JAGRAN Josh
Simplifying Test Prep

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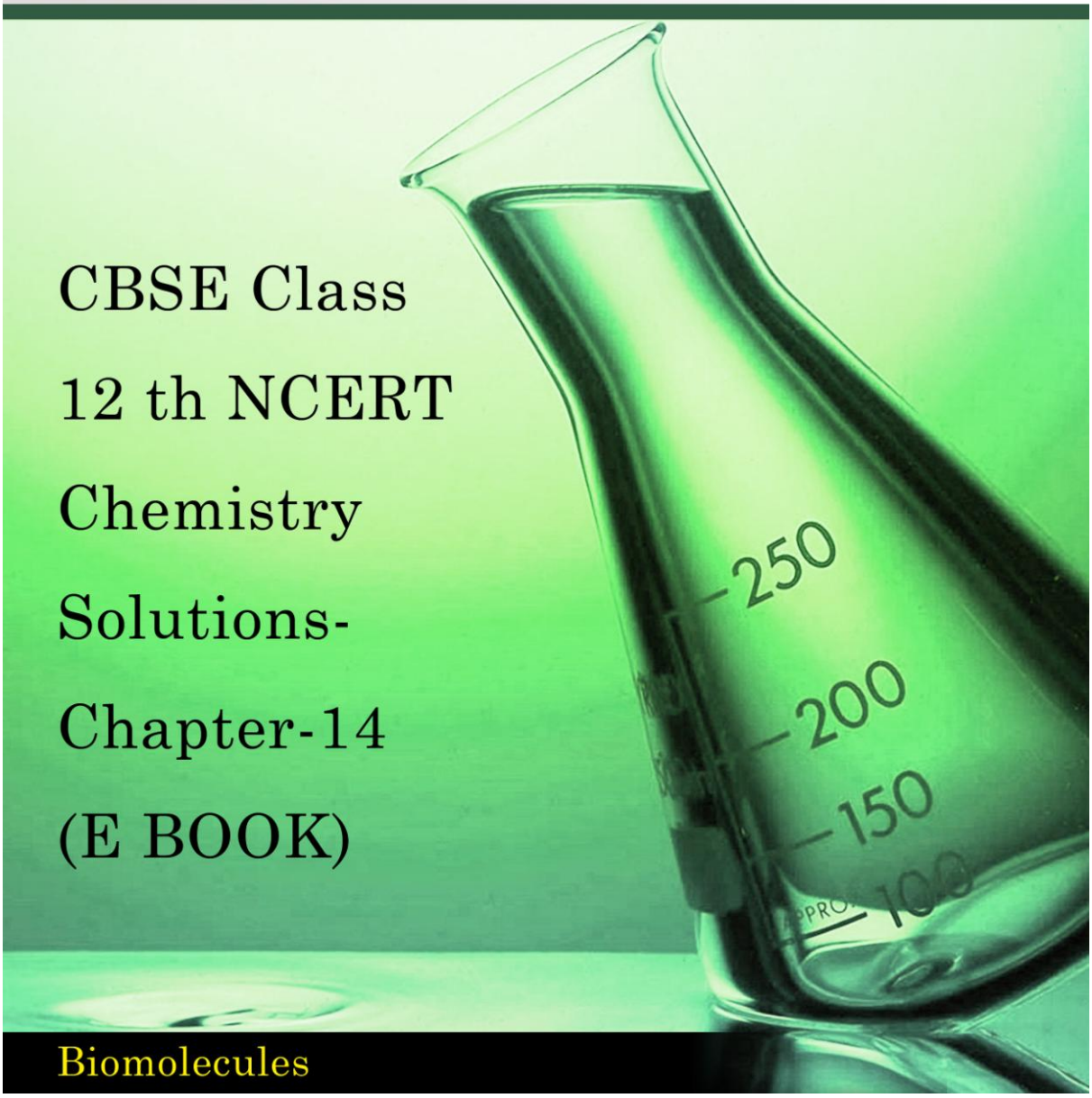


Preface

This e-book is prepared by the CBSE board exam experts of jagranjosh.com, an online educational portal of Dainik Jagran.

The purpose of providing solutions for CBSE class 12th Science and Mathematics NCERT book is to explain the questions in an easy way and as per the CBSE marking scheme. This is a product exclusively for CBSE class 12th students which acts as a time-saver by providing a pattern for the solutions of NCERT based questions as per the CBSE curriculum. This document help to build a strong concept on the chapter mentioned in here and hence the students have been guided in the most appropriate way for their board examination

Chapter-14
Biomolecules
Class-XII
Subject-Chemistry

14.1 What are monosaccharide?

Answer 14.1

Monosaccharide:

These are the simpler carbohydrates which cannot be hydrolysed further to its constituent aldehyde or ketone.

Classification of monosaccharide's on the basis of number of carbon atoms and the functional group: -

a) Monosaccharide's containing an aldehyde group are known as aldoses & those containing a keto group are known as ketoses.
b) On the basis of number of carbon atoms Monosaccharide's contain, they are further classified as trioses, tetroses, pentoses, hexoses, and heptoses.

14.2 What are reducing sugars?

Answer 14.2

Reducing sugars are carbohydrates which can reduce Fehling's solution and Tollen's reagent. Except sucrose, all monosaccharides and disaccharides are reducing sugars.

14.3 Write two main functions of carbohydrates in plants.

Answer 14.3

Two main functions of carbohydrates in plants are:

Cellulose is used to build the cell wall.

(i) Starch acts as storage molecules.

14.4 Classify the following into monosaccharides and disaccharides.
Ribose, 2-deoxyribose, maltose, galactose, fructose and lactose

Answer 14.4

Monosaccharide's: Ribose, 2-deoxyribose, galactose, fructose

Disaccharides: Maltose, lactose

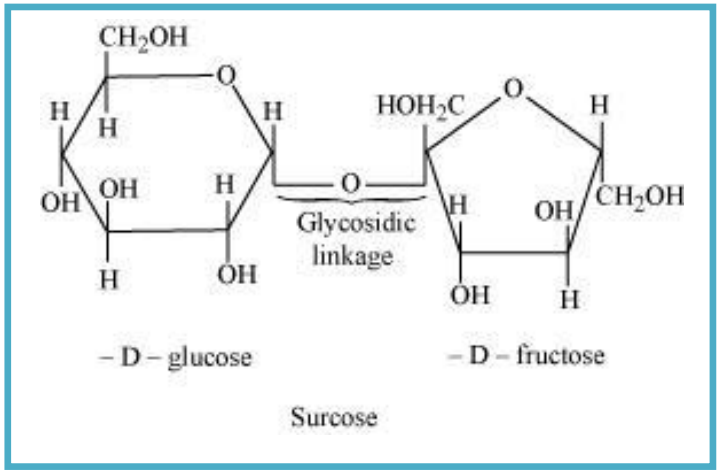
14.5 What do you understand by the term glycosidic linkage?

Answer 14.5

Glycosidic linkage:

It is the linkage formed between two monosaccharide units through an oxygen atom with the loss of a water molecule.

For example: Sucrose molecule



14.6 What is glycogen? How is it different from starch?

Answer 14.6

Both glycogen & starch are carbohydrates.

Starch is composed of two components − amylose (15 − 20%) and amylopectin (80 − 85%).

Glycogen is a polysaccharide & is present in animals. In animals, carbohydrates are stored as glycogen. It consists of only one component whose structure is similar to amylopectin. Glycogen is more branched than amylopectin.

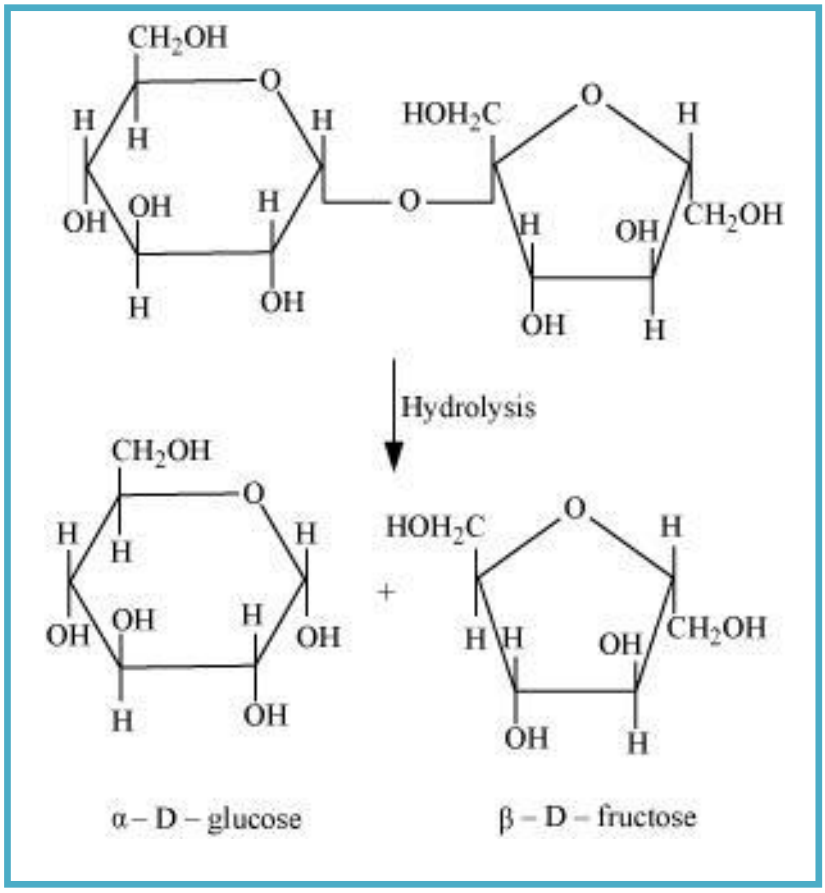
14.7 What are the hydrolysis products of?

(i) Sucrose

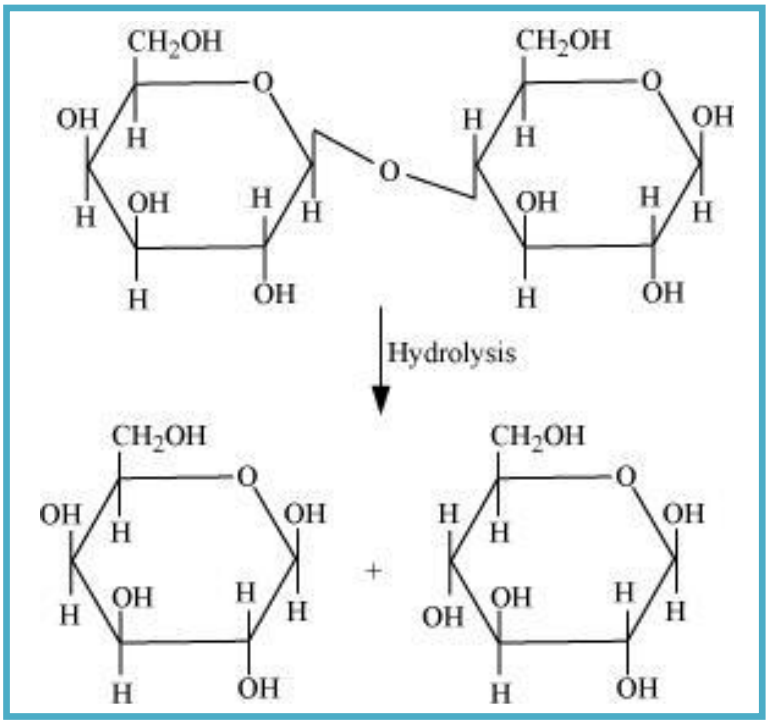
(ii) Lactose

Answer 14.7

(i) On hydrolysis, sucrose gives one molecule of ∝-D glucose and one molecule of β- D-fructose.



(ii) The hydrolysis of lactose gives β-D-galactose and β-D-glucose.

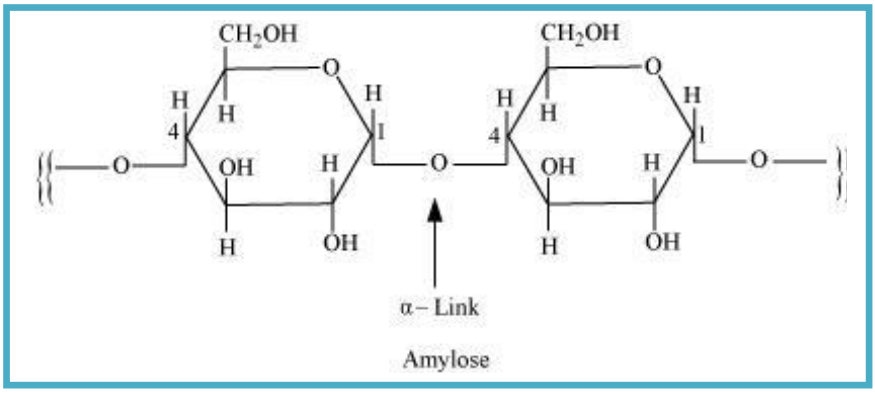


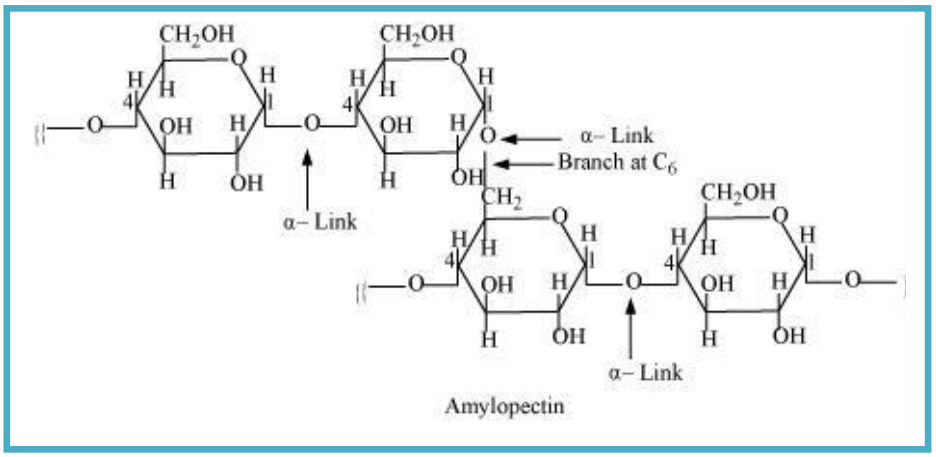
14.8 What is the basic structural difference between starch and cellulose?

Answer 14.8

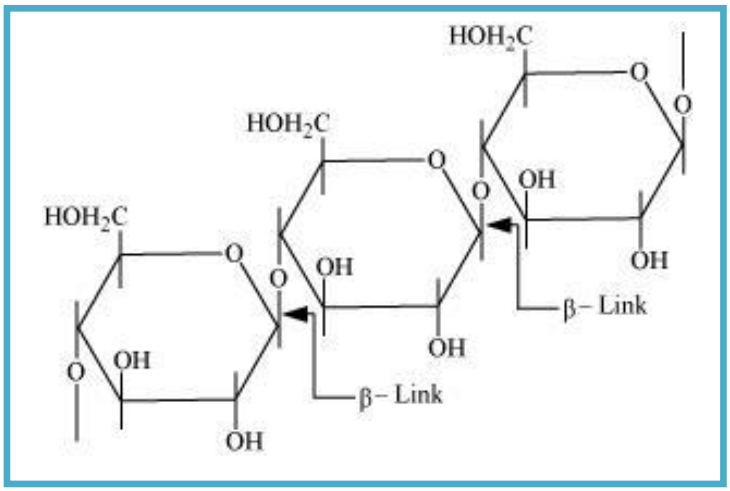
Starch: It consists of two components − amylose and amylopectin

- Amylose is a long linear chain of ∝−D−(+)−glucose units which joins at C1 & C4 position, forming glycosidic linkage (∝-link).
- Amylopectin is a branched-chain polymer of ∝-D-glucose units. In this, chain is further extended by C1 & C4 position, forming glycosidic linkage and the branching takes place at C1 & C6 position.





Cellulose: It is a straight-chain polysaccharide of β-D-glucose units which joins at C1−C4 & forms glycosidic linkage (β-link).



14.9 What happens when D-glucose is treated with the following reagents?

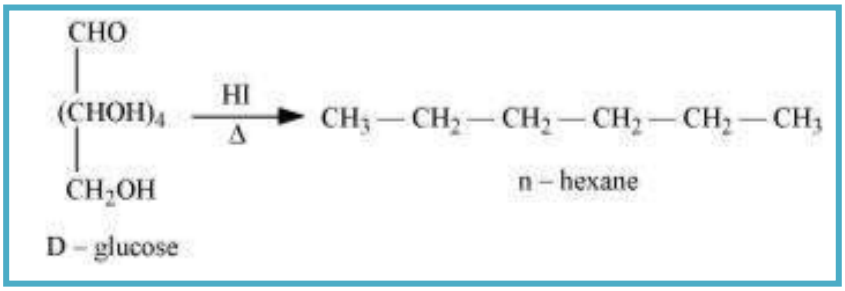
(i) HI

(ii) Bromine water

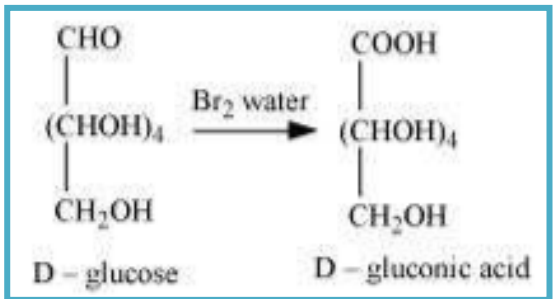
(iii) HNO_3

Answer 14.9

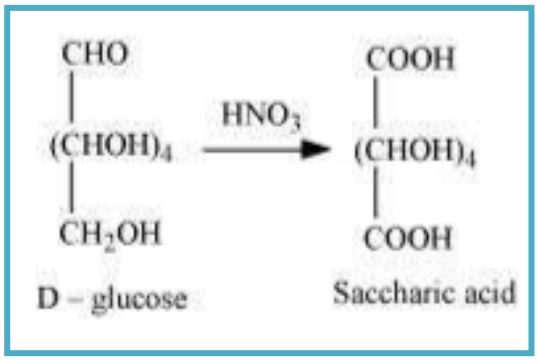
(i) When D-glucose is heated with HI for long time, n-hxane is formed.



(ii) When D-glucose is treated with Br water, D- gluconic acid is formed.



(iii) On being treated with HNO_3, D-glucose gets oxidised to give saccharic acid.



14.10 Enumerate the reactions of D-glucose which cannot be explained by its open chain structure.

Answer 14.10

Glucose exists in two crystalline forms − ∝ and β. The ∝-form crystallises from a concentrated solution of glucose at 303 K and the β-form crystallises from a hot and saturated aqueous solution at 371 K.

This behaviour cannot be explained by the open chain structure of glucose.

a) Aldehydes give Schiff's test, 2, 4-DNP test.

Glucose does not undergo these reactions.

b) Aldehydes react with $NaHSO_4$ to form the hydrogen sulphite addition product.

Glucose does not undergo these reactions.

c) The pentaacetate of glucose does not react with hydroxylamine. This indicates that a free −CHO group is not present in glucose.

14.11 What are essential and non-essential amino acids? Give two examples of each type.

Answer 14.11

Essential amino acids: These amino acids are essential for the human body, but they cannot be synthesised in the body. Thus, their requirement should be completed through food. For Example: Leucine & Valine.

Non-essential amino acids: These amino acids can be synthesised in the body. They are also important for the human body. For example: Alanine & Glycine.

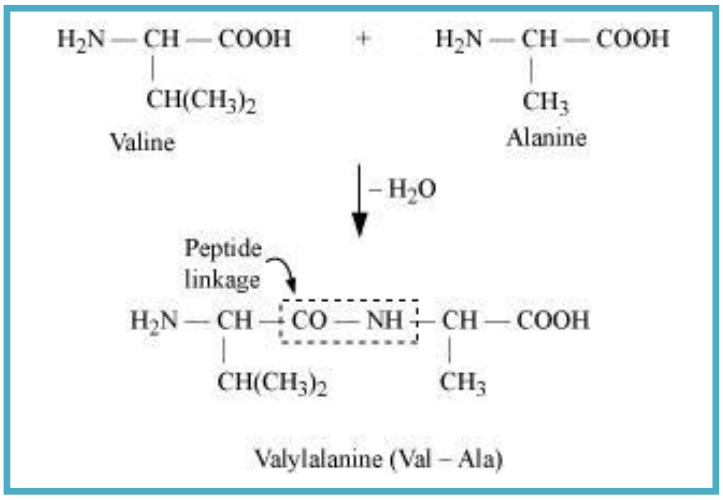
14.12 Define the following as related to proteins

(i) Peptide linkage
(ii) Primary structure
(iii) Denaturation

Answer 14.12

(i) **Peptide linkage:**

When −COOH group of one molecule of an amino acid and $-NH_2$ group of another molecule of the amino acid is reacted, amide is formed. In this reaction, elimination of a water molecule takes place. This linkage is known as a peptide linkage.



(ii) **Primary structure:**

It is a specific sequence of linkages between amino acids in a polypeptide chain. Different sequences are present in different proteins. Any change in the sequence creates a different protein.

(iii) **Denaturation:**

Protein has is a unique 3-dimensional structure and a unique biological activity. In such condition, it is active & takes part in reactions, & is known as native protein. However, when the native protein is subjected to physical changes such as change in temperature or chemical changes such as its H-bonds are disturbed, change in pH. These activities disturb the structure of protein. As a result, unfolding of the globules takes place which uncoils the helix. In this form, the protein loses its biological activity. This loss of biological activity by the protein is known as denaturation.

Denaturation destroys the secondary and the tertiary structures of the protein, but it does not alter the primary structure. For example: Coagulation of egg white when an egg is boiled.

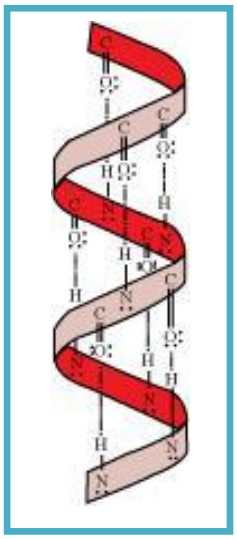
14.13 What are the common types of secondary structure of proteins?

Answer 14.13

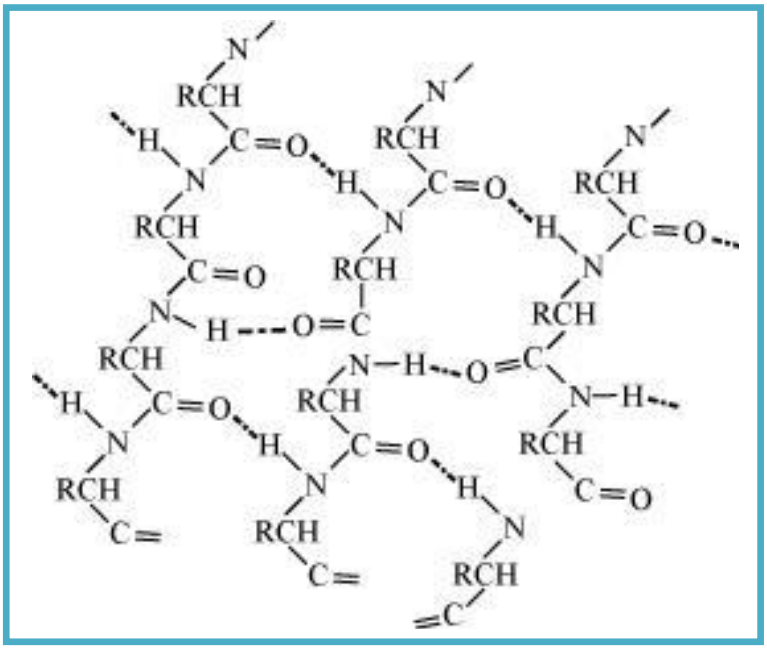
Two common types of secondary structure of proteins: -

(i) ∝-helix structure
(ii) β-pleated sheet structure

∝- **Helix structure:** In this structure, the −NH group of an amino acid forms hydrogen bond with the –CO– group of the adjacent turn of the right-handed screw (∝-helix).



β- **Pleated sheet structure:** In this structure, all the peptide chains are stretched out to the maximum extension possible and then lay side by side. These peptide chains are held together by intermolecular hydrogen bonds. This structure looks like the pleated folds of drapery. Thus, it is known as β-pleated sheet structure.



14.14 What type of bonding helps in stabilising the ∝-helix structure of proteins?

Answer 14.14

The hydrogen bonds formed between the −NH group of each amino acid & the -CO- group of the adjacent turns of the ∝-helix help in stabilising the helix.

14.15 Differentiate between globular and fibrous proteins.

Answer 14.15

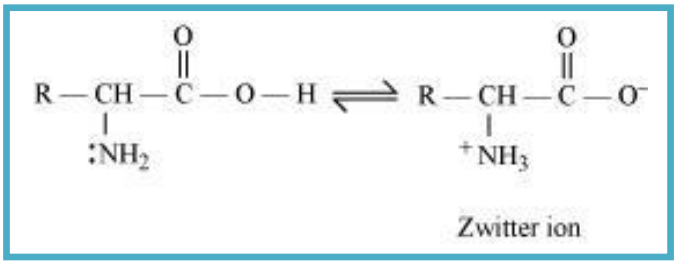
Fibrous protein	Globular protein
It has a fibre-like structure. These proteins are held together by strong hydrogen and disulphide bonds.	In this protein, polypeptide chain is folded around itself, results in a spherical structure.
They are generally responsible for structural purposes. For example, myosin is present in muscles; keratin is present in nails and hair.	All enzymes come in this category of proteins. Some hormones are also globular proteins for example- insulin.
It is insoluble in water.	It is soluble in water.

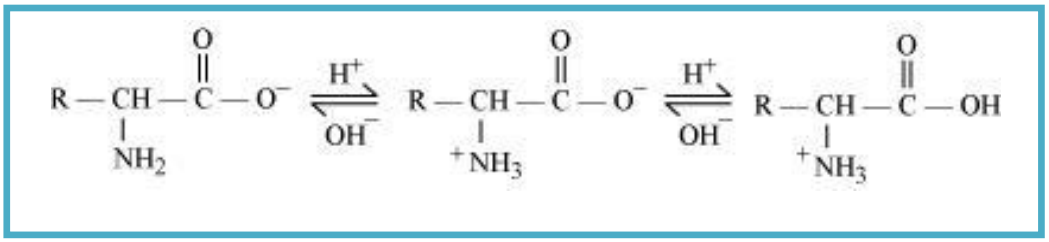
14.16 How do you explain the amphoteric behaviour of amino acids?

Answer 14.16

In aqueous solution, amino acid forms zwitter ion. Carboxyl group of an amino acid can lose a proton and the amino group can accept a proton, forms a dipolar ion known as zwitter ion.

In zwitter ionic form, amino acids can act both as an acid and base.





Hence, we can say that, amino acids show amphoteric behaviour.

14.17 What are enzymes?

Answer 14.17

Enzymes: They are proteins which catalyse biological reactions. They are very specific in nature and catalyse only a particular reaction for a particular substrate.

They are usually named after the particular substrate or class of substrate and sometimes after the particular reaction. For example: The enzyme used to catalyse the hydrolysis of maltose into glucose is named after sugar maltose, as maltase.

$$\underset{\text{Maltose}}{C_{12}H_{22}O_{11}} \xrightarrow{\text{Maltase}} \underset{\text{Glucose}}{2C_6H_{12}O_6}$$

14.18 What is the effect of denaturation on the structure of proteins?

Answer 14.18

Denaturation destroys the secondary and the tertiary structures of the protein, but it does not alter the primary structure. During denaturation, secondary and tertiary-structured proteins get converted into primary-structured proteins. When their secondary and tertiary structures of are destroyed, the enzyme loses its activity.

14.19How are vitamins classified? Name the vitamin responsible for the coagulation of blood.

Answer 14.19

On the basis of their solubility in water or fat, vitamins are classified into two groups.

(i) Fat-soluble vitamins: - Vitamins which are soluble in fat and oils, but not in water, are known as fat-soluble vitamins. For example- Vitamins A, D, E, and K.

(ii) Water-soluble vitamins: Vitamins which are soluble in water are known as water-soluble vitamins. For example- vitamin B & C.

Vitamin K is responsible for the coagulation of blood.

14.20 Why are vitamin A and vitamin C essential to us? Give their important sources.

Answer 14.20

Vitamin	Deficiency
Vitamin A	Xerophthalmia (hardening of the cornea of the eye). It leads to night blindness
Vitamin C	scurvy (bleeding gums)

Thus, we can say that, vitamin A & C are essential to us. The sources of vitamin A & C are:

Vitamins	Sources
Vitamin A	fish liver oil, carrots, butter, and milk
Vitamin C	are citrus fruits, *amla*, and green leafy vegetables

14.21 What are nucleic acids? Mention their two important functions.

Answer 14.21

Nucleic acids:

These are the bio molecules found in the chromosomes of all living cells. These are also known as polynucleotide as they are long-chain polymers of nucleotides.

There are mainly two types of nucleic acids – DNA & RNA.

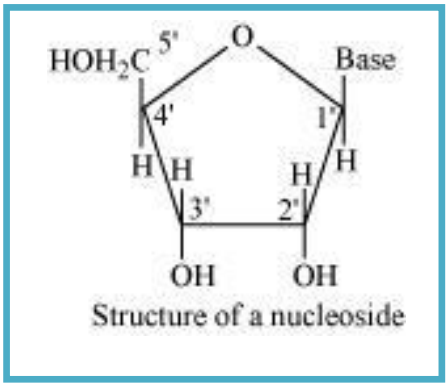
Two main functions of nucleic acids are:

(i) DNA is responsible for hereditary process.
(ii) DNA & RNA are responsible for protein synthesis in a cell.

14.22 What is the difference between a nucleoside and a nucleotide?

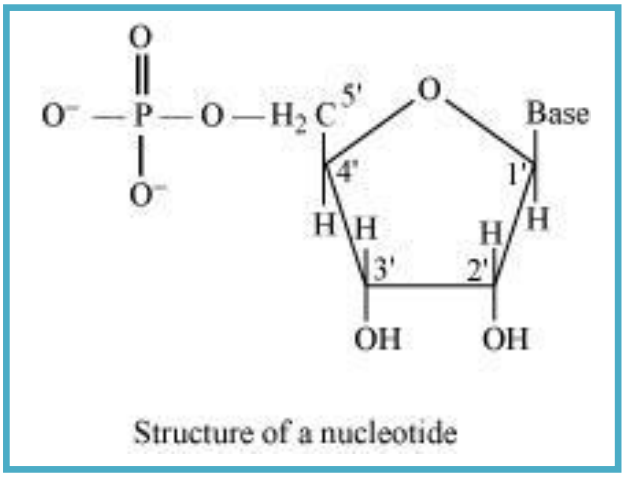
Answer 14.22

In nucleoside, base is attached to sugar at $1'$ position.



Structure of a nucleoside

On the other hand, in a nucleotide, all the three basic components of nucleic acids (i.e., pentose sugar, phosphoric acid, and base) are present.



Structure of a nucleotide

Nucleoside = Sugar + Base

Nucleotide = Sugar + Base + Phosphoric acid

14.23 The two strands in DNA are not identical but are complementary. Explain.

Answer 14.23

DNA is present in a helical structure, in which two strands are held together by hydrogen bonds between specific pairs of bases. Bases present on strands do not form bonds with same bases like Cytosine forms hydrogen bond with guanine, while adenine forms hydrogen bond with thymine. Thus, we can say that, two strands are complementary to each other. So that bases can form bonds.

14.24 Write the important structural and functional differences between DNA and RNA.

Answer 14.24

The structural differences between DNA and RNA are: -

DNA	RNA
The sugar molecule in DNA molecules is β-D-2 deoxyribose.	The sugar molecule in RNA molecules is β-D-ribose
Here thymine (T) is present instead of uracil (U).	Here uracil (U) is present & thymine (T) is absent.
The helical structure of DNA is double-stranded.	The helical structure of RNA is single-stranded.

The functional differences between DNA and RNA are: -

DNA	RNA
DNA forms the chemical basis of heredity.	RNA is not responsible for heredity
It do not synthesise proteins, but transfer coded message for the synthesis of proteins	It takes part in protein synthesis.

in the cells.	

14.25 What are the different types of RNA found in the cell?

Answer 14.25

(i) Messenger RNA (m-RNA)
(ii) Ribosomal RNA (r-RNA)
(iii) Transfer RNA (t-RNA)