



Biochemistry is the study of the chemistry of biomolecules and living organisms

Carbohydrate: is a biomolecule consisting of carbon (C), hydrogen (H) and oxygen (O) atoms, usually with a hydrogen–oxygen atom ratio of 2:1 (as in water) and thus with the empirical formula $C_m(H_2O)_n$ (where m may or may not be different from n). However, not all carbohydrates conform to this precise definition (e.g., uronic acids, deoxy-sugars such as fucose), nor are all chemicals that do conform to this definition automatically classified as carbohydrates (e.g. formaldehyde and acetic acid).

Carbohydrates and Biochemistry

- Carbohydrates are compounds of tremendous biological importance:
 - 1- they provide energy through oxidation
 - 2- they supply carbon for the synthesis of cell components
 - 3- they serve as a form of stored chemical energy
 - 4- they form part of the structures of some cells and tissues
- Carbohydrates, along with lipids, proteins, nucleic acids, and other compounds are known as **biomolecules** because they are closely associated with living organisms.

Carbohydrates

Carbohydrates, or *saccharides* (*saccharo* is Greek for “sugar”) are polyhydroxy aldehydes or ketones, or substances that yield such compounds on hydrolysis.



Carbohydrates



- Carbohydrates include not only sugar, but also the starches that we find in foods, such as bread, pasta, and rice.



- The term “carbohydrate” comes from the NOTE that when you heat sugars, you get carbon and water (hence, *hydrate of carbon*).



Origin of Carbohydrate

- 1- in plants, energy from the sun used to convert CO₂ and water into the carbohydrate.
- 2- Many type of glucose molecules are made into long-chain polymers of starch that store energy.



- 3- About 65% of the foods in our diet consist of carbohydrate
- 4- Bread, Pasta, Potatoes and rice
- 5- In milk such as sucrose and lactose
- 6- During digestion and cellular, metabolism, carbohydrate are converted into glucose.
- 7- In plants, a polymer of glucose called cellulose builds the structural framework.
- 8- The wood in our furniture, the pages in your notebook, and the cotton in our clothing are made of cellulose.

Classes of Carbohydrates

- **Monosaccharides** contain a single polyhydroxy aldehyde or ketone unit (e.g., glucose, fructose).



- **Disaccharides** consist of two monosaccharide units linked together by a covalent bond (e.g., sucrose).

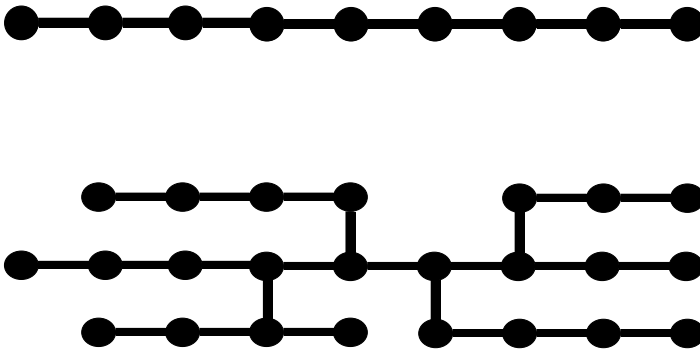


- **Oligosaccharides** contain from 3 to 10 monosaccharide units (e.g., maltotriose).





- **Polysaccharides** contain very long chains of hundreds or thousands of monosaccharide units, which may be either in straight or branched chains (e.g., cellulose, glycogen, starch).



Classification of Monosaccharides

- The monosaccharides are the simplest of the carbohydrates, since they contain only one polyhydroxy aldehyde or ketone unit.
- Monosaccharides are classified according to the number of carbon atoms they contain:

No. of	Class of carbons Monosaccharide
3	triose
4	tetrose
5	pentose
6	hexose

- The presence of an aldehyde is indicated by the prefix **aldo-** and a ketone by the prefix **keto-**.

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Techniques
Lecture 6: Carbohydrates

- Thus, glucose is an **aldohexose** (aldehyde + 6 Cs) and ribulose is a **ketopentose** (ketone + 5 Cs)