Chapter 28

Biomolecules

1. 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

2. Biuret test is not given by **[AIEEE-2010]**
   (1) Proteins (2) Carbohydrates
   (3) Polypeptides (4) Urea

3. Which of the following statements is correct? **[AIEEE-2012]**
   (1) All amino acids are optically active
   (2) All amino acids except glycine are optically active
   (3) All amino acids except glutamic acid are optically active
   (4) All amino acids except lysine are optically active

4. Which of the following compounds can be detected by Molisch's test? **[AIEEE-2012]**
   (1) Sugars
   (2) Amines
   (3) Primary alcohols
   (4) Nitro compounds

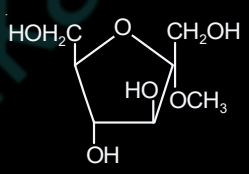
5. Synthesis of each molecule of glucose in photosynthesis involves **[JEE (Main)-2013]**
   (1) 18 molecules of ATP
   (2) 10 molecules of ATP
   (3) 8 molecules of ATP
   (4) 6 molecules of ATP

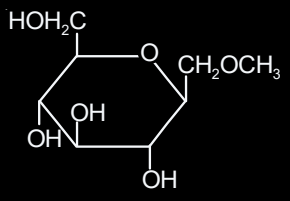
6. Which one of the following bases is not present in DNA? **[JEE (Main)-2014]**
   (1) Quinoline (2) Adenine
   (3) Cytosine (4) Thymine

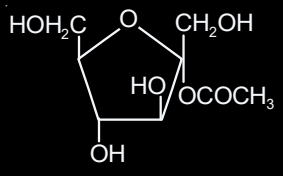
7. Which of the vitamins given below is water soluble? **[JEE (Main)-2015]**
   (1) Vitamin C (2) Vitamin D
   (3) Vitamin E (4) Vitamin K

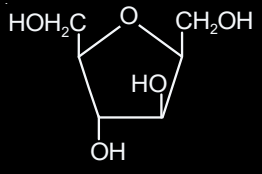
8. Thiol group is present in **[JEE (Main)-2016]**
   (1) Cystine (2) Cysteine
   (3) Methionine (4) Cytosine

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

   (1) 

   (2) 

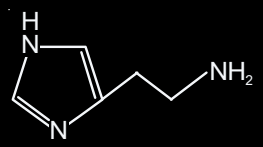
   (3) 

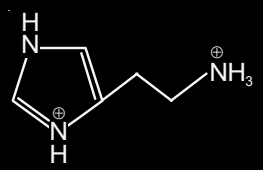
   (4) 

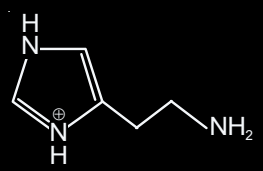
10. Glucose on prolonged heating with HI gives **[JEE (Main)-2018]**
    (1) *n*-Hexane (2) 1-Hexene
    (3) Hexanoic acid (4) 6-iodohexanal

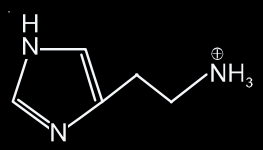
11. The predominant form of histamine present in human blood is (pK_a, Histidine = 6.0)

[JEE (Main)-2018]

(1) 

(2) 

(3) 

(4) 

12. The increasing order of pK_a of the following amino acids in aqueous solution is **[JEE (Main)-2019]**

Gly, Asp, Lys, Arg

(1) Gly < Asp < Arg < Lys

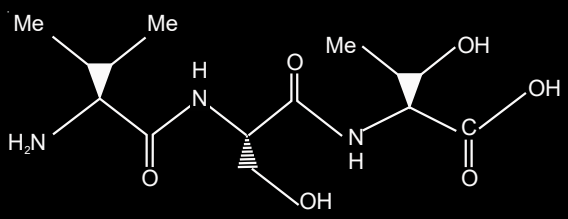
(2) Arg < Lys < Gly < Asp

(3) Asp < Gly < Arg < Lys

(4) Asp < Gly < Lys < Arg

13. The correct sequnce of amino acids present in the tripeptide given below is

The given tripeptide contains.



[JEE (Main)-2019]

(1) Leu - Ser - Thr

(2) Thr - Ser - Val

(3) Val - Ser - Thr

(4) Thr - Ser - Leu

14. The correct match between item 'I' and item 'II' is

Item 'I' (compound)	Item 'II' (reagent)
(A) Lysine	(P) 1-naphthol
(B) Furfural	(Q) ninhydrin
(C) Benzyl alcohol	(R) $KMnO_4$
(D) Styrene	(S) Ceric ammonium nitrate

[JEE (Main)-2019]

(1) (A) → (R); (B) → (P); (C) → (Q); (D) → (S)

(2) (A) → (Q); (B) → (P); (C) → (S); (D) → (R)

(3) (A) → (Q); (B) → (R); (C) → (S); (D) → (P)

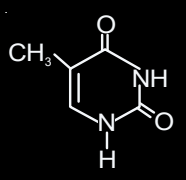
(4) (A) → (Q); (B) → (P); (C) → (R); (D) → (S)

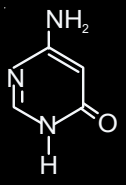
15. Which of the following tests cannot be used for identifying amino acids? **[JEE (Main)-2019]**

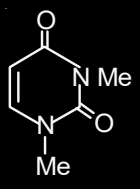
(1) Barfoed test (2) Biuret test

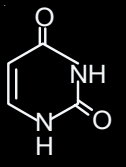
(3) Xanthoproteic test (4) Ninhydrin test

16. Among the following compounds, which one is found in RNA? **[JEE (Main)-2019]**

(1) 

(2) 

(3) 

(4) 

17. Among the following compounds most basic amino acid is **[JEE (Main)-2019]**

(1) Serine

(2) Lysine

(3) Histidine

(4) Asparagine

18. The correct statement(s) among I to III with respect to potassium ions that are abundant within the cell fluids is/are

I. They activate many enzymes

II. They participate in the oxidation of glucose to produce ATP

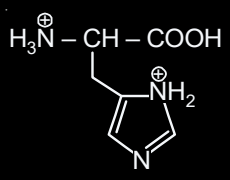
III. Along with sodium ions, they are responsible for the transmission of nerve signals

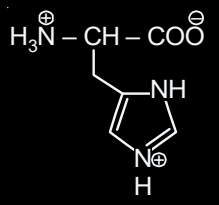
[JEE (Main)-2019]

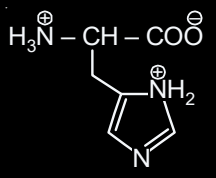
(1) I and III only (2) I, II and III

(3) III only (4) I and II only

19. The correct structure of histidine in a strongly acidic solution (pH = 2) is **[JEE (Main)-2019]**

(1) 

(2) 

(3) 

(4) 

20. Maltose on treatment with dilute HCl gives

[JEE (Main)-2019]

(1) D-Galactose

(2) D-Glucose and D-Fructose

(3) D-Glucose

(4) D-Fructose

21. Fructose and glucose can be distinguished by:

[JEE (Main)-2019]

(1) Fehling's test (2) Seliwanoff's test

(3) Barfoed's test (4) Benedict's test

22. Which of the following statements is not true about sucrose? **[JEE (Main)-2019]**

(1) The glycosidic linkage is present between C_1 of α-glucose and C_1 of β-fructose

(2) On hydrolysis, it produces glucose and fructose

(3) It is a non-reducing sugar

(4) It is also named as invert sugar

23. The peptide that gives positive ceric ammonium nitrate and carbylamine tests is

[JEE (Main)-2019]

(1) Ser - Lys (2) Lys - Asp

(3) Gln - Asp (4) Asp - Gln

24. Amylopectin is composed of **[JEE (Main)-2019]**

(1) β-D-glucose, $C_1 — C_4$ and $C_2 — C_6$ linkages

(2) α-D-glucose, $C_1 — C_4$ and $C_2 — C_6$ linkages

(3) β-D-glucose, $C_1 — C_4$ and $C_1 — C_6$ linkages

(4) α-D-glucose, $C_1 — C_4$ and $C_1 — C_6$ linkages

25. Number of stereo centers present in linear and cyclic structures of glucose are respectively :

[JEE (Main)-2019]

(1) 5 & 5 (2) 4 & 4

(3) 5 & 4 (4) 4 & 5

26. Which of the following statements is not true about RNA? **[JEE (Main)-2019]**

(1) It usually does not replicate

(2) It is present in the nucleus of the cell

(3) It controls the synthesis of protein

(4) It has always double stranded α-helix structure

27. Glucose and Galactose are having identical configuration in all the positions except position.

[JEE (Main)-2019]

(1) C – 2 (2) C – 5

(3) C – 3 (4) C – 4

28. Which of the given statements is INCORRECT about glycogen? **[JEE (Main)-2019]**

(1) It is present in some yeast and fungi.

(2) It is a straight chain polymer similar to amylose.

(3) It is present in animal cells.

(4) Only α-linkages are present in the molecule.

29. Match the following

(i) Riboflavin	(a) Beriberi
(ii) Thiamine	(b) Scurvy
(iii) Pyridoxine	(c) Cheilosis
(iv) Ascorbic acid	(d) Convulsions

[JEE (Main)-2020]

(1) (i)-(c), (ii)-(d),(iii)-(a), (iv)-(b)

(2) (i)-(c), (ii)-(a),(iii)-(d), (iv)-(b)

(3) (i)-(d), (ii)-(b),(iii)-(a), (iv)-(c)

(4) (i)-(a), (ii)-(d),(iii)-(c), (iv)-(b)

30. Which of the following statements is correct?

[JEE (Main)-2020]

(1) Gluconic acid is a dicarboxylic acid

(2) Gluconic acid can form cyclic (acetal/ hemiacetal) structure

(3) Gluconic acid is a partial oxidation product of glucose

(4) Gluconic acid is obtained by oxidation of glucose with HNO_3

31. Which of the following statement is not true for glucose? **[JEE (Main)-2020]**

(1) Glucose reacts with hydroxylamine to form oxime

(2) The pentaacetate of glucose does not react with hydroxylamine to give oxime

(3) Glucose exists in two crystalline forms α and β

(4) Glucose gives Schiff's test for aldehyde

32. Two monomers in maltose are **[JEE (Main)-2020]**

(1) α-D-glucose and α-D-glucose

(2) α-D-glucose and β-D-glucose

(3) α-D-glucose and α-D-galactose

(4) α-D-glucose and α-D-Fructose

33. A chemist has 4 samples of artificial sweetener A, B, C and D. To identify these samples, he performed certain experiments and noted the following observations :

(i) A and D both form blue-violet colour with ninhydrin.

(ii) Lassaigne extract of C gives positive $AgNO_3$ test and negative $Fe_4[Fe(CN)_6]_3$ test.

(iii) Lassaigne extract of B and D gives positive sodium nitroprusside test.

Based on these observations which option is correct? **[JEE (Main)-2020]**

(1) A : Aspartame; B : Alitame;
C : Saccharin; D : Sucralose

(2) A : Saccharin; B : Alitame;
C : Sucralose; D : Aspartame

(3) A : Alitame; B : Saccharin;
C : Aspartame; D : Sucralose

(4) A : Aspartame; B : Saccharin;
C : Sucralose; D : Alitame

34. A, B and C are three biomolecules. The results of the tests performed on them are given below

	Molisch's Test	Barfoed Test	Biuret Test
A	Positive	Negative	Negative
B	Positive	Positive	Negative
C	Negative	Negative	Positive

A, B and C are respectively **[JEE (Main)-2020]**

(1) A = Lactose, B = Fructose, C = Alanine

(2) A = Lactose, B = Glucose, C = Alanine

(3) A = Glucose, B = Fructose, C = Albumin

(4) A = Lactose, B = Glucose, C = Albumin

35. Consider the following rections:

(i) $\text{Glucose} + \text{ROH} \xrightarrow{\text{dry HCl}} \text{Acetal} \xrightarrow[(CH_3CO)_2O]{\text{x eq. of}} \text{acetyl derivative}$

(ii) $\text{Glucose} \xrightarrow{Ni/H_2} A \xrightarrow[(CH_3CO)_2O]{\text{y eq. of}} \text{acetyl derivative}$

(iii) $\text{Glucose} \xrightarrow[(CH_3CO)_2O]{\text{z eq. of}} \text{acetyl derivative}$

'x', 'y' and 'z' in these reactions are respectively.

[JEE (Main)-2020]

(1) 4, 5 & 5 (2) 4, 6 & 5

(3) 5, 4 & 5 (4) 5, 6 & 5

36. The correct observation in the following reactions is

$$\text{Sucrose} \xrightarrow[\text{Cleavage (Hydrolysis)}]{\text{Glycosidic bond}} A + B \xrightarrow{\text{Seliwanoff's reagent}} ?$$

[JEE (Main)-2020]

(1) Gives no colour

(2) Formation of red colour

(3) Formation of violet colour

(4) Formation of blue colour

37. Which of the following will react with $CHCl_3$ + alc. KOH? **[JEE (Main)-2020]**

(1) Adenine and thymine

(2) Thymine and proline

(3) Adenine and lysine

(4) Adenine and proline

38. What are the functional groups present in the structure of maltose? **[JEE (Main)-2020]**

(1) One acetal and one ketal

(2) One ketal and one hemiketal

(3) Two acetals

(4) One acetal and one hemiacetal

39. Which of the following is not an essential amino acid? **[JEE (Main)-2020]**

(1) Tyrosine (2) Valine

(3) Lysine (4) Leucine

40. Which one of the following statements is not true? **[JEE (Main)-2020]**

(1) Lactose contains α-glycosidic linkage between C_1 of galactose and C_4 of glucose

(2) Lactose is a reducing sugar and it gives Fehling's test

(3) On acid hydrolysis, lactose gives one molecule of D(+)-glucose and one molecule of D(+)-galactose

(4) Lactose ($C_{11}H_{22}O_{11}$) is a disaccharide and it contains 8 hydroxyl groups

41. The mass percentage of nitrogen in histamine is _____. **[JEE (Main)-2020]**

42. The number of $\diagup C=O$ groups present in a tripeptide Asp – Glu – Lys is _____. **[JEE (Main)-2020]**

43. The number of chiral centres present in threonine is _____. **[JEE (Main)-2020]**

44. The number of chiral carbon(s) present in peptide, Ile-Arg-Pro, is _____. **[JEE (Main)-2020]**

45. The number of chiral carbons present in sucrose is _____. **[JEE (Main)-2020]**

46. Out of the following, which type of interaction is responsible for the stabilisation of α-helix structure of proteins? **[JEE (Main)-2021]**

(1) Covalent bonding

(2) Hydrogen bonding

(3) Ionic bonding

(4) Vander Waals forces

47. Which of the glycosidic linkage between galactose and glucose is present in lactose? **[JEE (Main)-2021]**

(1) C-1 of galactose and C-4 of glucose

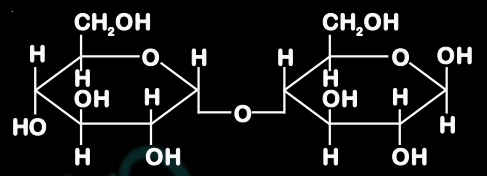
(2) C-1 of glucose and C-6 of galactose

(3) C-1 of galactose and C-6 of glucose

(4) C-1 of glucose and C-4 of galactose

48. Which of the following is correct structure of α-anomer of maltose ? **[JEE (Main)-2021]**

(1)



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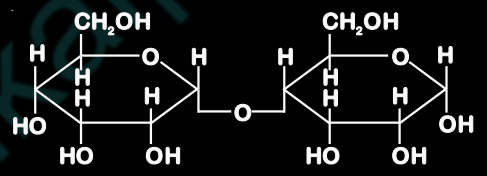

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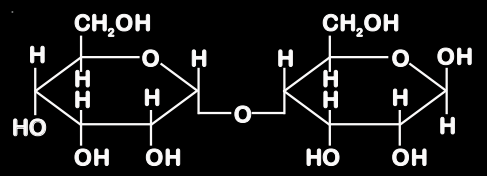

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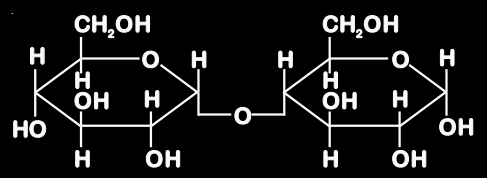


49. Which of the following vitamin is helpful in delaying the blood clotting? **[JEE (Main)-2021]**

(1) Vitamin B (2) Vitamin E

(3) Vitamin K (4) Vitamin C

50. Seliwanoff test and Xanthoproteic test are used for the identification of _____and _____ respectively. **[JEE (Main)-2021]**

(1) Ketoses, aldoses (2) Proteins, ketoses

(3) Ketoses, proteins (4) Aldoses, ketoses

51. Match List-I with List-II.

List-I	List-II
(a) Sucrose	(i) β-D-Galactose and β-D-Glucose
(b) Lactose	(ii) α-D-Glucose and β-D-Fructose
(c) Maltose	(iii) α-D-Glucose and α-D-Glucose

Choose the correct answer from the options given below : **[JEE (Main)-2021]**

(1) (a) → (i), (b) → (iii), (c) → (ii)

(2) (a) → (iii), (b) → (ii), (c) → (i)

(3) (a) → (ii), (b) → (i), (c) → (iii)

(4) (a) → (iii), (b) → (i), (c) → (ii)

52. Which among the following pairs of Vitamins is stored in our body relatively for longer duration?

[JEE (Main)-2021]

(1) Ascorbic acid and Vitamin D

(2) Vitamin A and Vitamin D

(3) Thiamine and Ascorbic acid

(4) Thiamine and Vitamin A

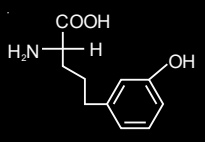
53. The secondary structure of protein is stabilised by:

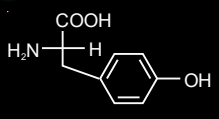
[JEE (Main)-2021]

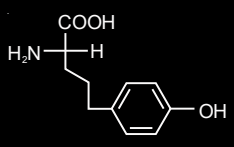
(1) Hydrogen bonding (2) van der Waals forces

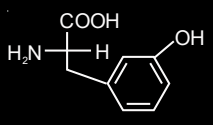
(3) Glycosidic bond (4) Peptide bond

54. Which of the following is correct structure of tyrosine? **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

55. Fructose is an example of **[JEE (Main)-2021]**

(1) Pyranose

(2) Heptose

(3) Aldohexose

(4) Ketohexose

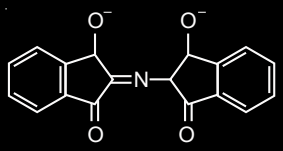
56. A non-reducing sugar "A" hydrolyses to give two reducing mono saccharides. Sugar A is :

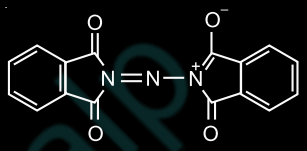
[JEE (Main)-2021]

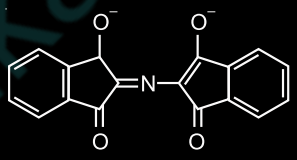
(1) Galactose (2) Sucrose

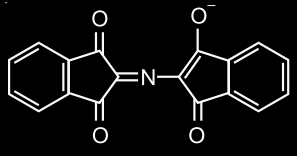
(3) Fructose (4) Glucose

57. The correct structure of Rhumann's Purple, the compound formed in the reaction of ninhydrin with proteins is: **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

58. Deficiency of vitamin K causes :

[JEE (Main)-2021]

(1) Cheilosis

(2) Increase in blood clotting time

(3) Increase in fragility of RBC's

(4) Decrease in blood clotting time

59. Which one of the following statements is not true about enzymes ? **[JEE (Main)-2021]**

(1) The action of enzymes is temperature and pH specific

(2) Enzymes are non-specific for a reaction and substrate

(3) Enzymes work as catalysts by lowering the activation energy of a biochemical reaction

(4) Almost all enzymes are proteins

60. Thiamine and pyridoxine are also known respectively as: **[JEE (Main)-2021]**

(1) Vitamin E and Vitamin B_2

(2) Vitamin B_2 and Vitamin E

(3) Vitamin B_1 and Vitamin B_6

(4) Vitamin B_6 and Vitamin B_2

61. Identify the incorrect statement from the following **[JEE (Main)-2021]**

(1) Amylose is a branched chain polymer of glucose

(2) β-Glycosidic linkage makes cellulose polymer

(3) Glycogen is called as animal starch

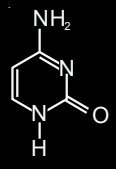
(4) Starch is a polymer of α-D glucose

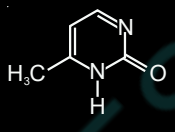
62. The water soluble protein is **[JEE (Main)-2021]**

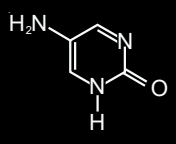
(1) Albumin (2) Collagen

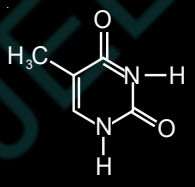
(3) Myosin (4) Fibrin

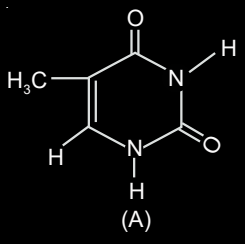
63. Which one of the following is correct structure for cytosine ? **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

64. 

(A)

The compound 'A' is a complementary base of ___in DNA strands. **[JEE (Main)-2021]**

(1) Uracil (2) Guanine

(3) Adenine (4) Cytosine

65. Which one among the following chemical tests is used to distinguish monosaccharide from disaccharide? **[JEE (Main)-2021]**

(1) Seliwanoff's test (2) Iodine test

(3) Tollen's test (4) Barfoed test

66. Compound A gives D-Galactose and D-Glucose on hydrolysis. The compound A is **[JEE (Main)-2021]**

(1) Amylose

(2) Lactose

(3) Maltose

(4) Sucrose

67. The total number of negative charge in the tetrapeptide, Gly-Glu-Asp-Tyr, at pH 12.5 will be _____. (Integer answer) **[JEE (Main)-2021]**

68. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Sucrose is a disaccharide and a non-reducing sugar.

Reason (R) : Sucrose involves glycosidic linkage between C_1 of β-glucose and C_2 of α-fructose.

the **most appropriate** answer from the options given below : **[JEE (Main)-2021]**

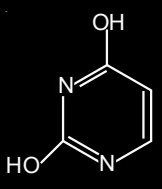
(1) Both (A) and (R) are true and (R) is the true explanation of (A)

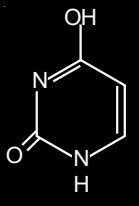
(2) (A) is true but (R) is false

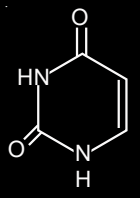
(3) Both (A) and (R) are true but (R) is not the true explanation of (A).

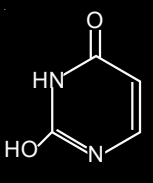
(4) (A) is false but (R) is true

69. Out of following isomeric forms of uracil, which one is present in RNA? **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

70. Which one of the following tests used for the identification of functional groups in organic compounds does not use copper reagent?

[JEE (Main)-2021]

(1) Seliwanoff's test

(2) Barfoed's test

(3) Benedict's test

(4) Biuret test for peptide bond

71. Hydrolysis of sucrose gives:

[JEE (Main)-2021]

(1) α-D-(–)-Glucose and β-D-(–)-Fructose

(2) α-D-(+)-Glucose and α-D-(–)-Fructose

(3) α-D-(–)-Glucose and α-D-(–)-Fructose

(4) α-D-(+)-Glucose and β-D-(–)-Fructose

72. Which one of the following compounds contains β–C_1–C_4 glycosidic linkage? **[JEE (Main)-2021]**

(1) Maltose (2) Lactose

(3) Sucrose (4) Amylose

73. Which of the following is **NOT** an example of fibrous protein? **[JEE (Main)-2021]**

(1) Albumin (2) Collagen

(3) Myosin (4) Keratin

74. A peptide synthesized by the reactions of one molecule each of Glycine, Leucine, Aspartic acid and Histidine will have _____ peptide linkages.

[JEE (Main)-2021]

75. A polysaccharide 'X' on boiling with dil. H_2SO_4 at 393 K under 2-3 atm pressure yields 'Y'. 'Y' on treatment with bromine water gives gluconic acid. 'X' contains β-glycosidic linkages only. Compound 'X' is:

[JEE (Main)-2022]

(1) starch (2) cellulose

(3) amylose (4) amylopectin

76. In alanylglycylleucylalanyvaline, the number of peptide linkages is _____.,

[JEE (Main)-2022]

77. How many of the given compounds will give a positive Biuret test_____? Glycine, Glycylalanine, Tripeptide, Biuret.

[JEE (Main)-2022]

78. The number of oxygens present in a nucleotide formed from a base, that is present only in RNA is _____. **[JEE (Main)-2022]**

79. Which one of the following is a water soluble vitamin, that is not excreted easily?

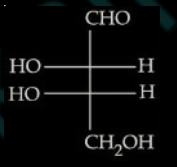
[JEE (Main)-2022]

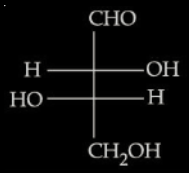
(1) Vitamin B_2 (2) Vitamin B_1

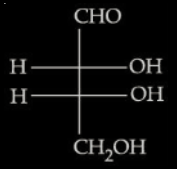
(3) Vitamin B_6 (4) Vitamin B_{12}

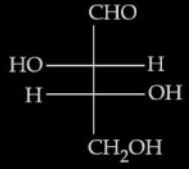
80. L-isomer of a compound 'A' ($C_4H_8O_4$) gives a positive test with $[Ag(NH_3)_2]^+$. Treatment of 'A' with acetic anhydride yields triacetate derivative. Compound 'A' produces an optically active compound (B) and an optically inactive compound (C) on treatment with bromine water and HNO_3 respectively. Compound (A) is:

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

81. Given below are two statements

Statement I: Maltose has two α-D-glucose units linked at C_1 and C_4 and is a reducing sugar.

Statement II: Maltose has two monosaccharides: α-D-glucose and β-D-glucose linked at C_1 and C_6 and it is a non-reducing sugar.

In the light of the above statements, choose the **correct** answer from the options given below.

[JEE (Main)-2022]

(1) Both Statement I and Statement II are true

(2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

82. Stability of α-Helix structure of proteins depends upon

[JEE (Main)-2022]

(1) dipolar interaction

(2) H-bonding interaction

(3) van der Walls forces

(4) π-stacking interaction

83. When sugar 'X' is boiled with dilute H_2SO_4 in alcoholic solution, two isomers 'A' and 'B' are formed. 'A' on oxidation with HNO_3 yields saccharic acid whereas 'B' is laevorotatory. The compound 'X' is :

[JEE (Main)-2022]

(1) Maltose (2) Sucrose

(3) Lactose (4) Starch

84. Sugar moiety in DNA and RNA molecules respectively are

[JEE (Main)-2022]

(1) β-D-2-deoxyribose, β-D-deoxyribose

(2) β-D-2-deoxyribose, β-D-ribose

(3) β-D-ribose, β-D-2-deoxyribose

(4) β-D-deoxyribose, β-D-2-deoxyribose

85. The structure of protein that is unaffected by heating is

[JEE (Main)-2022]

(1) Secondary Structure

(2) Tertiary Structure

(3) Primary Structure

(4) Quaternary Structure

86. During the denaturation of proteins, which of these structures will remain intact?

[JEE (Main)-2022]

(1) Primary (2) Secondary

(3) Tertiary (4) Quaternary

87. Glycosidic linkage between C1 of α-glucose and C2 of β-fructose is found in

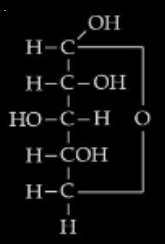
[JEE (Main)-2022]

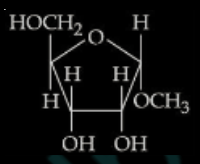
(1) maltose (2) sucrose

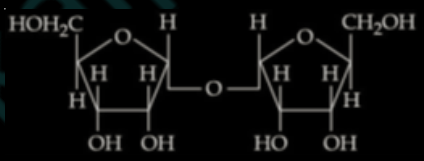
(3) lactose (4) amylose

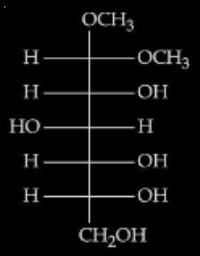
88. Which one of the following is a reducing sugar?

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

89. Animal starch is the other name of

[JEE (Main)-2022]

(1) amylose (2) maltose

(3) glycogen (4) amylopectin

90. 250 g solution of D-glucose in water contains 10.8% of carbon by weight. The molality of the solution is nearest to (Given: Atomic Weights are, H, 1 u; C, 12 u; O, 16 u)

[JEE (Main)-2022]

(1) 1.03 (2) 2.06

(3) 3.09 (4) 5.40

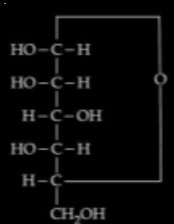
91. Match List-I with List-II **[JEE (Main)-2022]**

List-I	List-II
(A) Glucose + HI	(I) Gluconic acid
(B) Glucose + Br_2 water	(II) Glucose pentacetate
(C) Glucose + acetic anhydride	(III) Saccharic acid
(D) Glucose + HNO_3	(IV) Hexane

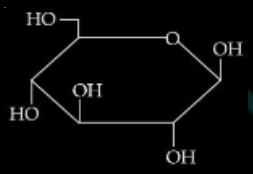
Choose the correct answer from the options given below:

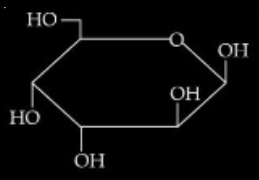
(1) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
(2) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
(3) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
(4) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

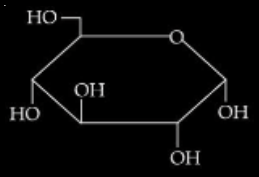
92. For the below given cyclic hemiacetal (X), the correct pyranose structure is: **[JEE (Main)-2022]**

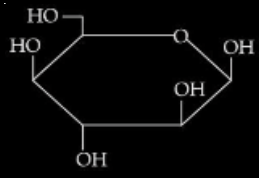


(X)

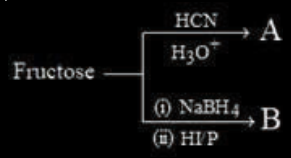
(1) 

(2) 

(3) 

(4) 

93. The formulas of A and B for the following reaction sequence



are

[JEE (Main)-2022]

(1) $A = C_7H_{14}O_8$, $B = C_6H_{14}$
(2) $A = C_7H_{13}O_7$, $B = C_7H_{14}O$
(3) $A = C_7H_{12}O_8$, $B = C_6H_{14}$
(4) $A = C_7H_{14}O_8$, $B = C_6H_{14}O_6$

94. In a linear tetrapeptide (constituted with different amino acids) – (number of peptide bonds) is _____. **[JEE (Main)-2022]**

95. Given below are two statements. One is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : Amylose is insoluble in water.

Reason R : Amylose is a long linear molecule with more than 200 glucose units. In the light of the above statements, choose the correct answer from the options given below. **[JEE (Main)-2022]**

(1) Both A and R are correct and R is the correct explanation of A
(2) Both A and R are correct but R is NOT the correct explanation of A
(3) A is correct but R is not correct
(4) A is not correct but R is correct

96. A sugar 'X' dehydrates very slowly under acidic condition to give furfural which on further reaction with resorcinol gives the coloured product after sometime. Sugar 'X' is **[JEE (Main)-2022]**

(1) Aldopentose
(2) Aldotetrose
(3) Oxalic acid
(4) Ketotetrose

Chapter 28

Biomolecules

1. Answer (2)

   A typical carbohydrate contains –OH and >C = O.

2. Answer (2)

   Biuret test is only given by amides. Carbohydrates are not amides and hence it does not give biuret test.

3. Answer (2)

4. Answer (1)

5. Answer (1)

   3 ATP molecules are needed per molecule of CO_2. Since one molecule of glucose has 6 C-atoms, the number of ATP molecules required is 18.

6. Answer (1)

   DNA contains ATGC bases

   A – Adenine

   T – Thymine

   G – Guanine

   C – Cytocine

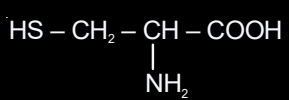
   So quinoline is not present.

7. Answer (1)

   Vitamin C is water soluble vitamin.

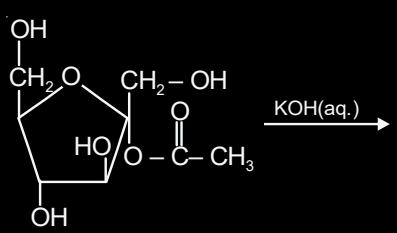
8. Answer (2)

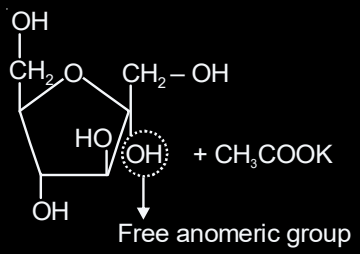
   (– SH) Thiol group is present in cysteine.



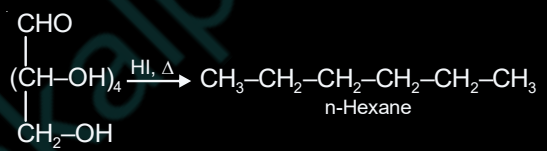
9. Answer (3)

   Sugars in which there is free anomeric –OH group are reducing sugars

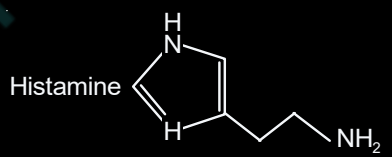




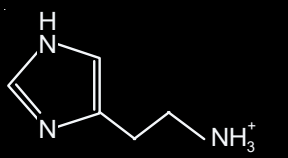
10. Answer (1)



11. Answer (4)

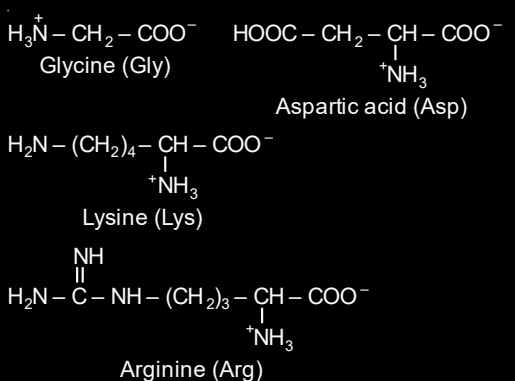


At pH (7.4) major form of histamine is protonated at primary amine.



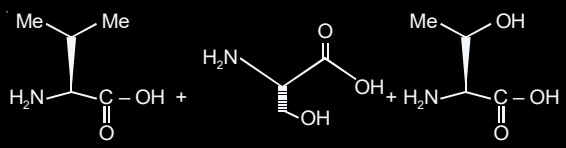
12. Answer (4)

Structures of the given α-amino acids are



Aspartic acid is acidic, glycine is neutral and lysine & arginine are basic α-amino acids with arginine being more basic due to stronger basic functional group. Their pK_a value is directly proportional to basic strength, i.e., Arg > Lys > Gly > Asp.

13. Answer (3)



VALINE (Val) SERINE (Ser) THREONINE (Thr)

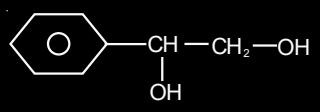
14. Answer (2)

– Lysine (amino - acid) reacts with ninhydrin to give a coloured product (blue purple)

– In furfural test (to distinguish between glucose and fructose) dilute sugar solution is added to 1-naphthol (in alcohol) and conc. HCl.

– Benzyl alcohol is oxidised to aldedydes using ceric ammonium nitrate

Styrene is converted to



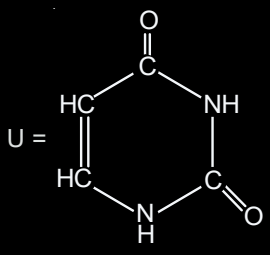
using $KMnO_4$

15. Answer (1)

Barfoed test is used for carbohydrate to check reducing nature of sugar.

16. Answer (4)

R.N.A contain Uracil



17. Answer (2)

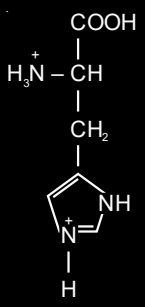
Lysine is the most basic among the given amino acids.

18. Answer (2)

K^+ ions act as carriers for nerve signals, are activators for many enzymes and participate in the oxidation of glucose to form ATP.

19. Answer (4)

Histidine (in strongly acidic solution)



20. Answer (3)

Hydrolysis of maltose give glucose as maltose is composed of two α-D glucose units.

21. Answer (2)

Seliwanoff's test is used to distinguish aldose and ketose.

22. Answer (1)

Sucrose contains glycosidic link between C_1 of α-D glucose and C_2 of β-D-Fructose.

$$C_{12}H_{22}O_{11} + H_2O \longrightarrow \text{Glucose} + \text{Fructose}$$

23. Answer (1)

Ceric ammonium nitrate test is given by alcohol. Only serine(ser) contain –OH group.

24. Answer (4)

Starch is a polymer of α-D-glucose. It has two components, namely

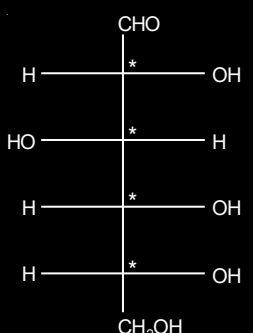
(i) Amylose and

(ii) Amylopectin

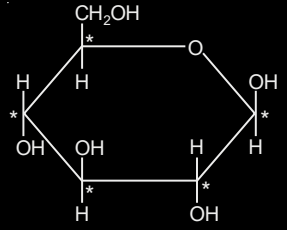
Amylose has only α-1,4-glycosidic linkage and is a linear polymer

Amylopectin has α-1, 6-glycosidic linkage in addition to α-1,4-glycosidic linkage and is a cross-linked polymer.

25. Answer (4)



4 stereogenic centres



5 stereogenic centres

26. Answer (4)

RNA has a single helix structure.

DNA has a double helix structure.

27. Answer (4)

Galactose and Glucose are C_4 epimers.

28. Answer (2)

Structure of glycogen is similar to amylopectin glycogen

– contains α-glycosidic linkages

– is stored in animal body

– is found in yeast and fungi

29. Answer (2)

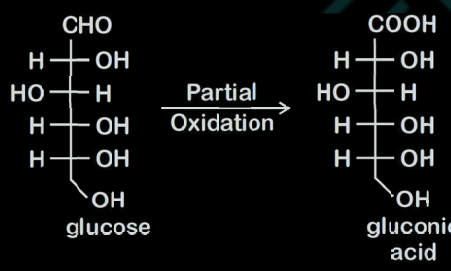
Thiamine (vitamin B_1) : Beriberi

Riboflavin (vitamin B_2) : Cheilosis

Pyridoxine (vitamin B_6) : Convulsions

Ascorbic acid (vitamin C) : Scurvy

30. Answer (3)

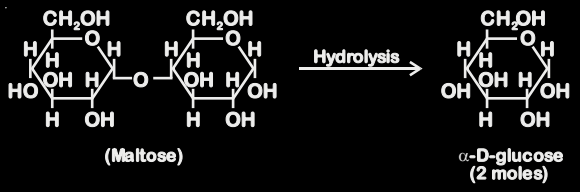


Gluconic acid is partial oxidation product of glucose and does not form hemiacetal or acetal.

31. Answer (4)

Glucose exists is two anomeric forms α and β. It forms oxime with NH_2OH and its pentaacetate does not react with NH_2OH because its anomeric OH group is converted into acetate group. But glucose does not give Schiff test for aldehyde

32. Answer (1)



33. Answer (4)

- Ninhydrin test is specific for amino acids.
- Both aspartame and alitame contains amino acids.
- Alitame is sulphur containing compound thats why gives sodium nitroprusside test
- Saccharin also contains sulphur
- Sucralose contains chloro group thats why its Lassaigne extract gives white ppt with $AgNO_3$.

$\therefore$ A = Aspartame, B = Saccharin

C = Sucralose, D = Alitame.

34. Answer (4)

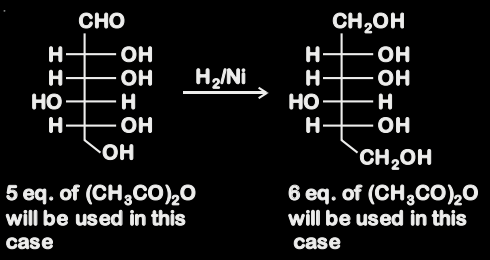
- All carbohydrates give, Molisch's test
- Barfoed test is specific for monosaccharide
- Biuret test is used for detecting the presence of peptide bonds

35. Answer (4)

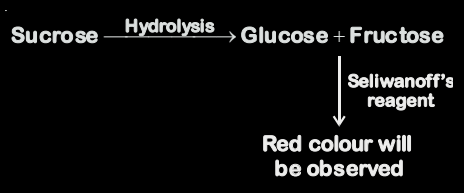
5 eq. of $(CH_3CO)_2O$ is used in (i) reaction.

6 eq. of $(CH_3CO)_2O$ is used in (ii) reaction

5 eq. of $(CH_3CO)_2O$ is used in (iii) reaction



36. Answer (2)

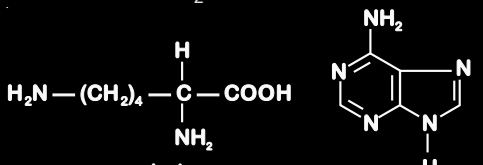


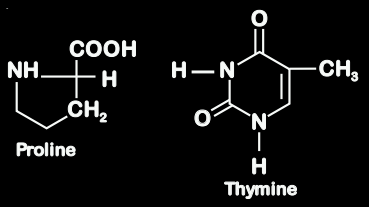
Ketose with seliwanoff's reagent gives red colour. It is a specific test for ketose.

37. Answer (3)

Primary amine react with $CHCl_3$ + KOH to give isocyanide

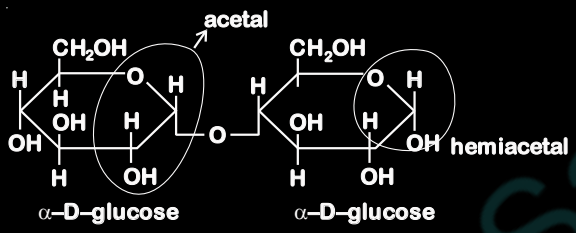
Adenine and lysine can react with $CHCl_3$ + KOH as they contain $–NH_2$ group.





38. Answer (4)

Maltose is a reducing sugar in which two α-D glucose units are joined through C_1 to C_4 linkage



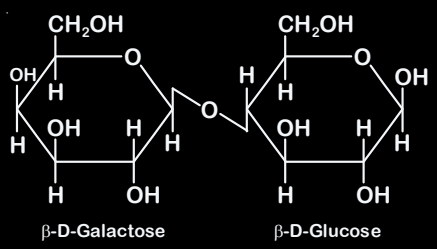
Maltose contains one acetal and one hemiacetal.

39. Answer (1)

Tyrosine is not an essential amino acid.

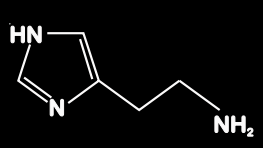
40. Answer (1)

Lactose contains β-glycosidic linkage between C_1 of galactose and C_4 of glucose.



41. Answer (37.84)

Histamine :



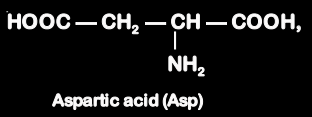
Chemical formulae : $C_5H_9N_3$

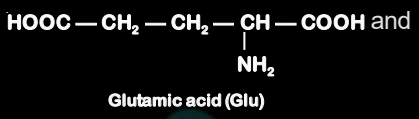
$$\therefore \text{ \% by mas of N} = \frac{3\times14}{(5\times12+1\times9+3\times14)}\times100$$

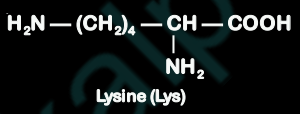
$$= \frac{42\times100}{111} = 37.84\%$$

42. Answer (5)

The amino acids present in the given tripeptide Asp – Glu – Lys are



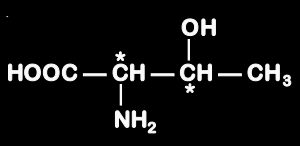




∴ Number of carbonyl groups present in tripeptide = 2 + 2 + 1 = 5

43. Answer (02.00)

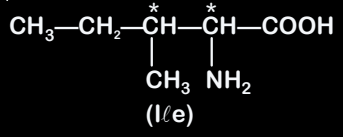
The structure of threonine is

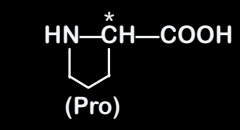


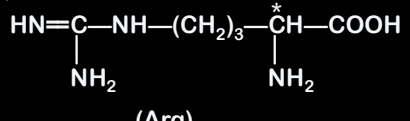
No. of chiral centres present in it = 2

44. Answer (4)

The amino acids present in the given tripeptide Ile–Arg–Pro are isoleucine, arginine and proline

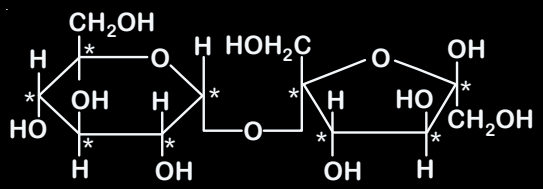






Number of chiral carbons present in the given tripeptide is 4.

45. Answer (09.00)

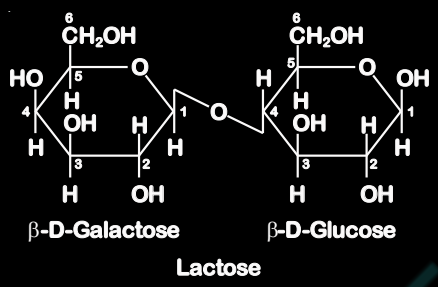


No. of chiral centres = 9

46. Answer (2)

"α-Helix is one of the most common ways in which a polypeptide chain forms all possible hydrogen bonds by twisting into a right handed screw (helix) with the –NH group of each amino acid residue hydrogen bonded to the $>C=O$ of an adjacent turn of the helix"

47. Answer (1)

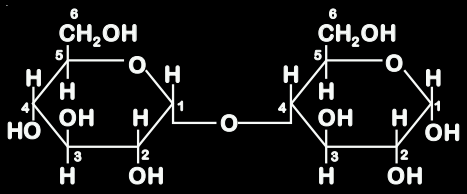


A glycosidic linkage is between C1 of β-D- galactose and C4 of β-D-glucose.

So option-1 is the correct answer.

48. Answer (4)

Maltose is composed of two units of α-D glucose which are joined through $C_1 - C_4$ glycosidic linkage



49. Answer (3)

Vitamin K is helpful in delaying the blood clotting.

50. Answer (3)

Seliwanoff test is used to distinguish ketoses from aldoses. On treatment with a concentrated acid, ketones are dehydrated more rapidly to give furfural derivative and on condensation with resorcinol give cherry red complex.

Positive Seliwanoff's test – Ketoses present

Positive Xanthoproteic test – Presence of aromatic amino acid

The Xanthoproteic reaction is a method that can be used to detect presence of protein soluble in a solution, using concentrated nitric acid.

51. Answer (3)

Disaccharides	Monomer present
Sucrose	α-D-glucose and β-D-fructose
Lactose	β-D-Galactose and β-D-Glucose
Maltose	α-D-Glucose and α-D-Glucose

(a) $\rightarrow$ (ii), (b) $\rightarrow$ (i), (c) $\rightarrow$ (iii)

52. Answer (2)

Vitamins which are soluble in fat and oils but insoluble in water are fat soluble vitamins, which are stored in our body relatively for longer time.

e.g. Vitamin A and Vitamin D

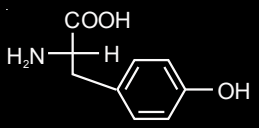
Thiamine (Vit B_1) and Ascorbic acid (Vit C) are water soluble.

53. Answer (1)

The secondary structure of protein is stabilised by hydrogen bonding.

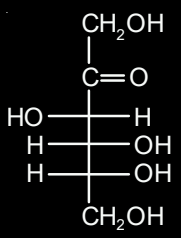
54. Answer (2)

Tyrosine is p-hydroxyphenylalanine. Its structure is



55. Answer (4)

Fructose is a ketohexose.



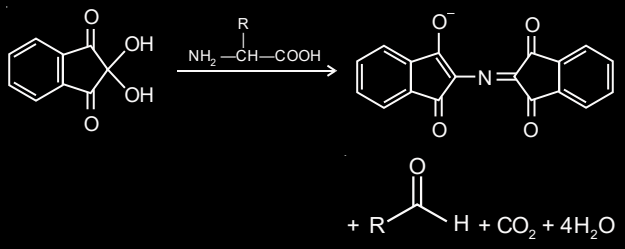
56. Answer (2)

Sucrose $\xrightarrow{\text{Hydrolyses}}$ glucose + fructose

Glucose and fructose both are monosaccharides. Sucrose is non-reducing sugar.

57. Answer (4)

Ninhydrin test



58. Answer (2)

Deficiency of vitamin K causes increase in blood clotting time.

59. Answer (2)

Enzymes are mostly proteins. They function as catalysts in biochemical reactions by lowering the energy of activation. They are highly specific w.r.t. temperature and pH in their action.

60. Answer (3)

Vitamin B_1 — Thiamine

Vitamin B_6 — Pyridoxine

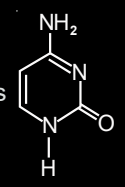
61. Answer (1)

Amylose is a unbranched chain with 200–1000 α-D-(+)-glucose units held together by C1-C4 glycosidic linkage.

62. Answer (1)

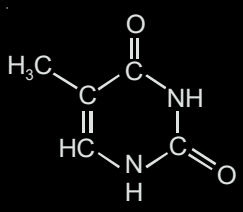
Globular proteins are usually soluble in water. Insulin and albumin are the common examples of globular proteins.

63. Answer (1)

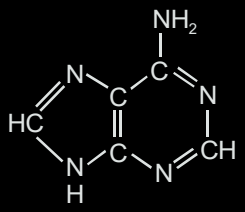
Cytosine is 

64. Answer (3)

The given compound (A) is Thymine. It always bind with adenine in DNA.



Thymine (T)

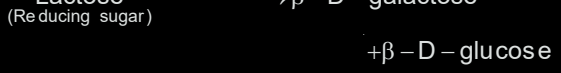


Adenine (A)

65. Answer (4)

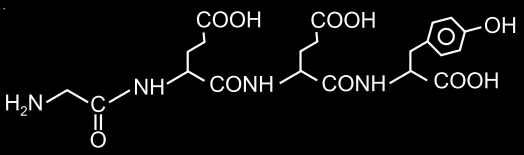
Barfoed's is a chemical test used to detect presence of monosaccharides from disaccharides.

66. Answer (2)



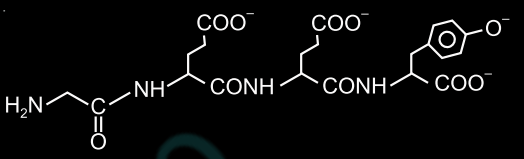
67. Answer (4)

Gly-Glu-Asp-Tyr



At pH = 12.5

—COOH, and phenol will lose its proton



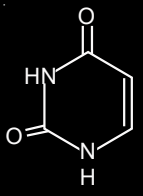
68. Answer (2)

Sucrose is a disaccharides and a non-reducing sugar because it does not contain free hemiacetal linkage.

Sucrose involves glycosidic linkage between C_1 of α–D–glucose and C_2 of β–D– fructose.

69. Answer (3)

The isomeric form of uracil present in RNA is

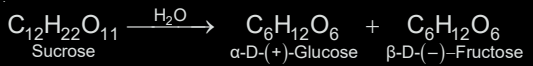


70. Answer (1)

Seliwanoff's test $\rightarrow$ Resorcinol dissolved in conc HCl.

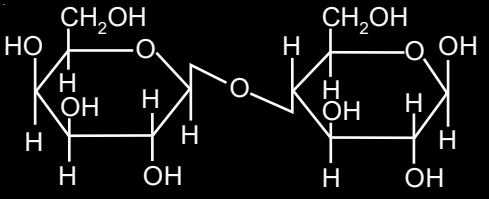
All other test use copper based reagent.

71. Answer (4)



72. Answer (2)

Lactose is



it has β–C_1–C_4 linkage

73. Answer (1)

When the polypeptide chains run parallel and are held together by hydrogen and disulphide bonds, then fibre-like structure is formed. Such proteins are generally insoluble in water. Some common examples are keratin (present in hair, wool, silk) and myosin (present in muscles), etc.

This structure results when the chains of polypeptides coil around to give a spherical shape. These are usually soluble in water. Insulin and albumins are the common examples of globular proteins.

74. Answer (3)

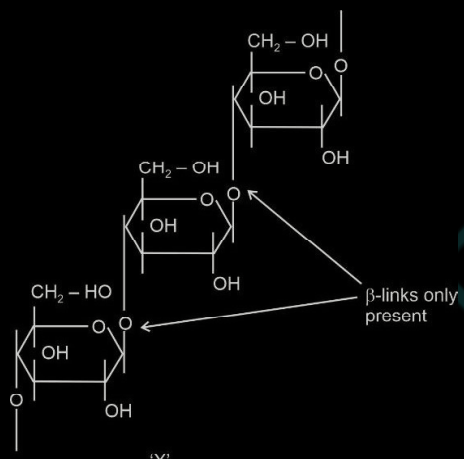
Combination of n amino acids gives a polypeptide with (n – 1) peptide linkages.

Similarly combination of four amino acids gives a tetrapeptide with three peptide linkages.

75. Answer (2)

Cellulose contains β-glycosidic linkages only.

Structure of cellulose



'X'

On boiling with dil. H_2SO_4 at 393 K under 2-3 atm, 'X' forms glucose, which given gluconic acid on treatment with bromine water.

76. Answer (4)

The given pentapeptide is

ALA – GLY – LEU – ALA – VAL

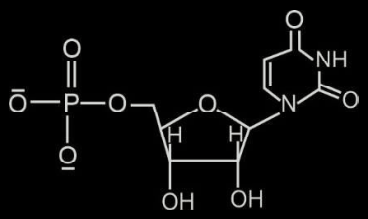
It has 4 peptide linkages.

77. Answer (2)

Since dipeptides and free amino acids do not give biuret test. Hence glycine and glycylalanine do not give this test.

78. Answer (9)

Nucleotide formed by Uracil, the base present in RNA, is

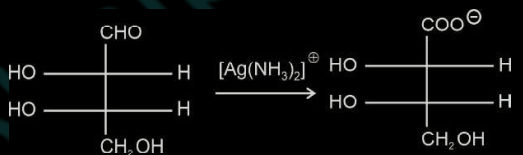


The number of oxygen = 9

79. Answer (4)

Vitamin B_{12} is water soluble and not excreted easily.

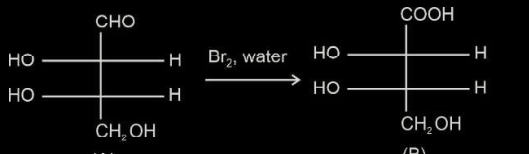
80. Answer (1)



L-crythrcosc

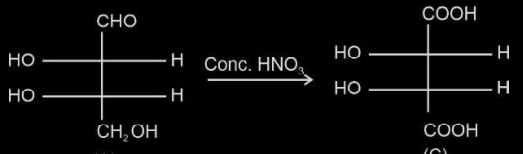
(A)

When (A) is heated with acetic anhydride, acetylation occurs and –OH group is replaced by $-O-\overset{\overset{O}{\|}}{C}-CH_3$ and hence, triacetate is formed.



(A)

(B)
Optically active

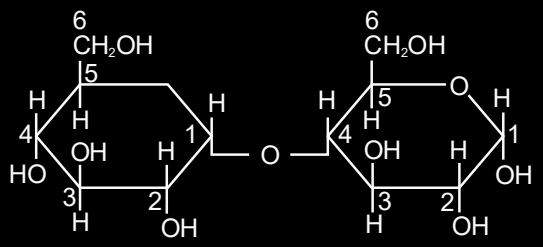


(A)

(C)
(Optically inactive)

81. Answer (3)

Maltose is composed of two α-D-glucose units in which C_1 of one glucose unit and C_4 of second glucose unit are linked.

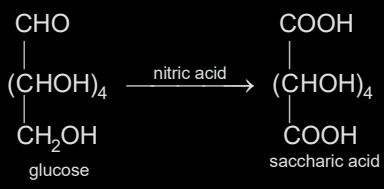


82. Answer (2)

Mostly H-bonding is responsible for the stability of α-helix form.

83. Answer (2)

$$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{D-(+)-Glucose (A)}}{C_6H_{12}O_6} + \underset{\text{D-(−)-Fructose (B)}}{C_6H_{12}O_6}$$



D-(–)-Fructose is a laevorotatory compound.

84. Answer (2)

DNA consists of β-D-2-deoxyribose sugar whereas RNA consists of β-D-ribose.

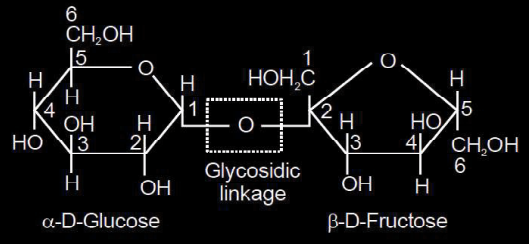
85. Answer (3)

Primary structure is unaffected by heating

86. Answer (1)

During the denaturation of proteins hydrogen bonds are disturbed. As a result, the secondary and tertiary structures are destroyed but the primary structures remain intact.

87. Answer (2)



Sucrose

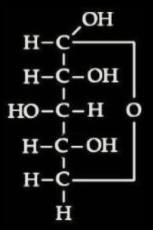
Hence in sucrose glycosidic linkage between C_1 of α-glucose and C_2 of β-D-fructose is found

Maltose $\Rightarrow$ Glycosidic linkage between C_1 and C_4

Lactose $\Rightarrow$ Glycosidic linkage between C_1 and C_4

Amylose $\Rightarrow$ Glycosidic linkage between C_1 and C_4

88. Answer (1)



The sugar gives +ve Tollen's test hence it's a reducing sugar.

89. Answer (3)

Animal starch is the other name of glycogen because its structure is similar to amylopectin.

90. Answer (2)

Weight of D-glucose in water = 250 g

$\therefore$ Weight of carbon in D-glucose

$$= \frac{250}{180} \times 72 = 100 \text{ g}$$

% of carbon in the aqueous solution of glucose is = 10.8%

$\therefore$ Weight of the solution is = 925.93

$\therefore$ Molality of D-glucose is

$$= \frac{\frac{250}{180}}{(925.93 - 250)} \times 1000$$

$$= \frac{250}{180 \times 675.93} \times 1000$$

$$= 2.06$$

91. Answer (1)

The correct match is:

(A) Glucose+HI/Red P$\rightarrow$ (IV) Hexane

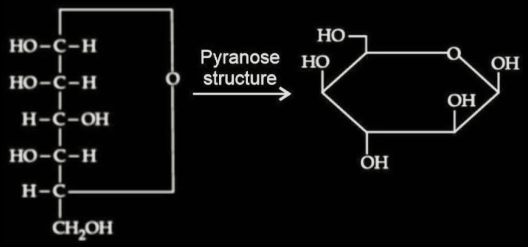
(B) Glucose+Br_2/water$\rightarrow$ (I) Gluconic acid

(C) Glucose + acetic Anhydride $\rightarrow$ (II) Glucose pentacetate

(D) Glucose + HNO_3 $\rightarrow$ (III) Saccharic acid

All the above reactions establish open chain structure of glucose.

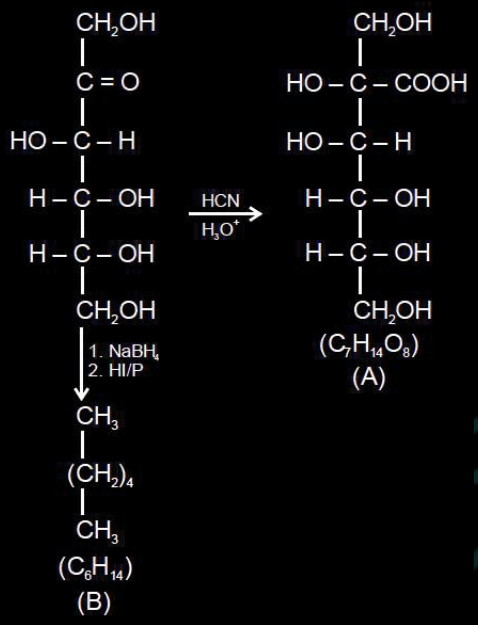
92. Answer (4)



–OH on right side will point downwards

–OH on left side will point upwards

93. Answer (1)



94. Answer (1)

In a linear tetrapeptide, four amino acids are linked and three peptide bonds are present.

Hence, 4 – 3 = 1

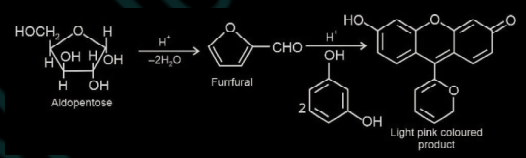
95. Answer (4)

Amylose is a linear polymer formed by combination of α-D glucose through 1, 4- glycosidic linkage.

It is water soluble

So, assertion is incorrect

96. Answer (1)



This is based on Seliwamoff's test which is used to distinguish between aldoses and ketoses. Ketoses give this test more rapidly than aldoses because they are more rapidly dehydrated than aldoses.

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