	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII	**DEPARTMENT: SCIENCE (2026-27)** **SUBJECT: CHEMISTRY**	**Date: 31/10/2026**
Worksheet: 06 **WITH ANSWERS**	**TOPIC: BIOMOLECULES**	**Note:** **A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

Multiple Choice Questions — 5 × 1 = 5 marks

1. Which of the following is a non-reducing sugar? **[1]**

(a) Glucose
(b) Sucrose
(c) Maltose
(d) Lactose

2. The deficiency of vitamin B_1 causes which disease? **[1]**

(a) Scurvy
(b) Rickets
(c) Beri-Beri
(d) Xerosis

3. Which of the following is NOT an essential amino acid? **[1]**

(a) Valine
(b) Lysine
(c) Glycine
(d) Phenylalanine

4. Which of the following is a water-soluble vitamin? **[1]**

(a) Vitamin A
(b) Vitamin C
(c) Vitamin D
(d) Vitamin K

5. Which enzyme converts starch into maltose? **[1]**

(a) Invertase
(b) Zymase
(c) Maltase
(d) Amylase

Assertion and Reason — 5 × 1 = 5 marks

Directions: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option from the following.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

6. Assertion (A): Glucose does not give Schiff's test. **[1]**
Reason (R): Glucose exists mainly in the cyclic hemiacetal form, so a free –CHO group is largely absent.

7. Assertion (A): Sucrose is a non-reducing sugar. **[1]**
Reason (R): The reducing groups of glucose and fructose are involved in the glycosidic bond in sucrose.

8. Assertion (A): Glucose is an aldohexose. **[1]**
Reason (R): Glucose is a reducing sugar.

9. Assertion (A): Vitamin C cannot be stored in our body. **[1]**
Reason (R): Vitamin C is a fat-soluble vitamin.

10. Assertion (A): In alkaline solution, glycine migrates towards the cathode during electrolysis. **[1]**
Reason (R): In alkaline solution, glycine exists as an anion, $H_2N–CH_2–COO^-$.

Very Short Answer (VSA) Questions — 5 × 1 = 5 marks

11. What is meant by mutarotation? **[1]**

12. Name the vitamin whose deficiency causes poor coagulation of blood. **[1]**

13. What type of bonding is present in the α-helix structure of proteins? **[1]**

14. What is obtained when starch is completely hydrolysed? **[1]**

15. Why is cellulose not digestible in human beings? **[1]**

Short Answer Questions (SA-I) — 5 × 2 = 10 marks

16. Differentiate between reducing and non-reducing sugars. Give one example of each. **[2]**

17. Distinguish between fibrous proteins and globular proteins. Give one example of each. **[2]**

18. What is the structural difference between α-D-glucose and β-D-glucose? What are such isomers called? **[2]**

19. What is meant by denaturation of a protein? Give one example. **[2]**

20. What type of linkages are found in (i) Maltose (ii) Glycylalanine **[2]**

Short Answer Questions (SA-II) — 3 × 3 = 9 marks

21. Write one source and the deficiency disease of each of the following vitamins: **[3]**
(i) Vitamin A
(ii) Vitamin C
(iii) Vitamin D

22. What happens when D-glucose is treated with the following? Name the product. **[3]**

(i) HI (prolonged heating)

(ii) Bromine water

(iii) HNO_3

23. Explain briefly the primary, secondary and tertiary structures of proteins. **[3]**

Long Answer Questions (LA) — 3 × 5 = 15 marks

24. Answer the following questions on nucleic acids: **[5]**

(a) State any three structural differences between DNA and RNA. [3]

(b) Name the nitrogenous bases obtained on complete hydrolysis of DNA. [1]

(c) Name the linkage that joins two nucleotides in a polynucleotide chain. [1]

25. Answer the following questions on glucose: **[5]**

(a) Write the chemical reactions of D-glucose with (i) NH_2OH and (ii) $(CH_3CO)_2O$. [2]

(b) Draw the simple Fischer projection of D-glucose . [2]

(c) Draw the cyclic structure of glucose represented by Haworth structure. [1]

26. Answer the following questions on carbohydrates: **[5]**

(a) What are carbohydrates? [1]

(b) How are carbohydrates classified? Give one example of each class. [3]

(c) Name the linkage by which monosaccharide units are joined in disaccharides and polysaccharides. [1]

Case Study Based Questions — 2 × 4 = 8 marks

27. **Read the passage given below and answer the questions that follow.**

Carbohydrates are classified as monosaccharides, oligosaccharides and polysaccharides. Sucrose, the common table sugar, is a disaccharide. On hydrolysis it gives an equimolar mixture of D-(+)-glucose and D-(–)-fructose. Sucrose is dextrorotatory ($[\alpha]_D$ = +66.5°), but the mixture obtained after hydrolysis is laevorotatory, so the sign of rotation changes from dextro to laevo. Starch is the main storage polysaccharide of plants. It is a mixture of two components: one is a long unbranched chain, and the other is a branched chain polymer.

(i) Why is sucrose a non-reducing sugar? [1]

(ii) What is invert sugar? Why is it called so? [1]

(iii) Name the two components of starch. [1]

(iv) Which component of starch is branched and insoluble in water? [1]

28. **Read the passage given below and answer the questions that follow.**

Proteins are polymers of α-amino acids joined together by peptide linkages. Each protein has a specific three-dimensional native structure, which is responsible for its biological activity. When a protein in its native form is subjected to a physical change such as a change in temperature, or a chemical change such as a change in pH, the hydrogen bonds are disturbed. The globules unfold, the helix uncoils and the protein loses its biological activity. This is called denaturation. Most enzymes are globular proteins that catalyse biochemical reactions in living cells, and each enzyme is specific for a particular reaction.

(i) What is a peptide linkage? [1]

(ii) Which structure of a protein remains intact during denaturation? [1]

(iii) Give one example of denaturation of a protein from everyday life. [1]

(iv) Why are enzymes called biocatalysts? [1]

Answers

1. **[1]**

(b) Sucrose

2. **[1]**

(c) Beri-Beri

3. **[1]**

(c) Glycine

4. **[1]**

(b) Vitamin C

5. **[1]**

(d) Amylase

6. **[1]**

(a) Both A and R are true and R is the correct explanation of A.

7. **[1]**

(a) Both A and R are true and R is the correct explanation of A.

8. **[1]**

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

9. **[1]**

(c) A is true but R is false.

10. **[1]**

(d) A is false but R is true.

11. **[1]**

The spontaneous change in the specific rotation of an optically active compound in solution, until it reaches a constant equilibrium value, is called mutarotation. For example, α-D-glucose and β-D-glucose in water both change to an equilibrium mixture with specific rotation +52.5°.

12. **[1]**

Vitamin K. Its deficiency increases the time taken for blood to clot (poor coagulation of blood).

13. **[1]**

Hydrogen bonding. In the α-helix, the –NH group of each amino acid residue is hydrogen-bonded to the –C=O group of the fourth residue that follows it.

14. **[1]**

D-Glucose. Starch is first hydrolysed to maltose by amylase, and maltose is then hydrolysed to D-glucose by maltase.

15. **[1]**

Cellulose is a polymer of β-D-glucose joined by β-glycosidic linkages. Human beings do not have the enzyme (cellulase) needed to hydrolyse these linkages, so cellulose cannot be digested.

16. **[2]**

Reducing sugars :These have a free aldehyde or ketone group, or a group that can be freed in solution (a free hemiacetal –OH). They reduce Tollens' reagent and Fehling's solution. Examples: glucose, fructose, maltose, lactose.

Non-reducing sugars: These have no free aldehyde or ketone group because the reducing groups are involved in the glycosidic bond. They do not reduce Tollens' reagent or Fehling's solution. Examples: sucrose, and also starch and cellulose.

17. **[2]**

Fibrous proteins: The polypeptide chains run parallel to each other and are held together by hydrogen bonds and disulphide bonds, forming fibre-like structures. They are insoluble in water. Examples: keratin, myosin.

Globular proteins: The polypeptide chains coil around to give a spherical (globular) shape. They are usually soluble in water. Examples: insulin, albumin.

18. **[2]**

α-D-Glucose and β-D-glucose are cyclic (pyranose) forms of D-glucose. They differ only in the configuration at C-1, the anomeric carbon. In the Haworth structure of the α-form, the –OH group at C-1 points downwards (trans to the $–CH_2OH$ group at C-5). In the β-form, it points upwards (cis to the $–CH_2OH$ group). Such a pair of isomers, which differ only in the configuration at C-1, are called anomers.

19. **[2]**

Denaturation is the loss of the biological activity of a protein when it is subjected to a physical change (such as heat) or a chemical change (such as a change in pH). The hydrogen bonds are disturbed, the globules unfold and the helix uncoils, so the secondary and tertiary structures are destroyed, while the primary structure remains intact.

Example: coagulation of egg white on boiling; curdling of milk is another example .

20. **[2]**

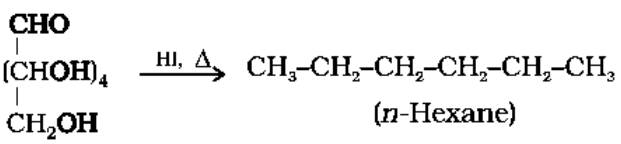
Example	**Maltose**	**Glycylalanine**
Linkage	Glycosidic linkage	Peptide linkage

21. **[3]**

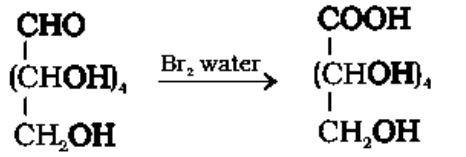
Vitamin	**Source**	**Deficiency disease**
(i) Vitamin A	Fish liver oil, carrots, butter and milk	Night blindness (xerophthalmia)
(ii) Vitamin C	Citrus fruits, amla and green leafy vegetables	Scurvy
(iii) Vitamin D	Exposure to sunlight, fish liver oil and egg yolk	Rickets in children; osteomalacia in adults

22. **[3]**

(i) HI (prolonged heating): n-Hexane is formed. This shows that all six carbon atoms of glucose are linked in a straight chain.

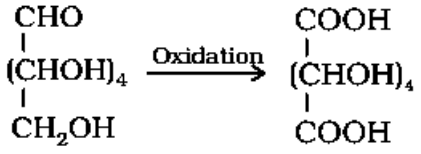


(ii) Bromine water: Gluconic acid is formed. Only the aldehyde group is oxidised to a carboxyl group. This shows that the carbonyl group is an aldehyde group.



Gluconic acid

(iii) HNO_3: Saccharic acid is formed. Both the –CHO group and the terminal $–CH_2OH$ group are oxidised to –COOH groups.



Saccharic acid

23. **[3]**

Primary structure: It is the specific sequence in which the amino acids are linked to each other by peptide bonds in the polypeptide chain. Any change in this sequence gives a different protein.

Secondary structure: It is the shape in which a long polypeptide chain folds because of hydrogen bonding between the –C=O group and the –NH group of the peptide bonds. It is of two types: the α-helix (a right-handed coil with about 3.6 amino acid residues per turn) and the β-pleated sheet (chains lie side by side, held by hydrogen bonds between neighbouring chains).

Tertiary structure: It is the overall folding of the secondary structure into a compact three-dimensional shape, which may be fibrous or globular. It is stabilised by hydrogen bonds, disulphide linkages, van der Waals forces and electrostatic forces.

24. **[5]**

(a) [3]

Basis of difference	**DNA**	**RNA**
Sugar	2-Deoxy-D-ribose	D-Ribose
Nitrogenous bases	Adenine, guanine, cytosine and thymine	Adenine, guanine, cytosine and uracil
Structure	Double-stranded helix; the two strands are complementary	Single-stranded (usually)
Function	Stores genetic information and is responsible for its transfer (replication)	Helps in protein synthesis (mRNA, rRNA and tRNA)

(b) [1]

Adenine (A), guanine (G), cytosine (C) and thymine (T). Of these, adenine and guanine are purines, while cytosine and thymine are pyrimidines.

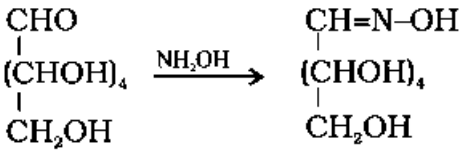
(c) [1]

Phosphodiester linkage. It joins the C-3′ of the sugar of one nucleotide to the C-5′ of the sugar of the next nucleotide through a phosphate group.

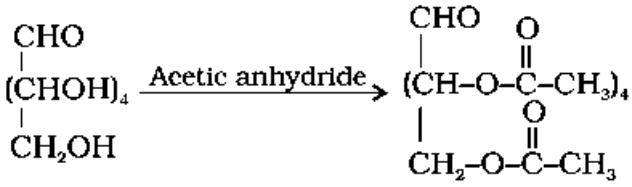
25. **[5]**

(a) [2]

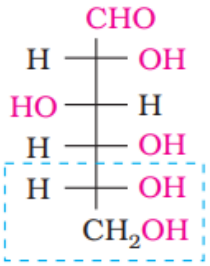
(i) With hydroxylamine, glucose forms glucose oxime. This confirms the presence of a carbonyl group.



(ii) With acetic anhydride, glucose forms glucose pentaacetate. This confirms the presence of five –OH groups.

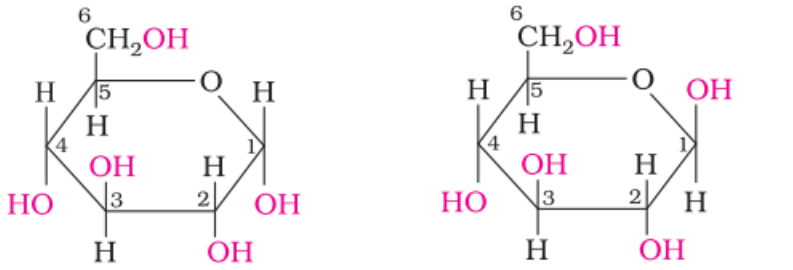


(b) [2]



D–(+) – Glucose

(c) [1]



26. **[5]**

(a) [1]

Carbohydrates are optically active polyhydroxy aldehydes or ketones, or compounds which produce such units on hydrolysis. (b) [3]

Carbohydrates are classified into three classes

Class	Characteristics	Example
Monosaccharides	Cannot be hydrolysed further to simpler carbohydrates	Glucose, fructose

Class	Characteristics	Example
Oligosaccharides	Give 2 to 10 monosaccharide units on hydrolysis	Sucrose, maltose, lactose
Polysaccharides	Give a large number of monosaccharide units on hydrolysis	Starch, cellulose, glycogen

(c) [1]

Glycosidic linkage. It is an oxide linkage (C–O–C) formed by the loss of a water molecule between two monosaccharide units.

27. **[4]**

(i) [1]

In sucrose, the reducing groups of glucose (C-1) and fructose (C-2) are involved in the glycosidic bond. No free aldehyde or ketone group is left, so sucrose does not reduce Tollens' reagent or Fehling's solution.

(ii) [1]

Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since the laevorotation of fructose (–92.4°) is more than dextrorotation of glucose (+ 52.5°), the mixture is laevorotatory. Thus, hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (–) and the product is named as invert sugar.

(iii) [1]

Amylose and amylopectin.

(iv) [1]

Amylopectin. It is a branched-chain polymer (α-1,4 links with α-1,6 links at the branches) and is insoluble in water, whereas amylose is an unbranched, water-soluble chain.

28. **[4]**

(i) [1]

The amide linkage (–CO–NH–) formed between the –COOH group of one α-amino acid and the $–NH_2$ group of another amino acid, with the loss of a water molecule, is called a peptide linkage.

(ii) [1]

The primary structure. Only the secondary and tertiary structures are destroyed.

(iii) [1]

Coagulation of egg white on boiling (or curdling of milk).

(iv) [1]

Enzymes are produced by living cells and catalyse the biochemical reactions of the body, such as digestion and metabolism, without being used up. Hence, they are called biocatalysts.

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