BASICS IN BIOCHEMISTRY

→ Biochemistry is the branch of science that deals with the study of chemical processes in living organisms. Living things require millions of chemical reactions to survive. These chemical reactions are generally grouped under Metabolism, including

- Anabolism – building up of molecules
- Catabolism – break down of molecules

→ Biochemistry deals with the organic molecules in the living system.

→ Organic molecules always contain carbon and are large molecules with many atoms linked by covalent bonds.

Biomolecules :-

→ Biomolecule is the molecule of life.

Characteristics of Biomolecules :-

1. Most of them are organic compounds.
2. They have specific shapes and dimensions.
3. Functional group determines their chemical properties.
4. Macromolecules are large molecules and are constructed from small building block molecules.

→ Carbohydrates, lipids, proteins and nucleic acids are the four main classes of biomolecules.

→ Carbohydrates, proteins and lipids are huge and therefore called macromolecules.
→ Macromolecules are polymers, built from monomers.
→ Polymer is a long molecule consists of many repeating units of monomers as their building blocks.

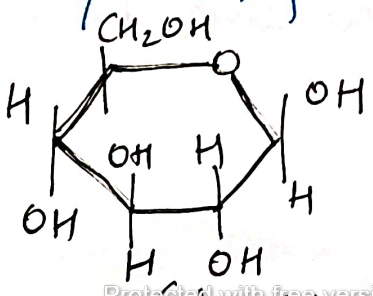
CARBOHYDRATES :-

→ A carbohydrate is an organic compound with the empirical formula $C_m(H_2O)_n$, consisting only of carbon, hydrogen and oxygen.
→ The ratio between hydrogen and oxygen atom is 2 : 1
→ The carbohydrates are divided into three types:- monosaccharides, disaccharides and polysaccharides.

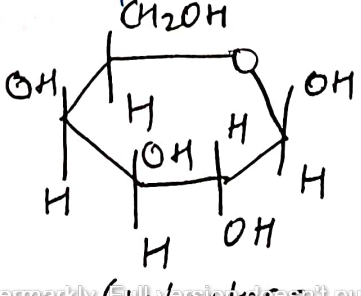
(1) MONOSACCHARIDES :-

- These are called as simple sugars with general formula $(CH_2O)_n$ where n is 3 or more
- These are main fuel for cellular work.

Eg :- Glucose, fructose & Galactose



Glucose



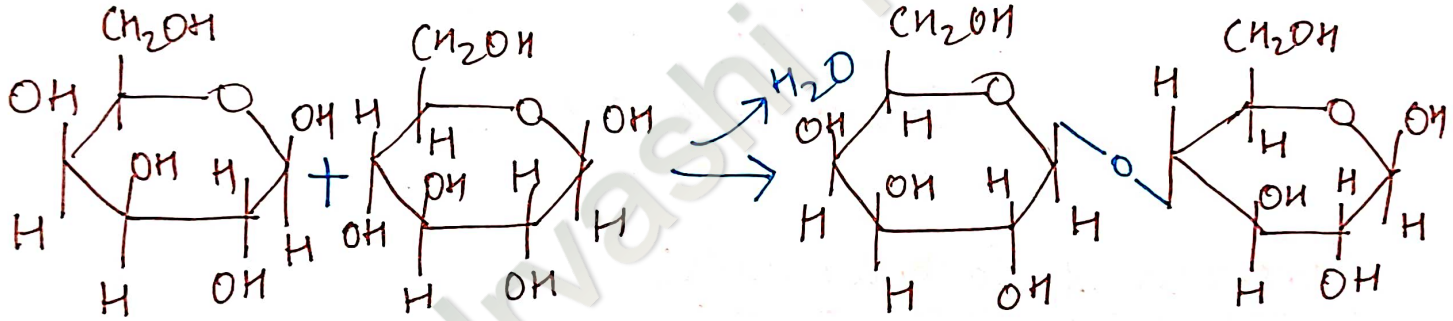
Galactose

2. DISACCHARIDES :-

→ Two monosaccharides are joined together are called disaccharides

→ Two monosaccharides are joined together by a covalent bond known as a Glycosidic bond, formed resulting in loss of hydrogen from one monosaccharides and a hydroxyl group from the other.

Eg:- Sucrose (Glucose + Fructose)
Maltose (Glucose + Glucose)
Lactose (Glucose + Galactose)



Galactose + Glucose ⟶ Lactose

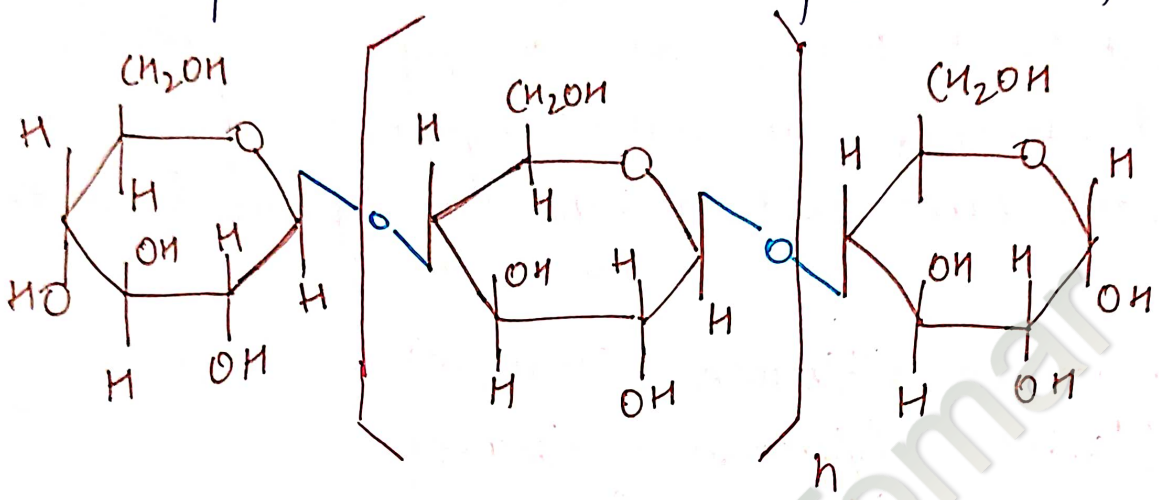
3) POLYSACCHARIDES:.

→ When a few (3-6) monosaccharides are joined together it is called an oligosaccharides. Many monosaccharides joined together make a polysaccharide.

→ They can be joined together in one long linear chain, or they may be branched.

→ They are also called as complex carbohydrates.

Eg:- Cellulose (unbranched polysaccharide)
(joined by β-1,4 glycosidic bonds)
— Important constituent of cell wall of plants.



Cellulose
(polysaccharide)

Functions of Carbohydrates:-

1) Energy production :- The primary role of carbohydrates is to supply energy to all cells in the body. Many cells prefer glucose as a source of energy versus other compounds like fatty acids.

Eg:- Red Blood cell and Brain cell uses glucose to produce energy.

→ Most of the carbohydrates in the food are digested and broken down into glucose before entering the bloodstream.

→ Glucose in the blood is taken up into your body's cells and used to produce a fuel molecule called ATP (adenosine triphosphate) through a series of complex processes known as cellular respiration. Cells can then use ATP to power a variety of metabolic tasks.

2) Energy Storage :-

→ If the body already has enough energy to support its functions, the excess glucose is stored as glycogen (majority stored in the muscles and liver).

→ The liver contains approximately 100 grams of glycogen. These stored glycose molecules can be released into the blood to provide energy throughout the body and help maintain normal blood sugar levels between meals.

→ Unlike liver glycogen, the glycogen in your muscles can only be used by muscle cells. It is vital for use during long periods of high-intensity exercise.

3) Building Macromolecules

→ Glucose is converted into ribose and deoxi-ribose, which is essential building blocks of important macromolecules such as RNA, DNA and ATP.