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.

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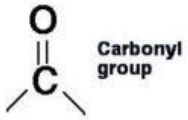
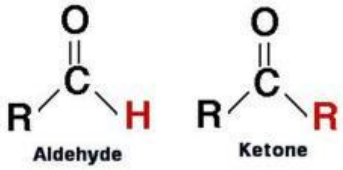
Mono-saccharides

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



- **General formula :** $(CH_2O)_n = C_nH_{2n}O_n$ **MCQ**



- **Classification :** **according to:**
  1. Number of **carbon atoms.**
  2. **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	• Ribose • Arabinose • Xylose	• Xylulose • Ribulose
6	Hexose	• Glucose • Galactose • Mannose	Fructose
7	Heptose		Sedo-heptulose

NB :

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

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Aldoses

Aldotriose	D-Glyceraldehyde			
Aldotetroses	D-Erythrose	D-Threose		
Aldopentoses	D-Ribose	D-Arabinose	D-Xylose	D-Lyxose
Aldohexoses	D-Allose	D-Altrose	D-Glucose	D-Mannose
	D-Gulose	D-Idose	D-Galactose	D-Talose

Three carbons

Dihydroxyacetone

Four carbons

D-Erythrulose

Five carbons

D-Ribulose

D-Xylulose

Six carbons

D-Psicose

D-Fructose

D-Sorbose

D-Tagatose

(b)

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▪ 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).*

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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.*

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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***
  - *Definition*
  - *Functions*
  - *Classification*
- ***Mono-saccharides :***
  - *Definition*
  - *General formula*
  - *Classification*
- ***Biological Importance of Monosaccharides :***
  - *Glucose (Dextrose)*
  - *Galactose & Fructose*
  - *Mannose*
  - *Ribose & deoxy-ribose*

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