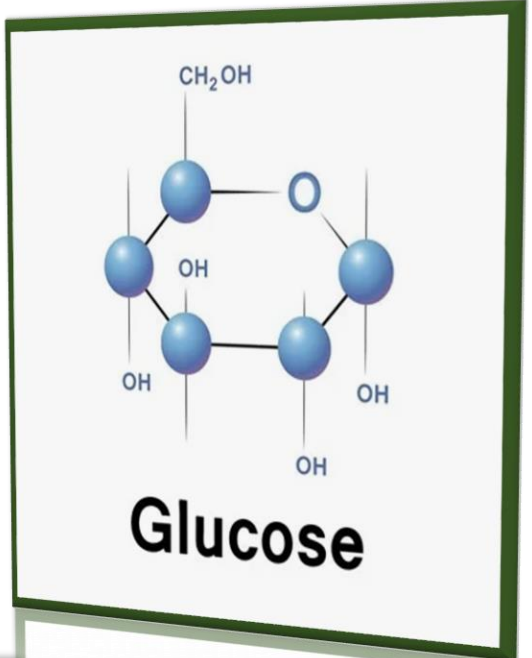
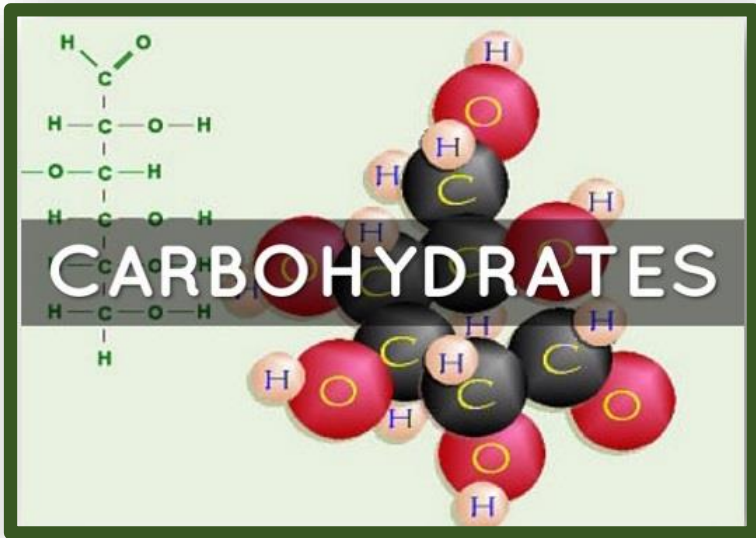




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General Chemistry

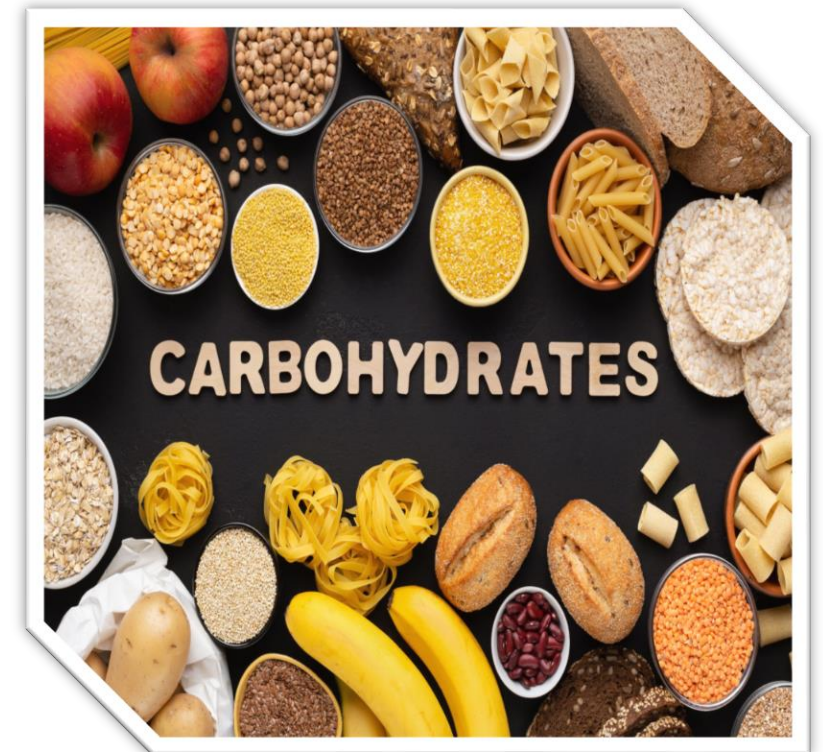
Tenth Lecture: Carbohydrates



Asst. Lec. Alaa Salman Al-Labban

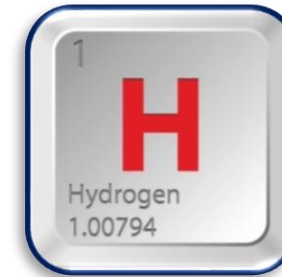
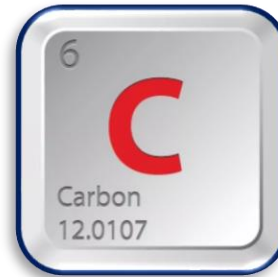
Out line

- ✓ **What is Carbohydrates**
- ✓ **Importance of Carbohydrates**
- ✓ **Classification of Carbohydrates**
- ✓ **Structures of Carbohydrates**



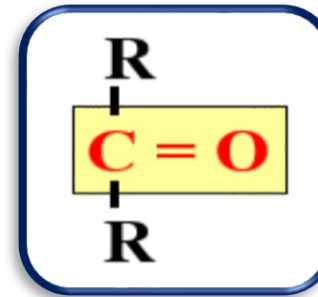
What is Carbohydrates

- ❑ **Carbohydrates:** are biological molecules that contain:



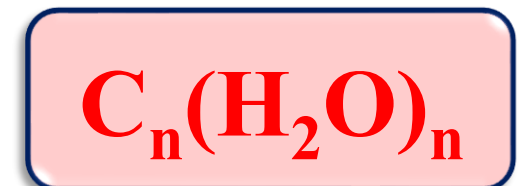
- ❑ So, it can be defined as **polyhydroxy aldehydes** or **ketones**.

Aldehyde



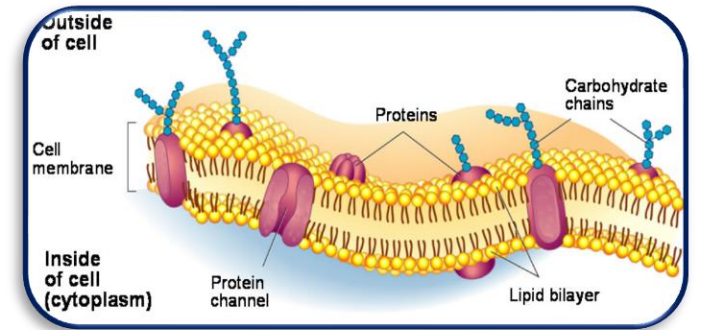
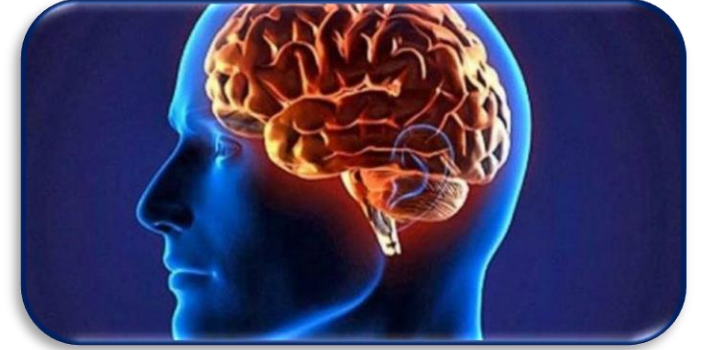
Ketone

- ❑ The general molecular formula of carbohydrates is



Importance of Carbohydrates

- ❑ Sources of **energy** especially for **brain** and **RBC**.
- ❑ Carbohydrates are structural of **cell membranes**.
- ❑ Serve as **metabolic intermediates**.
- ❑ Components of the **nucleotides** that form **DNA** and **RNA**.



Carbohydrates

```
graph TD; A[Carbohydrates] --> B[Monosaccharides]; A --> C[Polysaccharides]; A --> D[Oligosaccharides];
```

Monosaccharides

Polysaccharides

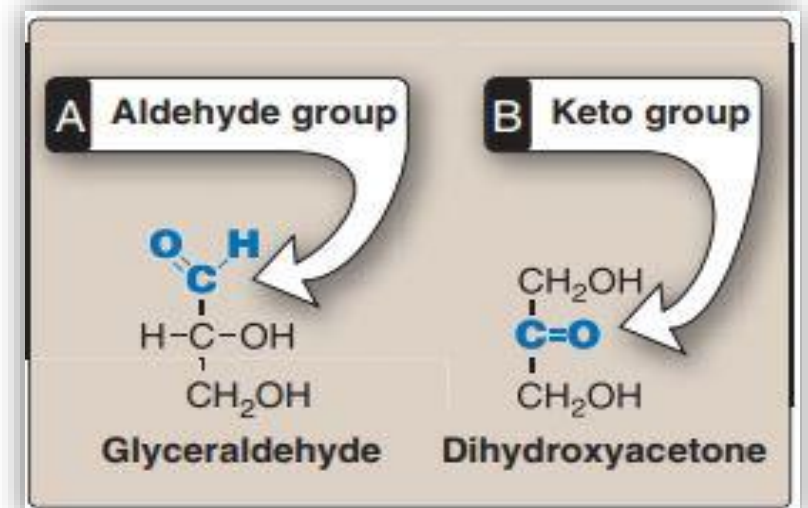
Oligosaccharides

Monosaccharides

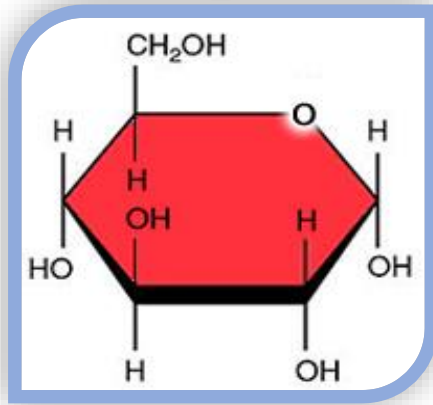
- ❑ The **simplest** units of carbohydrates
- ❑ Monosaccharides **cannot be hydrolyzed** into simpler carbohydrates.
- ❑ Monosaccharides classified according to:
 1. **Number of carbon atoms** they contain.
 2. **Functional groups:** depending upon whether they have an **aldehyde** or **ketone** group (**aldoses** and **ketoses**).

Classification of Monosaccharides

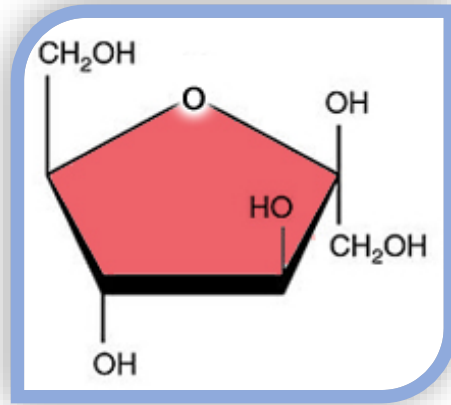
No. of Carbon	Type of sugar	Aldoses	Ketoses
3	TRIOSES	Glyceraldehydes	Dihydroxyacetone
4	TETROSES	Erythrose	Erythrulose
5	PENTOSES	Ribose, Xylose	Ribulose, xylulose
6	HEXOSEs	Glucose, Galactose	Fructose
7	HEPTOSEs	Glucoheptose	Sedoheptulose



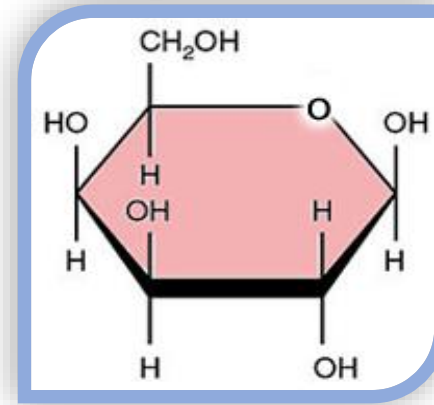
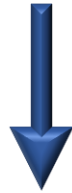
Examples of Monosaccharides



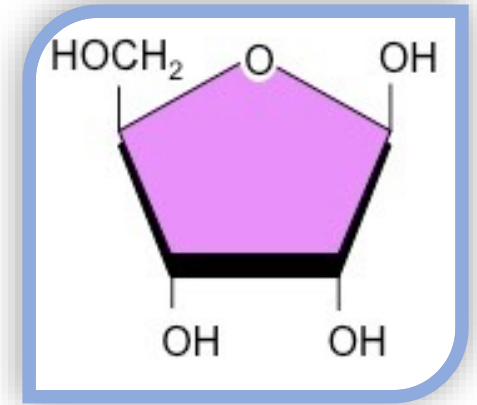
Glucose



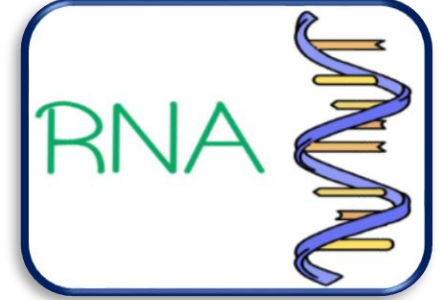
Fructose



Galactose

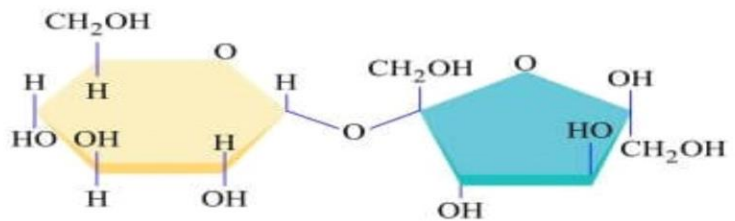


Ribose



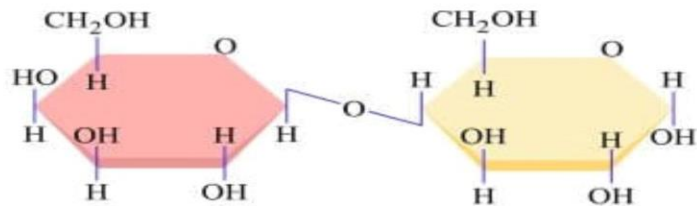
Oligosaccharides

- Oligosaccharides are composed of (2-10) monosaccharides linked by glycosidic bonds.



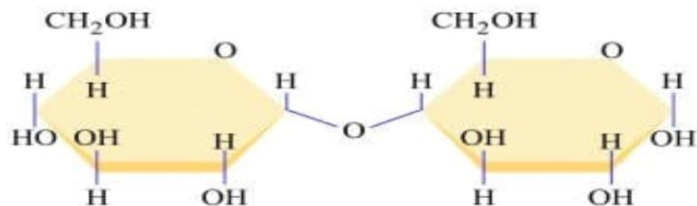
Sucrose
Glucose and Fructose

α -(1-2)



Lactose
Galactose and Glucose

β -(1-4)



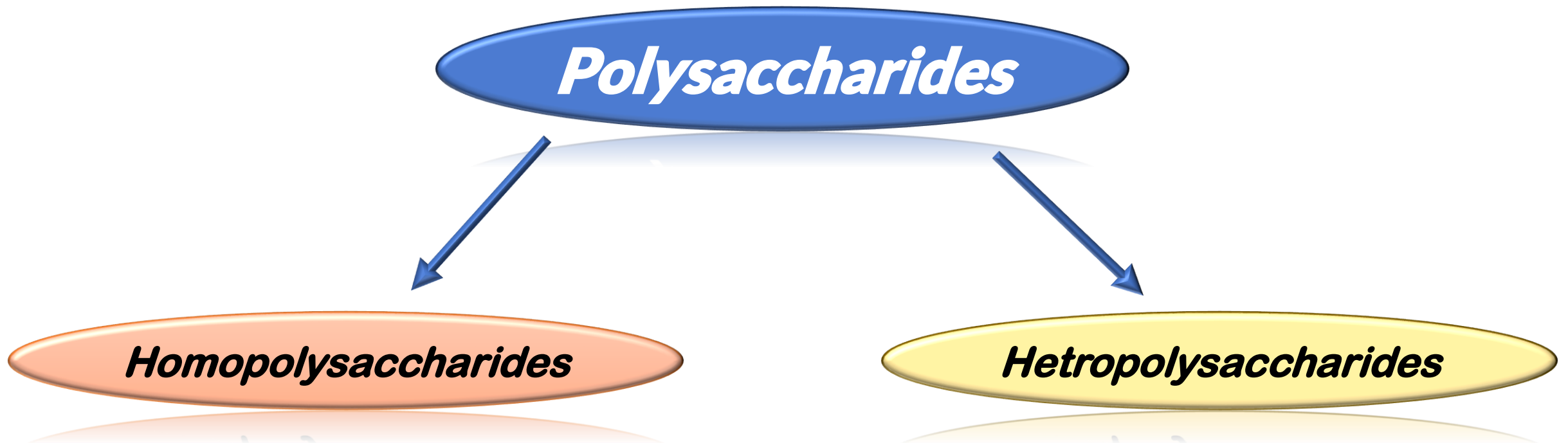
Maltose
Glucose and Glucose

α -(1-4)



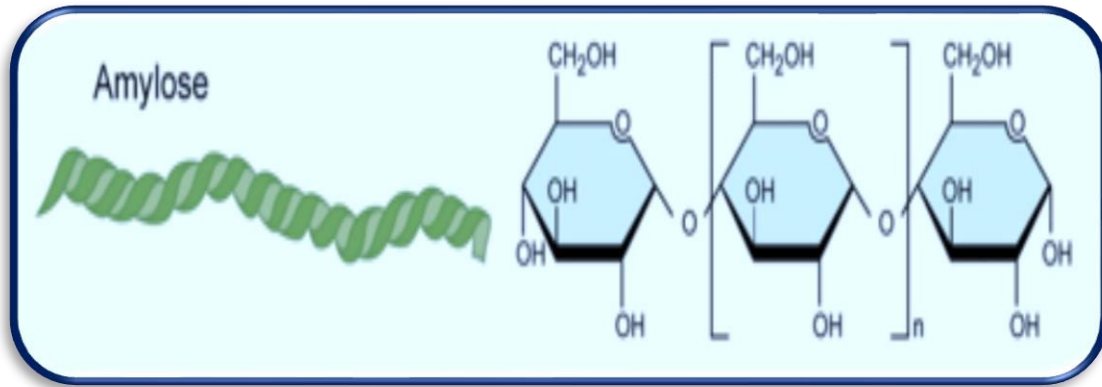
Polysaccharides

- ❑ **Polysaccharides** are long chains of monosaccharides condensation with each other by **glycosidic bonds**.
- ❑ **Polysaccharides** chains are **straight or branched**

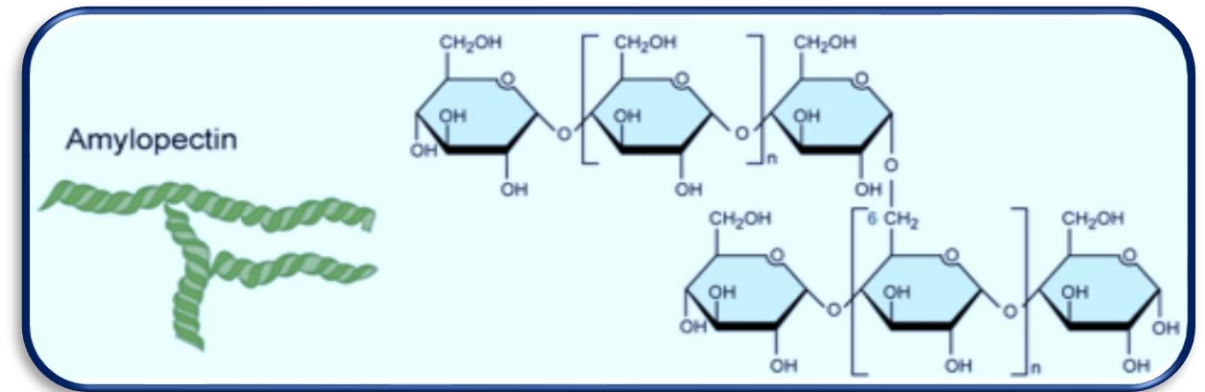


Examples of Homopolysaccharides

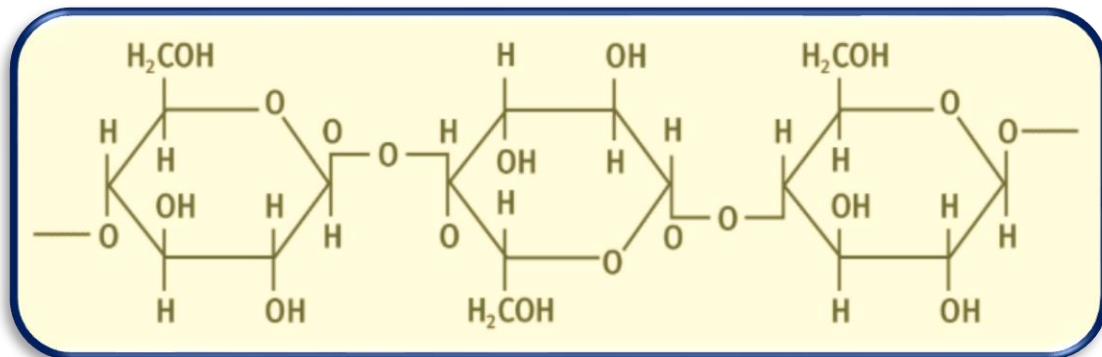
- ❑ Starch consists of amylose and amylopectin and its chains are straight and branched



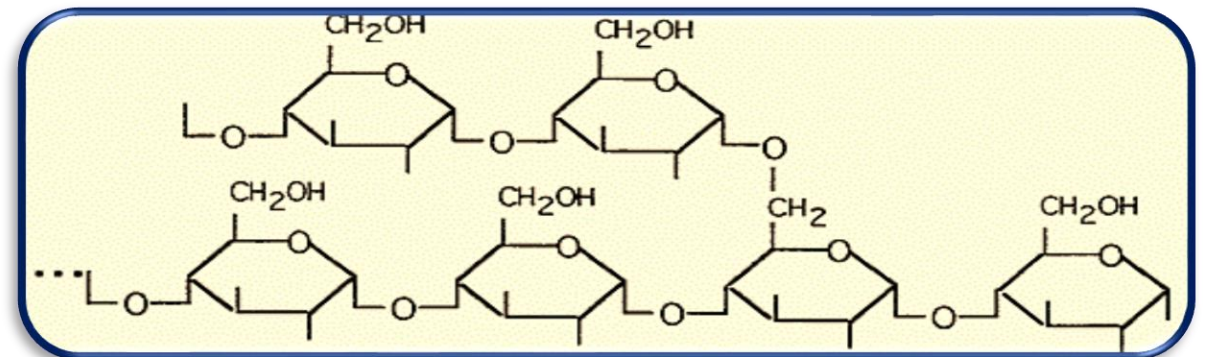
Amylose α -(1-4)



Amylopectin α -(1-4) α -(1-6)



Cellulose β -(1-4)



Glycogen α -(1-4) α -(1-6)

Examples of Heteropolysaccharides

- ❑ **Heparin** is a heterogeneous mucosal polysaccharide.
- ❑ **Heparin** consists of **Glucose amine, Glucuronic acid and sulfuric acid.**
- ❑ **Hyaluronic acid** is a heterogeneous polysaccharide, consists of **N-Acetyl-D-Glucosamine** and **Glucuronic acid.**
- ❑ **Hyaluronic acid** found in the fluids in the eyes and joints. It acts as a cushion and lubricant in the joints and other tissues.

