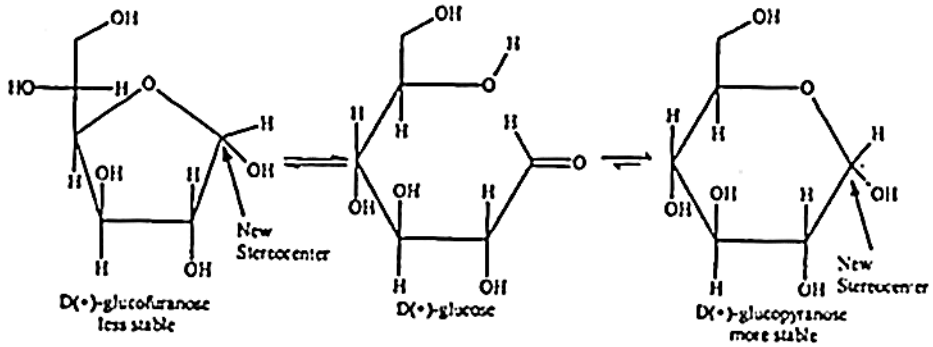
SOLVED EXAMPLES

Ex. 1 Write the hemiacetal formation for glucose.

Sol.

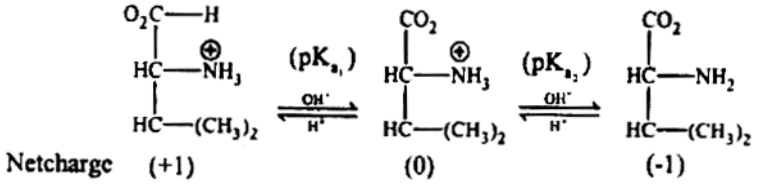


Ex. 2 The pKa of the carboxyl group in an amino acid valine, $(CH_3)_2CHCH(NH_2)(COOH)$ is 2.31 and the pKa for the amino group of the same amino acid is 9.69. compute the Isoelectric point (pI) for valine and draw the structure of this amino acid when the pH of the solution equals top1. Also draw the structures of valine that predominate at pH =2 and pOH =2.

Sol. The isoelectric point (p1) is the pH at which the amino acid exists only as a dipolar ion with net charge zero.

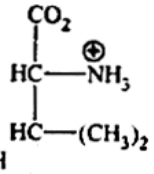
At isoelectric point, for a neutral amino acid, $\mathbf{pI = \frac{(pK_{a_1} + pK_{a_2})}{2}}$

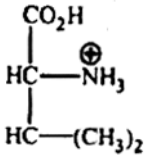
The dissociation of cationic form of valine can be represented as

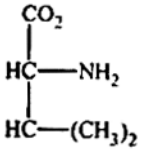


The species with zero net charge exists between species with (+1) and (—I) net charges.

$$pI = \frac{(pK_{a_1} + pK_{a_2})}{2} = \frac{9.69 + 2.31}{2} = 6$$

When the p1-I of the solution equals to p1, the structure of valine is 

When the pH of the solution is two, the structure of valine is 

When the pH of the solution is 12, the structure of valine is 

Ex. 3 Sucrose on hydrolysis yields a mixture which is

(A) Optically inactive **(B)** Dextrorotatory **(C)** Laevorotatory **(D)** Racemic

Sol. **(C)** Sucrose on hydrolysis yields equimolar mixture of D-(—)-fructose and D-(+)glycose. Since specific rotation of (—)-fructose is greater than (+)-glucose D the mixture is laevorotatory.

Ex. 4 A high molecular weight molecule which does not contain repeating structural units is called a

(A) Polymer **(B)** Macromolecule **(C)** Both **(A)** and **(B)** **(D)** None of these

Sol. **(B)** A polymer has always repeating structural units derived from monomer. For example proteins and nucleic acid are regarded as macromolecules, but not polymers because their molecules do not contain repeating structural units. All polymers are macromolecules, but all macromolecules are not polymers.

Ex. 5 The force of attraction between the neighbouring peptide chains is

(A) van der Waal's force **(B)** Covalent bond **(C)** Hydrogen bond **(D)** Peptide linkage

Sol. **(C)** Neighbouring peptide chains are held by hydrogen bonds between —CO— and — NH—.

Ex. 6 Peptides on hydrolysis give

(A) Ammonia **(B)** Amines **(C)** Amino acids **(D)** Hydroxy acids

Sol. **(C)** Peptides are formed by condensation of α-amino acids. Therefore, on hydrolysis they yield α-amino acids.

Ex. 7 An example of a condensation polymer is

(A) PVC **(B)** terylene **(C)** polypropylene **(D)** polystyrene

Sol. **(B)** In condensation polymerization, a series of condensation reactions between the (generally two) monomers containing atleast two functional groups each occur with the loss of a small molecule such as H_2O, CH_3OH or HX (X = halogen). Terylene is a condensation polymer of ethylene glycol and terephthalic acid.

Ex. 8 Although both polymers are prepared by free radical processes, poly (vinyl chloride) is amorphous and poly (vinylidene chloride) (saran) is highly crystalline. How do you account for the different ? (vinylidene chloride is 1,1-dichloroethene).

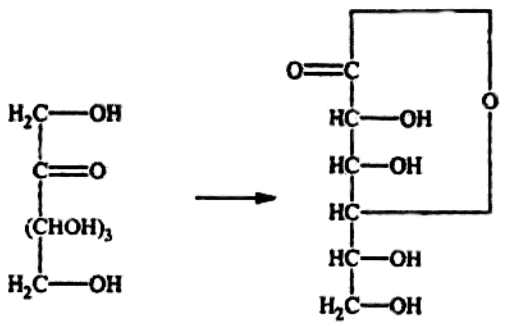
Sol. As poly (vinyl chloride) is able to show stereoisomerism and further it is formed by a free radical process, it is atactic (chlorine atoms (distributed randomly), the molecules fit together poorly.

Poly (vinylidene chloride) has two identical substituents on each carbon and the chains fit together well.

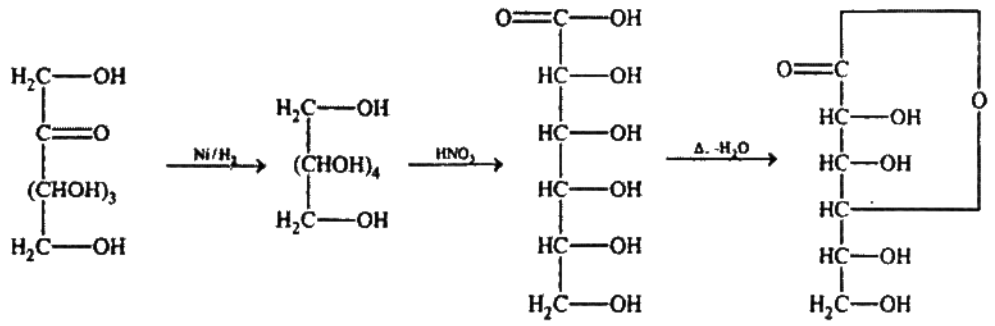
Ex. 9 Compound A $C_5H_{10}O_4$, is oxidized by $Br_2 - H_2O$ to the acid, $C_5H_{10}O_5$. (A) Forms a triacetate (Ac_2O) and is reduced by HI to n-pentane. Oxidation of (A) with HIO_4 gives, among other product, 1 molecule of CH_2O and 1 molecule of HCO_2H. What are the possible structures of (A) and how could you distinguish between them ?

Sol. (A) is an aldehyde, contains three hydroxyl groups and the carbon skeleton consists of five carbon atoms in a straight chain. Also, the formula $C_5H_{10}O_4$ therefore suggests that (A) is a deoxy-sugar. If we now try to work out the possibilities based directly on the periodic oxidation of (A), we shall find it.

Ex. 10 Convert



Sol.



Ex. 11 **(i)** Sulphanilic acid although has acidic as well as basic group, it is soluble in alkali but insoluble in mineral acid.

(ii) Sulphanilic acid is not solube in organic solvents.

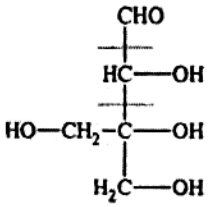
Sol. **(i)** Sulphanic acid exist as Zwitterion

The weakly acidic $-NH_3^+$ transfers H^+ to OH^- to form a soluble salt, $P-NH_2-C_6H_4-SO_3^-Na^+$ on the other hand $-SO_3^-$ is too weakly basic to accept H^+ from strong acids.

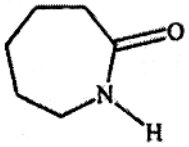
(iii) Due to its ionic character it is insoluble in organic solvents.

Ex. 12 Compound (A) $C_5H_{10}O_5$, give a tetra-acetate with Ac_2O and oxidation of (A) with $Br_2 - H_2O$ gives an acid, $C_5H_{10}O_6$. Reduction of (A) with HI and red phosphorous gives 3-methylbutane. What is structure of (A) ?

Sol. The formation of tetracetate indicates of 4OH group and oxidation with bromine water indicates presence of CHO group. Reduction with red phosphorous and HI indicates presence of one carbon in the side chain. Thus, the structure of (A) would be

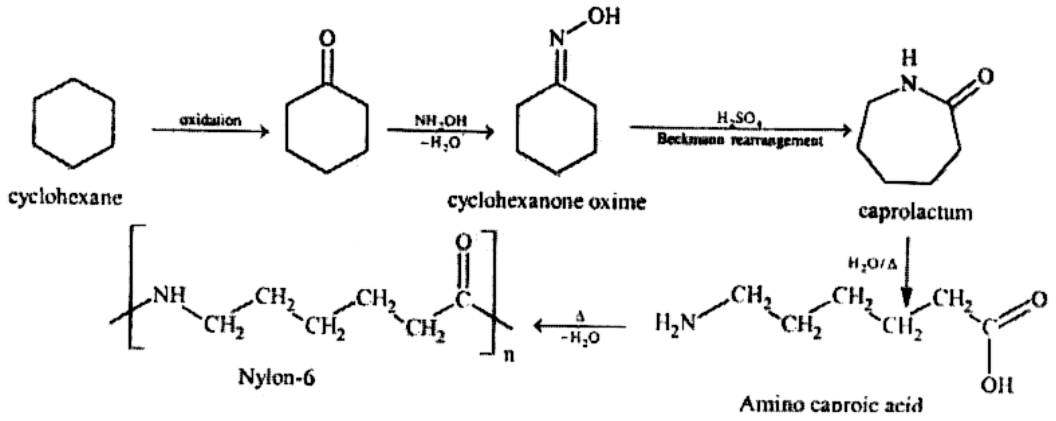


Ex. 13 What is the structure of nylon-6, made by alkaline polymerisation of caprolactum ?



Sol. The configuration of these carbons which are unchanged in the reactions, must be identical in order to get the same osazone.

(a) Nylon-6: Another polymer of this class is nylon-6. It is a monomer of caprolactam which is obtained from cyclohexane.



It used for making tyre cords, fabrics and ropes.

b) Nylon-6, 10: A polymer of hexamethylene diamine (six carbon atoms) and sebacic acid (ten carbon atoms).

$$nNH_2-(CH_2)_6-NH_2+nCOOH-(CH_2)_8-COOH \xrightarrow{-2n\ H_2O}$$

hexamethylene diamine; sebacic acid

$$(-CO-(CH_2)_8-CO-NH-(CH_2)_6-NH-CO-(CH_2)_8-CO-)_n$$

Nylon-6,10

These polymers are formed by the condensation of two or more monomers with the elimination of simple molecules like H_2O, NH_3, ROH etc.

Ex. 14 Supply structures for H through K. Given :

An Aldohexose $\xrightarrow{NH_2OH/base}$ H $\xrightarrow{Ac_2O/NaOAc}$ I $\xrightarrow{-HOAC}$ J $\xrightarrow{NaOMe/MeOH}$ K.

(b) Explain the last step (c). What is net structural change (d) Name this overall method. (c) Discuss the possibility of epimer formation.

Sol. a) H is an oxime $HOCH_2(CHOH)_4CH=NOH$; 1 s the completely acetylated oxime, $AcOCH_2(CHOH)_4CH=NoAc$ that loses 1 mole of HOAc to form J, $AcOCH_2(CHOAc)_4C\square N$; K is an aldopentose, $HOCH_2(CHOH)_3CHO$.

b) The acetates undergo transesterification to give methyl acetate freeing all the sugar OH's. This is followed by reversal of HCN addition.

c) There is loss of one C from the carbon chain.

d) Wohl Degradation

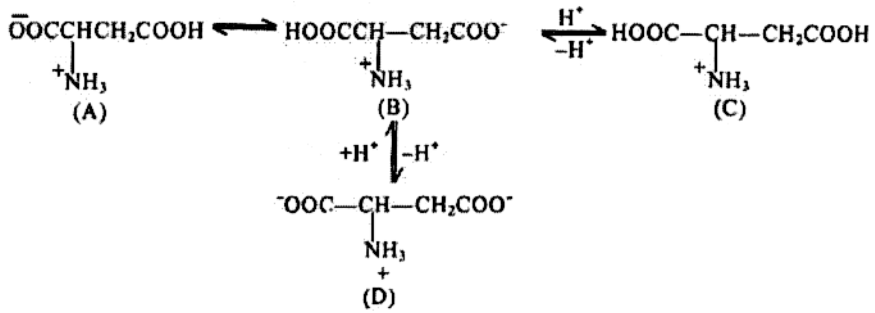
e) The α-CHOH becomes the –CH = O without any configurational changes of the other chiral carbons. Thus no epimers are formed.

Ex. 15 Glycine exists as $(H_3N^+CH_2COO^-)$ while anthranilic acid $(P-NH_2-C_6H_4-COOH)$ does not exist as dipolar ion.

Sol. –COOH is too weakly acidic to transfer H^+ to the weakly basic $-NH_2$ attached to the electron withdrawing benzene ring. When attached to an aliphatic carbon, the $-NH_2$ is sufficiently basic to accept H^+ from –COOH group.

Ex. 16 Why should isoelectric joint for Aspartic acid (2.98) be so much lower than that of leucine ?

Sol. This may be explained by considering following ion equilibrium

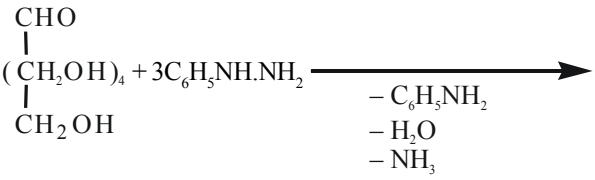


It is apparent that ions (A) and (B) are neutral, while (C) is a cation and (D) is dianion. In species (D), the anion is derived from the second –COOH group present in aspartic acid and is not possible in leucine. At neutral pH a significant concentration of (D), will be present in aqueous solution. It will therefore, be necessary to decrease the pH of such a solution if the formation of (D) is to be suppressed to a stage where anions and cations are present in equal concentration (the isoelectric point).

Ex. 17 (a) Show how an aldohexose can be used to synthesize 2-ketohexose.

(b) Since glucose is converted to fructose by this method, what can you say about the configuration of C_3, C_4 and C_5 in the sugars.

Sol.



Here aldohexose reacts with one molecule of phenylhydrazine which condenses with the aldehyde group to give phenylhydrazone. When warmed with excess of phenyl hydrazine, the secondary alcoholic group adjacent to the aldehyde group is oxidised by another molecule of phenylhydrazine, to a ketonic group. With this ketonic group, the third molecule of phenylhydrazine condenses to given osazone. The pheynlhydrazinyl group is transferred from osazone to C_6H_5CHO giving $C_6H_5CH = N.NHC_6H_5$ and a dicarbonyl compound called an osone. The more reactive aldehyde group of the osone is reduced, not the less reactive keto group and it give the 2-ketohexose.

Ex. 18 Starch is polymer of

(A) Fructose **(B)** Glucose **(C)** Lactose **(D)** None

Sol. **(B)** Starch is homopolysaccharide of glucose having 24 — 30 glucose units.

Ex. 19 The commonest disaccharide has the molecular formula

(A) $C_{10}H_{18}O_9$ **(B)** $C_{10}H_{20}O_{10}$ **(C)** $C_{11}H_{22}O_{11}$ **(D)** $C_{12}H_{22}O_{11}$

Sol. **(D)** The most common disaccharide is sucrose, whose molecular formula is $C_{11}H_{22}O_{11}$.

Ex. 20 The structure ofglyclne (amino acid) is $H_3N^+CH_2\,COO^-$ (Zwitter Ion.)

Select the correct statement of the following.

(A) Glycine, as well as other amino acids are amphoteric.

(B) The acidic functional group in amino acids is — NH_3^+

(C) The basic functional group in amino acids is —CO_2^-

(D) All the statements are correct

Sol. **(D)** Glycinc and all other amino acids are amphoteric because of the presence of NH_2 and CO_2H group both. The amino acid exists and Zwitter ion and acidic group is $—NH_3^+$ while basic group is $—CO_2^-$

Ex. 21 Sugars are characterised by the preparation of osazone derivatives. Which sugar have identical osazones.

(A) Glucose and lactose **(B)** Glucose and fructose

(C) Glucose and arabinose **(D)** Glucose and maltose

Sol. **(B)** The reaction with phenyl hydrazone gives same osazone because glucose and fructose differ only on carbon atoms 1 and 2 which are involved in osazone formation.

Ex. 22 Cane sugar on hydrolysis yields

(A) Glucose and maltose **(B)** Glucose and lactose

(C) Glucose and fructose **(D)** Only glucose

Sol. **(C)** $C_{12}H_{22}O_{11} \xrightarrow[H^+]{HOH} C_6H_{12}O_6 + C_6H_{12}O_6$

Glucose Fructose

The process is known as inversion of cane sugar.

Exercise # 1 [Single Correct Choice Type Questions]

1. The letter D in D-glucose signifies
(A) dextro rotatory **(B)** mode of synthesis **(C)** its configuration **(D)** its diamagnetic nature

2. Glycoside linkage is
(A) an acetal linkage **(B)** an ether linkage **(C)** an ester linkage **(D)** an amide linkage

3. Sucrose on hydrolysis yields a mixture which is
(A) optically inactive **(B)** dextrorotatory **(C)** laevorotatory **(D)** racemic

4. Hydrolysis of sucrose into (+) glucose and (-) fructose is known as
(A) Muta rotation **(B)** Inversion **(C)** Pyrolysis **(D)** None of these

5. Which of the following can be used for detection of traces of iodine ?
(A) Glucose in aqueous solution **(B)** Starch in aqueous solution
(C) Cellulose in alcoholic solution **(D)** Cellulose in aqueous solution

6. Which of the following pairs form the same osazone ?
(A) Glucose and fructose **(B)** Glucose and galactose
(C) Glucose and arabinose **(D)** Lactose and maltose

7. The term inverted sugar refers to an equimolar mixture :
(A) D-Glucose and D-galactose **(B)** D-Glucose and D-fructose
(C) D-Glucose and D-mannose **(D)** D-Glucose and D-ribose

8. Cellulose on hydrolysis yields
(A) β-D-Fructose **(B)** α-D-Glucose **(C)** β-D-Glucose **(D)** α-D-Fructose

9. Glucose when treated with CH_3OH in presence of dry HCl gas gives α- and β- methylglucosides because it contains
(A) an aldehydic group **(B)** a – CH_2OH group **(C)** a ring structure **(D)** five – OH group

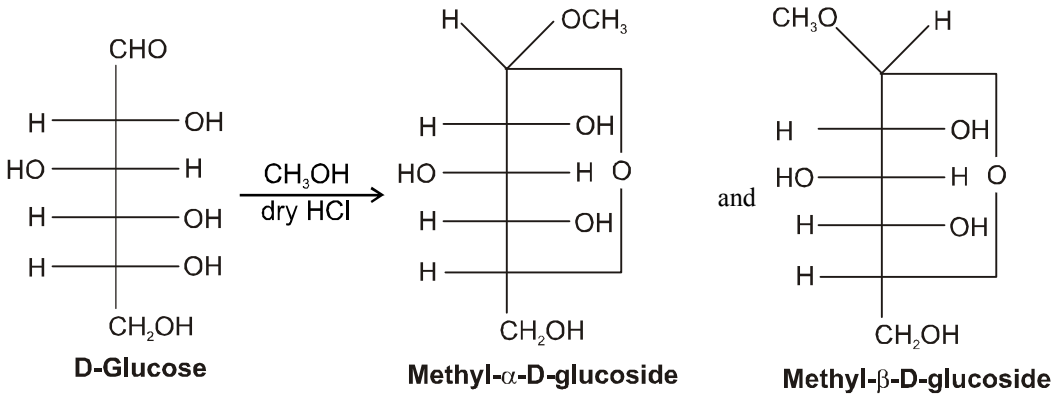
10. α-D glucose and β-D-glucose differ from each other due to the difference in one of the carbon atoms, with respect to its
(A) Number of OH groups **(B)** Configuration
(C) Conformation **(D)** Size of hemiacetal ring

11. In Ketohexose the possible optical isomers are
(A) 12 **(B)** 4 **(C)** 16 **(D)** 8

12. Which of the following indicates the presence of 5 –OH groups in glucose
(A) Penta-acetyl derivative of glucose **(B)** Cyanohydrin formation of glucose
(C) Reaction with fehling's solution **(D)** Reaction with Tollen's reagent

13. Find true and False from the following statements regarding carbohydrates
S_1 : All monosaccharides whether aldoses or ketoses are reducing sugars.
S_2 : Bromine water can be used to differentiate between aldoses and ketoses
S_3 : A pair of diastereomeric aldoses which differ only in configuration at C-2 are anomers.
S_4 : Osazone formation destroys the configuration at C-2 of an aldose, but does not affect the configuration of the rest of the molecule.
(A) TTTT **(B)** TFTF **(C)** TTFT **(D)** FTTT

14. D-glucose, on treating with methanol in presence of dry HCl gives methyl glucosides according to the following reaction



(I) (II) (III)

Mention true (T) and False (F) from the following statements

S_1 : The glucosides do not reduce fehling's solution

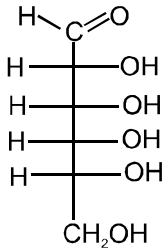
S_2 : The glucosides do not react with hydrogen cyanide or hydroxylamine

S_3 : Behaviour of glucosides as stated in S_1 and S_2 indicates the absence of free – CHO group.

S_4 : The two forms of glucosides are enantiomers.

(A) TTFF **(B)** FTTT **(C)** TTTF **(D)** TFTF

15.



Allose

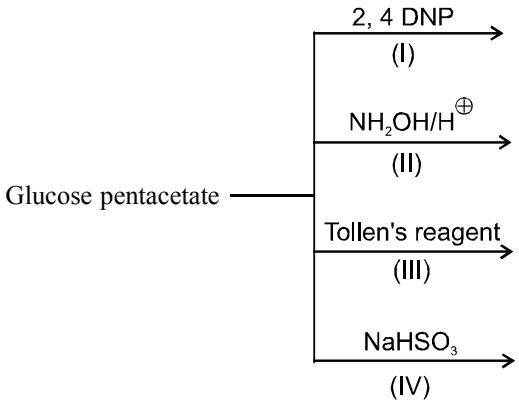
Given monosacharide is a/an

(A) Aldopentose **(B)** Aldohexose **(C)** Ketopentose **(D)** Aldoheptose

16. α -D (+) glucopyranose is

(A) acetal **(B)** ketal **(C)** hemiacetal **(D)** hemiketol

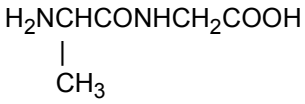
17. Observe the following laboratory tests for glucose pentacetate and mention +ve or –ve from the code given below.



(A) ++++ **(B)** −− −− **(C)** +−+− **(D)** ++−−

18. Which of the following α-amino acids is not optically active ?
(A) Alanine **(B)** Glycine **(C)** Phenylalanine **(D)** Cysteine

19. The name of the dipeptide

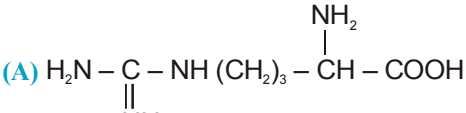


(A) Glycylglycine **(B)** Glycylalanine **(C)** Glycine alanine **(D)** Alanylglycine

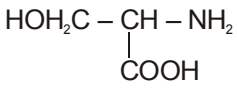
20. The force of attraction between the neighbouring peptide chains is
(A) Vander Waal's force **(B)** Covalent bond
(C) Hydrogen bond **(D)** Peptide linkage

21. Which of the following is a basic amino acid?

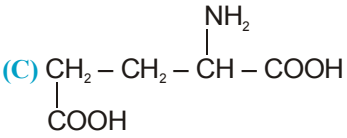
(A)



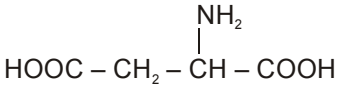
(B)



(C)

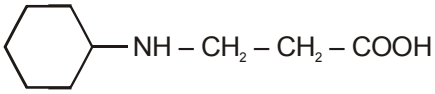


(D)

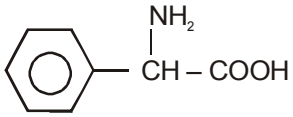


22. Which of the following is α – amino acid?

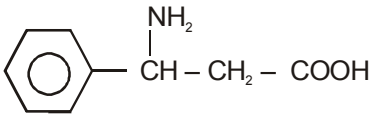
(A)



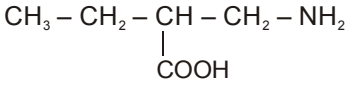
(B)



(C)



(D)



23. Polymer which has amide linkage is
(A) Nylon -66 **(B)** Terylene **(C)** Teflon **(D)** Bakelite

24. Ziegler-Natta catalyst is
(A) $K[PtCl_3(C_2H_4)]$ **(B)** $(Ph_3P)_3RhCl$ **(C)** $Al_2(C_2H_5)_6 + TiCl_4$ **(D)** $Fe(C_5H_5)_2$

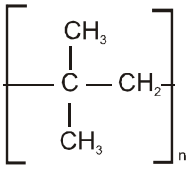
25. Starch is polymer of
(A) α-D-Glucose **(B)** β-D-Glucose
(C) α-D-Glucose and β-D-Glucose **(D)** α-D-Fructose

26. Nylon-66 is made by using
(A) Phenol **(B)** Benzaldehyde **(C)** Adipic acid **(D)** Succinic acid

27. Buna-S is a polymer of :
(A) Butadiene only **(B)** Butadiene and nitryl **(C)** Styrene only **(D)** Butadiene and styrene

28. Condensation product of caprolactam is :
(A) nylon-6 **(B)** nylon-6, 6 **(C)** nylon-60 **(D)** nylon-6, 10

29. Monomer of given polymer



is :
(A) 2- Methylpropene **(B)** Styrene **(C)** Propylene **(D)** Ethene

30. Which of the following is a nitrogen containing polymer ?
(A) Polyvinyl chloride **(B)** Bakelite **(C)** Nylon **(D)** Terylene

31. Which of the following statements about DNA is not correct ?
(A) It has a double helix structure
(B) It undergoes replication
(C) The two strands in a DNA molecule are exactly similar
(D) It contains the 2-deoxyribose pentose sugar.

32. Which of the following statements about RNA is not correct ?
(A) It has a single strand **(B)** It does not undergo replication
(C) It does not contain any pyridimine base **(D)** It controls the synthesis of proteins

33. Oils and fats are esters of higher fatty acids with :
(A) Ethanol **(B)** Glycol **(C)** Glycerol **(D)** Methanol

34. The chief constituents of cell membranes are :
(A) Simple triglycerides **(B)** Waxes **(C)** Phospholipids **(D)** Proteins

35. The sugar present in DNA is :
(A) Glucose **(B)** Deoxyribose **(C)** Ribose **(D)** Fructose

36. The pentose sugar in DNA and RNA has the :
(A) Open chain structure **(B)** Pyranose structure
(C) Furanose structure **(D)** None of the above

37. Which of the following is not a pyrimidine base ?
(A) Uracil **(B)** Guanine **(C)** Cytosine **(D)** Thymine

38. The relationship between the nucleotide triplets and the amino acids is called
(A) Translation **(B)** Transcription **(C)** Replication **(D)** A genetic code

39. The fats present in the body act as
(A) Food storage only **(B)** Heat insulator only
(C) Shock absorber only **(D)** All the three above

40. The most concentrated source of energy in the human body is
(A) Fats **(B)** Sugars **(C)** Proteins **(D)** Nuclei acids

41. Which of the following is a vitamin ?
(A) Glucose **(B)** Keratin **(C)** Maltose **(D)** Riboflavin

42. Vitamin B_6 is known as
(A) Pyridoxine **(B)** Thiamine **(C)** Tocopherol **(D)** Riboflavin

43. The best source of vitamin A is :
(A) Oranges **(B)** Beans **(C)** Carrots **(D)** Wheat

44. Vitamin D is called :
(A) Ascorbic acid **(B)** Calciferol or ergocalciferol
(C) Thiamine **(D)** Riboflavin

45. Vitamin E is also called :

(A) Cyanocobalamin **(B)** Tocopherol **(C)** Lactoflavin **(D)** Ascorbic acid

46. Which of the following is found in cod-liver oil ?

(A) Vitamin C **(B)** Vitamin E **(C)** Vitamin A **(D)** Vitamin B_1

47. The best source of vitamin C is :

(A) Code liver oil **(B)** Egg yolk **(C)** Citrus fruits **(D)** Fish liver oil

48. Deficiency of vitamin E causes

(A) Scurvy **(B)** Loss of appetite

(C) Loss of sexual power and reproduction **(D)** Beriberi

49. Which of the following is fat soluble vitamin ?

(A) Vitamin A **(B)** Pyridoxine **(C)** Riboflavin **(D)** Thiamine

50. Which one of the following vitamin contains a metal atom ?

(A) Vitamin A **(B)** Vitamin B_2 **(C)** Vitamin B_6 **(D)** Vitamin B_{12}

51. Identify the vitamin whose deficiency in our food decreases reproductive power :

(A) vitamin A **(B)** vitamin C **(C)** vitamin D **(D)** vitamin E

52. Beri-beri is casued due to :

(A) vitamin A **(B)** vitamin B **(C)** vitamin C **(D)** vitamin D

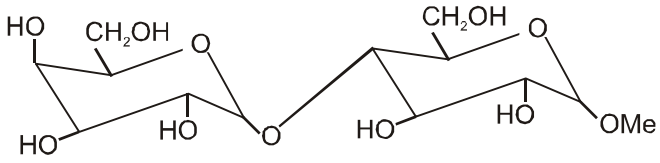
53. Milk contains vitamins :

(A) A, D and E **(B)** A, B_{12} and D **(C)** C, D and K **(D)** B_1, B_6 and D

54. Nervousness anaemia is caused by the deficiency of vitamin

(A) B_1 **(B)** B_2 **(C)** B_6 **(D)** B_{12}

55.



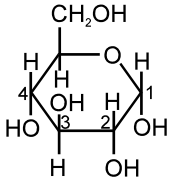
On acid hydrolysis of above disaccharide, we get

(A) Two moles of glucose **(B)** one mole of glucose

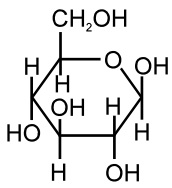
(C) One mole of galactose **(D)** one mole of glucose and one mole of galactose

56. Haworth's projection of α-D glucose is :

(A)



(B)



(C) both **(D)** none

57. Ketones do not reduce Tollen's reagents, but fructose with a keto group reduces it. It is attributed to

(A) Enolisation of keto group of fructose and then, its transformation into aldehyde group in presence of OH^- which is present in Tollen's reagent

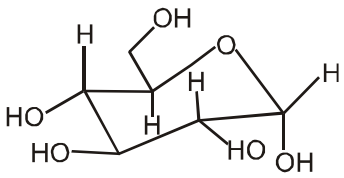
(B) > CHOH group which is also oxidised to keto group

(C) Both statements are correct

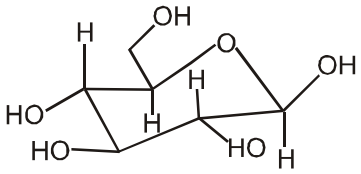
(D) None of the statement is correct

58. Which is correct structure of β-D-glucopyranose.

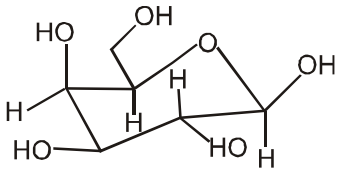
(A)



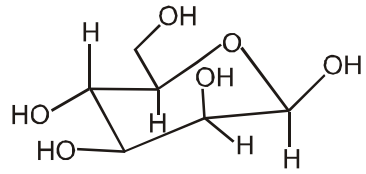
(B)



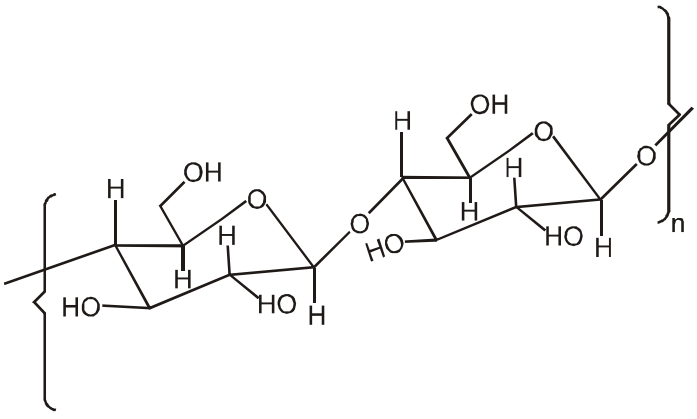
(C)



(D)



59. The structure of the following polymer is :

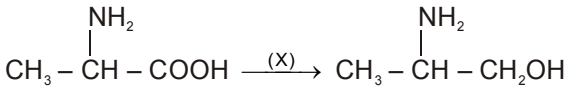


(A) Starch

(B) Sucrose

(C) Cellulose

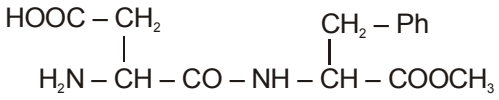
(D) Maltose

60. 

The reagent (X) can be

(A) H_2 / Pd/$BaSO_4$/quinoline **(B)** $NaBH_4$

(C) $LiAlH_4$ **(D)** CH_3MgI

61. 

(Aspartame)

Aspartame is 160 times as sweet as sucrose and is used as a sugar substitute.

the correct statement (s) about aspartame is (are)

I – It is an ester derivative of dipeptide

II – It can be named as aspartyl phenylalanine methyl ester

III – It is a tripeptide

IV – It is having four functional groups.

(A) I, II **(B)** I, II, IV

(C) II, III, IV **(D)** only II

62. In osazone formation of three molecules of phenylhydrazine which is the correct statement

(A) All the three molecules react in similar manner

(B) Two molecules reacts in similar manner whereas the third reacts in different way

(C) All the three molecules react in different way

(D) Only two react in same manner but the third molecules remains unreacted

63. Find the pair which is correctly matched

(A) Sucrose : monosaccharide

(B) Fructose : aldose sugar

(C) Glucose : mutarotation

(D) Sucrose : reducing sugar

64. Two hexoses form the same osazone find the correct statement about these hexoses.

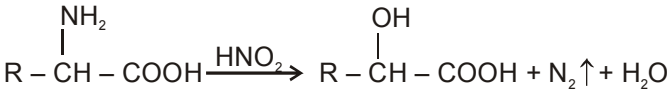
(A) Both of them must be aldoses

(B) They are epimers at C-3

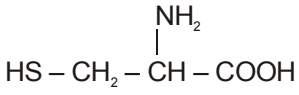
(C) The carbon atoms 1 and 2 in both have the same configuration

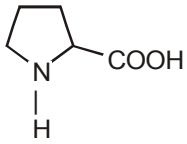
(D) The carbon atoms 3, 4 and 5 in both have the same configuration

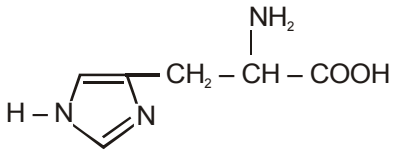
65. Nitrous acid (HNO_2) converts amino acids into hydroxy acids with retention of configuration. Estimation of nitrogen gas evolved in the reaction is the basis of Van slyke estimation of amino acids.

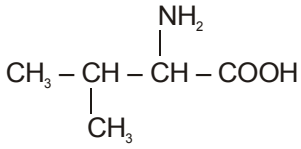


Which of the following amino acids cannot be analysed by Van slyke method?

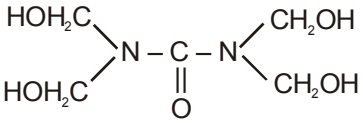
I –  (cysteine)

II –  (Proline)

III –  (Histidine)

IV –  (Valine)

(A) only I **(B)** only II **(C)** I and III **(D)** I, III, IV

66. 

The polymer obtained by the above compound is

(A) Bakelite

(B) Urea formaldehyde resine

(C) Melamine formaldehyde resin

(D) Tefflon

67. Which of the following contains isoprene unit?

(A) Natural rubber **(B)** Polyethylene

(C) Nylon – 66 **(D)** Dacron

68. Which of the following polymerises most easily ?

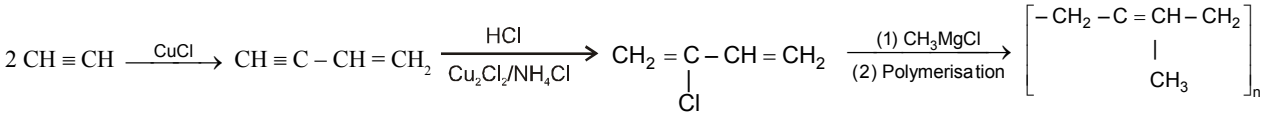
(A) $CH_3CH_2C{\equiv}CH$ **(B)** $CH_2{=}CH{-}CH{=}CH_2$

(C) $CH_3CH_2{-}CH{=}CH_2$ **(D)** $CH{\equiv}C{-}C{\equiv}CH$

69. Which of the following is condensation polymer?

(A) Polystyrene **(B)** PVC **(C)** Polyester **(D)** Teflon

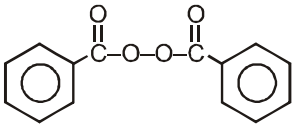
70. The polymerisation reaction shown below

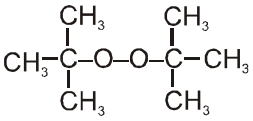


would produce :

(A) PVC **(B)** neoprene **(C)** chloroprene **(D)** Rubber

71. Which of the following is radical initiator

(A) R – N = N – R **(B)** 

(C)  **(D)** All

72. Which of the following compounds is found abundantly in nature ?

(A) Fructose **(B)** Starch **(C)** Glucose **(D)** Cellulose

73. Glucose on reduction with Na/Hg and water gives ?

(A) Sorbitol **(B)** Fructose **(C)** Saccharic acid **(D)** Gluconic acid

74. Glucose or fructose is converted into C_2H_5OH in the presence of ?

(A) Diastage **(B)** Maltase **(C)** Invertase **(D)** Zymase

75. Glucose cannot be classified as ?

(A) Hexose **(B)** Carbohydrate **(C)** Aldose **(D)** Oligo saccharide

76. Milk sugar is commonly known as

(A) Maltose **(B)** Lactose **(C)** Fructose **(D)** Glucose

77. Carbohydrates contain ?

(A) –OH group **(B)** –CHO group **(C)** >C=O group **(D)** All

78. Which of the following monosaccharide is pentose ?

(A) Glucose **(B)** Fructose **(C)** Arabinose **(D)** Galactose

79. On heating glucose with Fehling solution. We get a precipitate whose colour is ?

(A) Yellow **(B)** Red **(C)** Black **(D)** White

80. The commonest disaccharide has the molecular formula ?

(A) $C_{10}H_{18}O_9$ **(B)** $C_{10}H_{20}O_{11}$ **(C)** $C_{18}H_{22}O_{11}$ **(D)** $C_{12}H_{22}O_{11}$

81. Starch is changed into disaccharide in presence of ?

(A) Diastase **(B)** Maltase **(C)** Lactase **(D)** Zymase

82. A certain compound give negative test with ninhydrin, but positive test with benedict solution. The compound is ?

(A) Protein **(B)** Monosaccharide **(C)** Lipid **(D)** Amino acid

83. It is best to carry out reaction with sugars in neutral or acidic medium and not is alkaline medium because in alkaline medium sugars undergo ?

(A) Racemisation **(B)** Decomposition **(C)** Inversion **(D)** Rearrangement

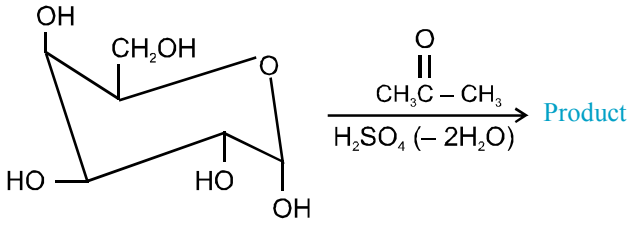
84. The reagent which forms crystalline osazone derivatives when heated with glucose is ?
(A) Fehling solution **(B)** Phenyl hydrazine **(C)** Benedict solution **(D)** Hydroxyamine

85. Which carbohydrate is used in silvering of mirror ?
(A) Sucrose **(B)** Fructose **(C)** Glucose **(D)** Starch

86. The charring product when $C_6H_{12}O_6$ is heated with conc. H_2SO_4 is due to ?
(A) Oxidation **(B)** Reduction **(C)** Dehydration **(D)** Dehydrogenation

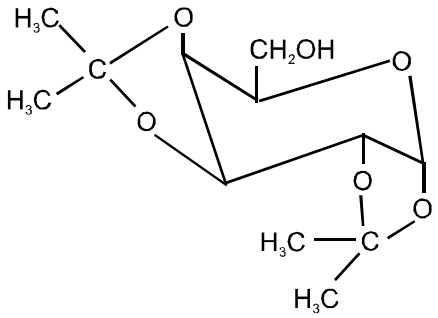
87. Consider following reagent :
I. Br_2 water II. Tollen's reagent III. Fehling's solution
which can be used to make distinction between an aldose and a ketose ?
(A) I, II and III **(B)** II and III **(C)** I only **(D)** II only

88. In a-D-galactopyranose the vicinal hydroxyl groups are cis to each other -

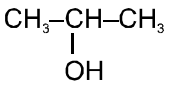


The product may be :

(A)

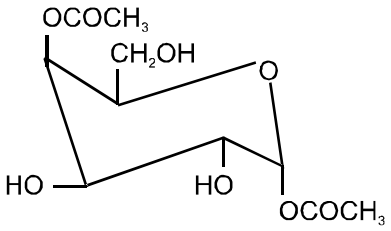


(B)



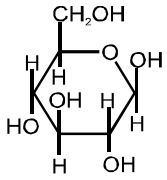
(C) CH_3COOH

(D)



89. The organic compound that will response Fehling's solution test is
(A) Ethanol **(B)** Acetone **(C)** Maltose **(D)** Benzaldehyde

Exercise # 2 Part # I [Multiple Correct Choice Type Questions]

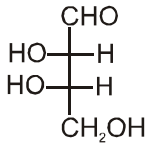
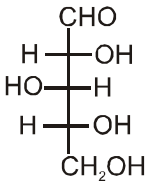
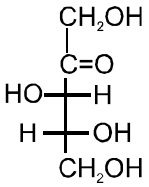
1.  Glucose

The correct statements about above structure of glucose are :

(A) It is a Pyranose form
(B) It is a furanose form
(C) It is a β-anomer
(D) It is a D -sugar

2. The correct statement (s) about starch

(A) It is a pure single compound
(B) It is mixture of two polysaccharides of glucose
(C) It involves the ($C_1 - C_4$) α-glycosidic linkage between two α - D glucose units
(D) It involves branching by ($C_1 - C_6$) glycosidic linkage

3. (I)  (II)  (III) 

The correct statement about the sugars given above are

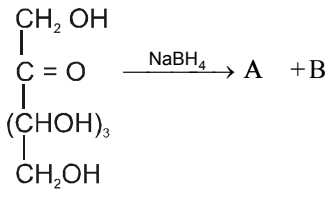
(A) I and II are L-Sugars
(B) II and III above D-Sugar
(C) I and III are D-sugars
(D) I is L-sugar

4. Which of the following are polyamide polymer ?

(A) Protein
(B) Nylon–6,6
(C) Nylon–6
(D) Polystyrene

5. Which of the following is /are reducing sugar

(A) Sucrose
(B) Glucose
(C) Fructose
(D) methylmaltoside

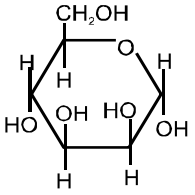
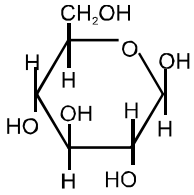
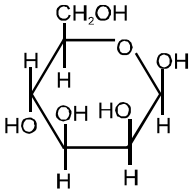
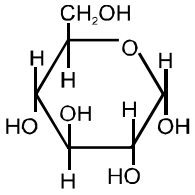
6. 

Fructose

The product A and B in the a above reaction are

(A) Diastereomers
(B) C-2 epimers
(C) Anomers
(D) Optically active hexahydroxy compounds

7. D-Mannose differs from D-glucose in its stereochemistry at C-2. The pyranose form of D-Mannose is

(A)  **(B)**  **(C)**  **(D)** 

8. The correct statements about anomers are

(A) Anomers have different stereochemistry at C-1(anomeric carbon)

(B) α-D-glucopyranose and β-D-glucopyranose are anomers

(C) Both anomers of D-glucopyranose can be crystallised and purified.

(D) When pure α-D-glucopyranose is dissolved in water its optical rotation slowly changes

9. The correct statements about peptides are

(A) A dipeptide has one peptide link between two amino acids.

(B) By convention N-Terminus is kept at left and C- terminus at right in the structure of a peptide

(C) If only one amino group and one carboxylic acid, group are available for reaction, then only one dipeptide can forms.

(D) A polypeptide with more than hundred amino acid residues (mol. mass > 10,000) is called a protein

10. Preparation of nylon from hexamethylene diamine and adipic acid is an example of :

(A) addition polymerisation **(B)** homopolymerisation

(C) condensation polymerisation **(D)** copolymerisation

11. Structures of some common polymers are given. Which are correctly presented ?

(A) Teflon $\{ CF_2 - CF_2 -)_n$

(B) Neoprene $\left(-CH_2 - \underset{\underset{Cl}{|}}{C} = CH - CH_2 - CH_2 - \right)_n$

(C) Terylene $\{OC-C_6H_4-COOCH_2-CH_2-O-)_n$

(D) Nylon-66 $\{ NH(CH_2)_6NHCO(CH_2)_4-CO-]_n$

12. Which of the following pairs is (are) correctly matched

(A) α- D (+) glucose and β-D(+) glucose → C-2 epimers

(B) Glucose and fructose → C-3 epimers

(C) Glucose → mutarotation

(D) Sucrose → Glucose + fructose

13. Which of these are polysaccharides of glucose ?

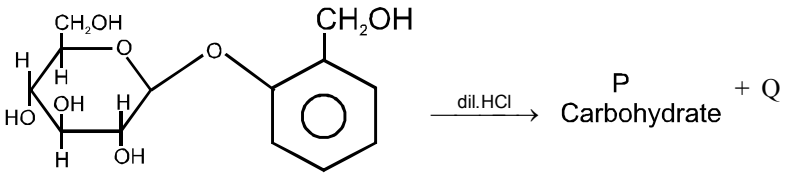
(A) Starch **(B)** Cellulose **(C)** Sucrose **(D)** Lactose

14. The correct structure of glycine at given pH are :

(A) $H_3\overset{\oplus}{N}CH_2-\underset{\underset{O}{\|}}{C}-OH$ at pH = 2.0 **(B)** $H_3\overset{\oplus}{N}CH_2-\underset{\underset{O}{\|}}{C}-O^{\ominus}$ at pH = 6.0

(C) $H_2NCH_2-\underset{\underset{O}{\|}}{C}-O^{\ominus}$ at pH = 9 **(D)** $H_2NCH_2-\underset{\underset{O}{\|}}{C}-OH$ at pH = 12

15. Salicin (structure given below) is a glycoside, found in the bark of willow tree, used in relieving pain. Observe the following reaction of salicin.



Salicin

The correct statement (s) is (are) :

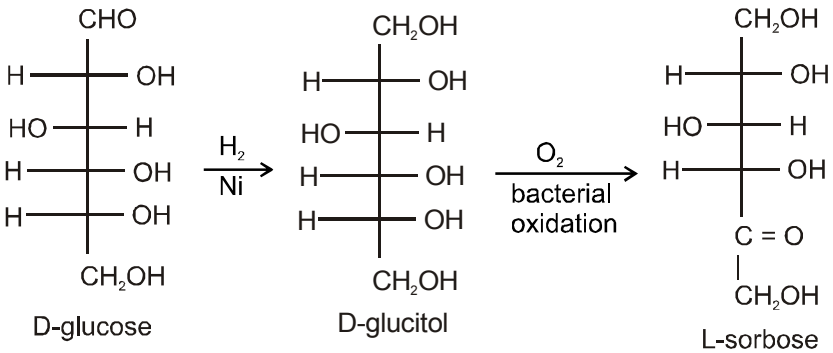
(A) P is D- glucose

(B) Q is 2-hydroxybenzylalcohol

(C) Q can be converted to a modern analgesic (pain killer), aspirin

(D) The above reaction occurs through a carbocation

16. L-Sorbose is the starting material for the synthesis of vitamin C. it can be prepared by D-glucose as follows



The correct statement about the above synthesis are -

(A) The overall result of synthesis is the transformation of D-aldohexose to L-ketohexose.

(B) The bacteria in second step selectively oxidises the –CHOH group of D-glucitol which corresponds to C-5 of D-glucose.

(C) The overall result of synthesis is the transformation of D-glucose to D-fructose.

(D) L-Sorbose is a reducing sugar.

Part # II [Assertion & Reason Type Questions]

Each question has 5 choices (A), (B), (C), (D) and (E) out of which only one is correct.

(A) Statement-1 is true, Statement-2 is true and Statement-2 is correct explanation for Statement-1

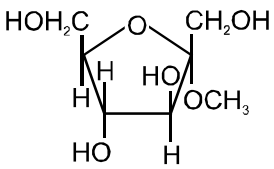
(B) Statement-1 is true, Statement-2 is true and Statement-2 is not correct explanation for Statement-1

(C) Statement-1 is true, Statement-2 is false

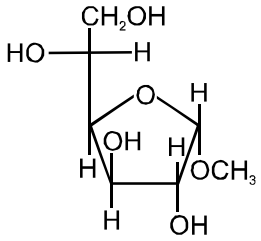
(D) Statement-1 is false, Statement-2 is true

(E) Both Statements are false

1. **Statement-1 :** Methyl α-D-fructofuranoside (I) undergoes acid catalysed hydrolysis at faster rate than that of methyl α-D-glucofuranoside (II).



(I)

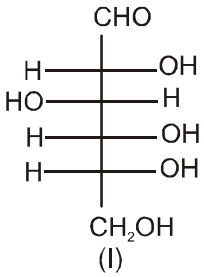


(II)

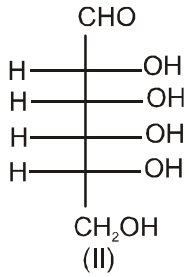
Statement-2 : The intermediate in glycoside hydrolysis is carbocation which 3° in case of I and 2° in case of II.

2. **Statement-1 :** Gly- Ala is a structural isomer of Ala-Gly.
Statement-2 : In Ala-Gly, Alanine is the N – terminal amino acid.

3. **Statement-1 :** D-glucose (I) yields an optically active saccharic acid on treatment with HNO_3, D-allose (II) yields an optically inactive alderic acid



(I)



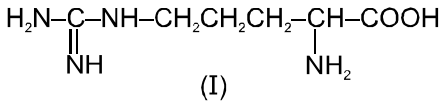
(II)

Statement 2 : Alderic acid produced from allose (II) has plane of symmetry

4. **Statement-1 :** Glucose and fractose cannot give similar osazone on reaction with $Ph–NH–NH_2$.
Statement-2 : Glucose and fructose have similar configuration on C_3, C_4, C_5 carbon.

5. **Statement-1 :** 1, 3-butadiene is monomer unit of natural rubber.
Statement-2 : Natural rubber formed by addition polymerisation.

6. **Statement-1 :** Arginine (I), is the most basic out of twenty common amino acids



(I)

Statement-2 : Arginine contains guanidine group whose protonated cation is highly stable due to + m effect

7. **Statement-1 :** Polybutadiene is an example of chain growth polymer.
Statement-2 : In chain growth polymers, the reactive particles may be free radicals or ions (cations or anions) to which monomers get added by a chain reaction.

8. **Statement-1 :** Bakelite is copolymer.
Statement-2 : Bakelite is a thermosetting material.

9. **Statement-1 :** All monosaccharides are sweet in taste.
Statement-2 : All monosaccharides have the general formula, $C_6H_{12}O_6$.

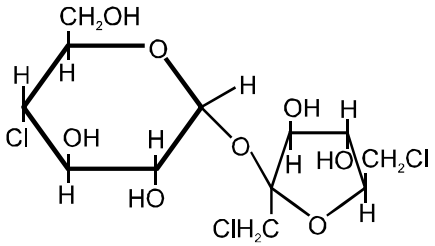
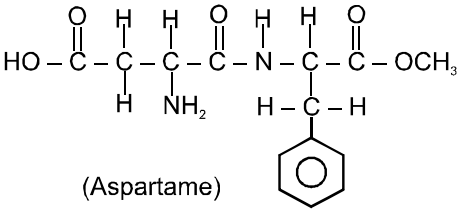
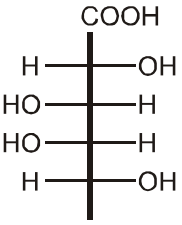
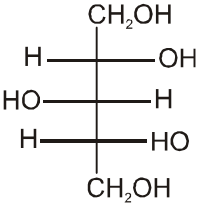
10. **Statement-1 :** Cellulose is not digested by human beings.
Statement-2 : Cellulose is a polymer of β-D-glucose.

Exercise # 3 Part # I [Matrix Match Type Questions]

1. Match Column-I with Column-II.

Column-I (polymer)	**Column-II (monomer)**
(A) Bakelite	**(p)** ω - caprolactam
(B) Polypropylene	**(q)** Ethylene glycol + phthalic anhydride
(C) Glyptal	**(r)** propene
(D) Nylon-6	**(s)** Phenol + formaldehyde

2. Match the Following :

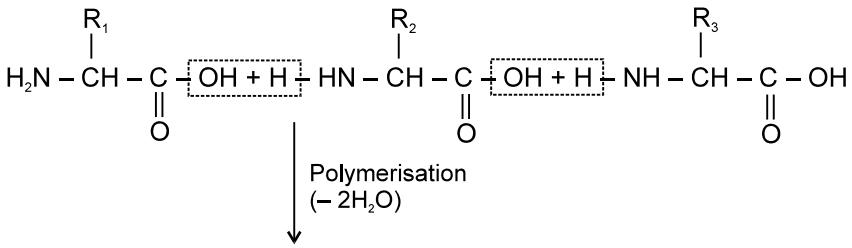
Column I (Artificial sweeteners)	**Column II (Characteristics)**
(A)  (Sucralose)	**(p)** A derivative of dipeptide
(B)  (Aspartame)	**(q)** A derivative of disaccharide
(C)  (Galactoric) (Aldaric acid)	**(r)** Reduction product of an aldopentose
(D)  (Xylitol)	**(s)** Oxidation product of aldohexose

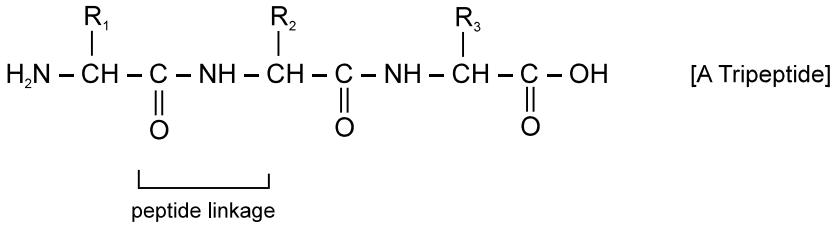
Part # II [Comprehension Type Questions]

Comprehension # 1

Proteins are biomolecules composed of α-amino acids. An α-amino acid has a general formula $R-\underset{\underset{NH_2}{|}}{CH}-COOH$.

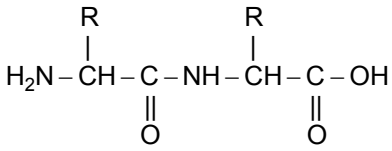
The amino acids polymerise and form an amide linkage (peptide linkage) between two monomeric amino acid units. The polymerisation takes place as follows





[A Tripeptide]

Two or more similar amino acids can also polymerise, for example a dimer will be like

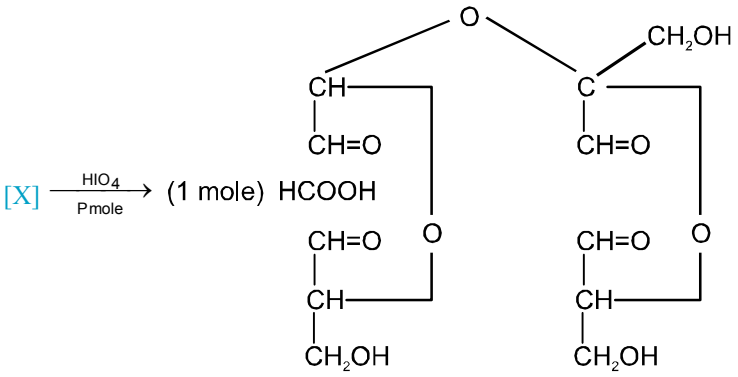


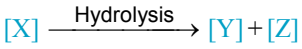
1. In the above trimer, if $R_1 = H$; $R_2 = CH_3$ & $R_3 = Ph$
then total number of optically active stereoisomers will be :
(A) 8 **(B)** 6 **(C)** 4 **(D)** 2

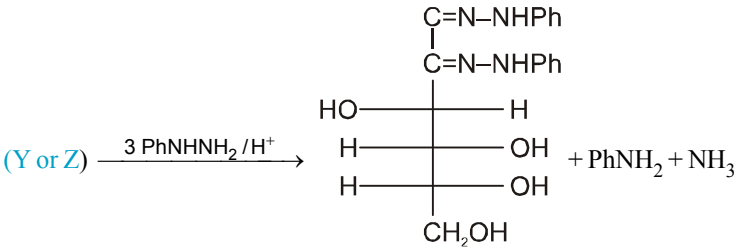
2. In the given trimer if $R_1 = H$; $R_2 = CH_3$ and $R_3 = Ph$
then the amino acids present in the trimer are :
(A) Glycine, Alanine & Phenyl Alanine
(B) Glycine, Leucine & Phenyl Alanine
(C) Alanine, Valine & Phenyl Alanine
(D) Alanine, Leucine & Lysine

3. Which statement is incorrect about the given trimer.
(A) it will liberate CO_2 with $NaHCO_3$.
(B) It will liberate N_2 with $NaNO_2$ / HCl
(C) It will give yellow precipitate with 2, 4-Dinitrophenylhydrazine
(D) It will rotate plane polarized light.

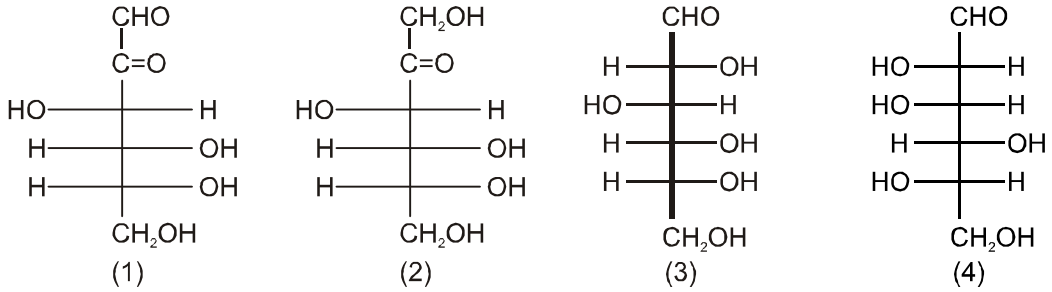
Comprehension # 2







1. Compounds Y and Z can be :



(A) 1 only **(B)** 2, 3 **(C)** 1, 4 **(D)** 2, 3, 4

2. Number of moles (P) of HIO_4 used per moles of compound X is :

(A) 2 **(B)** 3 **(C)** 4 **(D)** 5

Exercise # 4 [Subjective Type Questions]

1. Draw two anomers of D-fructose.

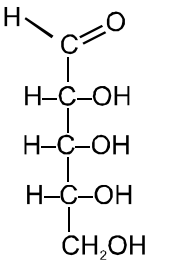
2. The specific rotation of two glucose anomers are $\alpha = +110^\circ$ and $\beta = +19^\circ$ and for the constant equilibrium mixtures is $+52.7^\circ$. Calculate the percentage compositions of the anomers in the equilibrium mixture.

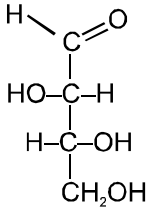
3. Consider an amylose chain of 4000 glucose unit. At how many cleavage require to lower the average length to 400 units.

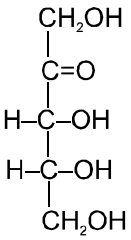
4. (A) $\xrightarrow[Br_2/H_2O]{HNO_3}$ m-tartaric acid / erythro aldonic acid

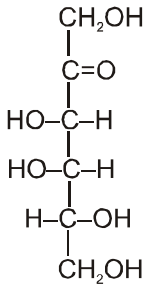
Predict (A) :

5. Classify the following monosaccharides in proper aldoses and ketose.

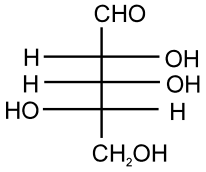
(i) 
2-deoxyribose

(ii) 
Threose

(iii) 
Ribulose

(iv) 
Tagatose

6. Write the anomer and epimer, enantiomer and ketose of the following aldose, also mention whether these are L sugars or D sugars .


L-aldopentose

7. $A + 4HIO_4 \longrightarrow 3HCOOH + HCHO + OHC-COOH$

$B + 5HIO_4 \longrightarrow 4HCOOH + 2HCHO$

Identify A and B.

8. On reduction of a monosaccharide A ($C_4H_8O_4$) mixture of two epimeric alcohols B & C is formed.
(a) Monosaccharide has aldehyde or ketone group ?
(b) Determine the structures of A , B and C.

9. On which side of neutrality (pH–7) , the isoelectric point of the following amino acids will lie ?

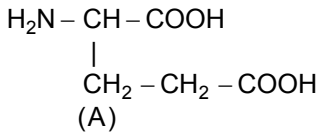
(a) $H-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$ **(b)** $H_2N-\underset{\displaystyle CH_2-CH_2-COOH}{\underset{|}{CH}}-COOH$ **(c)** $H_2N-\underset{\displaystyle (CH_2)_4-NH_2}{\underset{|}{CH}}-COOH$

10. 0.89 g of an α –amino acid (A) gave 0.224 lit. N_2 gas at NTP on reaction with HNO_2. In this process an optically active acid (B) is formed. A as well as B, gave cyclic compounds C and D on intermolecular dehydration. Identify A to D.

11. Glutamic acid (A) has isoelectric point 3.22

(a) What is the most likely structure of the compound at its isoelectric point ?

(b) What is the most likely structure of mono sodium glutamate.



(A)

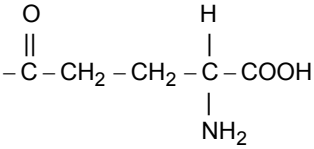
12. A polypeptide (Mol. wt = 360) formed by glycine (Mol. wt. = 75) amino acid. How many glycine units are used to form it.

13. An octapeptide (Mol. wt. = 516 g) on complete hydrolysis given glycine and alanine (Mol. mass = 89 g). Alanine contributes 41.59% to total weight of hydrolysed product. How many number of alanine unit present in octapeptide.

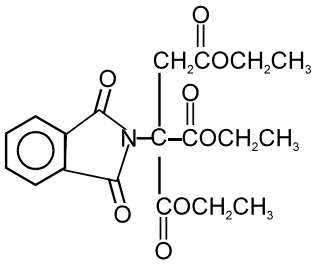
14. Give the amino acid sequence of the following polypeptides using the data given by partial hydrolysis.

(a) (Ser,Hyp,Pro,Thr) $\xrightarrow{H_3O+}$ Ser, Thr + Thr, Hyp + Pro, Ser

(b) (Ala, Arg,Cys,Val,Leu) $\xrightarrow{H_3O+}$ Ala, Cys + Cys, Arg + Arg, Val + Leu, Ala

15. Glutamic acid has lower isoelectric point while glutamine  has higher isoelectric pH. Explain ?

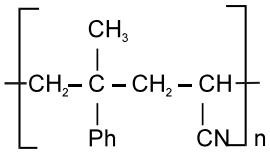
16. Hydrolysis of the following compound (A) in conc. HCl for several hours at 373K gives an amino acid . Identify it . Is it optically active ?

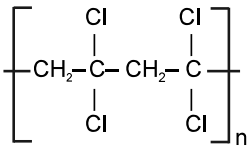
(A) 

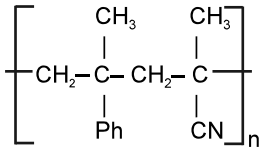
17. Distinguish between

(a) Glycine and acetamide **(b)** $\alpha-$, $\beta-$ & $\gamma-$ amino acids.

18. Write the structures of monomers of the following polymers.

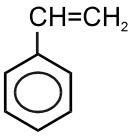
(a) 

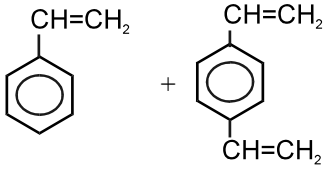
(b) 

(c) 

19. Give the following conversion acetaldehyde $\rightarrow$ alanine

20. Complete the following reactions

(a)  + $CH_2 = CH - C \equiv N \xrightarrow{150°C}$ (a copolymer)

(b)  $\xrightarrow{(C_6H_5COO)_2\ ,\Delta}$ a cross linked copolymer

21. Draw fischer projections for the two D–aldoheptoses whose stereorientation at C_2, C_3, C_4, C_5 is same as that of D–glucose at C_2,C_3,C_4 and C_5.

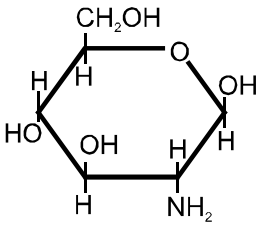
22. How many aldoheptoses are there ? How many are D-sugars & how many are L-sugars ?

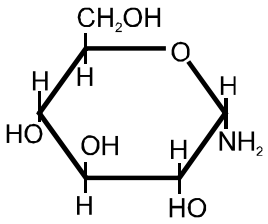
23. Aldoses give positive Tollen's, Fehling's and Osazone reactions but fail to respond Schiff's and bisulphite test.

24. **Fill in the blanks**

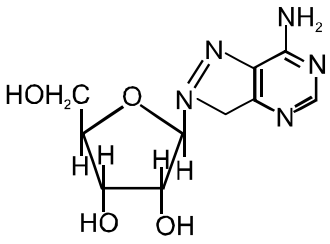
A sugar in which an amino group replaces the anomeric –OH is called glycosylamine. Also a sugar in which an amino group replaces a nonanomeric –OH is called an amino sugar.

Fill the correct answer (glycosylamine/amino sugar) in the blanks and complete the statements

(i)  is an example of .....

(ii) 

is an example of .....

(iii) 

is an example of .....

Exercise # 5 Part # I [Previous Year Questions] [AIEEE/JEE-MAIN]

1. Which of the following is a polyamide ? **[AIEEE-2005]**
(1) Bakelite **(2)** Terylene **(3)** Nylon-66 **(4)** Teflon

2. Which of the following is fully fluorinated polymer **[AIEEE-2005]**
(1) PVC **(2)** Thiokol **(3)** Teflon **(4)** Neoprene

3. The pyrimidine bases present in DNA are **[AIEEE-2006]**
(1) cytosine and guanine **(2)** cytosine and thymine
(3) cytosine and uracil **(4)** cytosine and adenine

4. The term anomers of glucose refers to **[AIEEE-2006]**
(1) a mixture of (D)–glucose and (L)–glucose
(2) enantiomers of glucose
(3) isomers of glucose that differ in configuration at carbon one (C–1)
(4) isomers of glucose that differ in configurations at carbons one and four (C–1 and C–4)

5. The secondary structure of protein refers to: **[AIEEE-2007]**
(1) α-helical backbone. **(2)** hydrophobic interactions.
(3) sequence of α-amino acids. **(4)** fixed configuration of the polypeptide backbone.

6. Bakelite is obtained from phenol by reacting with **[AIEEE-2008]**
(1) CH_3CHO **(2)** CH_3COCH_3 **(3)** HCHO **(4)** $(CH_2OH)_2$

7. Buna-N synthetic rubber is a copolymer of : **[AIEEE-2009]**
(1) $H_2C{=}CH{-}CH{=}CH_2$ and $H_5C_6{-}CH{=}CH_2$ **(2)** $H_2C{=}CH{-}CN$ and $H_2C{=}CH{-}CH{=}CH_2$
(3) $H_2C{=}CH{-}CN$ and $H_2C{=}CH{-}\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}{=}CH_2$ **(4)** $H_2C{=}CH{-}\underset{\displaystyle Cl}{\overset{\displaystyle |}{C}}{=}CH_2$ and $H_2C{=}CH{-}CH{=}CH_2$

8. The two functional groups present in a typical carbohydrate are : **[AIEEE-2009]**
(1) –CHO and –COOH **(2)** >C=O and –OH **(3)** –OH and –CHO **(4)** –OH and –COOH

9. The polymer containing strong intermolecular forces e.g. hydrogen bonding is **[AIEEE-2010]**
(1) teflon **(B)** nylon 6,6 **(3)** polystyrene **(4)** natural rubber

10. The presence or absence of hydroxy group on which carbon atom of sugar differentiates RNA and DNA. **[AIEEE-2011]**
(1) 1^{st} **(2)** 2^{nd} **(3)** 3^{rd} **(4)** 4^{th}

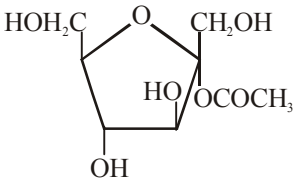
11. Synthesis of each molecule of glucose in photosynthesis involves : **[JEE (Mains)-2013]**
(1) 18 molecules of ATP **(2)** 10 molecules of ATP
(3) 8 molecules of ATP **(4)** 6 molecules of ATP

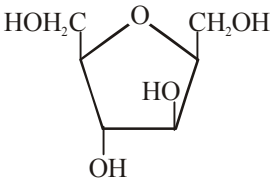
12. Which of the following statements about low density polythene is **FALSE** ? **[JEE (Mains)-2016]**
(1) It is a poor conductor of electricity.
(2) Its synthesis requires dioxygen or a peroxide initiator as a catalyst.
(3) It is used in the manufacture of buckets, dust-bins etc.
(4) Its synthesis requires high pressure

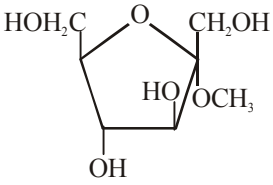
13. Thiol group is present in : **[JEE (Mains)-2016]**
(1) Cystine **(2)** Cysteine **(3)** Methionine **(4)** Cytosine

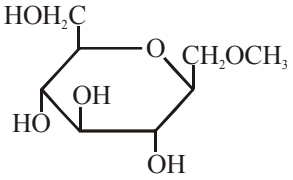
14. The formation of which of the following polymers involves hydrolysis reaction ? **[JEE (Mains)-2017]**
(1) Nylon 6 **(2)** Bakelite **(3)** Nylon 6,6 **(4)** Terylene

15. Which of the following compounds will behave as a reducing sugar in an aqueous KOH solution? **[JEE (Mains)-2017]**

(1) 

(2) 

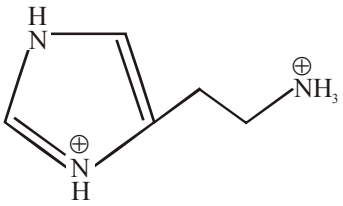
(3) 

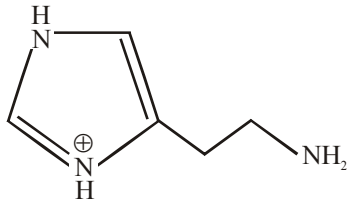
(4) 

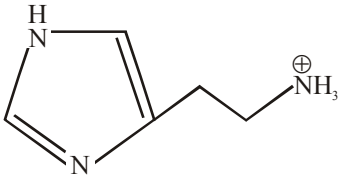
16. Glucose on prolonged heating with HI gives : **[JEE (Mains)-2018]**

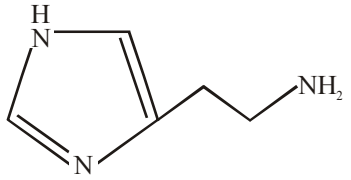
(1) 1-Hexene **(2)** Hexanoic acid **(3)** 6-iodohexanal **(4)** *n*-Hexane

17. The predominant form of histamin present in human blood is (Pk_a, Histidine = 6.0) **[JEE (Mains)-2018]**

(1) 

(2) 

(3) 

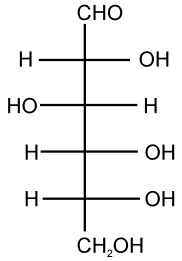
(4) 

Part # II [Previous Year Questions][IIT-JEE ADVANCED]

1. Which of the following pairs give positive Tollen's Test ? **[JEE-2004]**

(A) Glucose, sucrose **(B)** Glucose, fructose **(C)** Hexanol, Acetophenone **(D)** Fructose,sucrose

2. The Fischer projection formula of D-glucose is **[JEE 2004]**



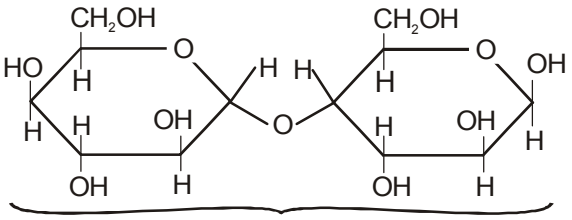
(i) Give Fischer projection formula of L-glucose.

(ii) Give the product of reaction of L-glucose with Tollen's reagent.

3. The two forms of D-Glucopyranose obtained from solution of D-Glucose are known as **[JEE-2005]**

(A) Epimers **(B)** Anomers **(C)** Enantiomers **(D)** Geometrical Isomers

4. Which of the following disaccharide will not reduce tollen's reagent. **[JEE-2005]**

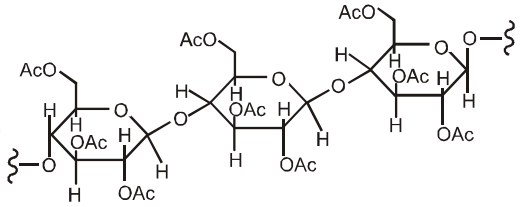


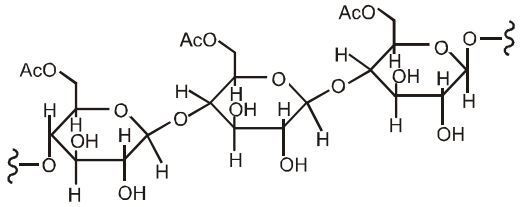
5. Match the chemical substances in Column-I with type of polymers/type of bonds in Column-II. **[JEE-2007]**

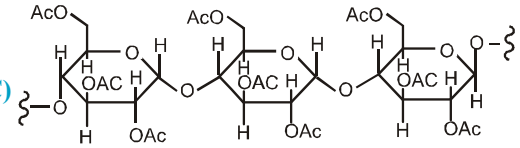
	Column-I		Column-II
(A)	cellulose	**(p)**	natural polymer
(B)	nylon-6, 6	**(q)**	synthetic polymer
(C)	protein	**(r)**	amide linkage
(D)	sucrose	**(s)**	glycoside linkage

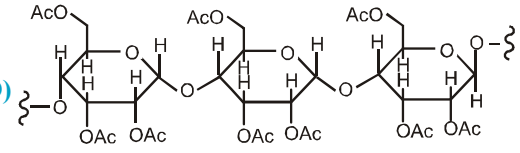
6. **Statement-1 :** Glucose gives a reddish-brown precipitate with Fehling's solution. **[JEE-2007]**
Statement-2 : Reaction of glucose with Fehling's solution gives CuO and gluconic acid.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

7. Cellulose upon acetylation with excess acetic anhydride/H_2SO_4 (catalytic) gives cellulose triacetate whose structure is

(A)


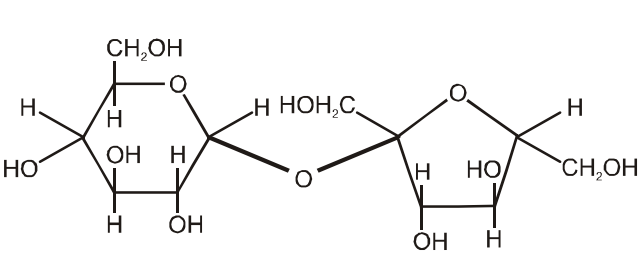
(B)


(C)


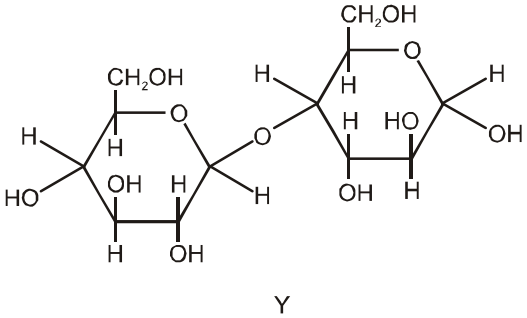
(D)


8. Among cellulose, poly vinyl chloride, nylon and natural rubber, the polymer in which the intermolecular force of attraction is weakest is : **[JEE 2009]**
(A) Nylon **(B)** Poly vinyl chloride **(C)** Cellulose **(D)** Natural Rubber

9. The correct statement(s) about the following sugars **X** and **Y** is(are) : **[JEE 2009]**



X

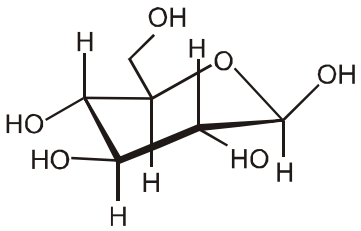


Y

(A) **X is** a reducing sugar and **Y** is a non-reducing sugar.
(B) **X** is a non-reducing sugar and **Y** is a reducing sugar.
(C) The glucosidic linkages in **X** and **Y** are α and β, respectively.
(D) The glucosidic linkages in **X** and **Y** are β and α, respectively.

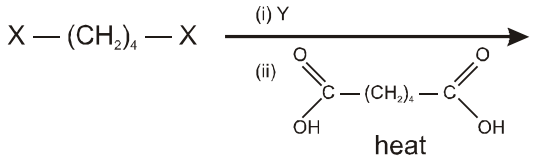
10. A decapeptide (Mol. Wt. 796) on complete hydrolysis gives glycine (Mol. Wt. 75), alanine and phenylalanine. Glycine contributes 47.0 % to the total weight of the hydrolysed products. The number of glycine units present in the decapeptide is **[JEE 2011]**

11. The following carbohydrate is **[JEE 2011]**



(A) a ketohexose **(B)** an aldohexose **(C)** an α-furanose **(D)** an α-pyranose

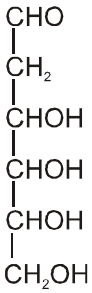
12. The correct functional group X and the reagent/reaction conditions Y in the following scheme are



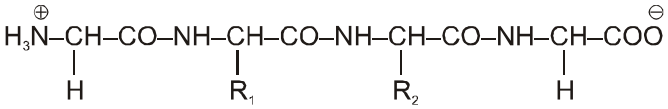
condensation polymer : **[JEE 2011]**

(A) X = $COOCH_3$, Y = H_2/Ni/heat **(B)** X = $CONH_2$, Y = H_2Ni/heat
(C) X = $CONH_2$, Y = Br_2/NaOH **(D)** X = CN, Y = H_2/NI/heat

13. When the following aldohexose exists in its D-configuration, the total number of stereoisomers in its pyranose form is : **[JEE-2012]**



14. The substituents R_1 and R_2 for nine peptides are listed in the table given below. How many of these peptides are positively charged at pH = 7.0 ? **[JEE-2012]**



Peptide	R_1	R_2
I	H	H
II	H	CH_3
III	CH_2COOH	H
IV	CH_2CONH_2	$(CH_2)_4NH_2$
V	CH_2CONH_2	CH_2CONH_2
VI	$(CH_2)_4NH_2$	$(CH_2)_4NH_2$
VII	CH_2COOH	CH_2CONH_2
VIII	CH_2OH	$(CH_2)_4NH_2$
IX	$(CH_2)_4NH_2$	CH_3

15. The total number of lone-pairs of electrons in melamine is **[JEE(Advanced)-2013]**

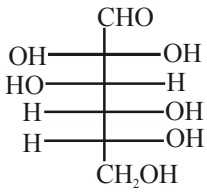
16. A tetrapeptide has – *COOH* group on alanine. This produces glycine (Gly), valine (Val), phenyl alanine (Phe) and alanine (Ala), on complete hydrolysis. For this tetrapeptide, the number of possible sequences (primary structures) with – NH_2 group attached to a chiral center is : **[JEE(Advanced)-2013]**

17. On complete hydrogenation, natural rubber produces : **[JEE(Advanced)-2016]**

(A) ethylene - propylene copolymer **(B)** vulcanised rubber

(C) polypropylene **(D)** polybutylene

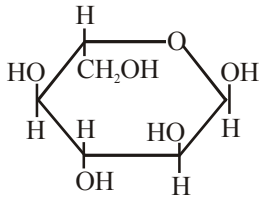
18. The Fishcher presentation of D-glucose is given below. **[JEE(Advanced)-2018]**



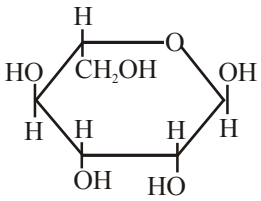
D-glucose

The correct structure(s) of β-L-glucopyranose is (are)

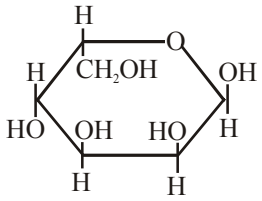
(A)



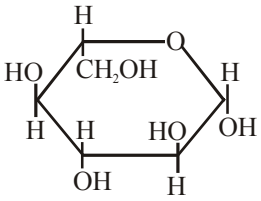
(B)



(C)



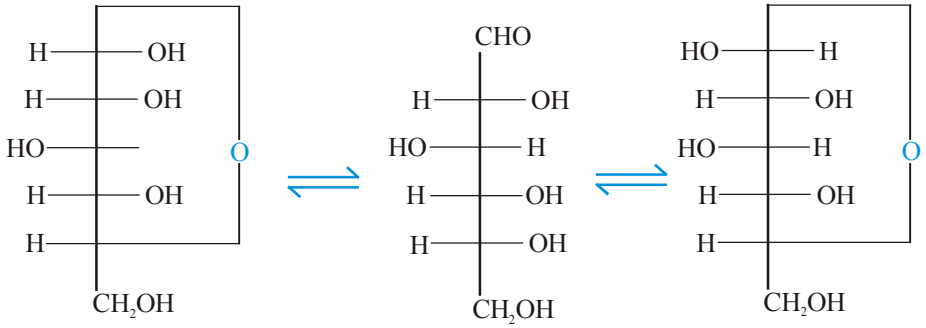
(D)



MOCK TEST

SECTION - I : STRAIGHT OBJECTIVE TYPE

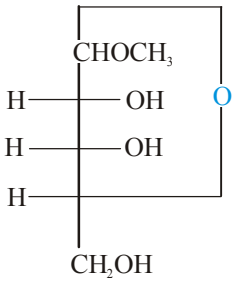
1.



The above process in which α and β from remain in equilibrium with acyclic form and a change in optical rotation is observed which is called as -

(A) Mutarotation **(B)** Epimerisation **(C)** Condensation **(D)** Inversion

2. How many moles of HIO_4 is required to break down the following molecules ?

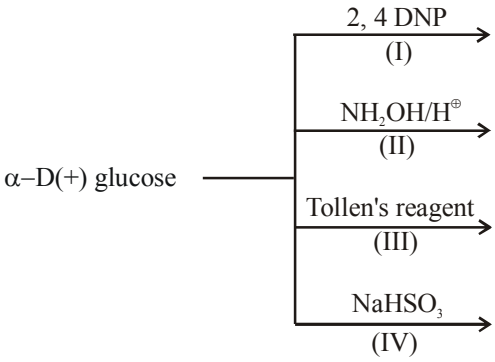


(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

3. Glycoside linkage is

(A) an acetal linkage **(B)** an ether linkage **(C)** an ester linkage **(D)** an amide linkage

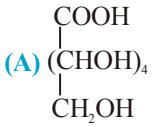
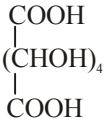
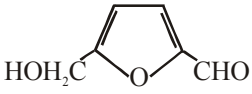
4. Observe the following laboratory tests for α–D(+) glucose and mention +ve or –ve ion from the code given below



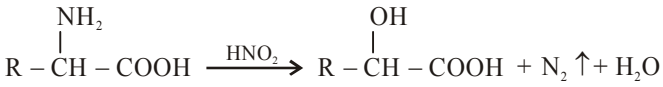
(A) ++++ **(B)** +++– **(C)** +–+– **(D)** ++––

5. $C_6H_{12}O_6 \xrightarrow[\Delta]{\text{Conc. HCl}}$ Product
glucose

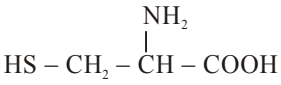
the product will be

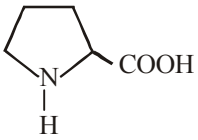
(A) 
(B) 
(C) HCOOH
(D) 

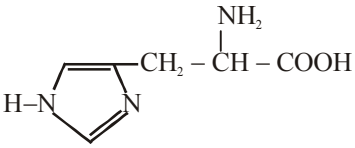
6. Nitrous acid (HNO_2) converts amino acids into hydroxy acids with retention of configuration. Estimation of nitrogen gas evolved in the reaction is the basis of Van slyke estimation of amino acids.

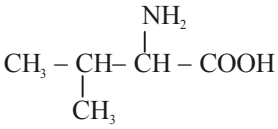


Which of the following amino acids cannot be analysed by Van slyke method ?

I –  (Cystine)

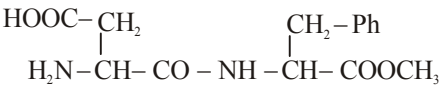
II –  (Proline)

III –  (Histidine)

IV –  (Valine)

Codes :

(A) only I **(B)** Only II **(C)** I and III **(D)** I, III, IV

7. 
(Aspartame)

Aspartame is 160 times as sweet as sucrose and is used as α sugar substitute.

The correct statement (s) about aspartame is (are)

I – It is an ester derivative of dipeptide

II – It can be named as aspartyl phenylalanine methyl ester

III – It is a tripeptide

IV – It is having four functional groups

(A) I, II **(B)** I, II, IV **(C)** II, III, IV **(D)** only II

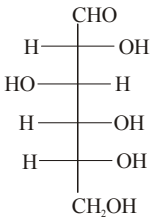
8. Polymer which has amide linkage is

(A) Nylon – 66 **(B)** Terylene **(C)** Teflon **(D)** Bakelite

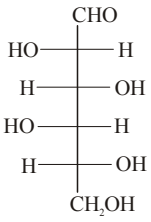
9. Which of the following is condensation polymer ?

(A) Polystyrene **(B)** PVC **(C)** Polyester **(D)** Teflon

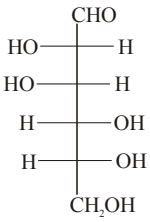
10. Which of the following aldohexoses give the same osazone derivative ?



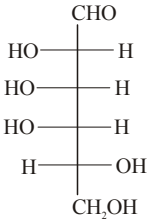
I



II



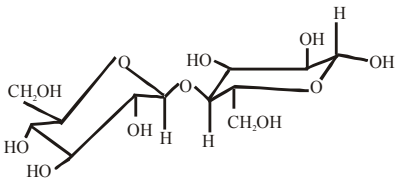
III

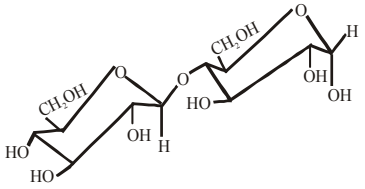


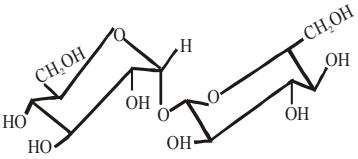
IV

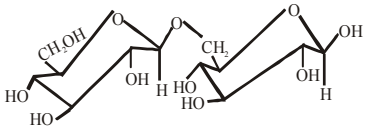
(A) I and IV **(B)** I and III **(C)** II and III **(D)** III and IV

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

(A)


(B)


(C)


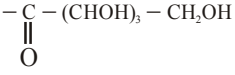
(D)


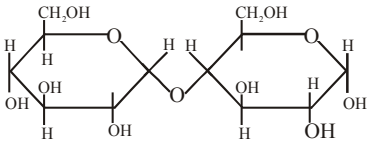
12. Basic solution of fructose contains :

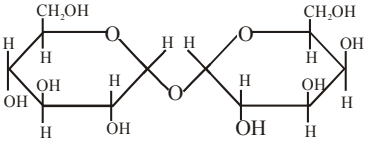
(A) Only fructose **(B)** Only glucose

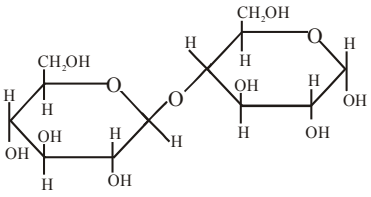
(C) Fructose and glucose **(D)** Glucose, fructose and mannose

13. Which of the following is a nonreducing sugar ?

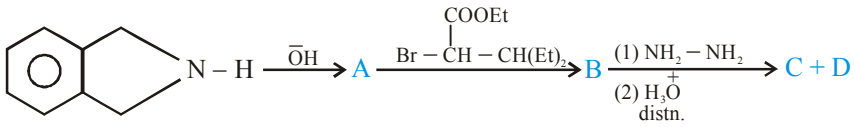
(A)


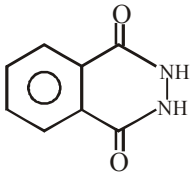
(B)


(C)


(D)


SECTION - II : MULTIPLE CORRECT ANSWER TYPE

14. 

(A) C is 

(B) D is $\overset{+}{N}H_3 - \underset{\displaystyle COO^-}{\underset{|}{CH}} - CH(Et)_2$

(C) D is $\overset{+}{N}H_3 - \underset{\displaystyle CH(Et)_2}{\underset{|}{\overset{\displaystyle COOEt}{\overset{|}{CH}}}}$

(D) All of these

15. Glucosazone is osazone derivative very simular to that formed from

(A) Fructose **(B)** Galactose **(C)** Mannose **(D)** Glucose

SECTION - III : ASSERTION AND REASON TYPE

Read the following question and choose the correct answer :

(A) Statement-1 is True, Statement-2 is True and Statement-2 is correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True and Statement-2 is not correct explanation for Statement-1

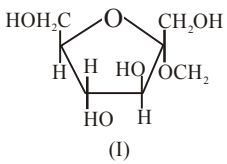
(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

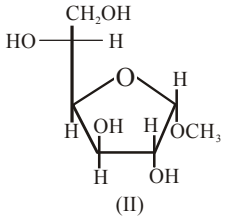
16. **Statement - 1 :** Gly – Ala is a structural isomer of Ala – Gly.

Statement – 2 : In Ala – Gly, Alanine is the N – terminal amino acid.

17. **Statement - 1 :** Methyl α–D–fructofuranoside (I) undergoes acid catalysed hydrolysis at faster rate than that of methyl α – D – glucofuranoside (II).



(I)



(II)

Statement - 2 : The intermediate in glycoside hydrolysis is carbocation which 3° in case of I and 2° in case of II.

SECTION - IV : COMPREHENSION TYPE

Read the following comprehensions carefully and answer the questions.

Comprehension # 1

An amino acid is characterized by two pKa values the one corresponding to the more acidic site is designated as pKa_1 and the other corresponding to the less acidic site is designated as pKa_2. The isoelectric point also called isoionic point (pt) is the pH at which concentration of zwitter ion is maximum. pI is the average of pKa_1 and pKa_2. Generally the value of pI is slightly less than 7.

Some amino acids have side chain with acidic or basic groups. These amino acids have pKa_3 value also for the side chain. Acidic amino acid have acidic side chains and basic amino acids have basic side chains. pI for acidic amino acid is average of pKa_1 and pKa_3. pI for basic amino acid is the average of pKa_2 and pKa_3.

Sr. No.	Amino acid	P^{Ka1}	P^{Ka2}	P^{Ka3} (side chain)
I	Aspartic acid	1.88	9.6	3.65
II	Glutamic acid	2.19	9.67	4.25
III	Lysine	2.18	8.95	10.53
IV	Arginine	2.17	9.04	12.48

18. In the table given above the acidic amino acid are

(A) I, II **(B)** I, III **(C)** II, III **(D)** I, II & IV

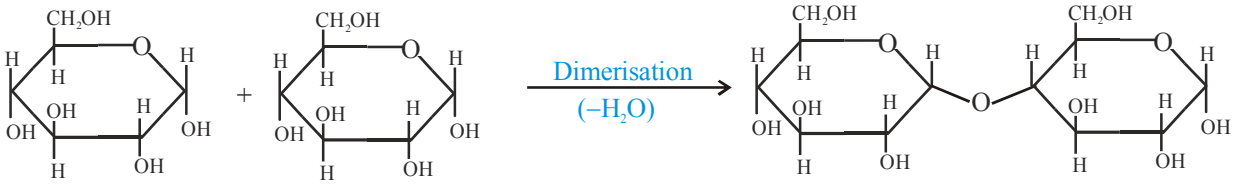
19. The isoelectric point (pt) of Aspartic acid will be

(A) 6.62 **(B)** 5.74 **(C)** 2.77 **(D)** 9.74

20. The isoelectric point of lysine will be

(A) 6.35 **(B)** 9.74 **(C)** 2.77 **(D)** 10.76

Comprehension # 2



(I) **(II)**

Polymerisation → **Starch (polymer) (III)**

21. What is true about compound (I)

(A) It has an acetal structure **(B)** It has tertiary hydroxy group

(C) It has a hemiacetal structure **(D)** It's degree of unsaturation is two

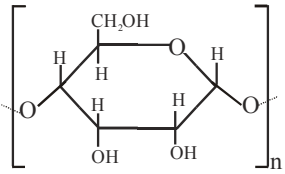
22. Compound (II) is /has

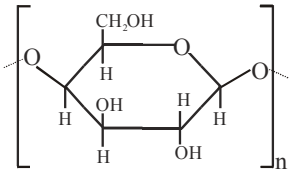
(A) A polysaccharide **(B)** Oligosaccharide

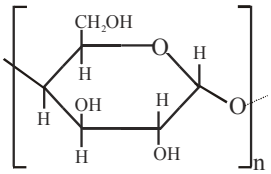
(C) Monosaccharide **(D)** Hydrogen deficiency index is three

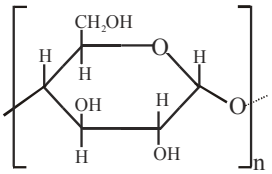
23. Assuming that polymerisation of (I) takes place in the manner similar to its dimerisation, then the structure of

polymer (III) can be correctly represented as

(A) 

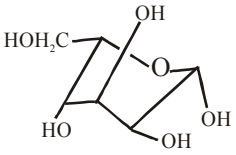
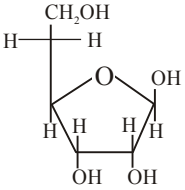
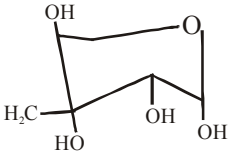
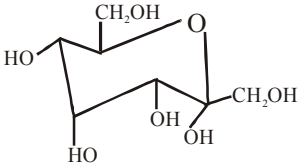
(B) 

(C) 

(D) 

SECTION - V : MATRIX - MATCH TYPE

24. Match the List - 1 with List - II

List - I Carbohydrates	List - II
(A) 	**(i)** Belong to L-series
(B) 	**(ii)** Branched-chain sugar
(C) 	**(iii)** Ketose
(D) 	**(iv)** Furanose form

ANSWER KEY

EXERCISE - 1

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

EXERCISE - 2 : PART # I

1. A, C, D	**2.** B, C, D	**3.** B, D	**4.** A, B, C	**5.** B, C	**6.** A, B, D
7. A, C	**8.** A, B, C, D	**9.** A, B, C, D	**10.** C, D	**11.** A, C, D	**12.** C, D
13. A, B	**14.** A, B, C	**15.** A, B, C, D	**16.** A, B, D		

PART # II

1. A	**2.** B	**3.** A	**4.** D	**5.** C	**6.** A	**7.** A	**8.** B	**9.** C	**10.** B

EXERCISE - 3 : PART # I

1. A → s, B → r, C → q, D → p **2.** A → q, B → p, C → s, D → r

PART # II

Comprehension # 1 : **1.** C **2.** A **3.** C

Comprehension # 2 : **1.** B **2.** B

EXERCISE - 5 : PART # I

1. 3	**2.** 3	**3.** 2	**4.** 3	**5.** 4	**6.** 3	**7.** 2	**8.** 3	**9.** 2	**10.** 2	**11.** 1	**12.** 3	**13.** 2
14. 1	**15.** 1	**16.** 4	**17.** 3									

PART # II

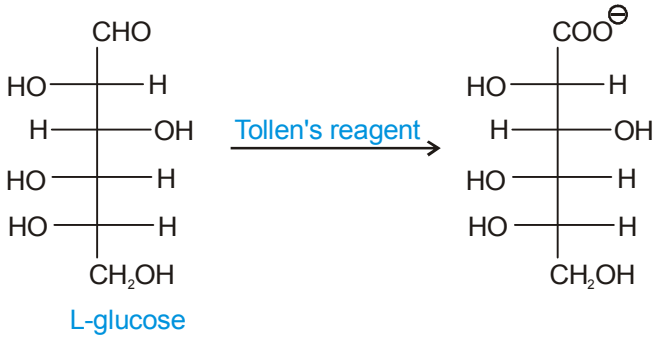
1. (B) **17.** A **18.** D

MOCK-TEST

1. A	**2.** A	**3.** A	**4.** B	**5.** D	**6.** B	**7.** B	**8.** A	**9.** C	**10.** B	**11.** C	**12.** D	**13.** C
14. AC	**15.** ACD	**16.** B	**17.** A	**18.** A	**19.** C	**20.** B	**21.** C	**22.** B	**23.** D			

24. A → i ; B → iv ; C → i, ii ; D → iii

5.



6. B

7. P is a reducing sugar as one monosaccharide has free reducing group because glycosidic linkage is (1, 4). Whereas in Q both the reducing groups are involved in glycosidic bond formation

8.	A - (p, s); B - (q, r); C - (p, r); D - (s)	**9.**	C	**10.**	A	**11.**	D
12.	B,C	**13.**	6	**14.**	B	**15.**	C, D	**16.**	8
17.	4	**18.**	6	**19.**	4				