Chemistry of life

The molecules of life **(carbohydrates, lipids, proteins and nucleic acid)** are organic molecules.

Organic: type of molecule that consist primarily of carbon and hydrogen atoms.

Carbon is a central element to life because most biological molecules are built on a carbon framework.

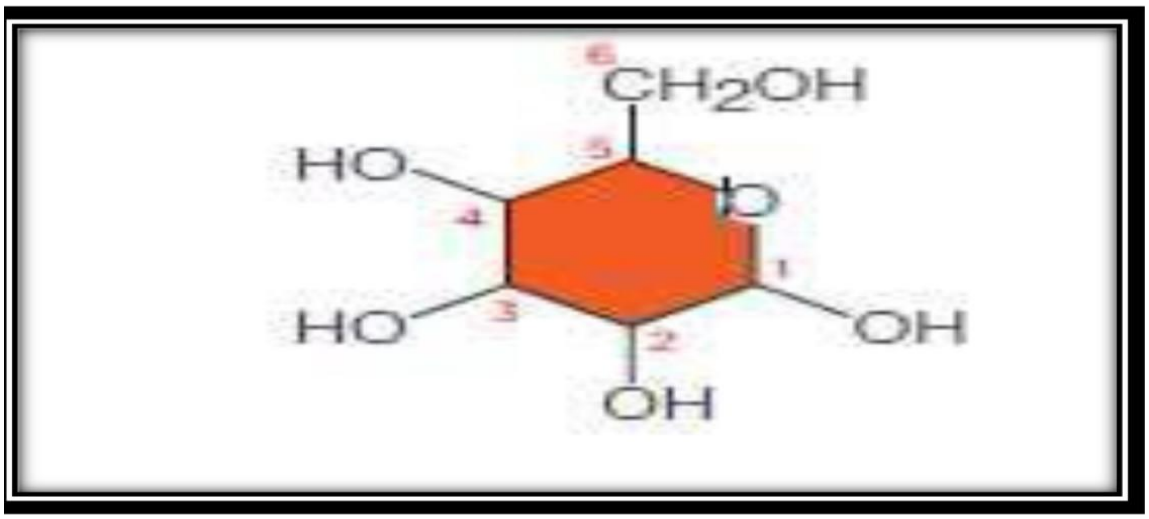
1- Carbohydrates

- Carbohydrates are the most abundant biological molecules. Cells use carbohydrates to help build cell parts or package them for energy.
- Most **carbohydrates** consist of carbon, hydrogen, and oxygen atoms in a 1:2:1 ratio. Due to differences in structure, carbohydrates separate into three major classes

A. Monosaccharides (monomers)

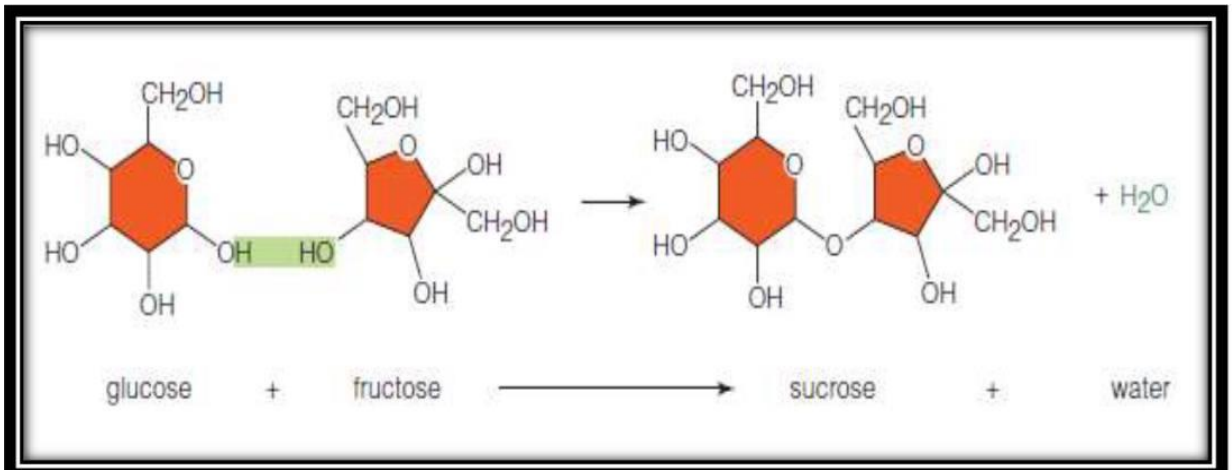
B. Oligosaccharides (Dimers)

C. Polysaccharides (Polymers)



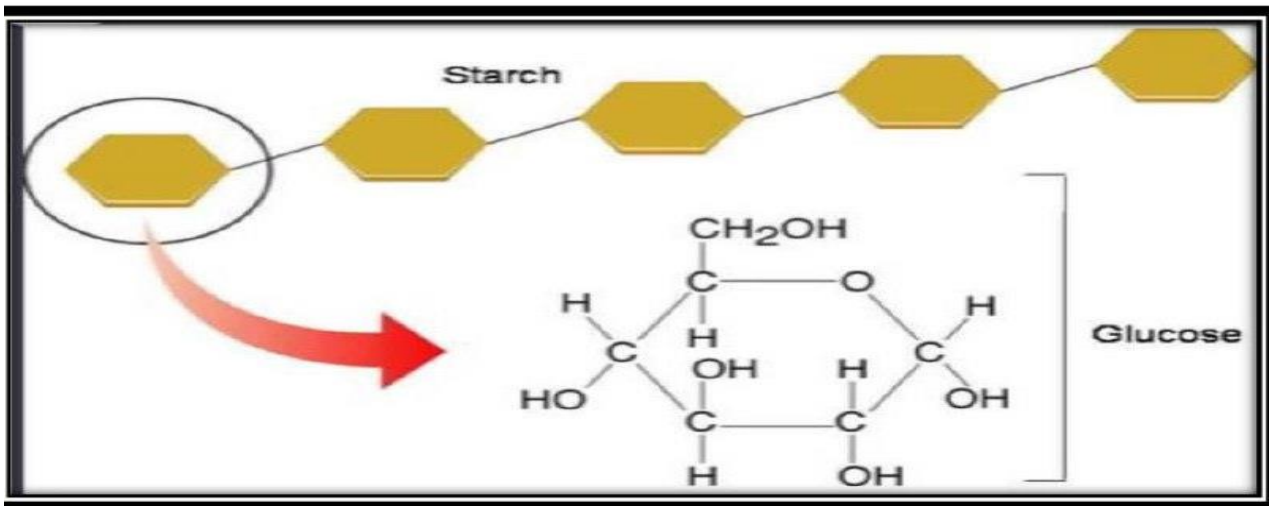
A. Monosaccharides :- The simple class of the carbohydrate, Consisting of a single sugar monomer, glucose molecule is example.

B.Oligosaccharides :- carbohydrate that consist of short chain of sugar unit, sucrose is example.



C.Polysaccharides complex carbohydrate that consist of straight or branched chains of monosaccharide.

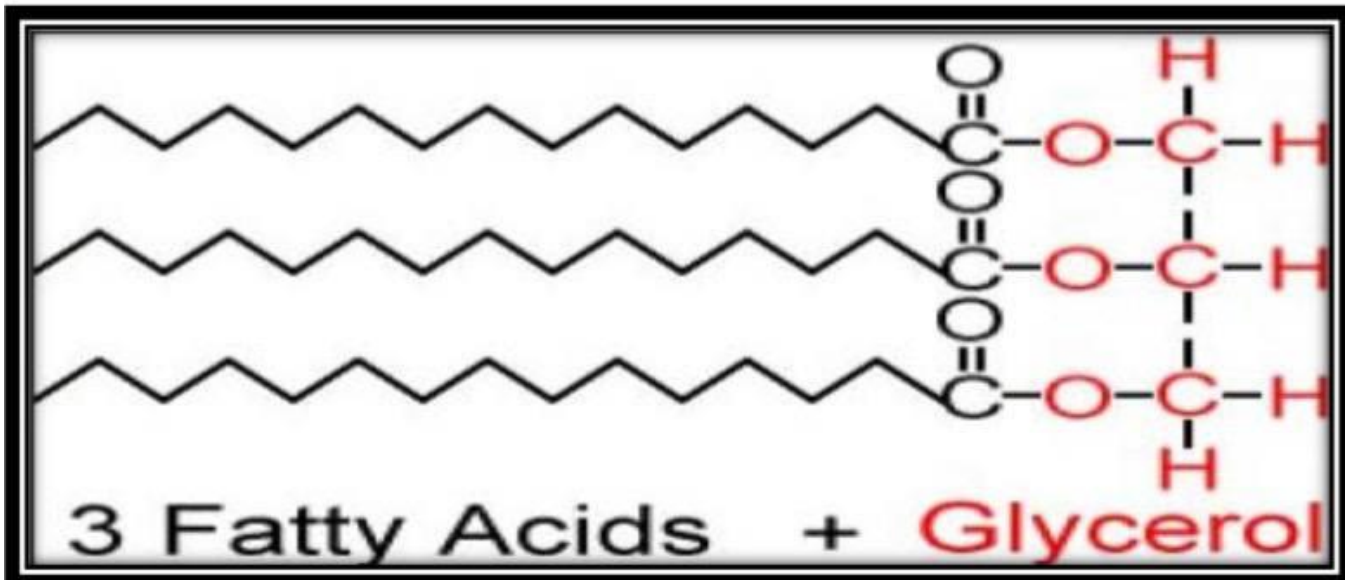
❖ In **animals** the storage Polysaccharides is **glycogen** whereas in **plant**, it is **starch**.



2- Lipids

The most important characteristics of lipids for biology is that they are relatively insoluble in water. The most important subclasses in your body are **triglycerides, phospholipid and steroids**.

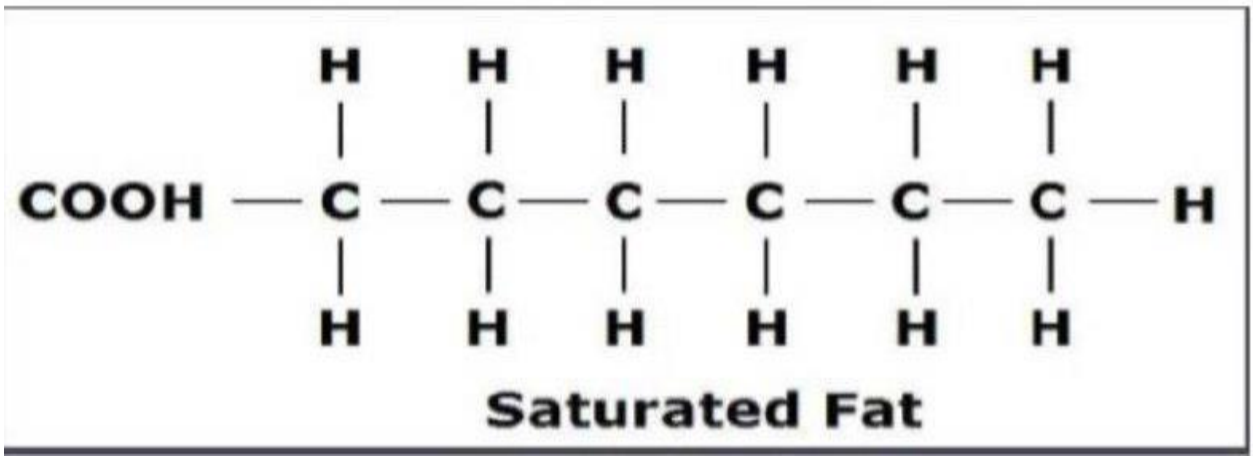
Triglycerides, also called neutral fats are synthesized from a molecule of **glycerol** and **three fatty acids**.



Fatty acids are chain of **hydrocarbons** that end in a group of atoms known as **a carboxyl group (COOH).**

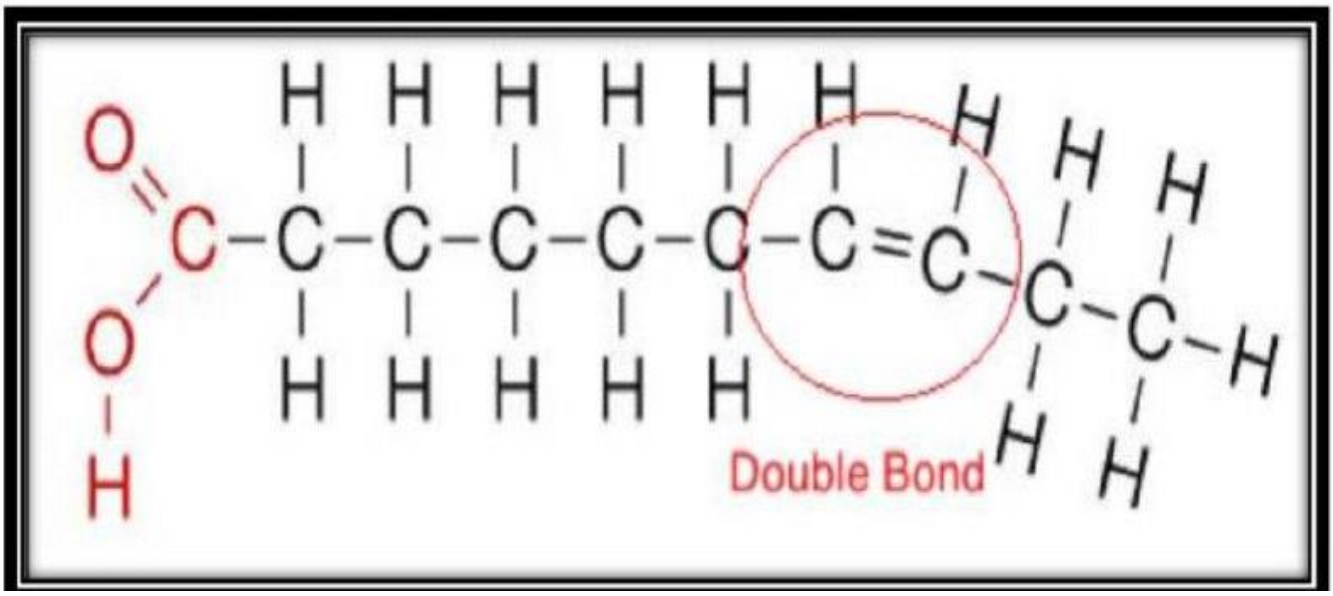
There are two type of Fatty acids?

❖ **Saturated fats** have a full complement of two hydrogen atoms for each carbon in their tail. The tails are fairly straight, allowing them to pack closely together. **As a result, saturated fats are generally solid at room temperature**.



❖ **Unsaturated fats** also called oils have fewer than two hydrogen atoms on one or more of the carbon atoms in the tail. As result double bonds from between

adjacent carbons, putting kinks in the tail and preventing the fats from associating closely together.



Phospholipids. they are the primary structural component of **cell membrane**. Like fats, phospholipids have a molecule of **glycerol as the back bone**, but they have **only two fatty acids tails**.
Replacing the third fatty acid is a negatively charged **phosphate group** and **another group** that varies depending on the phospholipids but is generally positively charged.

Steroids.consist of backbone of 3 six- membered carbon rings and 1 five membered carbon ring to which any number of different groups may be attached.

3- Proteins

♦ **Proteins** are built from amino acids. **Amino acid** is a small organic compound that consists of an amino group, a

carboxyl group (an acid), an atom of hydrogen, and one or more atoms called its R group.

♦ **Peptide bond**: covalent bond that joins the amino groups of one amino acid to the carboxyl group of another amino acid.

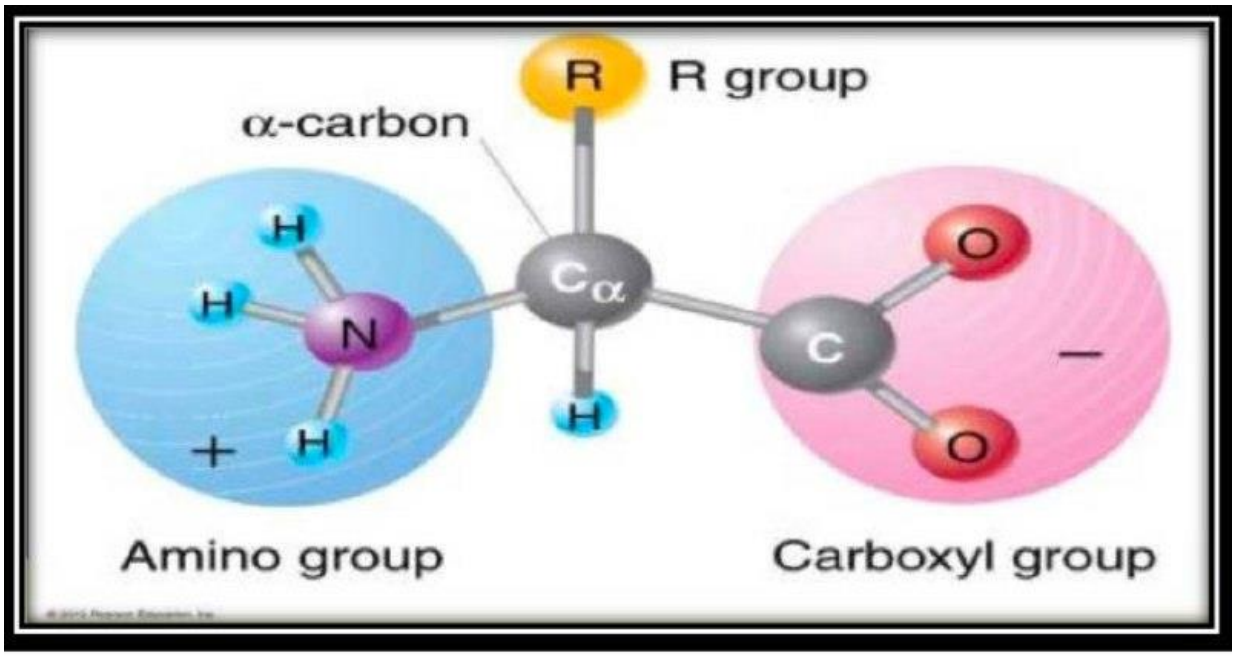
♦ **Polypeptide chain:** A chain of three or more amino acids joined by peptide bonds.

♦ **Glycoprotein:** An oligosaccharide attached to the proteins.

♦ **Lipoproteins:** a lipid attached to the proteins.

♦ **Structural proteins** are building blocks of your bones, muscles, and other body elements.

♦ **Transport proteins** help move substances and **regulatory proteins**, including some **hormones**, **adjust cell activities**



4-Nucleic acids

♦ Another important class of organic molecules is the nucleic acids, DNA (deoxyribonucleic acid) and RNA (ribonucleic acid).

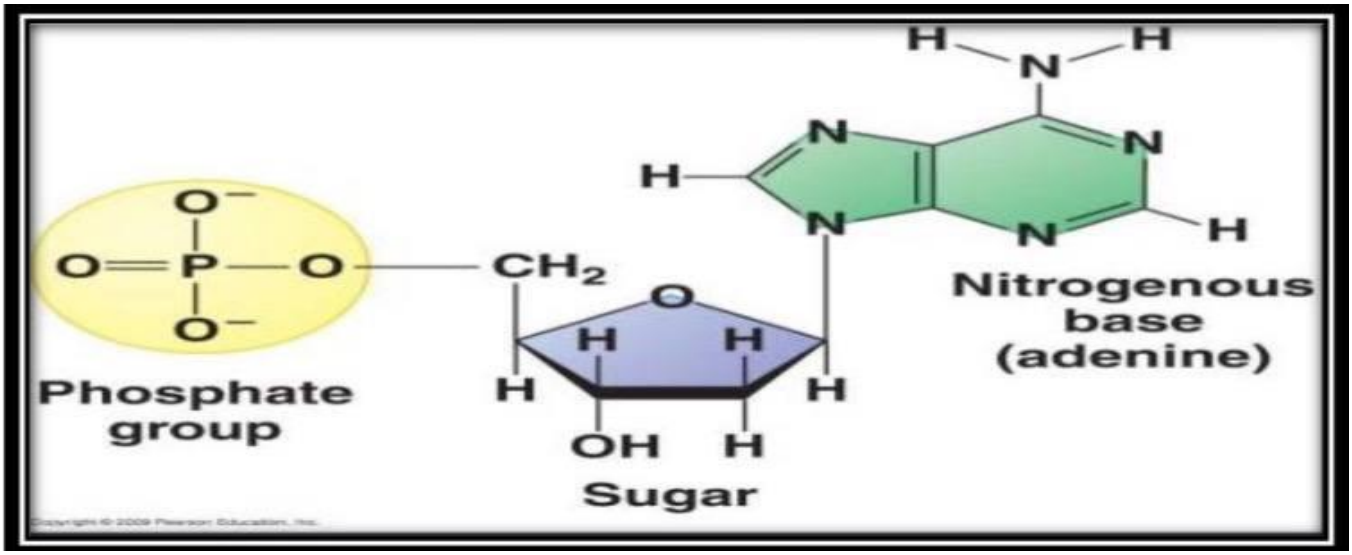
♦ A molecule of DNA Nucleotides

♦ Each nucleotides consist of:-

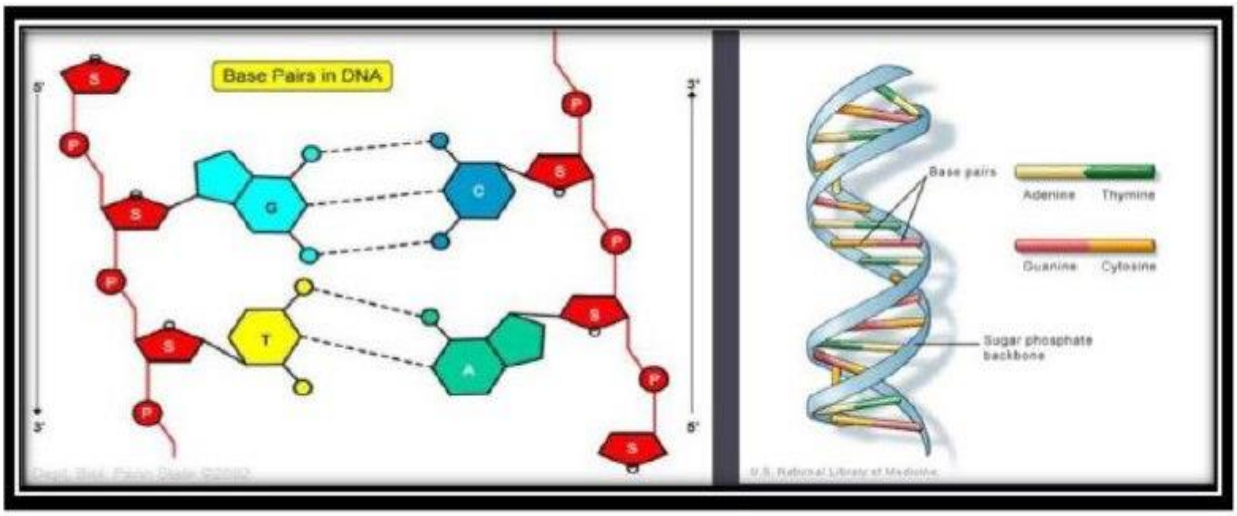
✓ Phosphate group

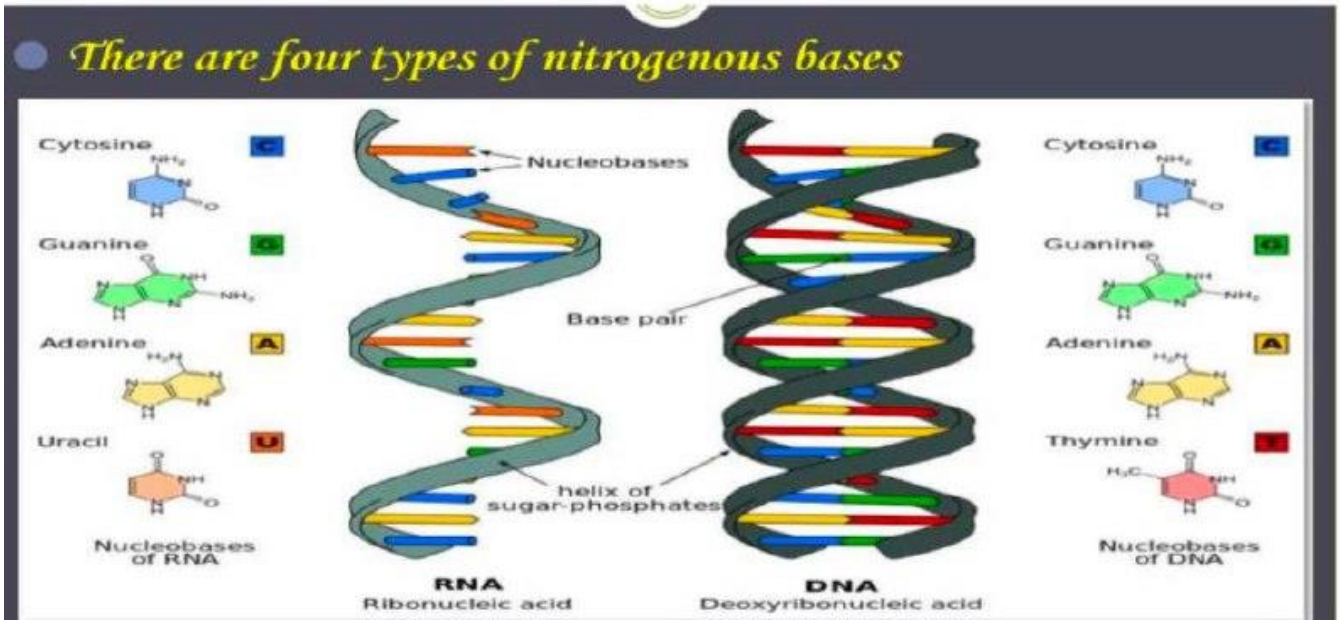
✓ Sugar group

✓ Nitrogenous base.



ϕ The phosphate and sugar from the backbone of the DNA molecule, whereas the bases from the rings.




There are four types of nitrogenous bases
Cytosine
Guanine
Adenine
Uracil
Nucleobases of RNA
Nucleobases
Base pair
helix of sugar-phosphates
RNA
Ribonucleic acid
DNA
Deoxyribonucleic acid
Cytosine
Guanine
Adenine
Thymine
Nucleobases of DNA