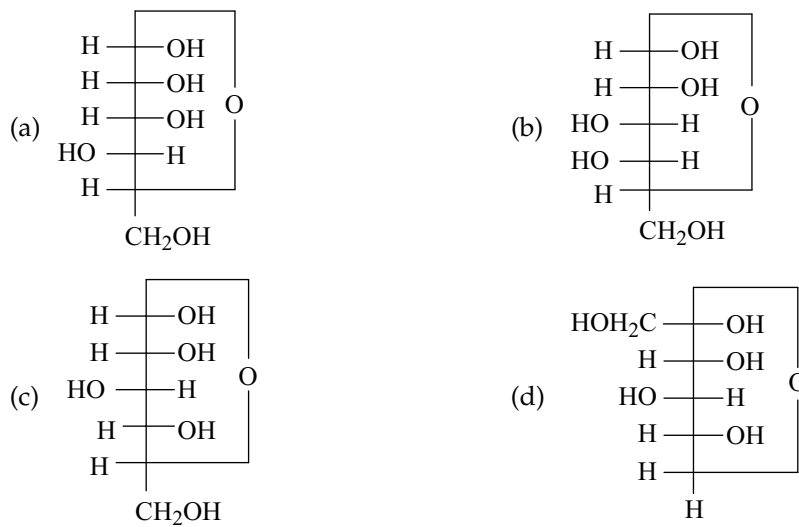
57. Identify structure of α -D-Ribulofuranose



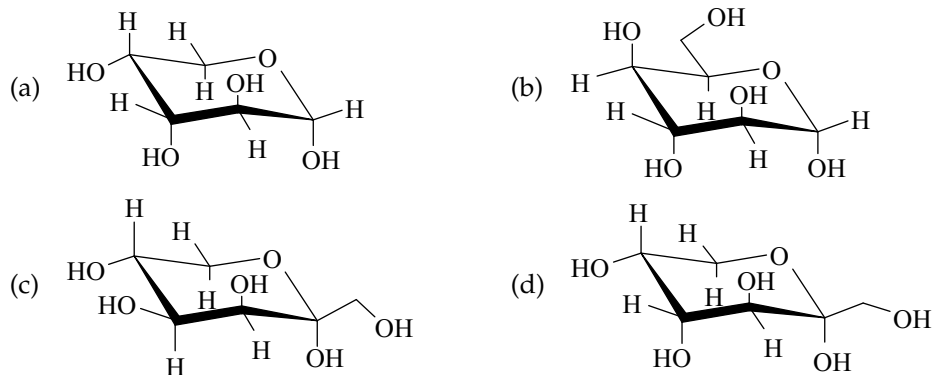
58. Identify structure of α -D-Xylofuranose



59. Identify structure of α -D-Glucopyranose

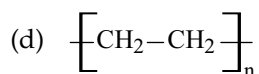
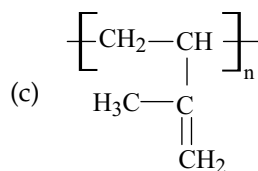


60. Identify structure of α -D-Arabinopyranose

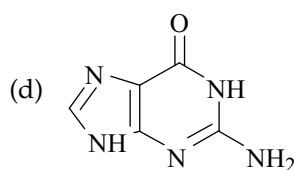
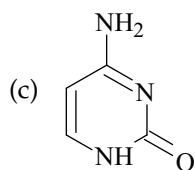
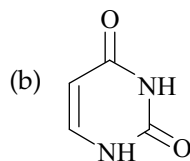
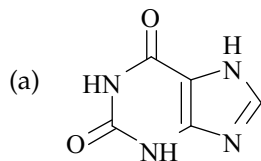


61. Identify structure of polyethene

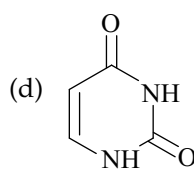
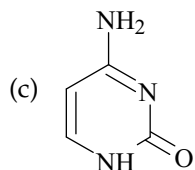
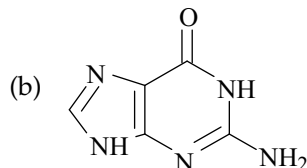
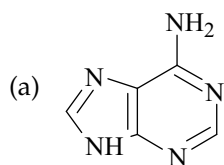




62. Identify structure of guanine



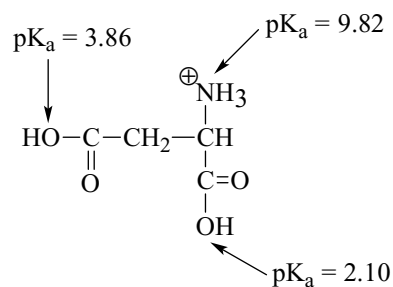
63. Identify structure of adenine



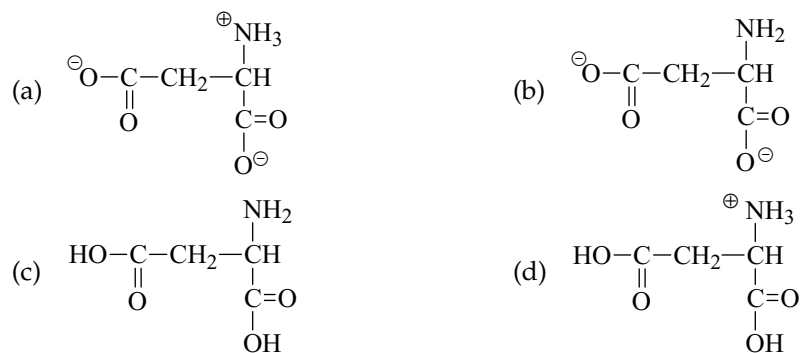
64. The pupils of eyes are dilated with a very dilute solution of an alkaloid which is

- (a) adrenaline (b) atropine
(c) equanil (d) ephedrine

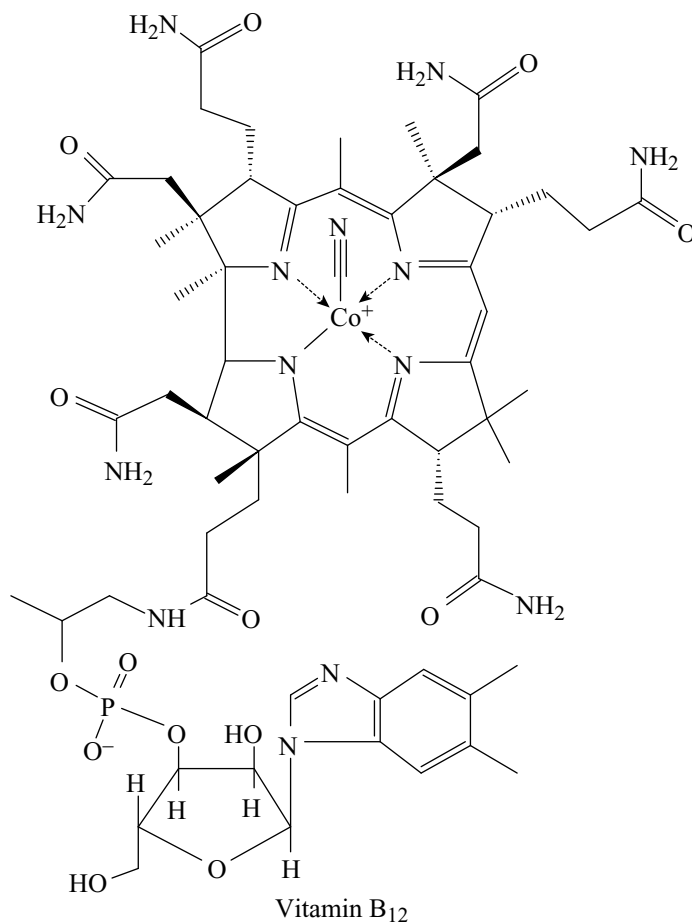
65. The pK_a values of aspartic acid, a naturally occurring amino acid are shown to the right. Choose from below, the structure of the major species present at a pH of 7.2.



Aspartic acid pK_a values

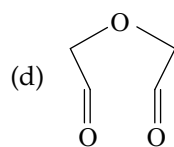
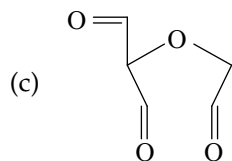
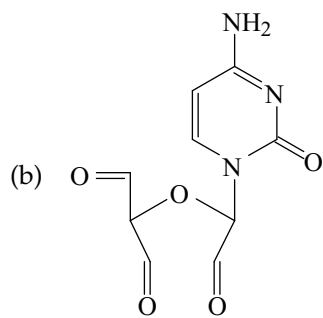
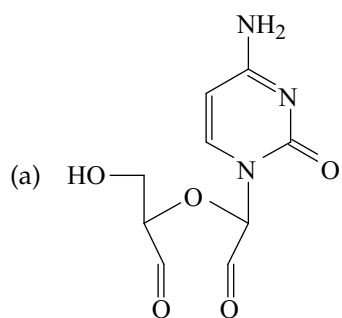
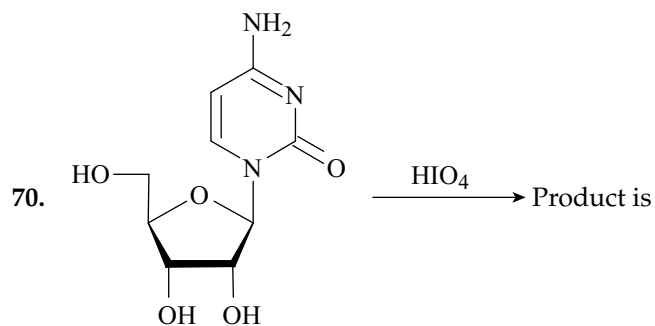


66. Penicillin was first discovered by
 (a) A. Fleming (b) L. Pasteur (c) G. Thompson (d) A. Noble
67. The poisonous gas evolved in Bhopal tragedy was
 (a) COCl_2 (b) CH_3NCO (c) CH_3CN (d) CO
68. In making lemon pickle
 (a) chillies are used to kill all germs and bacteria
 (b) lemon oil acts as a preservative
 (c) salt plays the same role as sugar in jam
 (d) citric acid acts as a preservative
69. Identify the sugar present in vitamin B₁₂

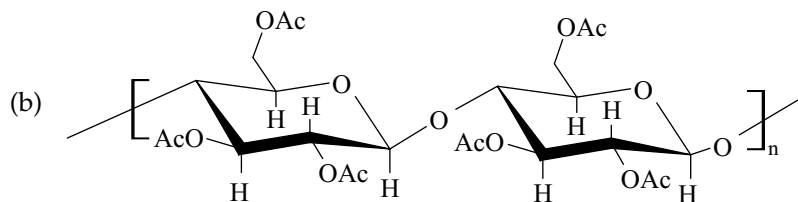
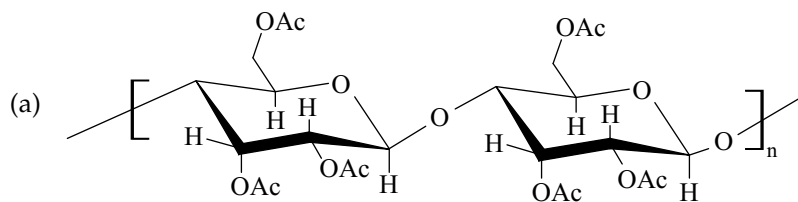


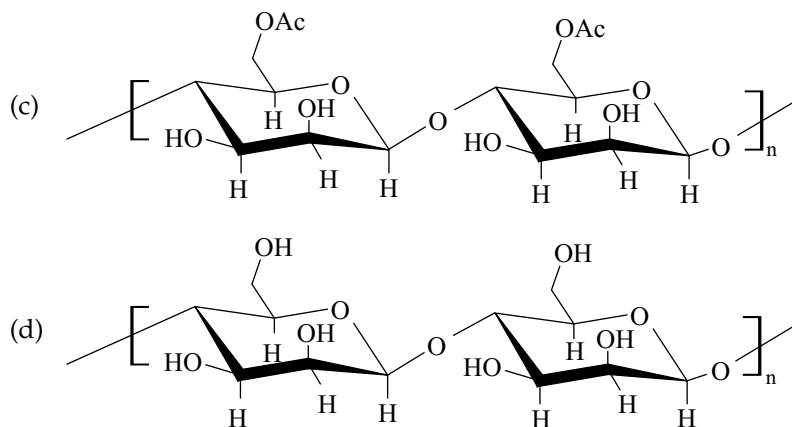
- (a) Triose
(c) Hexose

- (b) Pentose
(d) Tetrose

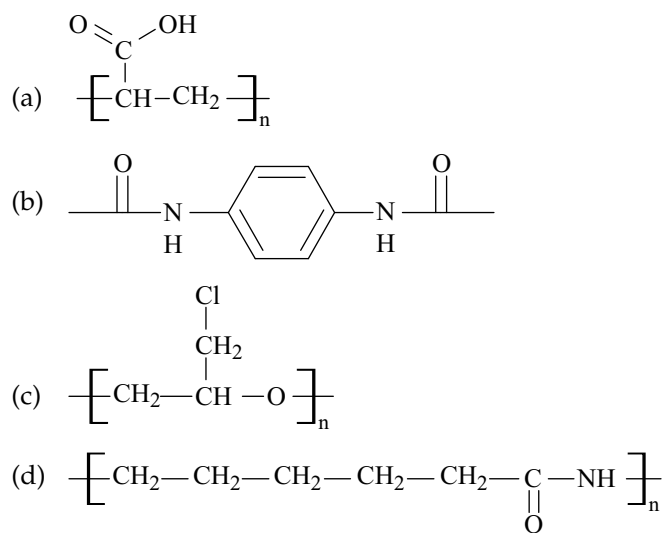


71. Identify structure of cellulose triacetate is

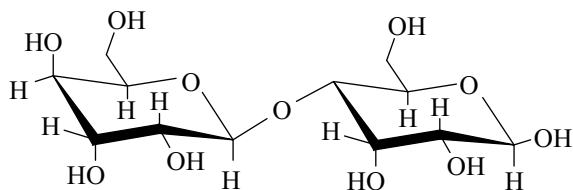




72. Identify the structure which gives Biurate test

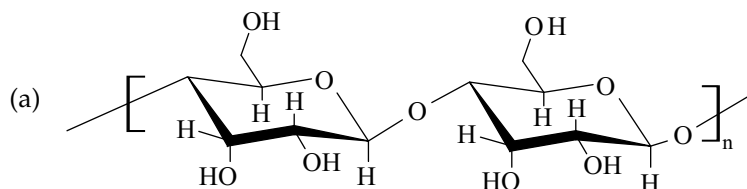


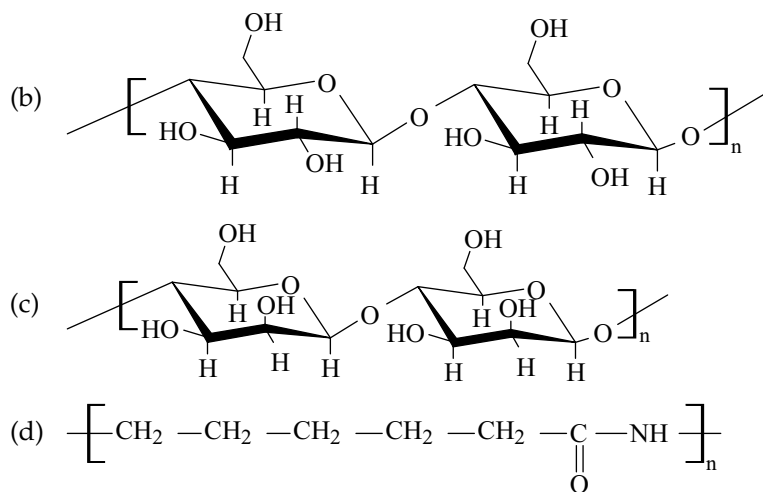
73. Identify the correct statement about the following disaccharide



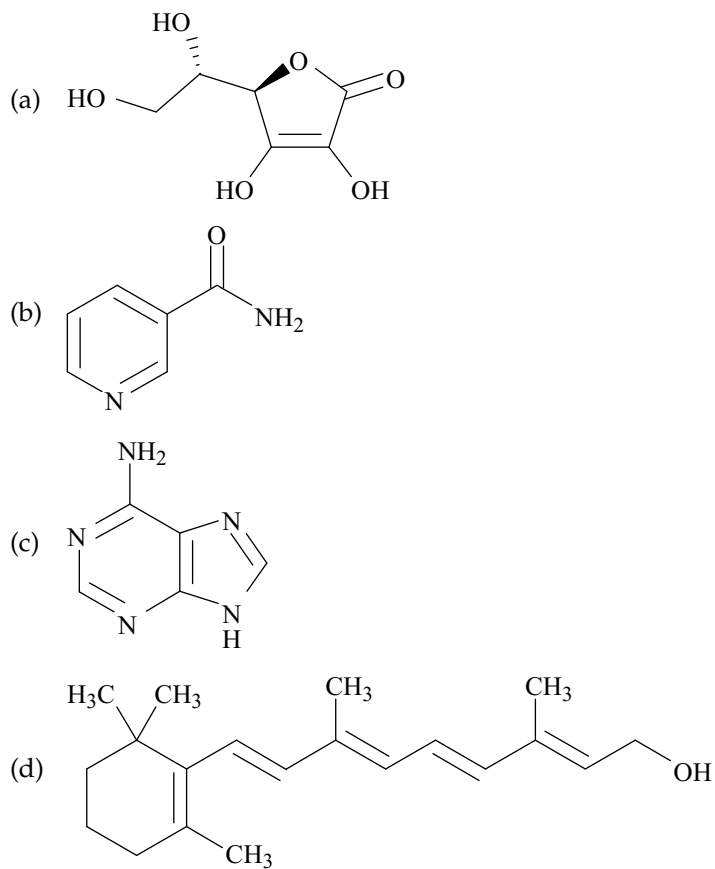
- (a) Both rings are pyranose
 (b) Reducing sugar
 (c) Non-reducing sugar
 (d) (a) and (b) both are correct

74. Identify the structure of cellulose

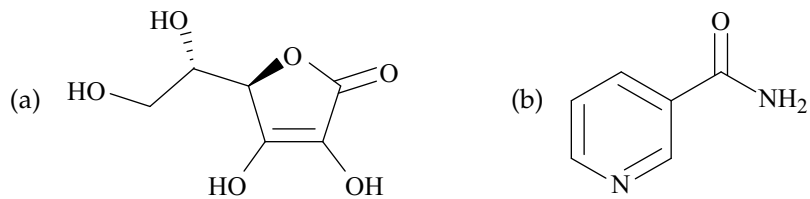


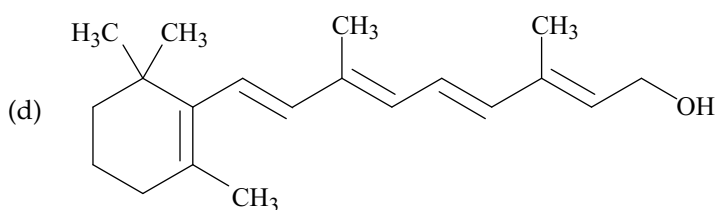
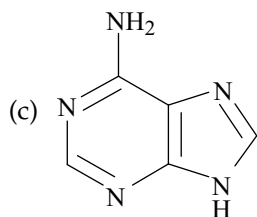


75. Identify the structure of Vitamin C

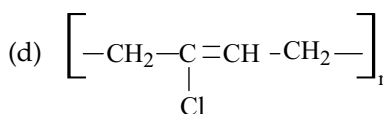
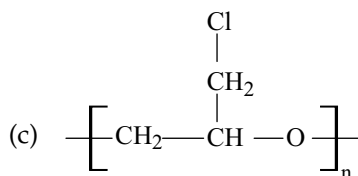
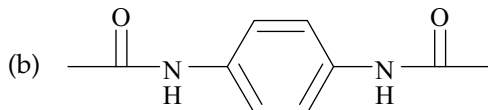
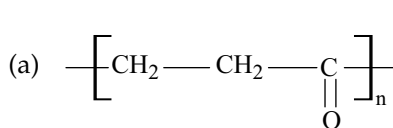


76. Identify the structure of Vitamin A





77. Identify the structure of neoprene



78. Synthetic polymer which resembles natural rubber is

- (a) chloroprene (b) glyptal (c) nylon (d) neoprene

79. D-(+)-Glucose shows mutarotation because

- (a) it undergoes interconversion with D-(-)-fructose
 (b) it undergoes interconversion between its pyranose structure and furanose structure
 (c) it undergoes interconversion between its α -D-(+)-glucopyranose and β -D-(+)-glucopyranose structures via the open-chain structure
 (d) it is dextrorotatory

80. Which of the following is not a biopolymer?

- (a) Nucleic acid (b) Rubber (c) Protein (d) Starch

81. Lysergic acid diethylamide (LSD) is

- (a) antibiotic (b) synthetic fibre
 (c) psychedelic drug (d) sweetening agent

82. PVC polymer can be prepared by which of the monomers?

- (a) $\text{H}_2\text{C}=\text{CHCl}$ (b) $\text{C}_6\text{H}_5\text{CH}=\text{CH}_2$ (c) $\text{CH}_3\text{CH}=\text{CH}_2$ (d) $\text{H}_2\text{C}=\text{CH}_2$

83. Diabetes is detected by testing the urine of a patient usually with

- (a) Benedict's reagent (b) Nessler's reagent
 (c) Fenton's reagent (d) Tollen's reagent

84. Which of the following sets contains only addition polymers?

- (a) Bakelite, PVC, polyethylene (b) Polyethylene, PVC, acrilon
 (c) Buna-S, nylon, polybutadine (d) Polyethylene, polypropylene, terylene

85. Which of the following is an example of azo dye?

- (a) Malachite green (b) Congo red
 (c) Martius yellow (d) Indigo

86. Which of the following is not an example of natural polymer?
(a) Leather (b) Silk (c) Wool (d) Nylon
87. Heroin is a derivative of
(a) nicotine (b) morphine (c) cocaine (d) caffeine
88. Which of the following fibres is not made up of polyamides?
(a) Natural silk (b) Artificial silk (c) Wool (d) Nylon
89. An aldose is converted into its next higher homologue by
(a) Amadori rearrangement (b) Wohl's method
(c) Killiani's reaction (d) Mutarotation
90. Nylon is
(a) polyethylene methyl acrylate fibre (b) polyamide fibre
(c) polythene derivative (d) polyester fibre
91. Polythene is a resin obtained by polymerisation of
(a) butadiene (b) ethylene (c) styrene (d) isoprene
92. Which of the following is used as an antipyretic?
(a) Chloroquine (b) Paracetamol
(c) Chloramphenicol (d) LSD
93. Point out the wrong statement
(a) Phenacetin is a very important antibiotic
(b) Penicillin was discovered by A. Flemming
(c) Chloroquine is an antimalarial drug
(d) Ether is an anaesthetic
94. The aqueous solution of carbohydrate gave a dark blue colour with iodine solution.
The carbohydrate is
(a) glucose (b) sucrose (c) fructose (d) starch
95. Aspirin is a/an
(a) anaesthetic (b) antipyretic (c) tranquillizer (d) narcotic
96. Which one of the following is a protein fibre?
(a) Rayon (b) Cotton (c) Silk (d) Polyester
97. The monomers used in the manufacture of nylon-6, 6 are
(a) adipic acid and butadiene (b) sebacic acid and hexamethylene diamine
(c) sebacic and butadiene (d) adipic acid and hexamethylene diamine
98. The antibiotic used for the treatment of typhoid is
(a) penicillin (b) terramycin
(c) chloramphenicol (d) sulphadiazine
99. A polyamide synthetic polymer prepared by prolonged heating of caprolactum is
(a) glyptal (b) nylon-6 (c) nylon-6, 10 (d) nylon-6, 6
100. Reserine is
(a) hormone (b) antibiotic (c) vitamin (d) tranquilizer

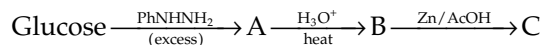
101. Which one of the following is a chromophore group?
(a) $-\text{SO}_3\text{H}$ (b) $-\text{OH}$ (c) $-\text{N}=\text{N}-$ (d) $-\text{NH}_2$
102. The specific rotation of a freshly prepared solution of α -D-glucose changes from a value of x° to a constant value of y° . The value of x and y are respectively
(a) 112° and 52.5° (b) 19° and 52.5° (c) 52.5° and 19° (d) 52.5° and 112°
103. The basic dye among the following is
(a) congo red (b) antiline yellow (c) alizarin (d) indigo
104. Which of the following is an chain growth polymer?
(a) Glyptal (b) Polypropylene (c) Nylon-6 (d) Nylon-6, 6
105. Starch is a polymer of
(a) ribose (b) glucose (c) lactose (d) fructose
106. The presence of carbohydrate in a sample can be detected by
(a) Benedict's test (b) Tollen's test (c) Biuret test (d) Molish test
107. Which of the following is an example of condensation polymer?
(a) Nylon-6, 6 (b) Bakelite (c) Buna-S rubber (d) All of these
108. Molisch test is used for the detection of
(a) alkaloid (b) carbohydrates (c) alkyl halide (d) fats
109. In making lemon pickle
(a) citric acid acts as a preservative
(b) lemon oil acts as a preservative
(c) salt plays the same role as sugar in jam
(d) chillies are used to kill all germs and bacteria
110. Neoprene is a polymer of
(a) butadiene (b) isoprene (c) styrene (d) chloroprene
111. Which of the following is an antibiotic?
(a) Paracetamol (b) Aspirin (c) Terramycin (d) Chloroquine
112. Hydrazine as a drug is used in the treatment of
(a) typhoid (b) malaria (c) cholera (d) tuberculosis
113. Arsenic drugs are mainly used in the treatment of
(a) jaundice (b) syphilis (c) typhoid (d) cholera
114. Sorbitol can be obtained by the reduction of
(a) fructose (b) glucose (c) saccharose (d) all of these
115. Bakelite is obtained from phenol by reacting with
(a) chlorobenzene (b) acetaldehyde
(c) formaldehyde (d) acetal
116. Which of the following is an alkaloid?
(a) Cocaine (b) Atropine (c) Nicotine (d) All of these

117. A raw material used in making nylon is
(a) isoprene (b) butadiene (c) adipic acid (d) ethylene
118. Polypropylene is not used in
(a) clothes (b) parachute ropes
(c) ropes (d) heat-resistant plastics
119. The drug which is effective in curing malaria is
(a) analgin (b) aspirin (c) salol (d) quinine
120. A substance which can act both as an antiseptic and disinfectant is
(a) phenol (b) aspirin (c) analgin (d) sodium pentothal
121. Dacron is an example of
(a) polypropylene (b) polyamide
(c) polyurethane (d) polyester
122. Which of the following is used as an anaesthetic?
(a) CO_2 (b) N_2O (c) CH_4 (d) N_2
123. Dettol consists of
(a) cresol + ethanol (b) chloroxylenol + terpineol
(c) xylenol + terpineol (d) none of the above
124. The pupils of eyes are dilated with a very dilute solution of an alkaloid which is
(a) atropine (b) adrenaline (c) equanil (d) ephedrine
125. Orlon is a unit of
(a) vinylcyanide (b) acrolein (c) glycol (d) isoprene
126. Penicillin was first discovered by
(a) A. Noble (b) L. Pasteur (c) G. Thompson (d) A. Fleming
127. The substances which relieve anxiety, reduce mental tension and induce sleep are called
(a) tranquillizers (b) antipyretics (c) analgesics (d) anaesthetics
128. To which class of dyes does phenolphthalein belong?
(a) Phthalein dyes (b) Nitro dyes
(c) Triphenylmethane dyes (d) Azo dyes
129. The poisonous gas evolved in Bhopal tragedy was
(a) CH_3CN (b) CH_3NCO (c) COCl_2 (d) CO
130. (+)-Sucrose is made up of
(a) L-fructose and L-glucose (b) D-glucose and L-fructose
(c) D-fructose and L-glucose (d) D-glucose and L-fructose
131. Which of the following sugars is obtained from nature, usually in a levorotatory form?
(a) Maltose (b) Fructose (c) Sucrose (d) Glucose
132. An example of natural biopolymer is
(a) rubber (b) nylon (c) teflon (d) DNA

133. In the ring structure of fructose, the anomeric carbon is
 (a) C-6 (b) C-5 (c) C-2 (d) C-1
134. Monosaccharides are assigned D- or L-configuration depending upon whether its standard Fischer projection formula has a right or left orientation respectively of the hydroxy group at the
 (a) anomeric carbon (b) bottom most asymmetric carbon
 (c) carbon number 2 (d) topmost asymmetric carbon
135. Teflon is a polymer of the monomer
 (a) $\text{CHCl} = \text{CHCl}$ (b) $\text{CHF} = \text{CHCl}$ (c) $\text{CHF} = \text{CH}_2$ (d) $\text{F}_2\text{C} = \text{CF}_2$
136. Cane sugar and invert sugar are
 (a) levorotatory and dextrorotatory respectively
 (b) dextrorotatory and levorotatory respectively
 (c) both levorotatory
 (d) both dextrorotatory
137. The major compound of sugar present in honey is
 (a) lactose (b) glucose (c) invert sugar (d) sucrose
138. Which one of the following statements is wrong?
 (a) PVC stands for polyvinyl chloride
 (b) Buna-S stands for natural rubber
 (c) PTFE stands for teflon
 (d) PMMA stands for polymethyl methyl acrylate
139. Cellulose is a linear polymer of
 (a) α -D-fructose (b) β -D-glucose (c) α -D-glucose (d) β -D-fructose
140. Aldoses can be differentiated from ketoses by
 (a) periodic acid (b) Tollen's reagents (c) bromine water (d) both (a) and (c)
141. Which of the following sugars exhibits mutarotation?
 (a) Fructose (b) Glucose (c) Lactose (d) All of these
142. Heating of rubber with sulphur is known as
 (a) vulcanisation (b) bessemerisation (c) galvanisation (d) sulphonation
143. Which of the following is the C-2 epimer of D-glucose?
 (a) D-Fructose (b) L-Glucose (c) D-Galactose (d) D-Mannose
144. Glucose reacts with an excess of phenylhydrazine to form
 (a) glucosone (b) glucose phenylhydrazone
 (c) glucosazone (d) fructose phenylhydrazone
145. Which of the following is a natural polymer?
 (a) Bakelite (b) Polythene (c) Buna-S (d) Protein
146. Which of the following pairs of sugars form identical osazone derivative?
 (a) D-(+)-Glucose and D-(-)-arabinose (b) D-(+)-Glucose and D-(-)-fructose
 (c) D-(+)-Glucose and (+)-maltose (d) D-(+)-Glucose and (+)-lactose

147. Which of the following sugars forms an osazone derivative which is identical with that of D-glucose?
 (a) D-Mannose (b) D-Galactose (c) D-Fructose (d) Both (a) and (c)
148. Upon hydrolysis lactose breaks down into
 (a) glucose and arabinose (b) glucose and fructose
 (c) glucose and galactose (d) glucose and mannose
149. Cellulose is a linear polymer of
 (a) β -glucose (b) α -fructose (c) α -glucose (d) amylose
150. On hydrolysis of starch, we finally get
 (a) sucrose (b) glucose (c) fructose (d) both (b) and (c)
151. D-glucose and D-fructose all form the same osazone derivative because all of them have
 (a) the same configuration at C-5
 (b) the same constitution at C-1 and C-2
 (c) the same constitution
 (d) the same constitution and configuration at C-3, C-4, C-5 and C-6 but different constitution and configuration at C-1 and C-2 which becomes identical by osazone formation
152. The fibre obtained by the condensation of hexamethylene diamine and adipic acid is
 (a) nylon-6, 6 (b) dacron (c) rayon (d) teflon
153. In the formation of osazone derivatives of aldohexoses and ketohexoses, the carbon atom(s) that participate(s) in the reactions is
 (a) C-1 and C-2 (b) C-2 and C-3 (c) C-1 (d) C-2
154. In an aqueous solution of D-glucose the percentages of α - and β -anomer at the equilibrium condition are respectively
 (a) 20% and 80% (b) 80% and 20% (c) 36% and 64% (d) 64% and 36%
155. Which of the following is a polysaccharide?
 (a) Cellobiose (b) Polyethylene (c) Cellulose (d) Nylon
156. Which one of the following is a thermosetting polymer?
 (a) SBR (b) Nylon-6, 6 (c) Bakelite (d) Nylon-6
157. Glucose gives positive silver mirror test with ammoniacal silver nitrate because it contains
 (a) aldehyde group (b) hydroxy group
 (c) ketone group (d) vicinal diol group
158. Which functional groups of glucose interact to form cyclic hemiacetal leading to pyranose structure?
 (a) Ketone group at C-2 and hydroxy group at C-5
 (b) Aldehyde group and hydroxy group at C-5
 (c) Aldehyde group and hydroxy group at C-4
 (d) Aldehyde group and hydroxy group at C-6
159. Which of the following reagents may be used to identify glucose?
 (a) NaHSO_3 (b) Ammoniacal AgNO_3 solution
 (c) CHCl_3 and alcoholic KOH (d) Neutral FeCl_3 solution

160. Fructose reduces Fehling's solution due to the presence of
 (a) hydroxy group (b) ketone group
 (c) aldehyde group (d) α -hydroxyketone group
161. Natural rubber is a polymer of
 (a) butadiene (b) isoprene (c) chloroprene (d) neoprene
162. The formation of furanose structure of fructose involves the interaction of functional groups present at
 (a) C-1 and C-4 (b) C-1 and C-5 (c) C-2 and C-5 (d) C-2 and C-6
163. The widely used plastic PVC is a polymerisation product of
 (a) $\text{CHCl} = \text{CHCl}$ (b) $\text{H}_2\text{C} = \text{CCl}_2$
 (c) $\text{H}_2\text{C} = \text{CH}_2$ (d) $\text{H}_2\text{C} = \text{CHCl}$
164. D-Glucose reacts with anhydrous methyl alcohol in the presence of dry HCl gas to form
 (a) β -methyl D-glucopyranoside
 (b) α -methyl D-glucopyranoside
 (c) 2, 3, 4, 5, 6-penta-O-methyl D-glucose
 (d) both (a) and (b)
165. Consider the following sequence of reactions

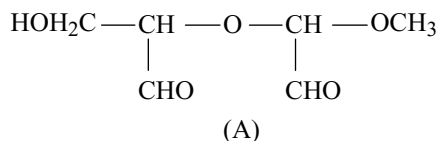


- The product (C) is expected to be
 (a) mannose (b) fructose (c) sorbitol (d) arabinose
166. Which of the following fibres is made of polyamides?
 (a) Raon (b) Orlon (c) Nylon (d) Dacron
167. In the multi-step conversion of an aldose into next higher aldose by Kiliani-Fischer synthesis, the reagent employed in the first step is
 (a) HCN (b) NH_2OH (c) $\text{Br}_2/\text{H}_2\text{O}$ (d) $\text{C}_6\text{H}_5\text{NHNH}_2$
168. Salol can be used as
 (a) antiseptic (b) antipyretic (c) both (a) and (b) (d) none of these
169. When methyl D-glucopyranoside is oxidised with periodic acid, how many moles of the oxidising agent are consumed per mole of the sugar?
 (a) 2 (b) 3 (c) 4 (d) 5
170. The urine of a diabetic patient contains
 (a) glucose (b) fructose (c) sucrose (d) galactose
171. D-Glucose and D-mannose are
 (a) epimers (b) anomers (c) diastereomers (d) both (a) and (c)
172. In which of the following sets do the carbohydrates contain disaccharides only?
 (a) Maltose, lactose, starch (b) Sucrose, lactose, cellulose
 (c) Maltose, sucrose, lactose (d) Maltose, lactose, mannose

173. When glucose is treated with an excess of HIO_4 , the products formed are
 (a) one mole of oxalic acid (COOHCOOH), three moles of HCOOH and one mole of HCHO
 (b) five moles of HCOOH and one mole of HCHO
 (c) one mole of glyoxal (CHOCHO), one mole of HCHO and three moles of HCOOH
 (d) six moles of HCOOH

174. Malisch test is performed for the detection of
 (a) carbohydrates (b) fats (c) alkaloids (d) alkyl halides

175. Methyl D-glucoside on reaction with HIO_4 consumes two moles of the reagent and produces the dialdehyde (A) and one mole of HCOOH .



The result of this reaction proves that glucose has

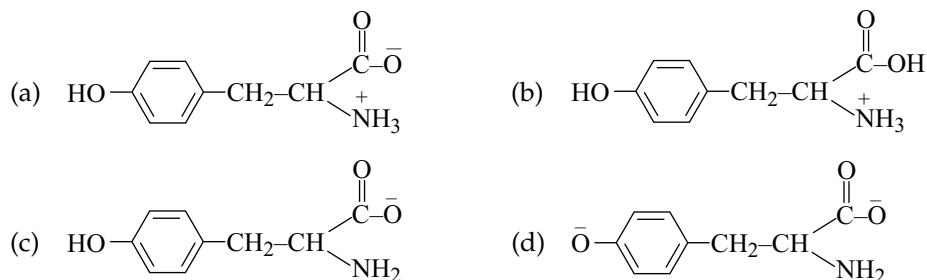
- (a) a four-membered ring structure (b) a furanose structure
 (c) an open-chain structure (d) a pyranose structure
176. Plants store their reserve carbohydrates in the form of
 (a) starch (b) cellulose (c) glycogen (d) cellobiose
177. Which one is an example of vat dye?
 (a) Indigo (b) Alizarin (c) Malachite green (d) Congo red
178. Starch consists of two polymeric units, namely
 (a) glycogen and collagen (b) cellulose and cellobiose
 (c) amylose and amylopectin (d) inulin and pectin
179. Ampicillin is
 (a) an antibiotic (b) an analgesic (c) an antimalarial (d) an antipyretic
180. Charring of sugar is due to
 (a) reduction and hydration (b) reduction
 (c) dehydration (d) oxidation
181. Isoprene substances are used for making
 (a) natural rubber (b) propane (c) petrol (d) liquid fuel
182. Glucose gives silver mirror with ammoniacal silver nitrate because it has
 (a) ketone (b) aldehyde (c) ester (d) alcoholic AgNO_3
183. Lactose on hydrolysis gives
 (a) glucose + galactose (b) fructose
 (c) fructose + glucose (d) glucose
184. Chloroquine is
 (a) an antipyretic (b) an antibiotic (c) an antimalarial (d) an analgesic

185. Terylene is a condensation polymer of ethylene glycol and
(a) salicylic acid (b) terephthalic acid
(c) benzoic acid (d) phthalic acid
186. Which of the following groups would you introduce into a dye to make it water soluble?
(a) $-\text{NO}_2$ (b) $-\text{SO}_3\text{H}$ (c) $-\text{Cl}$ (d) $-\text{OH}$
187. Polymer obtained by condensation polymerisation is
(a) PVC (b) teflon
(c) polythene (d) phenol-formaldehyde resin
188. A dye absorbs the wavelength corresponding to blue colour of light. The observed colour will be
(a) blue (b) orange (c) green (d) red
189. The product of addition polymerisation reaction is
(a) polythene (b) glyptal (c) nylon (d) terylene
190. With which of the following cations, alizarin will impart a violet colour on the fabrics?
(a) Cr^{3+} (b) Fe^{3+} (c) Ba^{2+} (d) Al^{3+}
191. Glucose cannot be classified as
(a) a hexose (b) a carbohydrate
(c) an aldose (d) an oligosaccharide
192. In the molecule of D-fructofuranose, the anomeric carbon is
(a) C-5 (b) C-2 (c) C-1 (d) C-6
193. Glucose is treated with excess of HIO_4 . How many moles of HIO_4 will be consumed per mole of the sugar?
(a) 5 (b) 4 (c) 3 (d) 2

LEVEL 2

Single and Multiple-choice Type

1. Which of the following represents (tyrosine) $\text{HO}-\text{C}_6\text{H}_4-\text{CH}_2-\text{CH}(\text{NH}_2)\text{COOH}$ at a pH = 2 and pH = 12?



2. Which of the following is/are co-polymer (s)?

(a) Nylon-66 (b) Bakelite (c) Teflon (d) Polystyrene

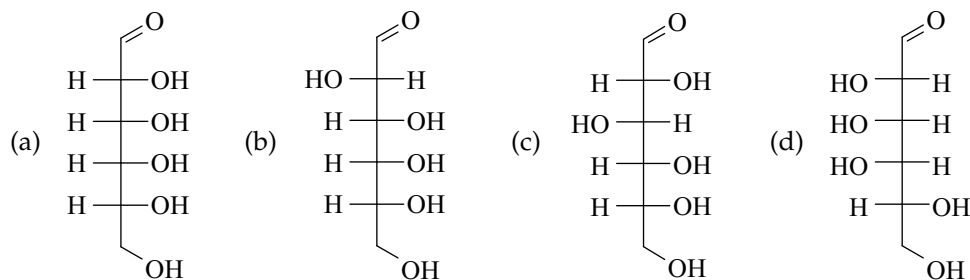
3. Which of the following do not undergo hydrolysis?

(a) Glucose (b) Fructose (c) Cane sugar (d) Maltose

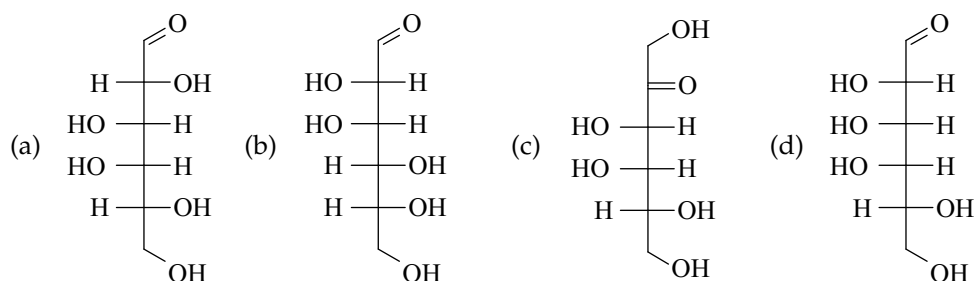
4. Among the following polymers, peptide linkage is present in

(a) Nylon-66 (b) Protein (c) Nylon-6 (d) Tafflon

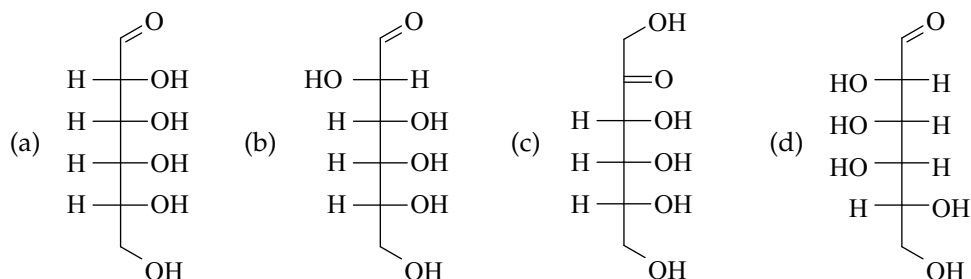
5. Identify the compound that gives same Osazone



6. Identify the compound that gives same Osazone



7. Identify the compounds which are inter-convertible in basic medium



8. Among the following polymers, identify the co-polymer

- (a) Nylon-6 (b) Buna-N (c) Buna-S (d) Protein

9. Among the following polymers, identify the co-polymer

- (a) Terylene (b) Glyptal (c) PVC (d) Protein

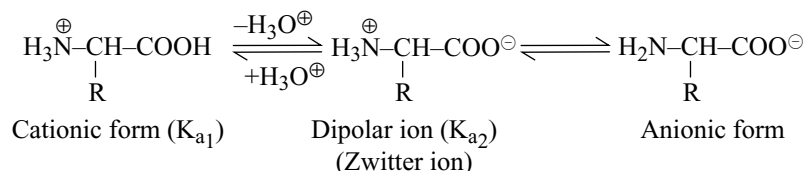
10. Among the following polymers, identify the homopolymer

- (a) Bakelite (b) Dacron (c) Natural rubber (d) Orlon

Comprehension Type

Passage 1

Amino acids contain both a basic group ($-\text{NH}_2$) and an acidic group ($-\text{CO}_2\text{H}$). In the dry solid state, amino acids exist as dipolar ions, a form in which the carboxylic group is present as a carboxylate ion, $-\text{CO}_2^-$ and the amino group is present as an ammonium ion, $-\text{NH}_3^+$. In aqueous solution, an equilibrium exists between the dipolar ion (zwitter ions) and the anionic and cationic forms of an amino acid.



In strongly acidic solutions ($\text{pH} \approx 0$) all amino acids are present primarily as cations, in strongly basic solution they are present as anions. At some intermediate pH, called the isoelectric point (pI), the concentration of the anions and cations is equal. Each amino acid has particular isoelectric point.

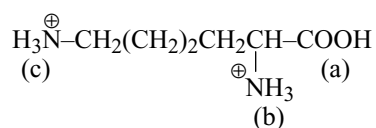
11. For the phenyl alanine, the first and second dissociation constants are given as $\text{pK}_{a1} = 1.8$ and $\text{pK}_{a2} = 9.1$. What will be the pH at isoelectric point?

- (a) 4.5 (b) 5.45 (c) 7 (d) 4.2

12. The formula of lysine is $\text{H}_2\text{N}(\text{CH}_2)_3 \cdot \underset{\text{NH}_2}{\text{CH}_2-\text{CH}-\text{COOH}}$ for lysine the value of pK_{a1} , pK_{a2} and pK_{a3} are 2.2, 9.0 and 10.5 respectively. The pH at isoelectric point of lysine is

- (a) 5.6 (b) 7 (c) 6.35 (d) 9.75

13. The dicationic form of the lysine is shown as



Arrange the shown hydrogen in the order of their acidic strength

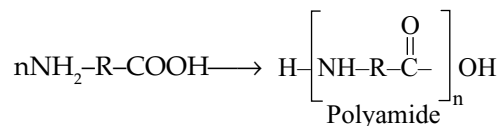
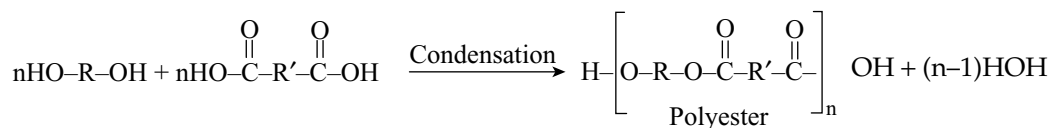
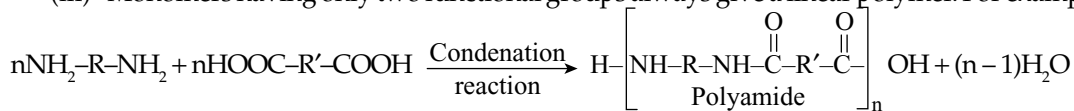
- (a) $a > b > c$ (b) $c > b > a$ (c) $a > b = c$ (d) $b = c > a$

Passage 2

Classification of Polymers

(A) Condensation polymers and condensation polymerisation:

- Condensation polymerisation is also known as step polymerisation.
- For condensation polymerisation, monomers should have at least two functional groups. Both functional groups may be same or different.
- Monomers having only two functional groups always give a linear polymer. For example

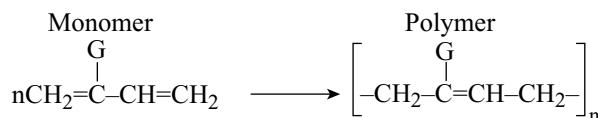


- Condensation polymers do not contain all the atoms initially present in the monomers. Some atoms are lost in the small molecule that is eliminated.
- Monomer having three functional groups always gives cross-linked polymer. Examples are: urea formaldehyde resin, phenol-formaldehyde resin, alkyd resin.

(B) Addition polymer:

- Polymers which are formed by addition reaction are known as addition polymers.
- If monomer is ethylene or its derivative then addition polymer is either linear polymer or branch-chain polymer. Examples are: Polyethylene, polyvinylchloride, polystyrene, polytetrafluoroethylene, polyvinyl cyanide, etc.
- If monomer is 1,3-butadiene or 2-substituted-1,3 butadiene $\left(\text{CH}_2=\underset{\text{G}}{\text{C}}-\text{CH}=\text{CH}_2 \right)$ then

polymer is always branch chain polymer which is always an elastomer. Example are:



- | | |
|--|-------------------------------------|
| (i) $\text{G} = \text{H}$, 1,3-butadiene | (i) Polybutadiene |
| (ii) $\text{G} = \text{CH}_3$, 2-methyl-1,3-butadiene | (ii) Polyisoprene |
| (iii) $\text{G} = \text{Cl}$, 2-chloro-1,3-butadiene or chloroprene | (iii) Polychloroisoprene (Neoprene) |
| (iv) Addition polymers retain all the atoms of the monomer units in the polymer. | |
| (v) Addition polymerisation takes place in three steps: Initiation, chain propagation and chain termination. | |
| (vi) Addition polymers are also known as chain growth polymers. | |

14. Which one of the following is a monomer of condensation polymer?
 (a) $\text{CH}_3(\text{CH}_2)_5\text{-COOH}$ (b) $\text{HO-CH}_2\text{-CH}_2\text{-OH}$
 (c) $\text{CH}_3\text{-CH=CH-NH}_2$ (d) $\text{CH}_3\text{-CH=CH-CH}_2\text{-CONH}_2$
15. Natural rubber is which type of polymer?
 (a) Condensation (b) Addition (c) Coordinate (d) None of these
16. Among the following, identify the condensation polymer
 (a) Nylon-6 (b) Buna-N (c) Polystyrene (d) Nylon-6-6

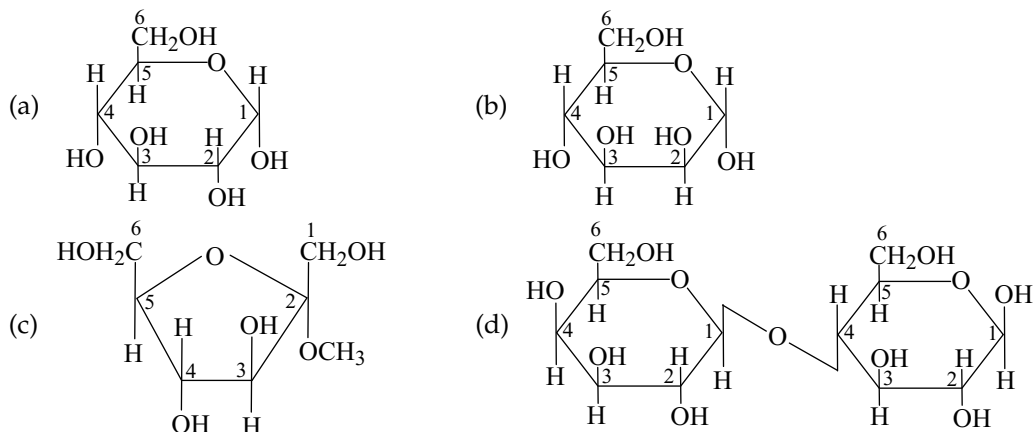
Passage 3

The carbohydrates in which the following properties are found are called reducing sugars.

The reduction of Tollen's reagent, Fehling's solution, Benedict's solution.

All monosaccharides are reducing sugars. Contrary to this the carbohydrates in which the above properties are not found are called non-reducing sugars. For example, sucrose, starch, cellulose, etc. The disaccharides, in which carbonyl group of any one monosaccharide from both the monosaccharides, is present as hemiacetal or ketal and does not involve in glycosidic linkage formation, are reducing. For example, maltose and lactose. Two diastereomeric monosaccharides are called epimers when their configuration differs only at stereogenic centre. Monosaccharides form glycoside with alcohol in the presence of an acid. All monosaccharides show mutarotation.

17. Which of the following is a non-reducing sugar?



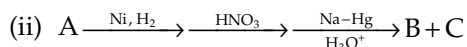
18. Which one of the following is C-2 epimers?
 (a) Glucose and galactose (b) Glucose and mannose
 (c) Glucose and fructose (d) Galactose and fructose
19. Which of the following statements about lactose is not correct?
 (a) It does not reduce Tollen's reagent
 (b) It is a disaccharide. On hydrolysis, it produces two monosaccharides
 (c) It possesses glycosidic linkage
 (d) All of them

Passage 4

Monosaccharides have —CHO (or C=O) and —OH groups, so they undergo usual oxidation and reduction. Further, monosaccharides form osazone when treated with excess of phenylhydrazine (3 equivalents). In osazone formation only the first two carbon atoms are involved. Thus

monosaccharides having identical configuration on rest of C atoms except first two will form same osazone. The same is the case with glucose and fructose.

A, B and C are three hexoses and form same osazone D. Compounds A to D behave as shown below:



20. Compound D is a osazone which can be obtained from

- (a) Only one compound (b) Two compounds
(c) Three compounds (d) Four compounds

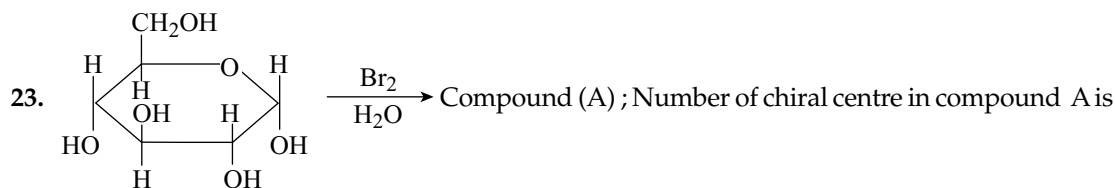
21. Compound A should be

- (a) D-glucose (b) D-fructose (c) L-glucose (d) L-fructose

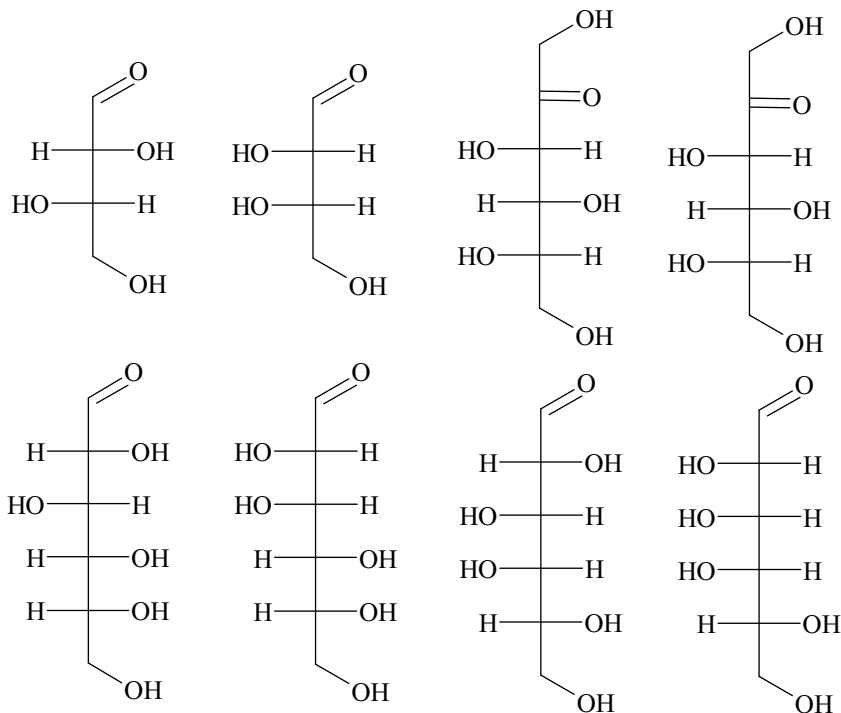
22. Compound B and C, respectively, are

- (a) D-glucose and D-mannose (b) D-mannose and D-glucose
(c) D-glucose and L-glucose (d) D-glucose and L-mannose

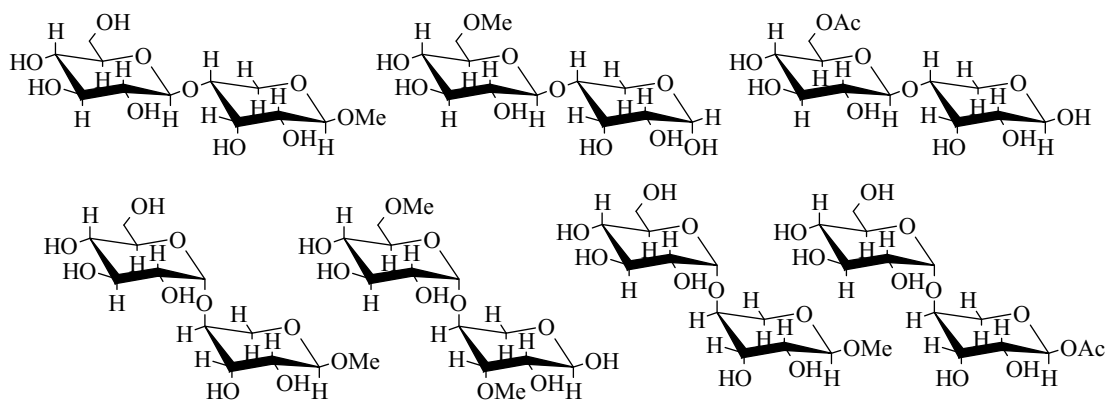
Integer Type



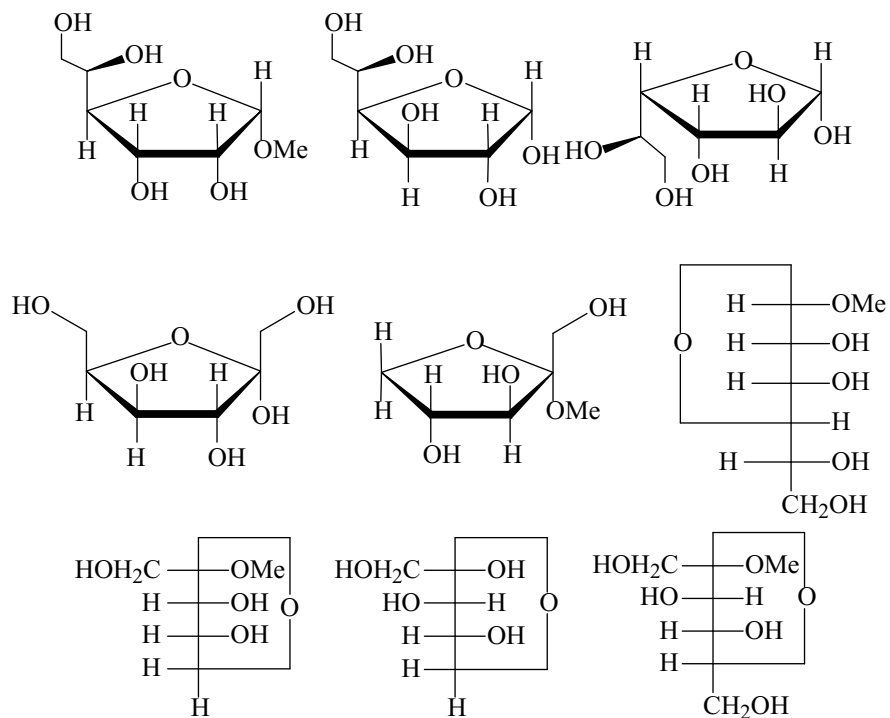
24. Identify the total number of carbohydrates which have D-configuration



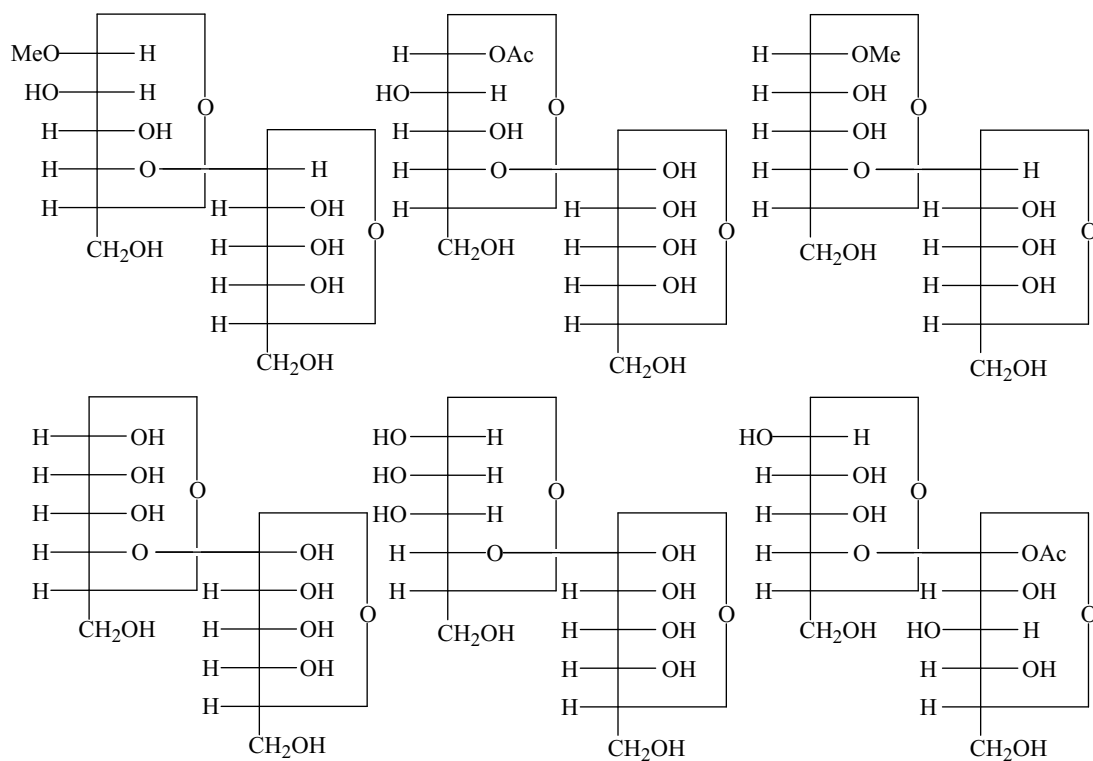
25. Identify the total number of carbohydrates which give mutarotation



26. Identify the total number of carbohydrates which give mutarotation



27. Identify total number of carbohydrates which give $\oplus$ ve tollen test.



Answer Keys

LEVEL 1

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

LEVEL 2

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