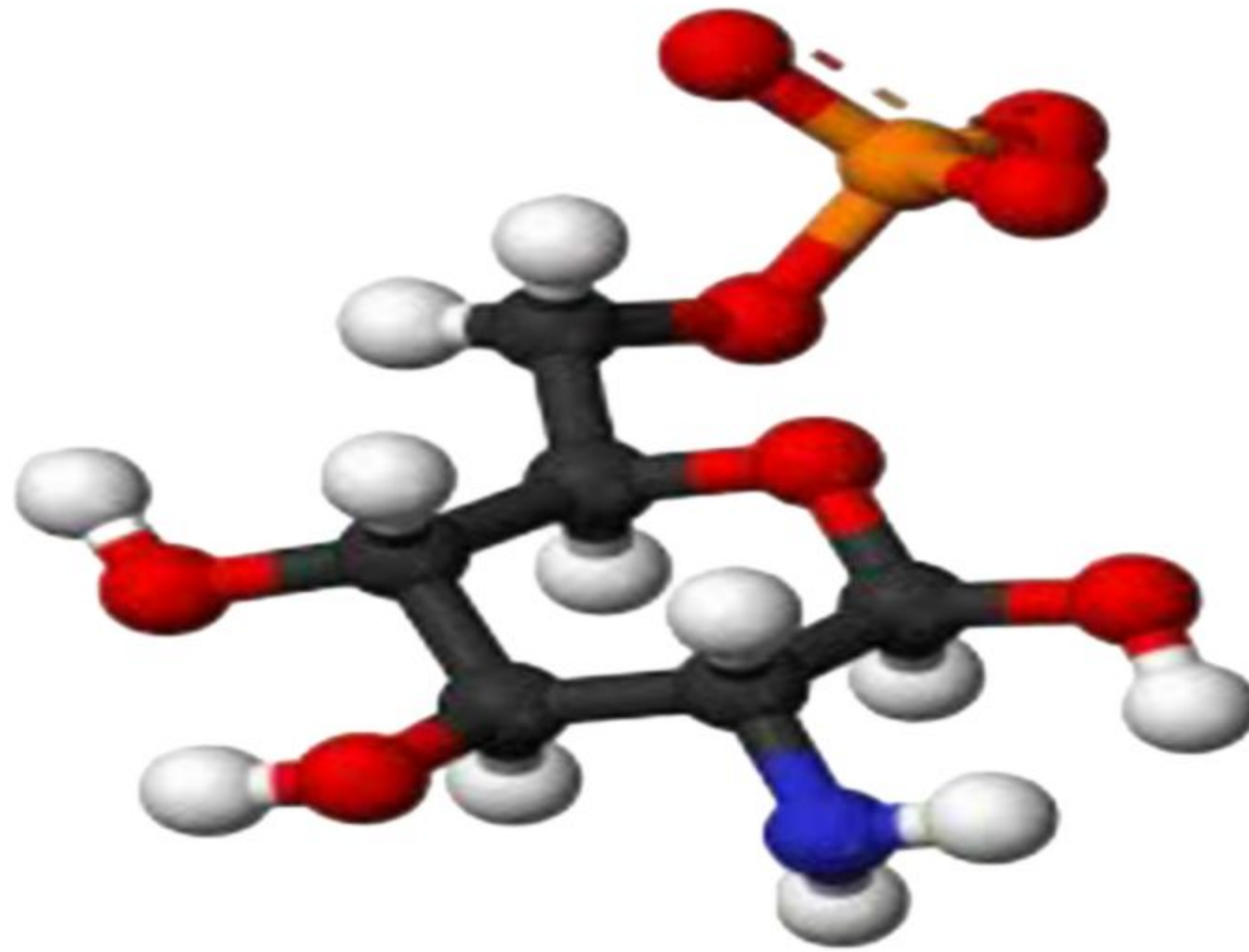


Carbohydrates



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Definition



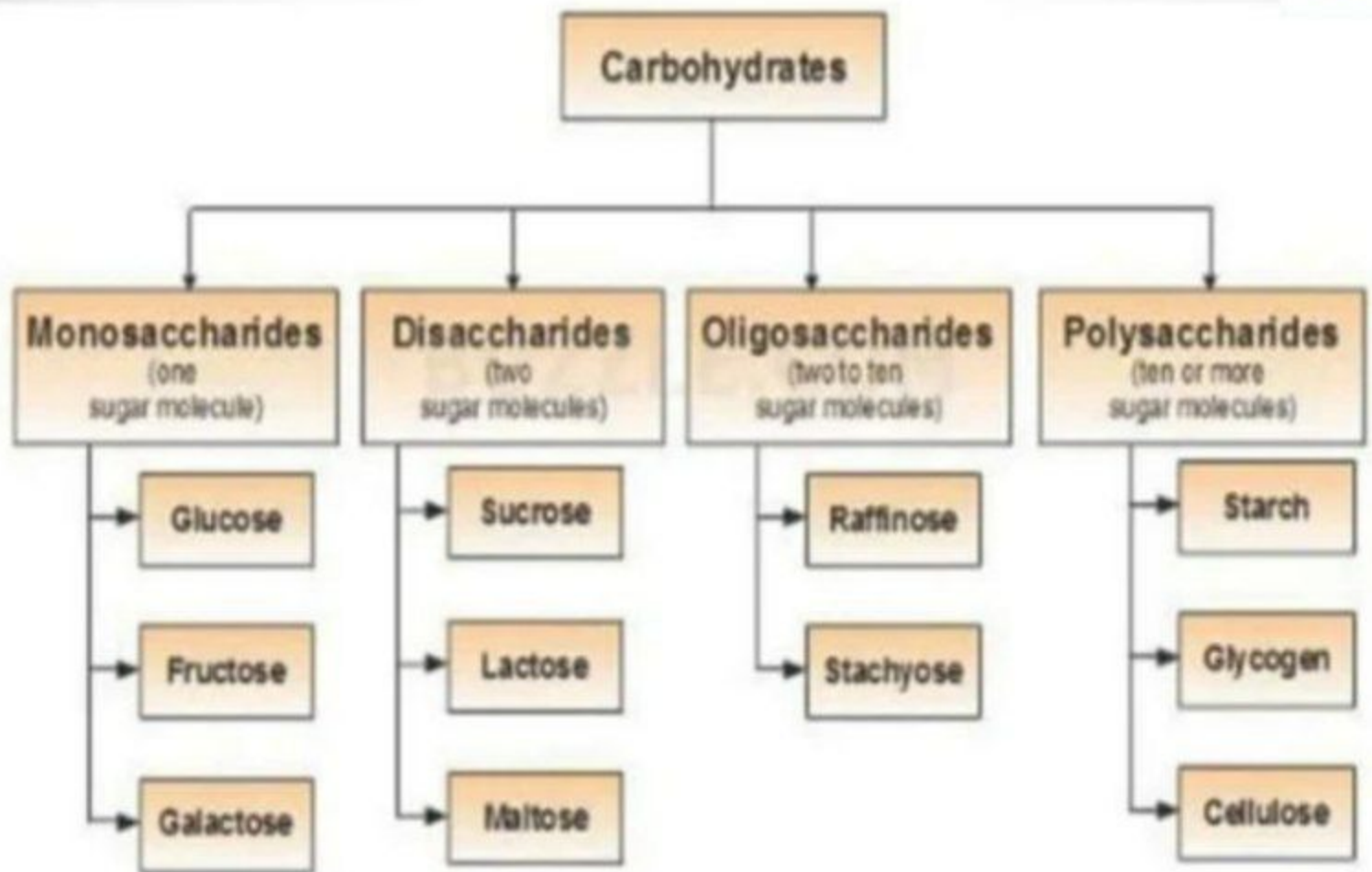
- **Carbohydrates** are most abundant biomolecules in the nature
- **Carbohydrates** are molecules that contain **carbon, hydrogen, and oxygen**.
- There are twice as many hydrogen atoms as carbon or oxygen atoms.
- The **general formula** for a carbohydrate can be written as $C_x(H_2O)_y$.
- They act as the source of energy (e.g. glucose), as a store of energy (e.g. starch and glycogen) and as structural units (e.g. cellulose in plants and chitins in insects).

Functions



- **Carbohydrates are involved in various functions:**
- They also act as precursor for many organic compounds.
- It also involved in structural components of many organisms.
- It also involves in immediate source of energy demands of the body by serving as the storage form of energy (glycogen).
- They also involved in the structural and cellular functions of cell such as- fertilization, cell growth and adhesion.

Classifications



- Carbohydrates are commonly referred to as a **saccharides** (greek: sakcharon means sugar).
- Carbohydrates are classified into three major groups depending upon whether these undergo hydrolysis and if so on then the number of products formed by them.
 - Monosaccharides
 - Oligosaccharides
 - Polysaccharides

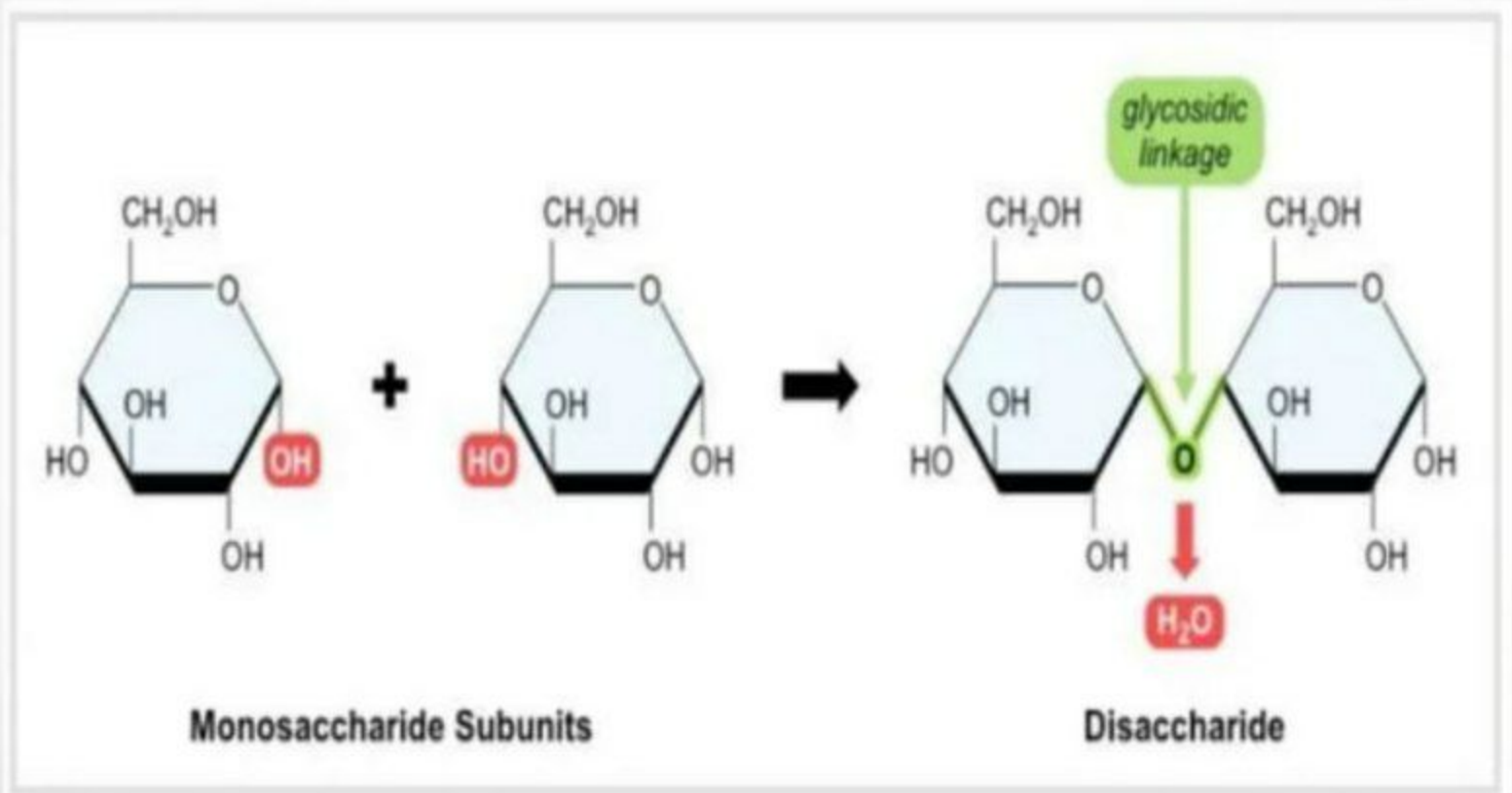


- Greek: mono means one.
- **Monosaccharides** are simple sugars in which there are one oxygen atom and two hydrogen atoms for each carbon atom present in the molecule.
- They have **general formula** as $(\text{CH}_2\text{O})_n$.
- Monosaccharides are **reducing sugars**.
- The test for reducing sugar is called **Benedict's test**.
- They are **sugars**, which taste sweet, are soluble in water and are insoluble in non-polar solvents.
- They exist in **straight chains** or **in the ring** or **cyclic forms**.

- They are classified according to the number of carbon atoms in each molecule as **trioses (3C)**, **tetroses (4C)**, **pentoses (5C)**, **hexoses (6C)**, **heptoses (7)** and so on.
- The names of all sugars end with **-ose**.
- **Examples:** Glyceraldehyde (triose), Erythrose (tetrose), Ribose (pentose), Glucose (hexose), Fructose (hexose), Galactose (hexose), Sedoheptulose (heptose), etc.
- They are used as a source of energy in respiration.
- They are important building blocks for large molecules.



Disaccharides – Structure, Properties, and Examples



- **Disaccharides** are made up of two monosaccharides joined together by a **condensation reaction**.
- **The condensation reaction** is the joining of two molecules with the formation of a new chemical bond and a water molecule is released when the bond is formed.
- A **glycosidic bond** is formed between two monosaccharides. If carbon 1 on one monosaccharide joins to carbon 4 on another monosaccharide, it is called a 1,4-glycosidic bond.
- Disaccharides are the most common, among oligosaccharides.
- It consists of two monosaccharides units which is held together by glycosidic bond.
- It is crystalline, soluble in water and sweet in taste.



Polysaccharides – Structure, Properties, and Examples



- **Polysaccharides** are polymers formed by combining many monosaccharide molecules (more than two) by condensation reactions.
- Molecules with 3-10 sugar units are known as **oligosaccharides** while molecules containing 11 or more monosaccharides are **true polysaccharides**.
- Polysaccharides **do not taste sweet**.
- Because their molecules are so enormous, the majority of polysaccharides **do not dissolve in water**.
- Polysaccharides made solely from one kind of monosaccharides are called **homopolysaccharides** (Starch) while those made of more than one monomer are called **heteropolysaccharides** (Hyaluronic acid).

- Greek: poly means many.
- They are generally polymers of monosaccharide units with high molecular weight.
- They are tasteless and most often form colloids with water.
- It is linear as well as branched polymer.
- **It is of two types:**
 - **Homopolysaccharides:** it yields only a single type of monosaccharide on hydrolysis.
 - **Heteropolysaccharides:** it yields a mixture of a few monosaccharides or their derivatives on hydrolysis

