



SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A++ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

UNIT I: INTRODUCTION TO LIFE

TOPIC: **General classification and important functions of carbohydrates**





Carbohydrates:

The most abundant organic molecules in nature

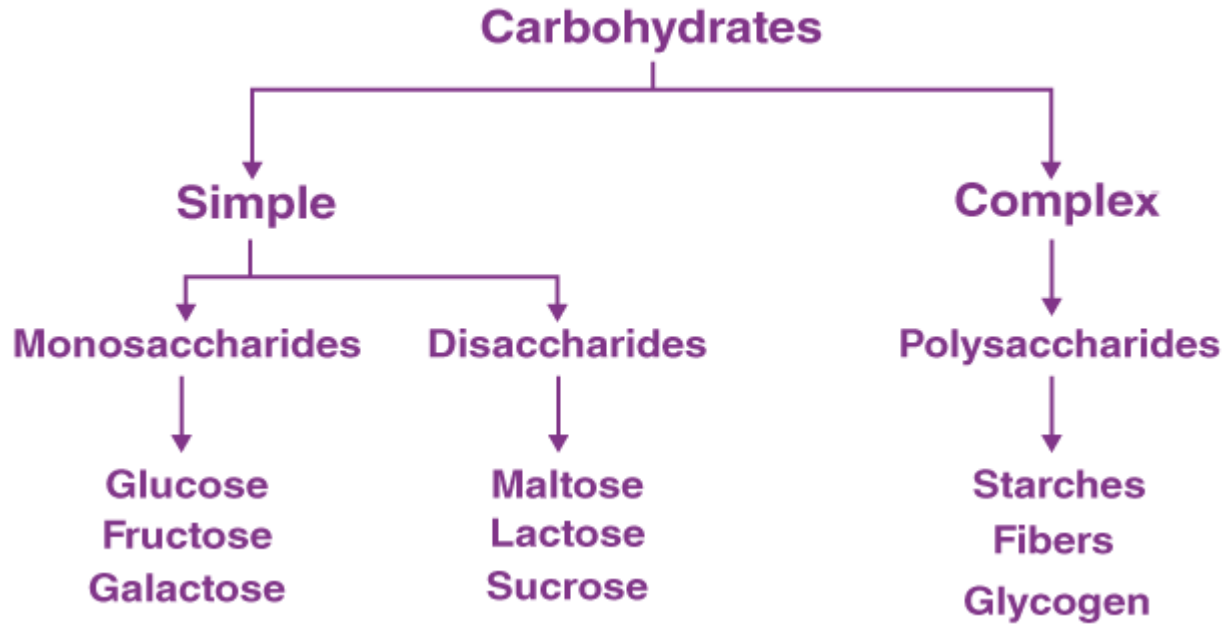
The empiric formula is $(\text{CH}_2\text{O})_n$, **“hydrates of carbon”**

Carbohydrates:

provide important part of energy in diet

Act as the storage form of energy in the body

are structural component of cell membranes





Monosaccharides

Further classified based on:

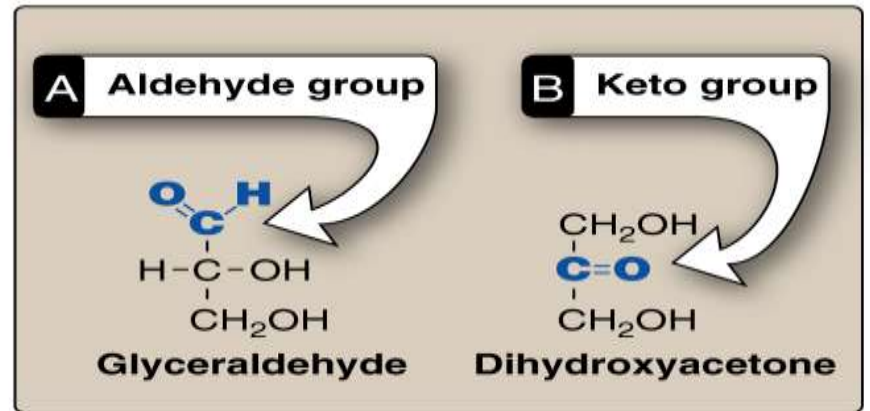
1. No. of carbon atoms

2. Functional sugar group:

Aldehyde group – **aldoses**

Keto group – **ketoses**

<u>Generic names</u>	<u>Examples</u>
3 carbons: trioses	Glyceraldehyde
4 carbons: tetroses	Erythrose
5 carbons: pentoses	Ribose
6 carbons: hexoses	Glucose
7 carbons: heptoses	Sedoheptulose
9 carbons: nonoses	Neuraminic acid





CARBOHYDRATES



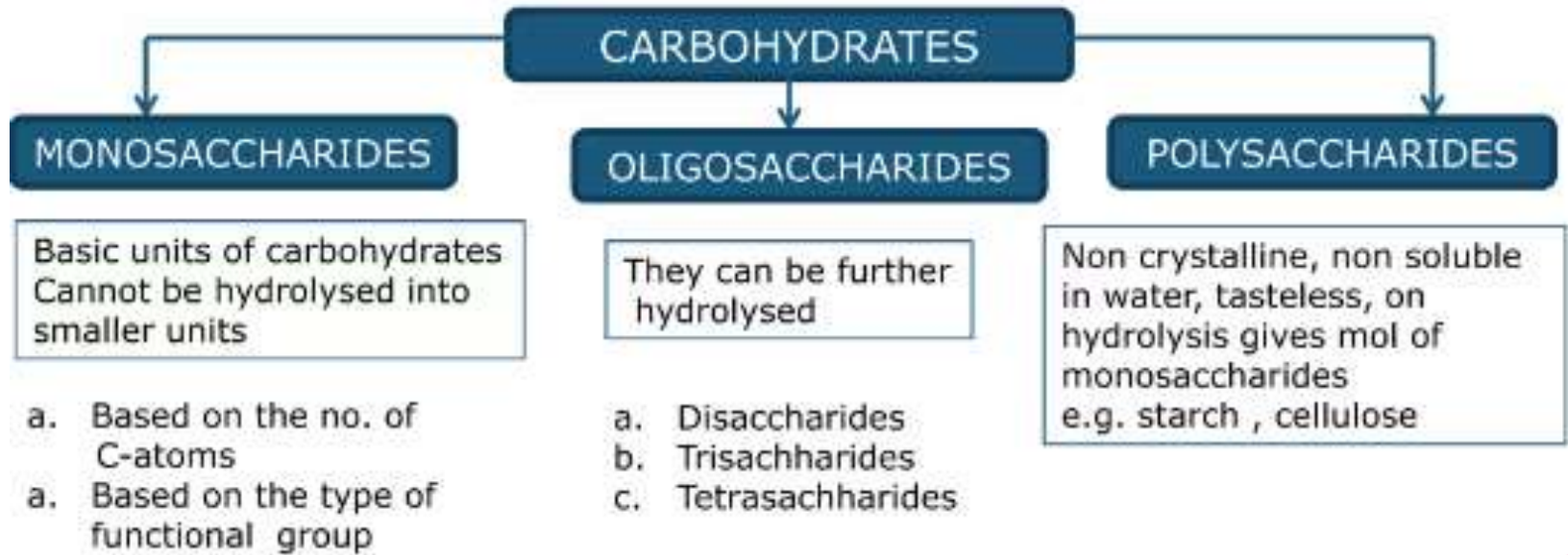
Carbohydrates are the most abundant organic molecules in nature.

The term carbohydrate is derived from the French term *hydrate de carbone* i.e. it is a hydrate of carbon or $C_n(H_2O)_n$

Carbohydrates are defined as organic substances having C, H & O
Wherein H and O are in the ratio 2:1 as found in H_2O

FUNCTIONS OF CARBOHYDRATES

- Most abundant **source of energy** (4 cal/g)
- **Precursors** for many organic compounds (**fats, amino acids**)
- Present **as glycoproteins and glycolipids** in the **cell membrane** and functions such as cell growth and fertilization
- Present as structural components like **cellulose in plants, exoskeleton** of some insects, **cell wall** of microorganisms
- **Storage form of energy** (glycogen) to meet the energy demands of the body.





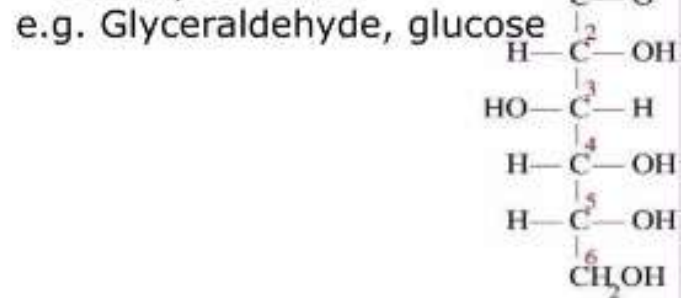
MONOSACCHARIDES

Based on the no of C-atoms

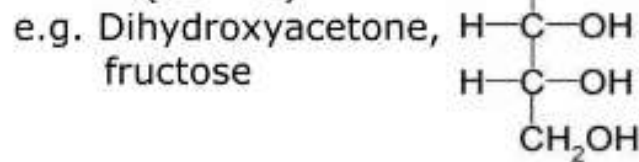
- **Trioses** ($C_3H_6O_3$)
e.g. Glyceraldehyde,
Dihydroxyacetone
- **Tetroses** ($C_4H_8O_4$)
e.g. Erythrose, Threose
- **Pentoses** ($C_5H_{10}O_5$)
e.g. Ribulose, Xylose
Arabinose
(*deoxyribose* - $C_5H_{10}O_4$)
- **Hexoses** ($C_6H_{12}O_6$)
e.g. glucose, fructose
galactose, mannose
- **Heptoses** ($C_7H_{14}O_7$)
e.g. sedoheptulose
glucoheptose

Based on the functional group

- **Aldoses** : the functional group is Aldehyde -CHO



- **Ketoses** : the functional group is ketone ($C = O$)





Derivatives of Monosaccharides

- 1. Deoxy Sugars** : Deoxygenation of ribose produces deoxyribose, which is a structural component of DNA
- 2. Amino Sugars** : When 1 or more $-OH$ groups of monosaccharides are replaced by $-NH_2$ (amino group) it forms an amino sugar e.g. Glucosamine, which forms chitin, fungal cellulose, hyaluronic acid.
- 3. Sugar Acid** : Oxidation of $-CHO$ or $-OH$ group forms sugar acids. Ascorbic acid is a sugar acid
- 4. Sugar alcohols** : Reduction of aldoses or ketoses. Glycerol and Mannitol.



OLIGOSACCHARIDES

They are formed by condensation of 2-9 monosaccharides

Depending upon the no. of monosaccharide molecules they are :

- a. Disaccharides (sucrose, lactose)
- b. Trisaccharides (raffinose)
- c. Tetrasaccharides (stachyose)

The smallest and the commonest oligosaccharides are Disaccharides



STRUCTURAL POLYSACCHARIDES

CELLULOSE

1. Occurs exclusively in plants and is the **most abundant organic substance** in plant kingdom.
2. Predominant constituent of plant cell wall.
3. **It is totally absent in animals.**

CHITIN

1. **Second most abundant** organic substance.
2. Complex carbohydrate of **Heteropolysaccharide** type.
3. Found in the exoskeletons of some invertebrates like insects and crustaceans. Provides both strength and elasticity.
4. Becomes hard when impregnated with calcium carbonate.



RECAP....



...THANK YOU