INDIAN SCHOOL AL WADI AL KABIR

Class: XII	**DEPARTMENT OF SCIENCE -2025-26** **SUBJECT: CHEMISTRY**	**DATE: 03/09/2025**
WORKSHEET NO: 5	**CHAPTER: BIOMOLECULES**	**A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

1. Which of the following is a non-reducing sugar?
A. Maltose
B. Sucrose
C. Lactose
D. Glucose

2. What type of glycosidic linkage is found in amylose?
A. C1-C4 β linkage
B. C1-C6 β linkage
C. C1-C6 α linkage
D. C1-C4 α linkage

3. Which monosaccharide is commonly known as dextrose?
A. Fructose
B. Sucrose
C. Glucose
D. Ribose

4. The structural relationship between α-D (+) glucose and β-D (+) glucose is best described as:
A. Optical isomers
B. Geometrical isomers
C. Anomers
D. Enantiomers

5. Which protein structure classification includes the β-pleated sheet?
A. Quaternary structure
B. Primary structure
C. Secondary structure
D. Tertiary structure

6. In which biomolecule would you find α-helices?
A. Nucleotides

B. Starch
C. Polypeptides
D. Sucrose

7. Regarding amino acids, which of the following is true?
A. Basic amino acids are obtained only through diet
B. Essential amino acids can be synthesized by the body
C. Essential amino acids must be obtained through diet
D. Non-essential amino acids must be obtained through diet

8. Where is the peptide linkage found?
A. Rubber
B. Vitamins
C. Carbohydrates
D. Proteins

9. Consider the following statements about sucrose:
Assertion: Sucrose is a non-reducing sugar
Reason: Sucrose contains a glycosidic linkage
A. Both Assertion and Reason are true, and Reason explains Assertion
B. Both Assertion and Reason are true, but Reason does not explain Assertion
C. Assertion is true, but Reason is false
D. Assertion is false, but Reason is true

10. When milk curdles, what type of protein change occurs?
A. Secondary structure formation
B. Denaturation
C. Primary structure formation
D. Quaternary structure formation

11. Which statement about albumin is correct?
A. It's a fibrous protein with a straight chain structure
B. It's a globular protein with a coiled structure
C. It's a structural protein with β-pleated sheets only
D. It's a membrane protein with α-helices only

12. What type of bonds form between amino acids in a protein chain?
A. Glycosidic bonds
B. Hydrogen bonds
C. Peptide bonds
D. Ionic bonds

13. In protein structure, what immediately follows the formation of peptide bonds?
A. Quaternary structure
B. Secondary structure

C. Tertiary structure
D. Primary structure

14. Nucleosides are composed of
A. a pentose sugar and phosphoric acid
B. a nitrogenous base and phosphoric acid
C. a nitrogenous base and a pentose sugar
D. a nitrogenous base, a pentose sugar and phosphoric acid.
(Term I, 2021-22)

15. Nucleic acids are polymer of
A. amino acids B. nucleosides C. nucleotides D. glucose.
(Term I, 2021-22, 2021C)

16. The base which is present in DNA but not in RNA, is
A. cytosine B. guanine C. adenine D. thymine.

17. Assertion: The backbone of DNA and RNA molecules is a chain consisting of heterocyclic base, pentose sugar and phosphate group.
Reason: Nucleotides and nucleosides mainly differ from each other in presence of a phosphate group.
A. Both Assertion (A) and Reason are true and Reason (R) is the correct explanation of the Assertion (A)
B. Both Assertion (A) and Reason (R) are true, but Reason (R) is the correct explanation the Assertion (A)
C. Assertion (A) is true, but Reason (R) is false.
D. Assertion (A) is false, but Reason (R) is true. (2023)

VERY SHORT ANSWER TYPE QUESTIONS(2M)

18. Give the reaction of heating glucose with hydroxylamine. Presence of which group is confirmed by this reaction? (2023)
19. Define the following terms:
(i) Oligosaccharides
(ii) Invert sugar (2020)
20. Write the reactions showing the presence of following in the open structure of glucose:
(i) an aldehyde group
(ii) a primary alcohol. (2020)
21. Enumerate the reactions of glucose which cannot be explained by its open chain structures. (Delhi 2014C)
22. Define denaturation of protein. What is the effect of denaturation on the structure of protein? (2023)
23. Write two differences between DNA and RNA.

SHORT ANSWER TYPE QUESTIONS(3M)

24. (a) Write the product when D-glucose reacts with conc. HNO_3.
(b) Amino acids show amphoteric behaviour. Why?
(c) Write one difference between α-helix and β-pleated structure of protein. (2023)
25. Define proteins and classify them on the basis of their molecular shape. (2020C)
26. Differentiate between the following:
(i) Amylose and Amylopectin

(ii) Peptide linkage and Glycosidic linkage
(iii) Fibrous proteins and Globular proteins.

(Delhi 2019)

27. Define the following terms as related to proteins:
(i) Peptide linkage (ii) Primary structure (iii) Denaturation (AI 2015, 2014)
28. What are essential and non-essential amino acids? Give two examples of each.

(AI 2014C)

29. Differentiate between following:
(i) Amylose and Amylopectin
(ii) Globular protein and Fibrous protein
(iii) Nucleotide and Nucleoside (2020)
30. Define the following terms:
(a) Invert sugar (b) Native protein (c) Nucleotide (2019)
31. Differentiate the following
(i) Fibrous protein and Globular protein
(ii) Essential amino acids and Non-essential amino acids
(iii) DNA and RNA
32. Give reasons for any 3 of the following observations:
(a) Penta-acetate of glucose does not react with hydroxylamine.
(b) Amino acids behave like salts.
(c) Water soluble vitamins must be taken regularly in diet.
(d) The two strands in DNA are complimentary to each other. (2023)

CASE BASED QUESTIONS

33. Read the given passage and answer the questions number (i) to (v) that follow:

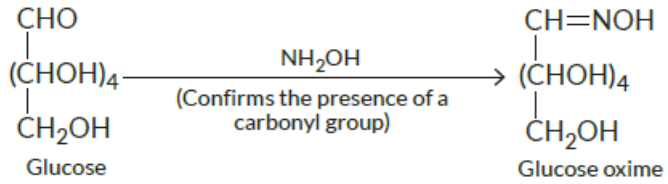
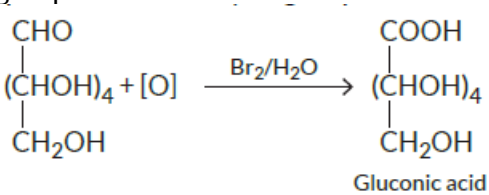
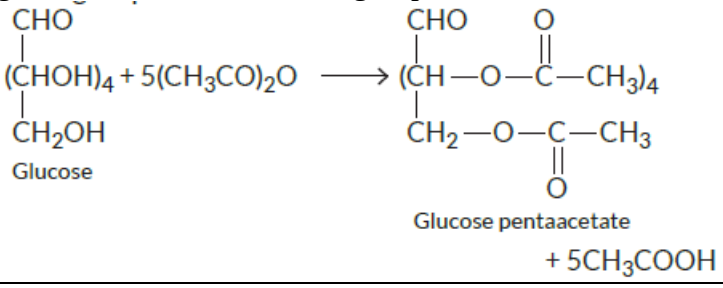
Organic compounds containing amine as functional group are present in a vivid variety of compounds, namely amino acids, hormones, neurotransmitters, DNA, alkaloids, dyes, etc. Drugs including nicotine, morphine, codeine and heroin, etc. which have physiological effects on humans also contain amino group in one form or another. Amines are basic because of the presence of lone pair of electrons on nitrogen. Addition of nitrogen into an organic framework leads to the formation of two families of molecules, namely amines and amides. As chemistry students, we must appreciate the versatility of nitrogen.
(i) What are amino acids?
(ii) Why are amino acids amphoteric?
(iii) Give one point of difference between acidic and basic amino acid.
(iv) What are essential amino acids?

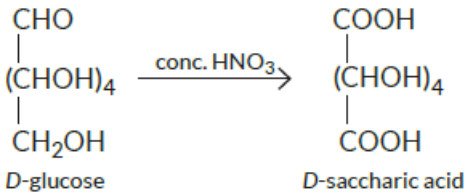
(2020)

LONG ANSWER TYPE QUESTIONS(5M)

34. (a) Define vitamins and classify them on the basis of their solubility.
(b) What are the products of hydrolysis of maltose?
(c) What type of bonding provides stability to a-helix structure of protein?
(d) Name the vitamin whose deficiency causes pernicious anaemia

Answers

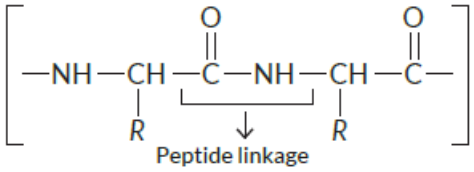
1	B. Sucrose
2	D. C1-C4 α linkage
3	C. Glucose
4.	C. Anomers
5.	C. Secondary structure
6.	C. Polypeptides
7.	C. Essential amino acids must be obtained through diet
8.	D. Proteins
9.	B. Both Assertion and Reason are true, but Reason does not explain Assertion
10.	B. Denaturation
11.	B. It's a globular protein with a coi'ed structure
12.	C. Peptide bonds
13.	D. Primary structure
14.	C. a nitrogenous base and a pentose sugar
15.	C. nucleotides
16.	D. thymine
17.	B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A)
18.	
19.	The carbohydrates which on hydrolysis give 2-10 monosaccharides. For example, sucrose, lactose, maltose, etc. (ii) An equimolar mixture of glucose and fructose, obtained by hydrolysis of sucrose in presence of an acid or the enzyme invertase is called invert sugar.
20.	(i) Glucose on oxidation with a mild oxidising agent like bromine water gives gluconic acid containing the same six carbon atoms as present in glucose. This indicates presence of aldehyde group.  (ii) On acetylation with acetic anhydride, glucose gives a pentaacetate. This confirms that glucose contains five – OH groups. 

21.	The following reactions of *D*-glucose cannot be explained on the basis of its open chain structure: (i) *D*-Glucose does not react with sodium bisulphite (NaHSO3). (ii) It does not give 2, 4-DNP test and Schiff's test. (iii) The pentaacetate of *D*-glucose does not react with hydroxylamine.
22.	When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein. During denaturation, 2° and 3° structures are destroyed but 1° structure remains intact.
23.	Structural differences between DNA and RNA : (i) The sugar in DNA is deoxyribose while that in RNA is ribose. (ii) DNA has a double-stranded helical structure, while RNA has a single-stranded helical structure. Functional differences between DNA and RNA : (i) DNA is the chemical basis of heredity and is responsible for maintaining the identity of different species. (ii) RNA molecules are responsible for protein synthesis but the message for the synthesis of a particular protein is present in DNA.
24.	(a) On oxidation with nitric acid, *D*-glucose yields saccharic acid.  *D*-glucose *D*-saccharic acid (b) As amino acids have both acidic (carboxy group) and basic groups (amino group) in the same molecule, they react with both acids and bases. Hence, they show amphoteric behaviour. (c)In a-helix structure, intramolecular H-bonding takes place whereas in b-pleated structure, intermolecular H-bonding takes place.
25	Proteins are the biomolecules of the living system made up of nitrogenous organic compounds by condensation polymerisation of a-amino acids. On the basis of molecular structure, proteins are classified as : (a) Fibrous proteins: In fibrous proteins, polypeptide chains are parallel and are held together by hydrogen and disulphide bonds. These are insoluble in water, e.g., keratin and myosin. (b) Globular proteins: Globular proteins result when the polypeptide chains coil around to give three-dimensional spherical shape. These are soluble in water, e.g., insulin and albumins.
26	(i) Amylose is a linear condensation polymer of a-*D*-glucose in which C1 of one glucose unit is attached to C4 of the other through a-glycosidic linkage while amylopectin is a highly branched polymer in which a-*D*-glucose is linked with C1-C4 linkage and C1-C6 linkage is present between two linear chains. (ii) Peptide linkage is an amide linkage formed between -COOH group of one a-amino acid and -NH2 group of the other amino acid by loss of a molecule of water whereas a linkage between two monosaccharides units through oxygen atom is called glycosidic linkage.

(iii)

S.No.	Globular proteins	Fibrous proteins
1.	These are cross-linked proteins and are condensation product of acidic and basic amino acids.	These are linear condensation polymer.
2.	These are soluble in water, mineral acids and bases.	These are insoluble in water but soluble in strong acids and bases.
3.	These proteins have three dimensional folded structure. These are stabilised by internal hydrogen bonding, *e.g.*, egg albumin, enzymes.	These are linear polymers held together by intermolecular hydrogen bonds, *e.g.*, hair, silk.

27. (i) Proteins are the polymers of a-amino acids linked by amide formation between carboxyl and amino
group. This is called peptide linkage or peptide bond.



(ii) **Primary structure:** The specific sequence in which the various amino acids present in a protein are linked to one another is called its primary structure. Any change in the primary structure creates a different protein.
(iii) **Denaturation:** The loss of biological activity of a protein by changing the pH, temperature or by adding
some salt due to disruption of the native structure of protein is called denaturation. During denaturation, secondary and tertiary structure of protein is destroyed but primary structure remains intact.

28. Amino acids which cannot be synthesised in the body and must be obtained through diet are known as essential amino acids, *e.g.*, valine and leucine. There are ten essential amino acids. Amino acids which can be synthesised in the body are known as non-essential amino acids, *e.g.*, alanine and glutamic acids.

29. (i)

S.No.	Amylose	Amylopectin
1.	15-20% part of starch	80-85% part of starch
2.	Made up of linear chain polymers of α-D glucose with C1-C4 linkage.	Made up of branched polymers of α-D glucose with C1-C4 and C1-C6 linkage between two chains
3.	Water soluble	Water insoluble

(ii)

S.No.	Globular proteins	Fibrous proteins
1.	These are cross-linked proteins and are condensation product of acidic and basic amino acids.	These are linear condensation polymer.
2.	These are soluble in water, mineral acids and bases.	These are insoluble in water but soluble in strong acids and bases.
3.	These proteins have three dimensional folded structure. These are stabilised by internal hydrogen bonding, *e.g.*, egg albumin, enzymes.	These are linear polymers held together by intermolecular hydrogen bonds, *e.g.*, hair, silk.

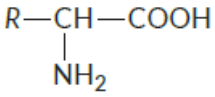
(iii) Nucleoside contains pentose sugar, and base whereas nucleotide contains pentose sugar, base as well as phosphate group.
Nucleoside = Base + Sugar
Nucleotide = Base + Sugar + Phosphate

30. (a) An equimolar mixture of glucose and fructose, obtained by hydrolysis of sucrose in presence of an acid or the enzyme invertase is called invert sugar.
(b) Native proteins: Protein purified from natural source which includes blood, plasma from animal etc.
(c) When nucleoside is linked to phosphoric acid at 5′-position of sugar moiety, we get a nucleotide.

31. (i)

S.No.	Globular proteins	Fibrous proteins
1.	These are cross-linked proteins and are condensation product of acidic and basic amino acids.	These are linear condensation polymer.
2.	These are soluble in water, mineral acids and bases.	These are insoluble in water but soluble in strong acids and bases.
3.	These proteins have three dimensional folded structure. These are stabilised by internal hydrogen bonding, *e.g.*, egg albumin, enzymes.	These are linear polymers held together by intermolecular hydrogen bonds, *e.g.*, hair, silk.

(ii) Amino acids which cannot be synthesized in the body and must be obtained through diet are known as essential amino acids, e.g., valine, leucine, etc. The amino acids, which can be synthesised in the body, are known as non-essential amino acids.
(iii) The sugar in DNA is deoxyribose while that in RNA is ribose. DNA has a double-stranded helical structure, while RNA has a single-stranded helical structure

32	(a) As glucose forms a six-membered ring in which —CHO group combines with —OH group at C-5, pentaacetate of glucose does not react with hydroxylamine due to the absence of free —CHO group. (b) Amino acids behave like salts rather than simple amines or carboxylic acids. This behaviour is due to the presence of both acidic (carboxyl group) and basic (amino groups) group in the same molecule. (c) Water soluble vitamins must be taken regularly in diet because they are readily excreted in urine and cannot be stored (except vitamin B12) in our body. (d) The two strands in DNA are complementary to each other because the hydrogen bonds are formed between specific pairs of bases. Adenine forms hydrogen bonds with thymine whereas cytosine forms hydrogen bonds with guanine.
33.	i) Organic compounds containing both amino (- NH2) and carboxyl (-COOH) functional groups are called amino acids.  (ii) As amino acids have both acidic (carboxyl group) and basic groups (amino group) in the same molecule, they react with both acids and bases. Hence, they show amphoteric behaviour. (iii) Acidic amino acids are those which contain more number of carboxyl groups as compared to amino groups whereas basic amino acids are those which contains more number of amino groups than carboxyl groups. (iv) Amino acids which cannot be synthesized in the body and must be obtained through diet are known as essential amino acids, *e.g.*, valine, leucine, etc
34.	(a) Organic compounds required in the diet in small amounts to perform specific biological functions for normal maintenance of optimum growth and health of the organism are called vitamins. Vitamins are classified into two groups depending upon their solubility in water or fat. (i) Fat soluble vitamins, (e.g., vitamin A and D) (ii) Water soluble vitamins, (e.g., vitamin B and C) (b) Maltose Hydrolysis Glucose + Glucose (c) a-helix structure of protein stabilised by hydrogen bonding (d) Vitamin B12

Prepared by: *Ms Jenesha Joseph*	*Checked by:* *HOD Science*