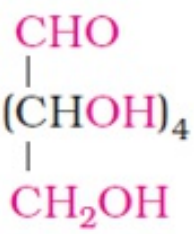
CBSE Test Paper-01

Class - 12 Chemistry (Biomolecules)

1. ____ are joined together by phosphodiester linkage between 5' and 3' carbon atoms of the pentose sugar.
   a. Nucleosides
   b. Nucleic acids
   c. Proteins
   d. Nucleotides
2. The following molecule is called as



   a. carbohydrate
   b. Vitamin
   c. Protein
   d. Lipid
3. One or more of the following vitamin is insoluble in water
   a. all of these
   b. vitamin D
   c. vitamin K
   d. Vitamin E
4. Night blindness is caused by the deficiency of
   a. Vitamin D
   b. Vitamin B
   c. Vitamin C
   d. Vitamin A
5. Oxime is formed by treating glucose with
   a. Water
   b. nitric acid
   c. bromine water

d. hydroxylamine

6. Name the forces responsible for secondary and tertiary structure.
7. Write name of linkage joining two amino acids.
8. Deficiency of which vitamin causes scurvy?
9. How do epimers differ from anomers?
10. What type of bonding helps in stabilising the $\propto$ -helix structure of proteins?
11. Distinguish between α-glucose and β-glucose.
12. Define the terms as related to proteins:
    i. Peptide linkage
    ii. Primary structure
    iii. Denaturation
13. What are nucleotides? Name two classes of nitrogen containing bases found amongst nucleotides.
14. What are the common types of secondary structure of proteins?
15. Define the following terms:
    i. Co-enzymes
    ii. Mutation in biomolecules
    iii. List four main functions of carbohydrate in organism.

CBSE Test Paper-01

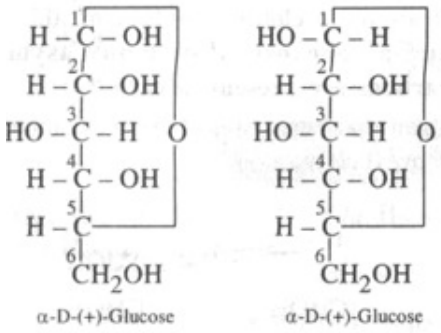
Class - 12 Chemistry (Biomolecules)

Solutions

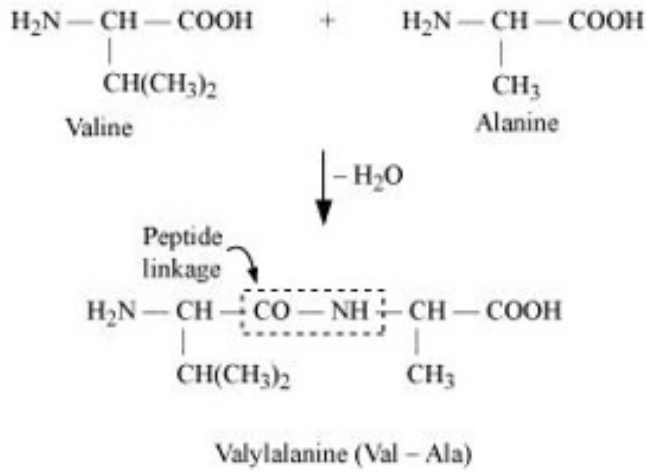
1. (d) Nucleotides
   Explanation: When nucleoside is linked to phosphoric acid at 5'-position of sugar moiety, we get a nucleotide and nucleotides are joined by a phosphodiester bond between 5' and 3' carbon atoms of the pentose sugar.
2. (a) carbohydrate
   Explanation: It is aldohexose. An aldohexose is a hexose with an aldehyde group on one end.it is naturally occurring in nature and is found in fruits.
3. (a) all of these
   Explanation: Vitamins which are soluble in fat and oils but insoluble in water are kept in fat soluble vitamins. These are vitamins A, D, E and K. They are stored in liver and adipose (fat storing) tissues. All these are insoluble in water.
4. (d) Vitamin A
   Explanation: Vitamin A keeps eyes in good health. Deficiency of Vitamin A causes Night Blindness.
5. (d) hydroxylamine
   Explanation: Glucose reacts with hydroxylamine (NH_2OH) to form an oxime. Oxime is formed by combination of carbonyl group of glucose and hydroxyl group of hydroxyl amine.
6. The forces which are responsible for tertiary structure of proteins are hydrogen bonds, disulphide linkage, vanderwalls and electrostatic forces of attraction.
7. Peptide linkage
8. Vitamin C
9. Carbohydrate which differ in configuration at the glycosidic carbon (i.e., C_1 in aldoses and C_2 in ketoses) are called anomers while those which differ in configuration at any carbon other than glycosidic carbon are called epimers. For example,α -D - glucose and β- D- glucose are anomers since they differ in configuration at C_2 (other than the glycosidic carbon C_1. In other words, glucose and monose are C_2 epimers, similarly, we

can show that glucose and galactose are C_2 epimers since they differ in configuration only at C_4.

10. The H-bonds formed between the -NH group of each amino acid residue and the $>C=O$ group of the adjacent turns of the -helix help in stabilising the helix.
11. α -glucose and β -glucose differ in configuration at C-1. They Differ in optical rotation. The differ in melting point also. Such isomers differing in configuration at C-1 are called anomers.



12. i. Peptide linkage:
    The amide formed between -COOH group of one molecule of an amino acid and $-NH_2$ group of another molecule of the amino acid by the elimination of a water molecule is called a peptide linkage.



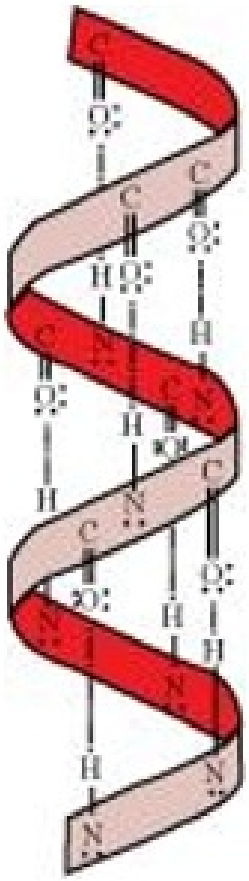
Valylalanine (Val – Ala)

ii. Primary structure: The primary structure of protein refers to the specific sequence in which various amino acids are present in it, i.e., the sequence of linkages between amino acids in a polypeptide chain. The sequence in which amino acids are arranged is different in each protein. A change in the sequence creates a different protein.

iii. Denaturation: In a biological system, a protein is found to have a unique 3-dimensional structure and a unique biological activity. In such a situation, the protein is called native protein. However, when the native protein is subjected to physical

changes such as change in temperature or chemical changes such as change in pH, its H-bonds are disturbed. This disturbance unfolds the globules and uncoils the helix. As a result, the protein loses its biological activity. This loss of biological activity by the protein is called denaturation. During denaturation, the secondary and the tertiary structures of the protein get destroyed, but the primary structure remains unaltered. One of the examples of denaturation of proteins is the coagulation of egg white when an egg is boiled.

13. Nucleotides are monomer of nucleic acid. They are made up of heterocyclic base containing nitrogen, a fine carbon sugar and a phosphate group etc. e.g. AMP, ADP. They consists of heterocyclic bases. Adenine (A), Guanine (G), Cytosine (C) Thymine (T) and uracil (u).
14. There are two common types of secondary structure of proteins: $\propto$ - Helix structure
In this structure, the $-NH$ -NH group of an amino acid residue forms H-bond with the $\rangle c=o$ group of the adjacent turn of the right-handed screw ($\propto$ -helix).

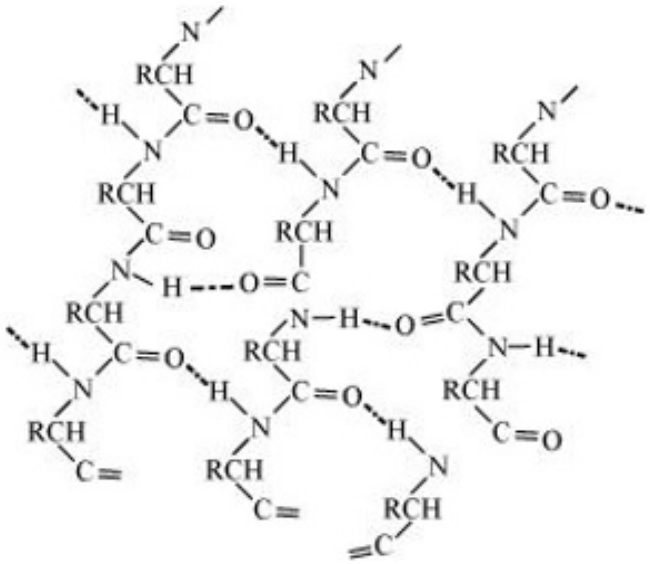


β pleated sheet structure:

β pleated sheet structure:

This structure is called so because it looks like the pleated folds of drapery. In this

structure, all the peptide chains are stretched out to nearly the maximum extension and then laid side by side. These peptide chains are held together by intermolecular hydrogen bonds.



i. $\propto$ -helix structure

ii. β pleated sheet structure

15. i. Co-enzymes: Prosthetic groups which get attached to enzymes at the time of reaction are called co-enzyme. They increase the activity of enzymes.

ii. Mutation in biomolecules: A Difference of a single base in DNA molecule can cause change in amino acid sequence which leads to mutation.

iii. Nucleotides: They are monomers of nucleic acids. They consist of heterocylic base. Pentose sugar and phosphoric acid residues.

Function of carbohydrate:

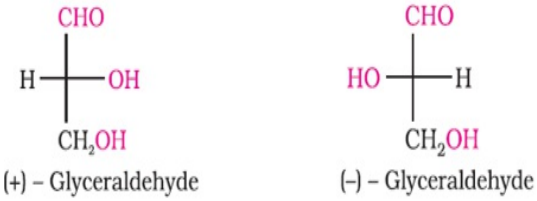
i. They act as biofuel.

ii. Cellulose forms cell wall of the plants.

CBSE Test Paper-02

Class - 12 Chemistry (Biomolecules)

1. Zwitter ionic form of amino acids behave like
   a. cation
   b. anion
   c. dipolar ion
   d. non – polar molecule
2. Choose the appropriate answer(s) for the below representation from the options given



   a. Stereo isomers
   b. Dextro and laevo rotatory molecules
   c. Enantiomers
   d. All of these
3. ATP is
   a. Adrnosine
   b. Nucleoside
   c. Nucleotide
   d. Cytosine
4. Commercially glucose is obtained by
   a. hydrolysis of sucrose
   b. boiling sucrose with dilute HCl or H_2SO_4 in alcoholic solution
   c. hydrolysis of starch by boiling it with dilute H_2SO_4 at 393 K under pressure.
   d. crushing ripe grapes
5. Reducing sugars are
   a. all monosaccharides
   b. All of these
   c. those carbohydrates which reduce Tollen's reagent
   d. those carbohydrates which reduce Fehling’s solution

6. Name the purines present in DNA.
7. Name different bases present in (i) DNA (ii) RNA
8. Deficiency of which vitamin causes night-blindness.
9. Glucose or sucrose are soluble in water but cyclohexane or benzene (simple six membered ring compounds) are insoluble in water. Explain.
10. When is a protein said to be denatured?
11. What do you understand by secondary structure of proteins?
12. Enumerate the reactions of D-glucose which cannot be explained by its open chain structure.
13. Give a diagrammatic representation of protein structure (two subunits of two types in quaternary structure).
14. How are harmones and vitamins different in respect of their sources and functions?
15. How do you explain the absence of aldehyde group in the pentaacetate of D-glucose?

CBSE Test Paper-02

Class - 12 Chemistry (Biomolecules)

Solutions

1. (c) dipolar ion

   Explanation: 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 group) groups in the same molecule. In aqueous solution, the carboxyl group can lose a proton and amino group can accept a proton, giving rise to a dipolar ion known as zwitter ion. This is neutral but contains both positive and negative charges.
2. (d) All of these

   Explanation: Glyceraldehyde has one chiral centre (the asymmetric C) and has two enantiomers as we can see they are mirror images of each other. Stereoisomers of a compound are those isomers of the compound which have same molecular formula but different spatial arrangements of their atoms in space. So these compounds are stereoisomers. These compounds are dextrorotatory (+) isomer and laevorotatory (-) isomers as one rotates the path of light in right direction whereas the other rotates in left direction.
3. (c) Nucleotide

   Explanation: When nucleoside is linked to phosphoric acid at 5'-position of sugar moiety, we get a nucleotide. ATP (Adenosine triphosphate) is nucleotide of adenosine with 3 phosphoric acid molecules.
4. (c) hydrolysis of starch by boiling it with dilute H_2SO_4 at 393 K under pressure.

   Explanation: Commercially glucose is obtained by hydrolysis of starch by boiling it with dilute H_2SO_4 at 393 K under pressure (2-3 atm).

   $(C_6H_{10}O_5)_n + nH_2O \rightarrow nC_6H_{12}O_6$
5. (b) All of these

   Explanation: All those carbohydrates which reduce Fehling's solution and Tollens' reagent are referred to as reducing sugars. All monosaccharides whether aldose or ketose are reducing sugars.

6. Adenine and Guanine.

7. Bases present in DNA - Thyamine (T), Adenine (A), Guanine (G), Cytosin (C) and in RNA are uracil (U), Adenine (A), Cytosine (C) and Guanine (G).

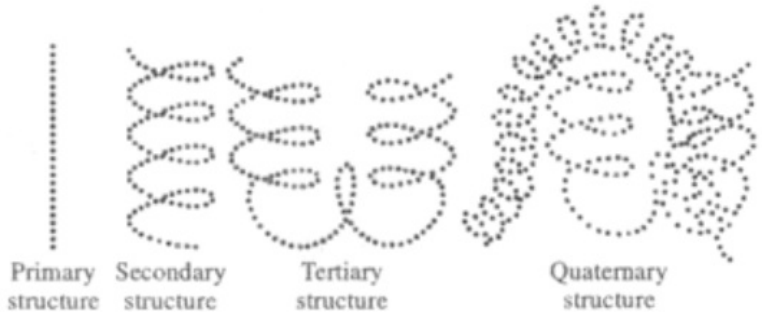
8. Vitamin A

9. A glucose molecule contains five -OH groups while a sucrose molecule contains eight -OH groups. Thus, glucose and sucrose undergo extensive H-bonding with water. Hence, these are soluble in water.
   But cyclohexane and benzene do not contain -OH groups. Hence, they cannot undergo H-bonding with water and as a result, are insoluble in water.

10. When 2° and 3° structure of protein is destroyed by changing pH or in temperature protein is said to be denatured.

11. The secondary structure of protein refers to the shape in which a long polypeptide chain can exist arising due to regular folding of the backbone of poly peptide chain due to hydrogen bonding between > C = O and - N –H group of poly peptide chain.

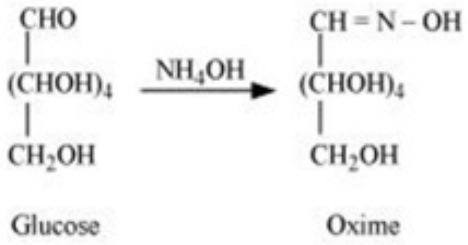
12. (1) Aldehydes give 2, 4-DNP test, Schiff's test, and react with $NaHSO_4$ to form the hydrogen sulphite addition product. However, glucose does not undergo these reactions.
    (2) The pentaacetate of glucose does not react with hydroxylamine. This indicates that a free -CHO group is absent from glucose.
    (3) Glucose exists in two crystalline forms -$\propto and \beta$. The form (m.p. = 419 K) crystallises from a concentrated solution of glucose at 303 K and the β form (m.p = 423 K) crystallises from a hot and saturated aqueous solution at 371 K. This behavior cannot be explained by the open chain structure of glucose.

13. 

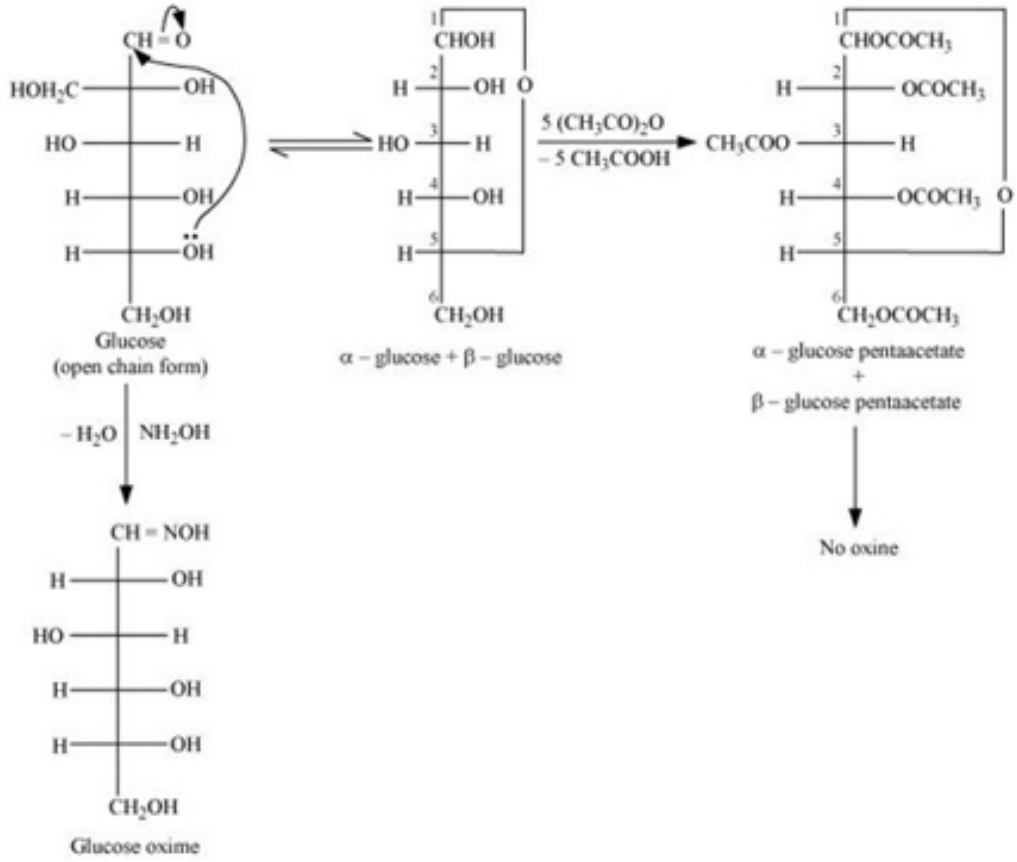
14. Hormones are secreted by endocrine glands I.e. ductless glands. They have specific

biological function. They are responsible for growth and development and various metabolic activities of living organisms. There is no external source of hormones except biological. Vitamins are complex compounds obtained from fruits and vegetables. They can't be synthesised inside the body.

15. D-glucose reacts with hydroxylamine NH_2OH to form an oxime because of the presence of aldehydic (-CHO) group or carbonyl carbon. This happens as the cyclic structure of glucose forms an open chain structure in an aqueous medium, which then reacts with NH_2OH to give an oxime.



But pentaacetate of D-glucose does not react with NH_2OH. This is because pentaacetate does not form an open chain structure.



CBSE Test Paper-03

Class - 12 Chemistry (Biomolecules)

1. The monomeric unis of starch is / are:
   a. Mannose
   b. Glucose and Fructose
   c. Glucose
   d. Fructose
2. D – ribose and 2 – deoxy – D – ribose are
   a. vitamins
   b. hexose sugars
   c. nucleic acids
   d. pentose sugars
3. Which of the following is not present in DNA?
   a. Adenine
   b. Thymine
   c. Uracil
   d. Guanine
4. Building unit of a protein is
   a. β – Aminoacid
   b. λ – Aminoacid
   c. γ– Aminoacid
   d. α– Aminoacid
5. The cyclic form of fructose is called
   a. Fructofuranose
   b. Pyran
   c. Furan
   d. Pyranose
6. What are the three components of nucleic acids?
7. What is the biological effect of denaturation of proteins?
8. Write functional differences between RNA & DNA.

9. What are essential and non-essential amino acids? Give two examples of each type.
10. What are nucleotides?
11. What are vitamins? Deficiency of which vitamin causes convusious?
12. What happens when D-glucose is treated with the following reagents
    i. HI
    ii. Bromine water
    iii. HNO_3
13. How are carbohydrates classified?
14. How are polymers classified on the basis of forces operating between their molecules? To which of these classes does nylon-6, 6 belong?
15. a. Answer the following question briefly:
        i. What are any two food sources of vitamin A?
        ii. What are nucleotides?
    b. How are carbohydrate classified?

CBSE Test Paper-03

Class - 12 Chemistry (Biomolecules)

Solutions

1. (c) Glucose
   Explanation: Starch is a polymer of α-glucose.
2. (d) pentose sugars
   Explanation: Two aldopentoses viz. D-ribose and 2-deoxy-D-ribose are present in nucleic acids.
3. (c) Uracil
   Explanation: DNA contains four bases viz. adenine (A), guanine (G), cytosine (C) and thymine (T). So Uracil is not present in DNA.
4. (d) α– Aminoacid
   Explanation: Proteins are the polymers of α-amino acids. So building unit of a protein is α – Aminoacid.
5. (a) Fructofuranose
   Explanation: Cyclic form of fructose is called Fructofuranose. The ring, thus formed is a five membered ring and is named as furanose with analogy to the compound furan. Furan is a five membered cyclic compound with one oxygen and four carbon atoms.
6. The three components of nucleic acid are base, sugar and phosphate group..
7. On denaturation, protein globules unfold and unhelix gets uncoiled and protein looses its biological activity.
8. DNA is very important for passing of hereditary information from one generation to other. In RNA, protein synthesis takes place.
9. Essential amino acids are required by the human body, but they cannot be synthesised in the body. They must be taken through food. For example: valine and leucine.
   Non-essential amino acids are also required by the human body, but they can be synthesised in the body. For example: glycine, and alanine

10. Nucleotides are monomer of nucleic acid. They are made up of a heterocyclic base containing nitrogen, a five carbon sugar and a phosphate group, e.g. AMP (Adenosine monophosphate).

11. Vitamin are complex organic compounds which are essential for normal maintenance of optimum growth and health of the organism. Their deficiency diseases. Deficiency of vitamin B cause convulsion.

12. i. $$\underset{\text{D - Glucose}}{\begin{array}{l}\text{CHO}\\|\\(\text{CHO})_4\\|\\\text{CHO}\end{array}} + \text{HI} \rightarrow \text{CH}_3\text{ - }\text{CH}_2\text{ - }\text{CH}_2\text{ - }\text{CH}_2\text{ - }\text{CH}_2\text{ - }\text{CH}_3$$

ii. $$\underset{\text{D - Glucose}}{\begin{array}{l}\text{CHO}\\|\\(\text{CHO})_4\\|\\\text{CHO}\end{array}} \xrightarrow{Br_2\,water} \underset{\text{Gluconic acid}}{\begin{array}{l}\text{COOH}\\|\\(\text{CHOH})_4\\|\\\text{CH}_2\text{OH}\end{array}}$$

iii. $$\underset{\text{D - Glucose}}{\begin{array}{l}\text{COOH}\\|\\(\text{CHOH})_4\\|\\\text{CH}_2\text{OH}\end{array}} + HNO_3 \rightarrow \underset{\text{Saccharic acid}}{\begin{array}{l}\text{COOH}\\|\\(\text{CHOH})_4\\|\\\text{COOH}\end{array}}$$

13. On the basis of hydrolysis carbohydrates are classified into three clauses:
    i. Monosaccharides : example - glucose, fructose.
    ii. Disaccharides: example - maltose, sucrose
    iii. Polysaccharides: example - starch, glycogen.
14. Polymers are classified in the following four subgroups on the basis of magnitude of intermolecular forces present in them.
    i. **Elastomers.** The polymer chains are held together by weakest intermolecular forces.
    Example - Buna - S, Buna-N, Neoprene.
    ii. **Fibres.** They have strong forces of attraction. Example - Polyamides, (Nylon 6, 6), polyesters.
    iii. **Thermoplastics.** They are long chain molecules capable of repeatedly softening on slight heating and hardening on cooling. Example - Polythene, polystyrene.
    iv. **Thermosetting.** They do not become soft on heating and cannot be remoulded. Example - Bakelite.

Nylon-6, 6 belongs to fibres.

15. a. i. Carrot and cod liver oil.
    ii. Nucleotides are monomers of nucleic acids. They consist of heterocyclic base, pentose sugar and phosphoric acid reside.
    b. Carbohydrate are classified as:
        i. Monosacchrides
        ii. Oligosaccharides
        iii. Polysacchrides.