

Carbohydrate (CHO)

▪ Definition :

- Organic compounds composed of **C, H, O**.

Or

- **Poly hydroxy-aldehydes or ketones** and all compounds yielding them on hydrolysis. عديد الهيدروكسيل او المركبات اللي تنتجهم لما تتكسر

▪ Function :

1. **Source** of energy. مصدر للطاقة
2. **Cell recognition**. التعرف والتواصل بين الخلايا
3. **Structure** of cell membranes. تركيب جدار الخلية
4. **Structure** of glycoproteins & glycolipids.
5. **Structure** of nucleic acids as Pentose sugars (which is ribose & deoxy-ribose).

▪ Classification :

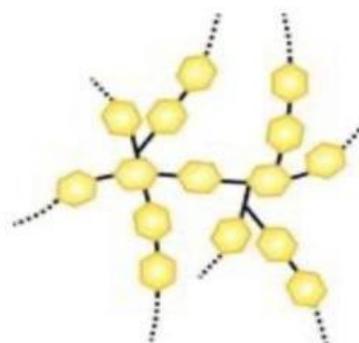
Monosaccharides (simple sugars)	Disaccharides	Oligosaccharides	Polysaccharides (Glycans)
Single unit.	2 units.	3-10 units.	>10 units.



Monosaccharide



Disaccharide

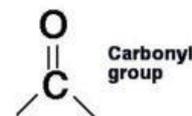


Polysaccharide

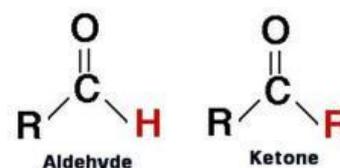
Mono-saccharides

▪ Definition :

- carbohydrates that contain **only one** sugar unit & **cannot** be hydrolyzed into smaller units. وحدات بسيطة لا يمكن تسكيرها لوحدات اصغر
- It is the **simplest** unit of Carbohydrates.



▪ General formula : $(\text{CH}_2\text{O})_n = \text{C}_n\text{H}_{2n}\text{O}_n$ **MCQ**



▪ Classification : according to:

- Number of **carbon atoms**.
- Active** (carbonyl) group whether aldehyde or ketone.

No. of carbon atoms	Generic name	Aldoses	Ketoses
3	Triose	Glyceraldehyde	Di-hydroxy-acetone
4	Tetrose	Erythrose	Erythrulose
5	Pentose	<ul style="list-style-type: none"> Ribose Arabinose Xylose 	<ul style="list-style-type: none"> Xylulose Ribulose
6	Hexose	<ul style="list-style-type: none"> Glucose Galactose Mannose 	Fructose
7	Heptose		Sedo-heptulose

NB :

- The most abundant monosaccharides are the **Aldohexoses**. **MCQ**

▪ Biological Importance of Monosaccharides :

A. Glucose (Dextrose) (Grape Sugar):

1. Major source of **energy** for human and animal tissues.
2. Brain & Erythrocytes (RBCs) depend on glucose as they **cannot oxidize** alternative fuels.
3. So the body maintains blood glucose level **70–110 mg/dl**.
4. Ingested carbohydrates are absorbed in form of **glucose** , then It is converted into other sugars in liver & other tissues.

B. Galactose :

- Synthesized in **mammary gland** to form the disaccharides **lactose** (milk sugar).
- Enter in structure of **glycolipid & glycoproteins**.

C. Mannose :

- Enter in the structure of **glycoproteins & amino-sugar acids**.

D. Fructose (Levulose) (Fruit Sugar) :

- Present in **semen** (Seminal fluid) & sperms use fructose for energy. **MCQ**
- Enter in structure of **disaccharide "sucrose"** & **polysaccharide "inulin"**.

E. Ribose & deoxy-ribose :

- Enter in structure of nucleic acids **RNA & DNA**.
- Enter in structure of high-energy phosphate compounds as **ATP**.
- Enter in structure of **coenzymes** (NAD).

Case scenario

- Fouad is a 35 years old male patient, presented to emergency room (ER with complaints of dizziness, fatigue, pale skin, headache, sweating and rapid heartbeats
- What is the diagnosis ?
 - The case represents **hypoglycemia**
 - The patient blood pressure **110/70 mmHg** & random blood sugar **49 mg/dl**
 - Some cells and tissues, including brain and erythrocytes , depend on glucose because they cannot oxidize alternative fuels.
 - Therefore, the body maintains a blood glucose level of **70/110 mg/dl** at all times.

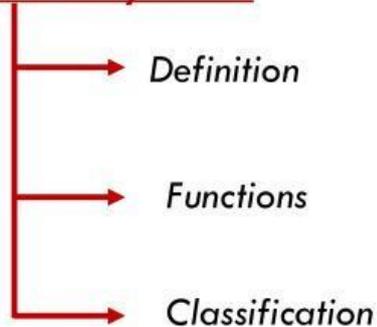


MCQ notes :

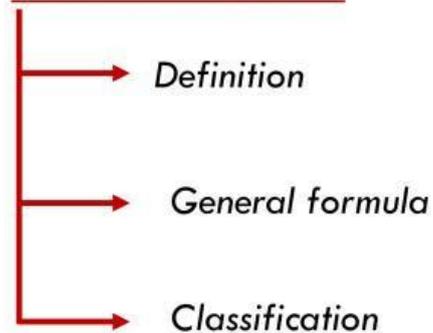
1. **Disacharides** is formed of 2 monosacharide units
2. **Pentose sugar** is ribose
3. **Aldo- hexoses** are glucose , galactose and mannose
4. **Ingested CHO** is in the form of glucose (dextrose)
5. **Source of energy for sperm** is fructose (levulose)

Summary of lecture

▪ Carbohydrates



▪ Mono-saccharides :



▪ Biological Importance of Monosaccharides :

