NCERT Solutions for Class 12 Chemistry

Chapter 10 – Biomolecules

Intext Questions with Solutions of Class 12 Chemistry Chapter 10 – Biomolecules

10.1

Glucose or sucrose are soluble in water but cyclohexane or benzene (simple six membered ring compounds) are insoluble in water. Explain.

📌 ***Key Points to Note***

- Glucose/sucrose: Polar, form hydrogen bonds with water
- Cyclohexane/benzene: Non-polar, cannot form hydrogen bonds

Ans – The existence of H-bonding demonstrates every compound's ability to dissolve (solubility). Since they can readily develop an H-bond using water, glucose (5 -OH units) & sucrose (8 -OH compounds) remain soluble in water. On the other hand, since they lack -OH categories, cyclohexane & benzene tend to remain insoluble in water-based components.

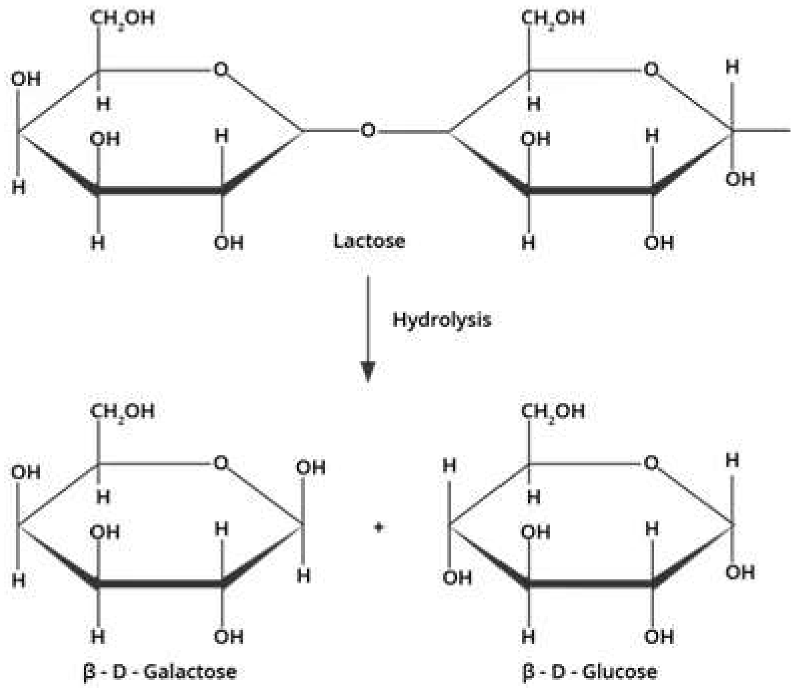
10.2

What are the expected products of hydrolysis of lactose?

📌 ***Key Points to Note***

- Lactose is a disaccharide
- Composed of glucose and galactose
- Hydrolysis breaks glycosidic bond

Ans – β-D-galactose & β-D-glucose, which are the constituents of lactose, hydrolyze to produce the identical molecules. A pair of monosaccharides – glucose and galactose, combine to form lactose, a type of disaccharide. It is represented by a chemical composition named $C_{12}H_{22}O_{11}$. The following may be demonstrated using,



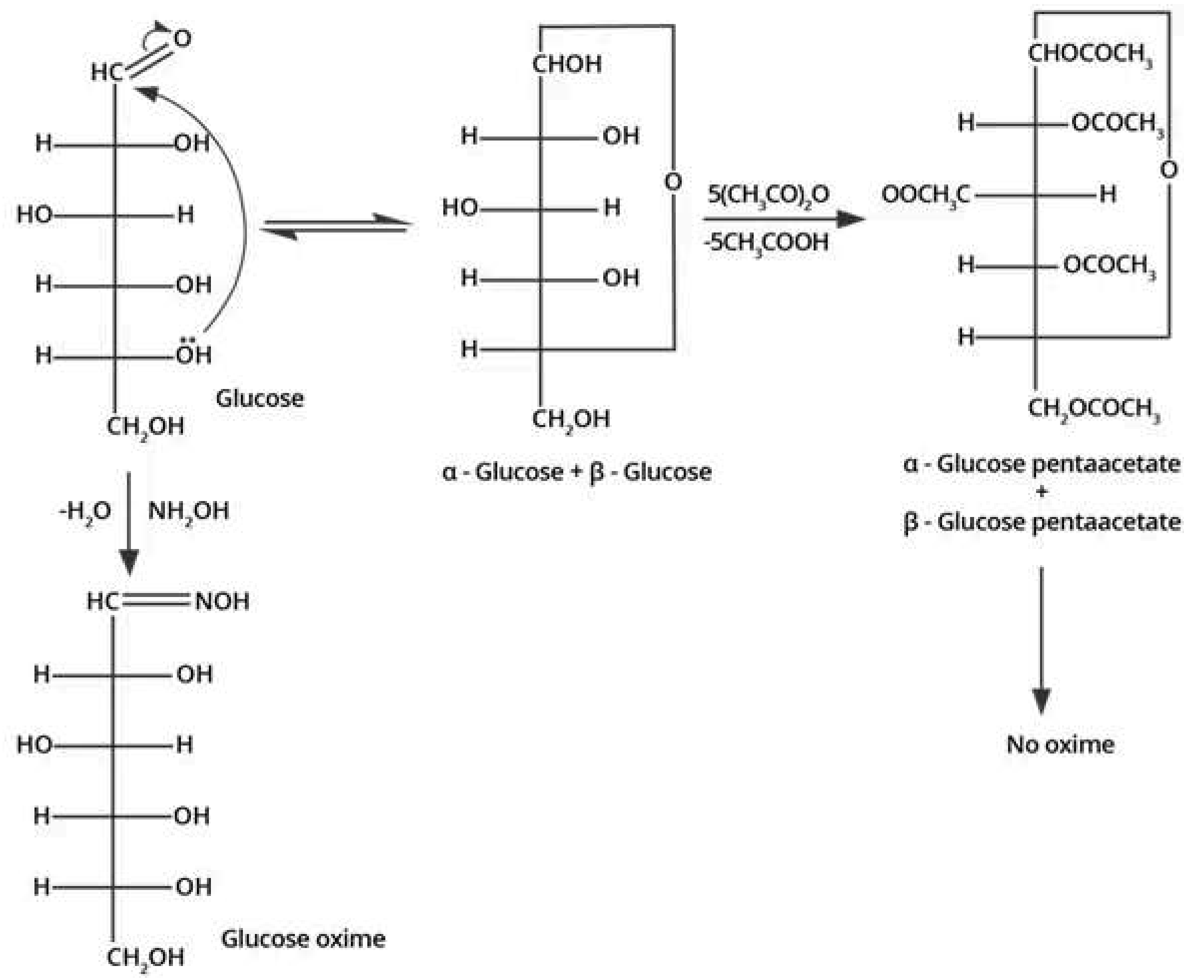
10.3

How do you explain the absence of aldehyde group in the pentaacetate of D-glucose?

📌 ***Key Points to Note***

- Formation of pentaacetate involves acylation of all –OH groups
- Glucose exists in cyclic hemiacetal form
- Acetylation converts hemiacetal into acetal, blocking ring opening

Ans – Given that D-glucose has an aldehyde component in its porous arrangement, it interacts alongside hydroxylamine (NH_2OH) to generate an oxime. On the other hand, D-glucose pentaacetate fails to interact through hydroxylamine since it does not have an open configuration. This seamlessly shows that D-glucose pentaacetate doesn't contain any aldehydic component. The below illustration serves as a justification for the above statement. It goes like this,



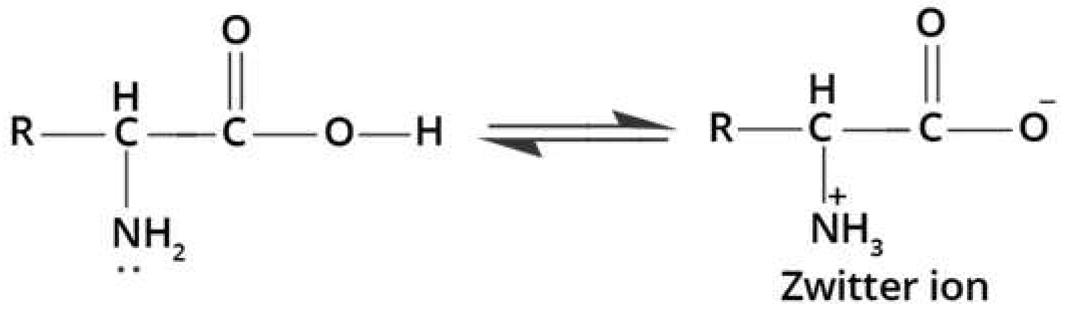
10.4

The melting points and solubility in water of amino acids are generally higher than that of the corresponding halo acids. Explain.

📌 ***Key Points to Note***

- Amino acids exist as zwitterions ($-NH_3^+$ and $-COO^-$)
- Strong ionic interactions and hydrogen bonding
- Halo acids lack zwitterionic character

Ans – Neither basic (amino) nor acidic (carboxyl) categories are present in amino acid molecules. As a result, when these substances disintegrate in water-based components, they exhibit dipolar activity leading to the production of zwitterion. Halo acidic substances, on the other hand, behave differently. Whenever the group of amino acids gains a proton while the group made up of carboxyl releases one, the zwitterion is created. This may be demonstrated by,



Because of this, amino acids possess greater melting temperatures & are more soluble in liquids as opposed to comparable halo-acidic solutions.

10.5

Where does the water present in the egg go after boiling the egg?

📌 ***Key Points to Note***

- Proteins denature and coagulate
- Water gets trapped in solid protein matrix

Ans – Whenever an egg is boiled in water in a container its globular protein molecules transform into an impermeable substance that resembles rubber material and forms a bond made of hydrogen within the egg that takes in every drop of the water that has been added. The coagulating mechanism of albumin which is commonly found in egg whites is a prime example of denaturation protein degradation in this context.
As a result, once the egg is boiled, the temperature goes up, favouring denaturation & assisting the coagulation process of protein structures. The coagulated protein molecules subsequently employ H-bonding to capture the additional liquid that was already present in the substance. This tells you why upon cooking the egg's yolk, we fail to observe any kind of water substances from above.

10.6

Why cannot vitamin C be stored in our body?

📌 ***Key Points to Note***

- Water-soluble vitamins are not stored
- Excess excreted in urine

Ans – Water-soluble compounds are not retained in the human body because they are continuously excreted through urine. Vitamin C is a water-soluble nutrient in the body so it cannot be stored.

10.7

What products would be formed when a nucleotide from DNA containing thymine is hydrolysed?

📌 ***Key Points to Note***

- Hydrolysis of nucleotide breaks phosphodiester and glycosidic bonds
- Components of nucleotide: nitrogenous base, sugar, phosphate

Ans – When a DNA nucleotide that includes thymine is broken down through hydrolysis, it produces three separate parts:

- **Thymine** – the nitrogenous base
- **Deoxyribose** – a sugar molecule
- **Phosphoric acid** – the phosphate group

Every DNA nucleotide is made of these three components. Thymine is just one of the four bases used in DNA (the others are adenine, guanine, and cytosine). So, when the bond between these parts is broken during hydrolysis, they come apart as individual molecules.

10.8

When RNA is hydrolysed, there is no relationship among the quantities of different bases obtained. What does this fact suggest about the structure of RNA?

📌 ***Key Points to Note***

- Base pairing implies equal ratios
- Random base ratios imply lack of base pairing
- RNA is mostly single-stranded

Ans – Think about the double-stranded arrangement of DNA, where the amino acids adenine & thymine constantly couple together. On the other hand, the amino acids such as cytosine & guanine continuously couple up via the bonding of hydrogen.
As a result, the amount of adenine generated upon hydrolysis is equivalent to one molecule of thymine. Likewise, the amount of cytosine is equivalent to the amount of guanine. However, there seems to be no link among the compounds that are produced whenever RNA is processed. This demonstrates that RNA has one distinct helix.

Exercise Questions with Solutions of Class 12 Chemistry Chapter 10 – Biomolecules

10.1

What are monosaccharides?

Ans – Monosaccharides are the most fundamental forms of both sugar & carbs. By burning down glucose from monosaccharides & capturing the energy generated, the majority of creatures generate and keep power. Aldose is a distinct type of monosaccharide that consists of an aldehyde. Meanwhile, ketose is a monosaccharide compound that contains a ketone substance. They can't go through further hydrolysis to produce less complicated parts. Following that, they are categorized according to the various C atomic particles: trioses, tetroses, pentoses, hexoses & heptoses. Aldoses (aldehyde) & ketoses (ketone) are examples of functional categories. Currently, a monosaccharide is called ketopentose when its structure includes five C atoms along with a ketone as being a group with functional value

10.2

What are reducing sugars?

Ans – Reducing sugars that are tiny carbs can function as reducing substances for metallic salts. They typically include a handful of sugar groups. Since these compounds oxidize aldehydes & offer a distinct colour shift following reduction, they are being continuously employed in research. Reducing sugars happens to be the carbohydrates that lower Fehling's solution along with Tollen's reagent. With the exception of sucrose, most disaccharides & monosaccharides have reduced sugars.

10.3

Write two main functions of carbohydrates in plants.

Ans – Plants employ carbohydrates to construct the combinations that they have. Instances of structures found in carbohydrates that support the continued functioning of plant cells include chitin, cellulose along hemicellulose. Plants create glucose, a straightforward sugar compound that may be employed as fuel, throughout photosynthesis. In plants, polysaccharides, or carbs, serve 2 primary purposes:

- The cell membrane is constructed from cellulose.
- A storehouse component is a starch.

10.4

Classify the following into monosaccharides and disaccharides.

Ribose, 2-deoxyribose, maltose, galactose, fructose and lactose.

📌 ***Key Points to Note***

- Monosaccharides: Ribose, 2-deoxyribose, galactose, fructose
- Disaccharides: Maltose, lactose

Ans – The most basic sugar molecules are a substance called monosaccharides while a condensation process joins two kinds of monosaccharides to make disaccharides. The following elements can be listed as,

- Monosaccharides like fructose, galactose, 2-deoxyribose & ribose.
- Lactose & maltose happen to be disaccharides.

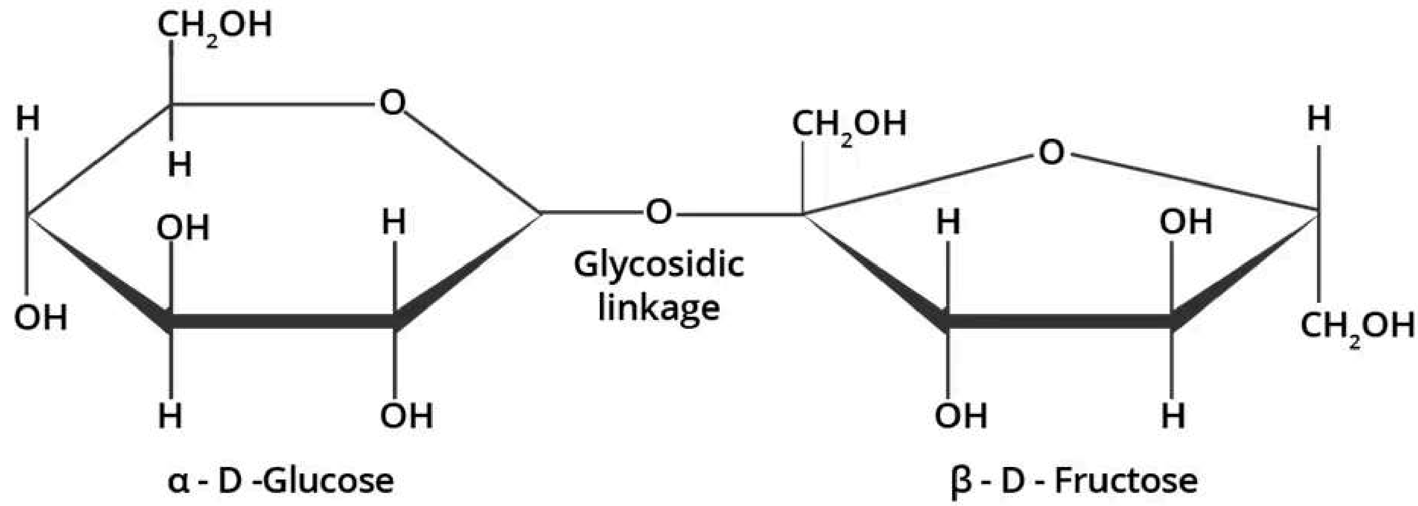
10.5

What do you understand by the term glycosidic linkage?

📌 ***Key Points to Note***

- Glycosidic linkage: Covalent bond formed between two monosaccharide units through an oxygen atom.

Ans – Glycosidic linkage denotes the bond created when 2 units of monosaccharide lose one of their water molecules and join via an oxygen atom. A condensing process that occurs between the anomeric structure of a single glucose and the hydroxyl oxygen atom located on its carbon forms a glycosidic bond. For instance, α-D-glucose along with β-D-fructose are joined by a glycosidic bond in the sucrose molecular structure. This may be demonstrated by,



Sucrose

10.6

What is glycogen? How is it different from starch?

📌 ***Key Points to Note***

- Glycogen: Storage polysaccharide in animals.
- Difference from starch:
  - Glycogen is more highly branched than starch.
  - Starch is plant storage form; glycogen is animal storage form.

Ans – Growing plants manufacture starch within their plastids, whereas mammals make glycogen in the muscles of their skeletal system & liver cell membranes. Unlike starch, which is made up of 2 distinct complicated carbohydrates (amylose & amylopectin), it is a greatly branched complicated carbohydrate containing a protein core.

While amylopectin is more commonly found & features a branching arrangement, amylose is not as prevalent & linear movement. Glycogen, a complex type of carbohydrate substance, is how carbohydrates have been well-maintained in organisms like mammals.

The 2 elements that are responsible for starch formation are a type of carbohydrate namely, amylose (about 15–20%) & amylopectin (about 80–85%). In contrast, glycogen is made up of only one element that resembles amylopectin within composition but is much more convoluted as opposed to amylopectin itself.

10.7

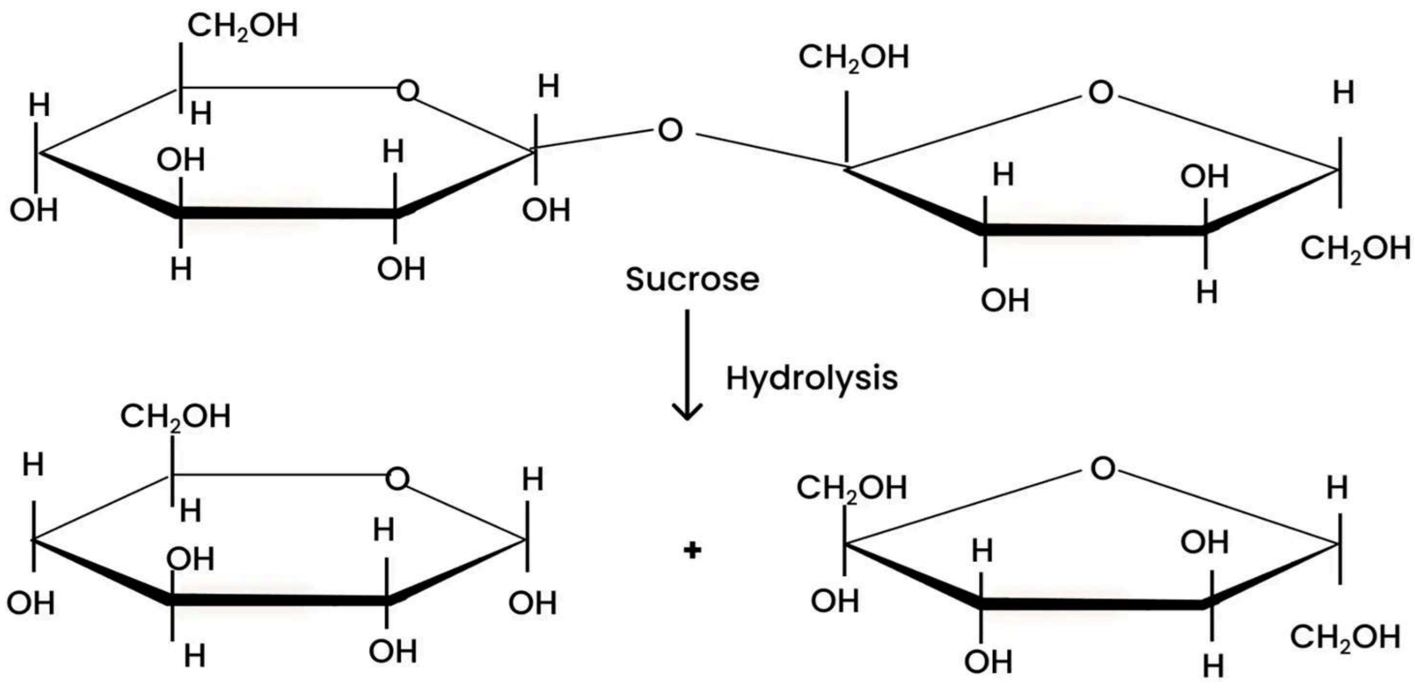
What are the hydrolysis products of

(i) sucrose and (ii) lactose?

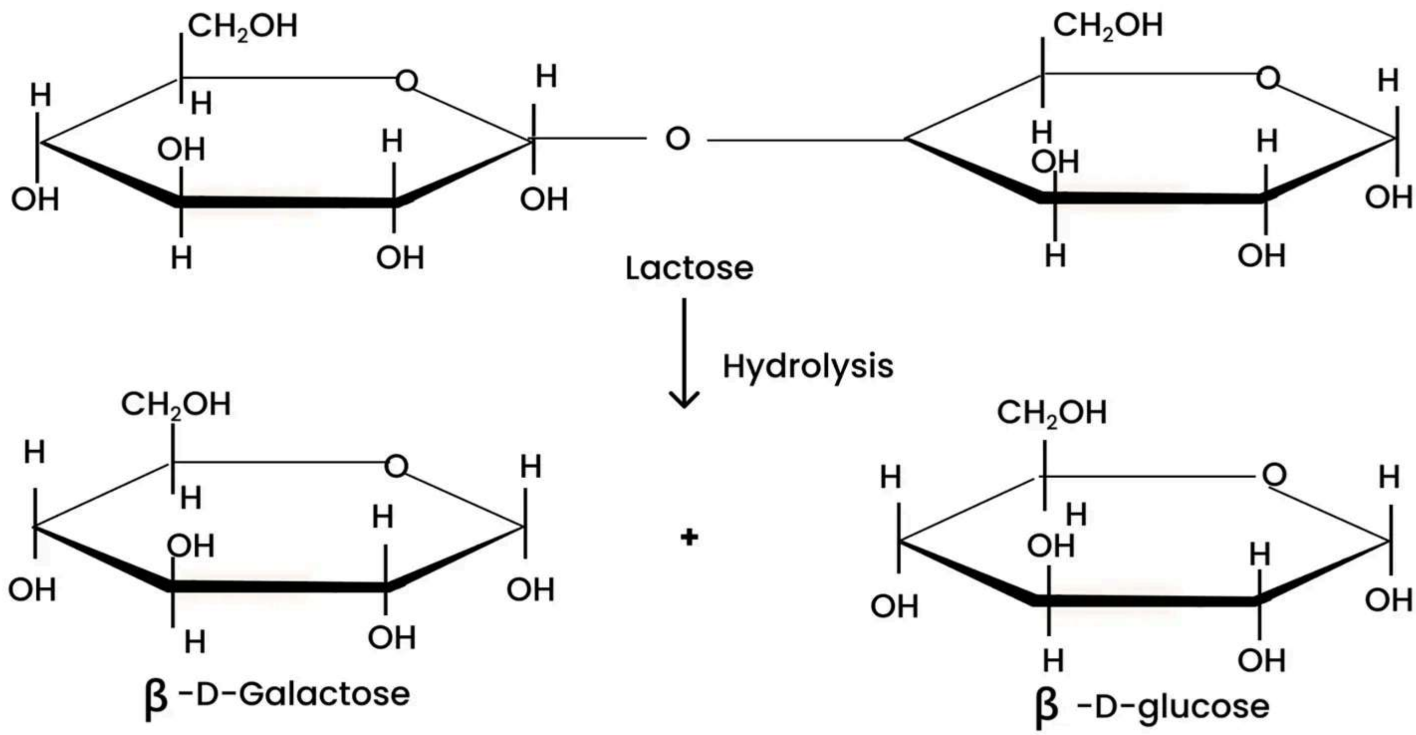
📌 ***Key Points to Note***

- Sucrose → Glucose + Fructose
- Lactose → Glucose + Galactose

Ans – (i) A single molecule of glucose along with a fructose particle combine to form sucrose, a type of disaccharide. The hydrolysis of sucrose yields identical amounts of α-D-glucose & β-D-fructose. We call this process inversion & could have been demonstrated as,



(ii) A single molecule of glucose along with a galactose molecule combine to form lactose, a kind of disaccharide. Equivalent quantities of β-D-galactose & β-D-glucose are produced whenever lactose hydrolyse. This may be demonstrated by,



10.8

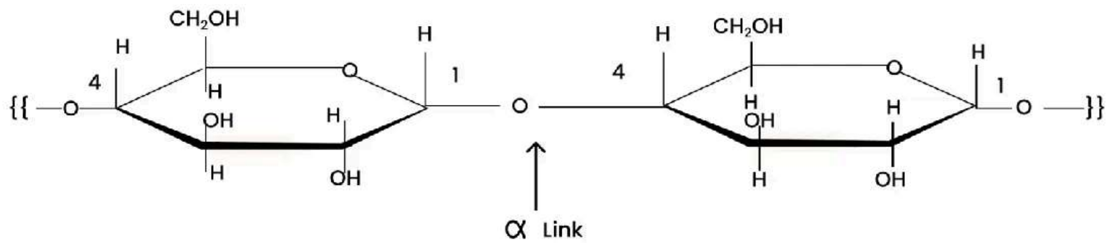
What is the basic structural difference between starch and cellulose?

📌 ***Key Points to Note***

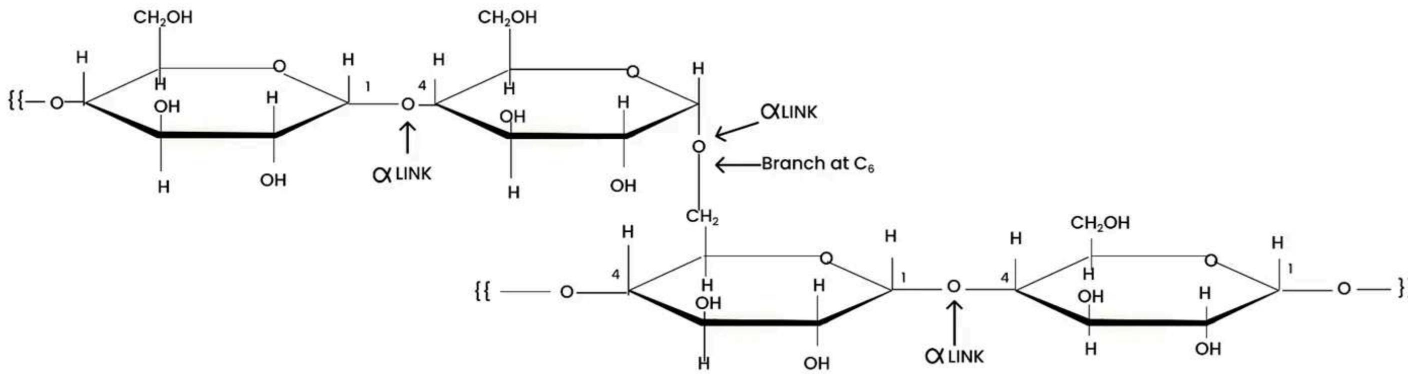
- **Starch**: Made of α-D-glucose units (α-1,4 linkages)
- **Cellulose**: Made of β-D-glucose units (β-1,4 linkages)

Ans – Starch is an intricate carbohydrate that can be preserved in plant tissues. Amylose alongside amylopectin are their two primary constituents. Amylose is an extended linear chain containing α-D-glucose components connected at locations between 1 & 4 (also known as the C1–C4 linkage) through a glycosidic bond.

A branched-chain polymeric compound of α-D-glucose monomers is amylopectin. Glycosidic bonding from C1 to C4 forms a chain & bifurcation takes place at these positions.

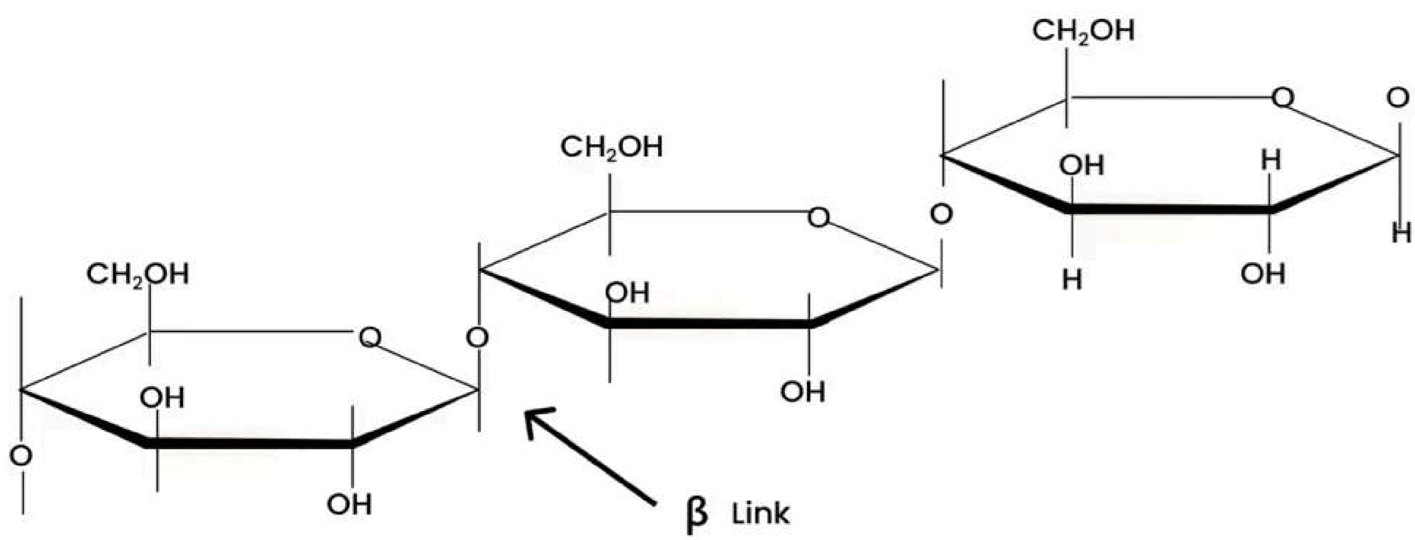


Amylose



Amylopectin

Cellulose – The fragments of cellulose, a type of glucose polymeric material, are joined by beta connections and may be spun along the center of a spine of glucose component polymer chains. This compound is an essential part of plant cells and is the largest naturally occurring organic molecule. A glycosidic bond connects the β-D-glucose molecules in this straight-chain polymer at locations 1 through 4 or C1–C4.



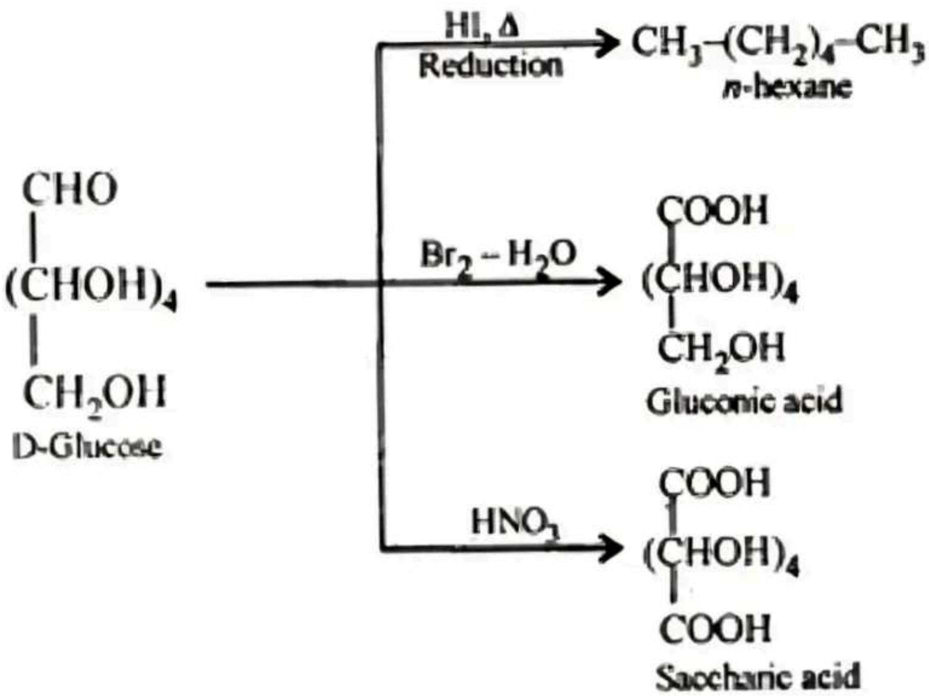
10.9

What happens when D-glucose is treated with the following reagents? (i) HI (ii) Bromine water (iii) HNO_3

📌 ***Key Points to Note***

- **HI**: Reduces glucose to n-hexane (removes all oxygen functionalities)
- **Bromine water**: Oxidizes aldehyde group to carboxylic acid → gluconic acid
- **HNO_3 (Nitric acid)**: Oxidizes both –CHO and $–CH_2OH$ groups → glucaric acid

Ans –



10.10

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

📌 ***Key Points to Note***

- Glucose forms **pentaacetate**, so it has **5 –OH groups**, but doesn't react with **hydroxylamine (NH_2OH)** or **$NaHSO_3$**, suggesting –CHO is not free.
- Glucose does not give **Schiff's test**.
- Existence of **α and β anomers** indicates a **cyclic (hemiacetal) structure**.
- Shows **mutarotation**, which cannot be explained by a straight-chain form.

Ans – Schiff's examination, the 2-DNP test along with the process that occurs with NaHSO4 to produce hydrogen sulphite that serves as an additional by product are the reactivity of D-glucose that cannot be accurately characterized because of its open framework.
Aldehydes, however, provide every single one of them whenever needed. Because there is no free-CHO band present, glucose pentaacetate has no interaction using hydroxylamine. There are 2 crystalline kinds of glucose, α & β, each of which has a different melting temperature. An open component cannot carry out the exact same functionality.

10.11

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

📌 ***Key Points to Note***

- **Essential amino acids**: Not synthesized by the body; must be obtained from diet.
- **Non-essential amino acids**: Can be synthesized by the body.
- Examples to remember:
  - Essential: Valine, Lysine
  - Non-essential: Alanine, Aspartic acid

Ans – The fundamental amino groupings (-NH2) along with carboxyl groups (-COOH) are found in amino acids, which are chemical molecules. Amino acids constitute the building blocks of protein molecules. Peptide & protein molecules constitute long sequences of amino acids that link together. The human digestive system has 2 different kinds of amino-acidic substances,

Essential amino acids:

- Although the human organism needs them, it is unable to manufacture them.
- Nutrients need to be absorbed through diet. Leucine alongside valine are some examples.

Non-essential amino acids:

- Although the human organism can create them, they additionally are necessary. Alanine alongside glycine in are few notable instances.

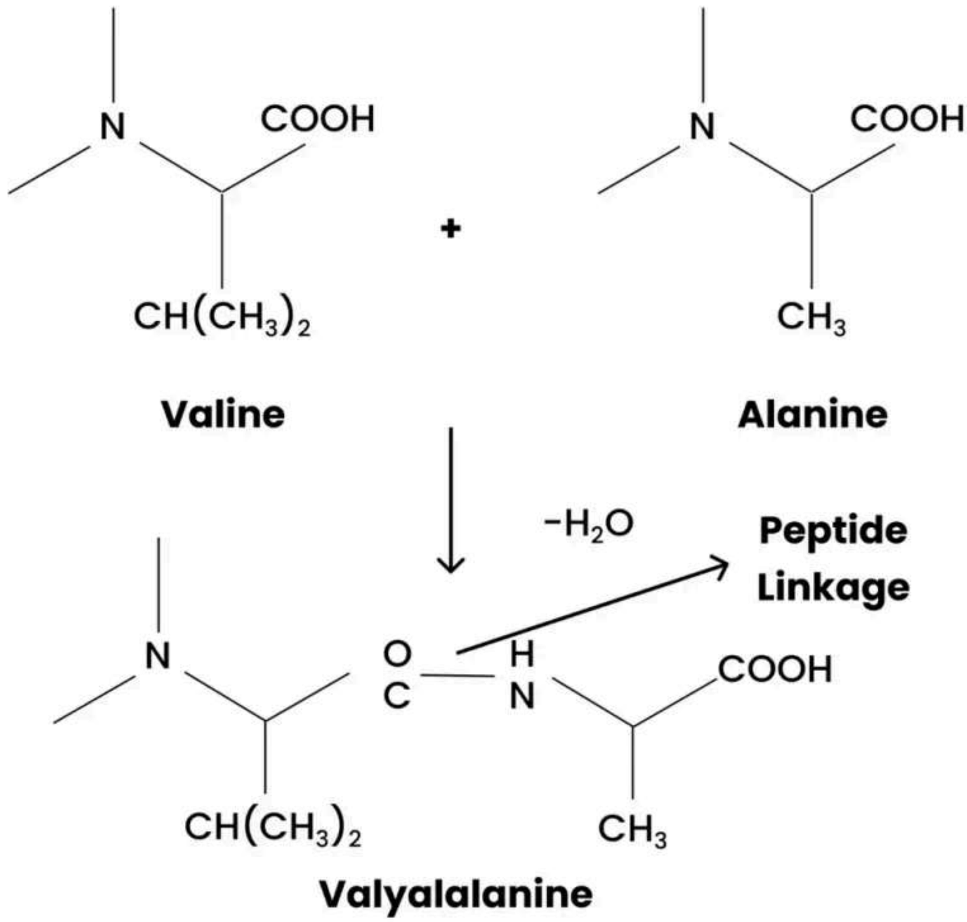
10.12

Define the following as related to proteins (i) Peptide linkage (ii) Primary structure (iii) Denaturation.

📌 ***Key Points to Note***

- **Peptide linkage**: Bond between –COOH of one amino acid and $–NH_2$ of another.
- **Primary structure**: Linear sequence of amino acids in a protein.
- **Denaturation**: Loss of biological activity due to unfolding of protein structure.

Ans – (i) When the α-amino compounds of a specific molecule combine alongside the α-carboxyl group on a different molecule, a molecule of water is removed, forming a peptide linkage, which is a type of amide connection. The below mechanism is a condensation or dehydration-induced synthesis process that often takes place among amino acids. Whenever water molecules are eliminated, the -COOH group that is left with a single amino acid is seamlessly linked to the $-NH_2$ category of a different amino acid to develop a peptide bond. It is simple to represent something as,



(ii) The key component of a cellular protein is the particular arrangement of amino acids (the arrangement of bonds among amino acids within a polypeptide string) that contains different amino acids. A novel protein is produced when the pattern gets slightly altered.

(iii) Because of its distinct three-dimensional framework, proteins have particular biological activities in ecosystems that exist. The hydrogen bonds in these proteins are disrupted once they undergo certain modifications, such as a physical temperature shift or a chemical pH shift. These disruptions cause the globules to unfurl & the helix to break apart, which causes the protein component to lose its biological function. This is referred to as denatured protein synthesis. Usually, the secondary & tertiary components of proteins are destroyed by denaturation; the basic blueprint is left intact.

10.13

What are the common types of secondary structure of proteins?

📌 ***Key Points to Note***

- **α-helix**: Right-handed coil stabilized by hydrogen bonds.
- **β-pleated sheet**: Sheet-like structure with chains lying side by side, stabilized by hydrogen bonding.

Ans – The two of the most prevalent varieties of the protein's secondary arrangement that exist,

- ***α* – helix structure:**

The internal makeup of the α-helix is characterized by the $-NH_2$ group that includes the remaining amino acid forming an H-bond between the COOH group, which is a constituent of neighbouring twists in a right-handed spiral orientation.

- ***β* – pleated sheet structure:**

The term "β-pleated sheet structure" comes from the fact that it resembles ruffled patterns of drapery in the background. In this case, every peptide strand has been expanded to almost its entire length before being arranged against one another flank. Intermolecular bonds of hydrogen hold them connected.

10.14

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

📌 ***Key Points to Note***

- **Intramolecular hydrogen bonding** between the N-H group of one amino acid and the C=O group of another (typically 4 residues apart) stabilizes the α-helix structure.

Ans – The α-helix represents the most prevalent kind of secondary framework in protein molecules. The presence of the α-helices arrangement was initially predicted by Linus Pauling. The protein's alpha-helix configuration is stabilized by hydrogen bonding. A prevalent pattern in the extracellular matrix of protein molecules, the alpha-helix (α-helix) is an upright helix orientation (helix) that occurs when each strand of N-H grouping gives the bonds of hydrogen that links to the amino acid's strand of C=O position.

Thus, the α-helix is stabilized by the H-bond that forms among the $-NH_2$ group that comprises each amino acid along with the -COOH section of nearby amino acid groups.

10.15

Differentiate between globular and fibrous proteins.

📌 ***Key Points to Note***

- **Shape**: Globular – spherical; Fibrous – elongated/strand-like
- **Solubility**: Globular – water-soluble; Fibrous – insoluble
- **Function**: Globular – metabolic (e.g. enzymes); Fibrous – structural (e.g. keratin, collagen)

Ans – The key variations among the globular & fibrous proteins can be represented as:

Fibrous Protein	**Globular Protein**
The polypeptide group forms an arrangement that resembles fibers. Powerful disulfide along with hydrogen bonds hold them intact.	This protein's circular form results from the folding of its polypeptide chain surrounded all over by itself.
Fibrous protein remains water-insoluble.	Globular protein stands as water-soluble.
Utilized for architectural motives. For instance, myosin is found in muscles, collagen can be seen in tendons & keratin is commonly found in hair & nails.	Each of these digestive enzymes tends to be a protein with a globular structure, as are certain hormonal substances like insulin.

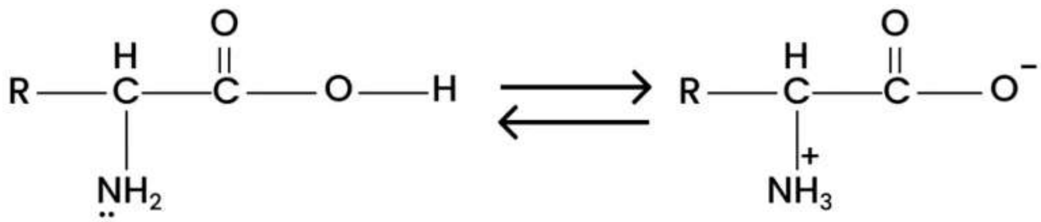
10.16

How do you explain the amphoteric behaviour of amino acids?

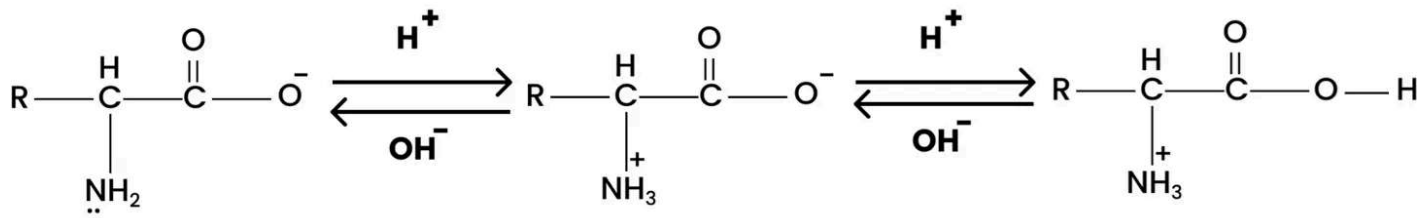
📌 ***Key Points to Note***

- Zwitterion formation
- Presence of both $–NH_2$ (basic) and –COOH (acidic) groups
- Acts as acid in basic medium and base in acidic medium

Ans – When combined with water resources, amino acids tend to exhibit dipolar conduct, meaning that one amino acid's carboxyl bond releases a proton while another amino acid's amine group can take the identical proton to produce a zwitterion. The reason for this might have been represented by,



The amino acid exhibits an amphoteric activity in this zwitterionic state, functioning as the two bases and acidic substances. Given that amino acids include both basic alongside acidic groups —the carboxyl & amine groups, respectively—they exhibit the characteristics of amphoteric substances.



10.17

What are enzymes?

Ans – The proteins in our bodies called digestive enzymes which accelerate chemical processes in the bodies of living things. They are essential for existence and carry out a number of critical bodily processes, including metabolic processes and digesting. Typically, all bodily fluids & connective tissues include enzymes. Intracellular enzymes catalyse every single one of the processes that occur in the cycle of metabolism.

Enzymes comprise protein molecules that operate as biological regulators or as accelerators for processes in the body. They exclusively stimulate an ideal synthesis for a given substrate in the solution, making them very specialized in function.

They typically terminate in "-ase" & are called after the particular component or event that is occurring. For instance, Maltase is the enzyme that catalyses the conversion from maltose to glucose in the bloodstream. Oxidoreductases are digestive enzymes that trigger the simultaneous decomposition of a particular substrate and oxidative degradation of a different one.

10.18

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

📌 ***Key Points to Note***

- Disruption of **secondary and tertiary structures**
- **Primary structure remains intact**
- Loss of **biological activity**

Ans – The process of protein denaturation preserves the main framework while destroying the secondary & tertiary components. The covalent connections are broken and the link between chains of amino substances is disrupted by this mechanism.

Helixes & globules break apart and unravel as a consequence of the denaturation process. The primary proteins do not undergo modifications throughout the above procedure, but both secondary & tertiary protein sequences are eliminated. The denaturation process can occasionally transform secondary & tertiary molecules into predominantly organized protein structures.

10.19

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

📌 ***Key Points to Note***

- Vitamins: **Water-soluble** (B-complex, C) and **Fat-soluble** (A, D, E, K)
- **Vitamin K**: Required for **blood coagulation**

Ans – The list that follows constitutes a breakdown of vitamins based on how soluble they become in lipid or water components. Let's look through them in detail,

- While the nutrients are insoluble in water elements, vitamins A, D, E & K remain soluble within oil substances & fatty acids.
- Water-soluble vitamins include vitamin C along with the B group vitamins (B1, B2, B6, B12, etc).
- Because they are insoluble in excess fat or water, biotin and vitamin H serve as the exceptions.
- Vitamin K is the kind of vitamin that causes hemoglobin to coagulate.

10.20

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

📌 ***Key Points to Note***

- **Vitamin A**: Essential for vision, immune function; sources: carrots, liver, dairy

- **Vitamin C**: Important for wound healing, immunity; sources: citrus fruits, amla, guava

Ans – We need combined vitamins A & C since a lack of one of them can lead to major problems with health. A lack of the antioxidant vitamin C causes a condition known as scurvy, or bleeding from the gums.

Meanwhile, a lack of vitamin A causes xerophthalmia, or stiffening of the eye's surface of the cornea leading to blindness during the night. Vitamin C is found in fruit such as citrus & leafy green veggies, while vitamin A is found in oil from cod liver, carrots, melted butter & dairy.

10.21

What are nucleic acids? Mention their two important functions.

📌 ***Key Points to Note***

- Nucleic acids = DNA and RNA
- Made of nucleotides (sugar + base + phosphate)
- Functions:
  - Store genetic information (DNA)
  - Help in protein synthesis (RNA)

Ans – Nucleic acids are chemicals that are present in the nucleus of cells that survive and are crucial components of chromosome configuration Deoxyribonucleic acid, also called DNA along with RNA, also known as ribonucleic acid, are the two distinct primary forms of nucleic acids that exist.

Functions include Inherited traits that are passed down from a single generation to the next through the process of genetic material (DNA). We call this a hereditary trait. The two types of RNA & DNA are in charge of the cell's production of protein molecules.

10.22

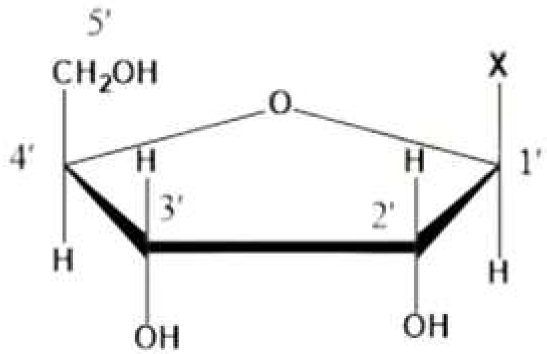
What is the difference between a nucleoside and a nucleotide?

📌 ***Key Points to Note***

- **Nucleoside** = Sugar + Nitrogenous base
- **Nucleotide** = Nucleoside + Phosphate group

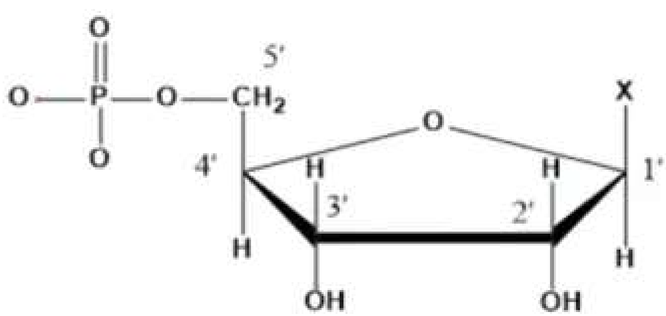
Ans – Nucleoside:

- The basic structure and simplified expression tend to be as follows: Nucleoside = sugar + base (X).
- A substance known as sugar along with a mineral base lacking the element phosphate contributes to the molecular makeup of a nucleoside. These nucleosides are created when a foundation attaches itself to the sugar's 1' location.



Nucleotide:

- A compound of phosphates, a sugar substance & a base made of nitrogen constitutes a nucleotide's chemical composition. Each of the three nucleic acid constituents—base, sugar substance & phosphoric acid—combine to make nucleotide.
- The basic composition and refined formulations can be defined as follows: Nucleotide = sugar + base (X) + phosphoric acid.



10.23

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

📌 ***Key Points to Note***

- Base pairing: A with T, G with C
- One strand determines the sequence of the other
- Hydrogen bonding between complementary bases

Ans – The bonds of hydrogen among certain pairs of bases hold the 2 distinct segments of DNA connected in its helix form. Adenine and thymine create bonds made of hydrogen, whereas cytosine and guanine do the same. The hydrogen bonds connecting the particular combination of bases hold the double-stranded spiral helix of DNA cohesive. Both adenine & thymine create H-bonds, whereas cytosine & guanine make up bonds containing hydrogen. As a result, both strings complement one another.

10.24

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

📌 ***Key Points to Note***

- Sugar difference: DNA → deoxyribose, RNA → ribose
- Bases: DNA has thymine, RNA has uracil
- Structure: DNA is double-stranded, RNA is single-stranded
- Function: DNA stores genetic info; RNA helps in protein synthesis

Ans – The two types of RNA & DNA, are distinct from one another in their structure as well as their function. Here are some of the major differences,

Structural Variations:

DNA	**RNA**
The sugar molecule available in the DNA component would be β-D-2- deoxyribose.	The sugar molecule available in the RNA component would be β-D-ribose.
DNA element consists of thymine (T).	RNA element consists of uracil (U).
The helical arrangement tends to be double-stranded.	The helical arrangement tends to be single-stranded.

Functional Variations:

DNA	**RNA**
DNA is based on the chemical component of heredity.	On the other hand, RNA won't determine the function of heredity.
Instead of making protein molecules, they provide encrypted data to the cell	Inside cell membranes, small molecules of RNA are responsible for the synthesis of

membranes so that protein compounds may be made.	protein chains.

10.25

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

Ans – Different types of RNA found in cells are

- mRNA (messenger RNA): Carries genetic code from DNA
- tRNA (transfer RNA): Brings amino acids to ribosome
- rRNA (ribosomal RNA): Structural and catalytic part of ribosomes