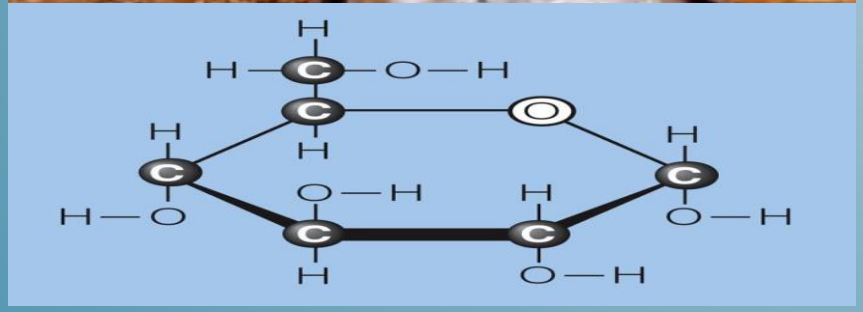
Biochemistry – Year 2



Lecture 2

By

Assistance teacher

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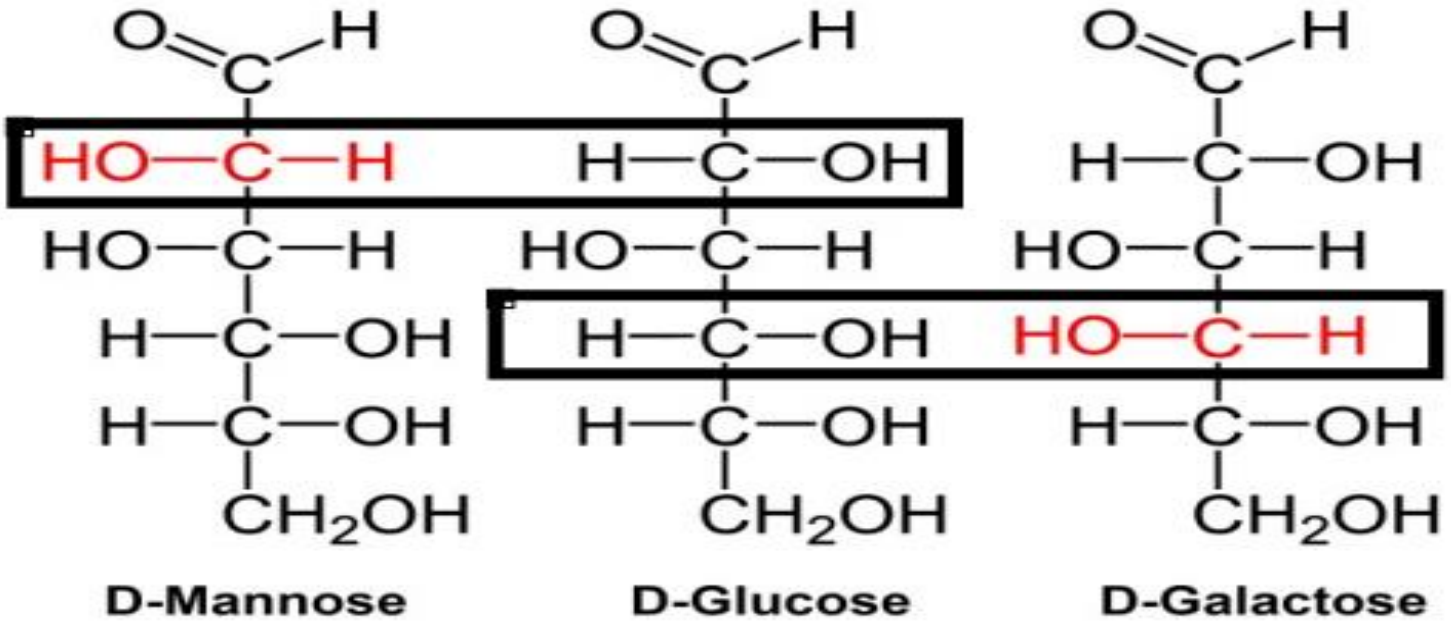
4.Epimers: are 2 monosaccharides that differ in the configuration of –H and –OH around only one specific carbon atom (with the exception of the carbonyl carbon).

Glucose and Mannose are epimers at C2.

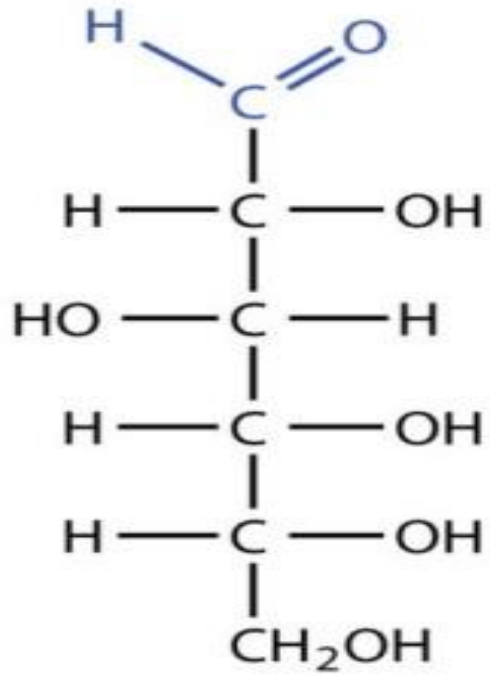
Glucose and galactose are epimers at C4.



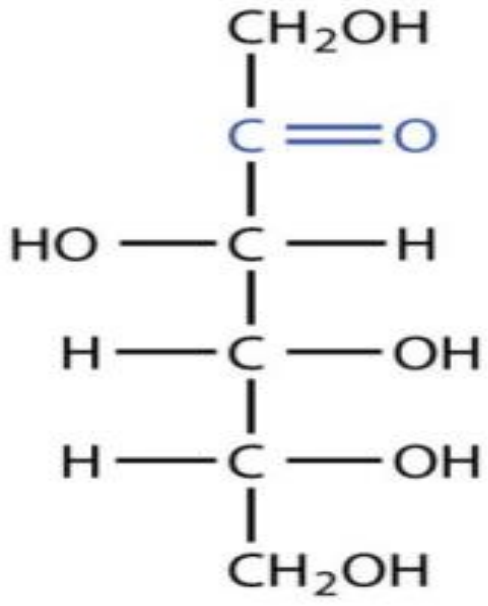
5.Aldose and Ketose: Fructose and Glucose have the same molecular formula , but they differ in the site of the carbonyl group.

In glucose , the carbonyl group is at C1 so I is an Aldose.

IN fructose , the carbonyl group is at C2 so I is an ketose.



Glucose
(an aldohexose)



Fructose
(a ketohexose)

Pentose:

Sugar	Source	Biochemical importance
D-Ribose	Nucleic acid and metabolic intermediate	Structural component of nucleic acids and co-enzymes including ATP and NAD
D-Ribulose	metabolic intermediate	Intermediate in the pentose phosphate pathway
D-Arabinose	Plant gum	Constituent of Glycoproteins

Hexoses:

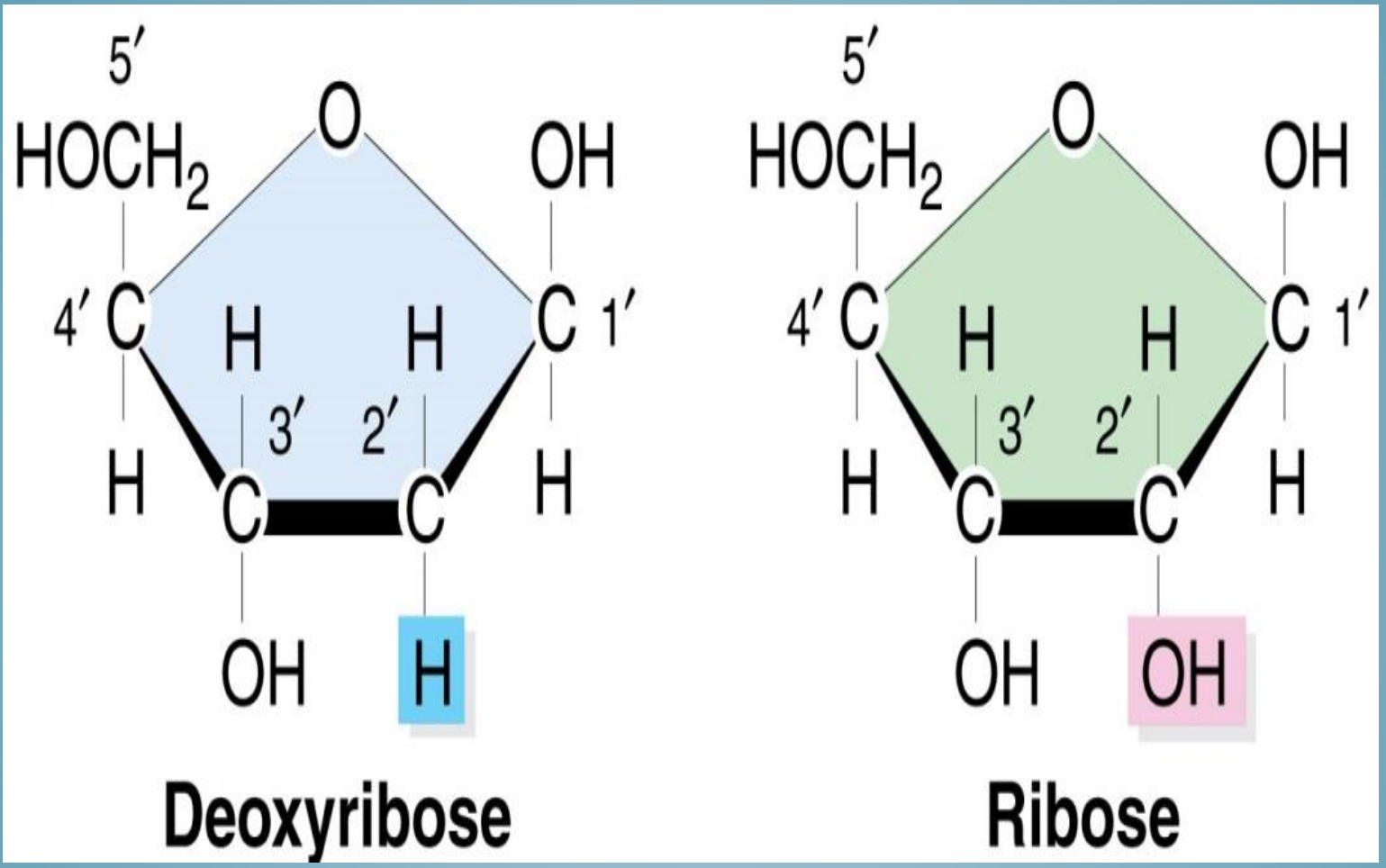
Sugar	Source	Biochemical importance
D-Glucose	Fruit sugar hydrolysis of starch	The main metabolic fuel of the tissues.
D-Fructose	Fruit juice, honey , cane sugar	It is metabolized to glucose.
D- Galactose	Hydrolysis of lactose	It is metabolized to glucose. Synthesized in mammary glands for synthesis of lactose in milk

Biologically important derivatives of monosaccharides:

1. Deoxy sugers

Deoxy sugers are those in which one hydoxyl group has been replaced by hydrogen. An example are :

A. Deoxyribose in DNA.
B. Deoxy suger L-fucose occur in glycoproteins.
C. Deoxyglucose is used experimentally as an inhibitor of glucose metabolism.


5′
HOCH2
O
OH
4′
C
H
H
C
1′
3′
2′
H
C
C
H
OH
H
Deoxyribose
5′
HOCH2
O
OH
4′
C
H
H
C
1′
3′
2′
H
C
C
H
OH
OH
Ribose

2. Amino sugers or hexosamines

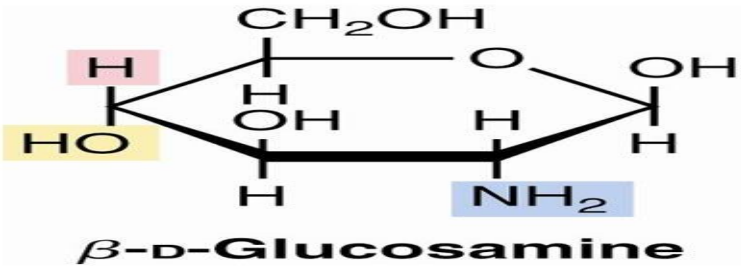
Sugers that is the OH group at C-2 is replaced by an amino group . The amino sugers include:

D-glucosamine

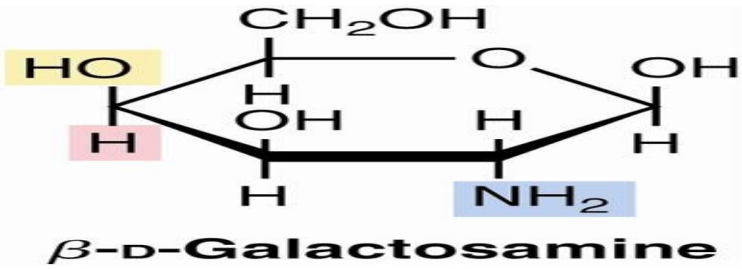
D- galactosamine

D- mannosamine .

Several antibiotics **(e.g, erythromycine)** contain amino sugers , which are important for their antibiotic activity.



β-D-Glucosamine

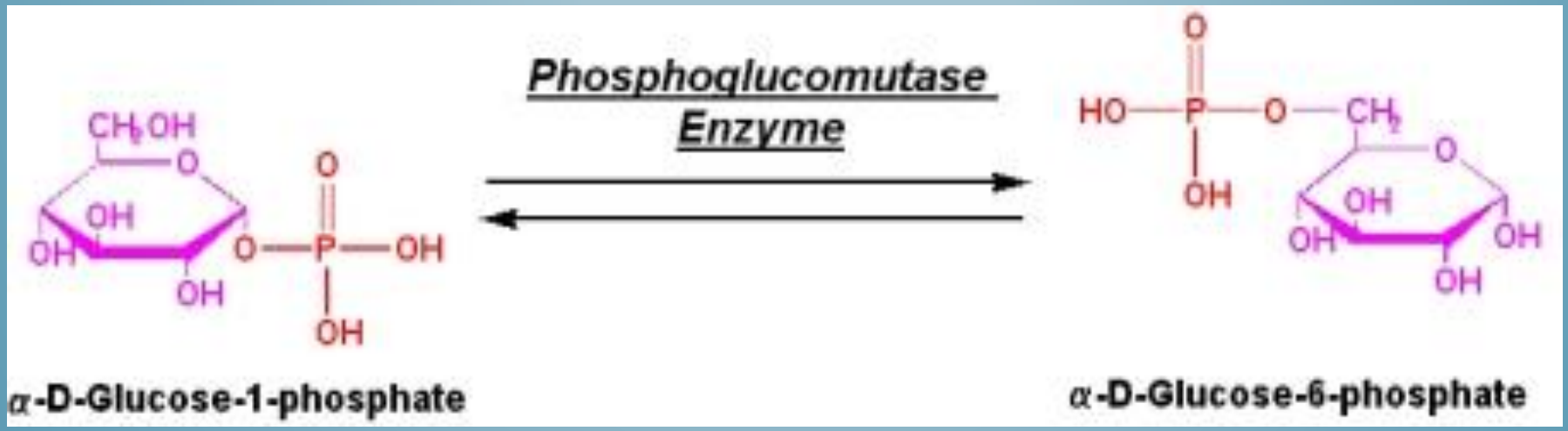


β-D-Galactosamine

3. Sugar esters

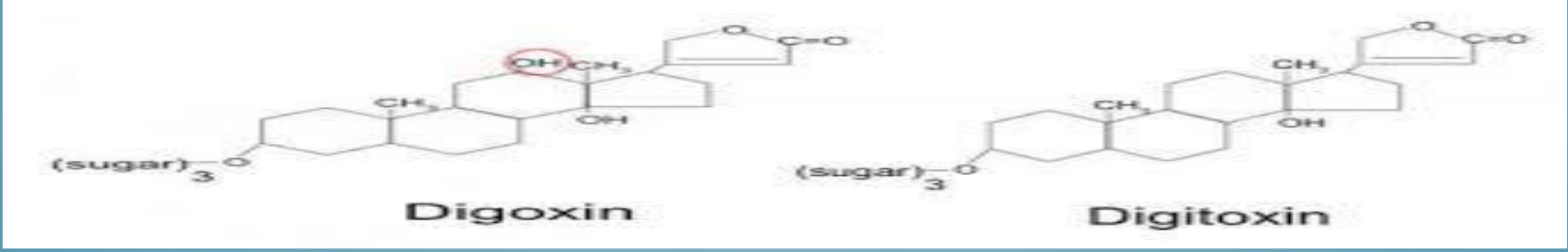
Is a sugar phosphates which are intermediates in monosaccharides metabolism .

E .g , glucose 6 phosphates and glucose 1 phosphates



Glycosides

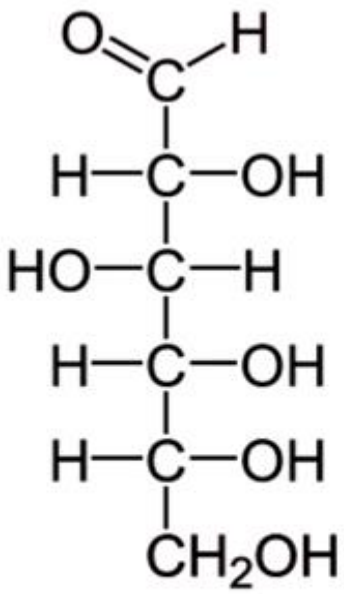
Glycosides are compounds formed from a condensation between a monosaccharide , or monosaccharides residue which called **(glycone)** , and the hydroxyl group of a second compound that may , or may not which called **aglycone** (in the case of an aglycone : the aglycone may be methanol , glycerol , a sterol , or phenol) .
Glycosides are important in medicine e.g. **Cardiac glycosides** because of their action on the heart , all contain steroids as the aglycone component . These include derivatives of digitalis



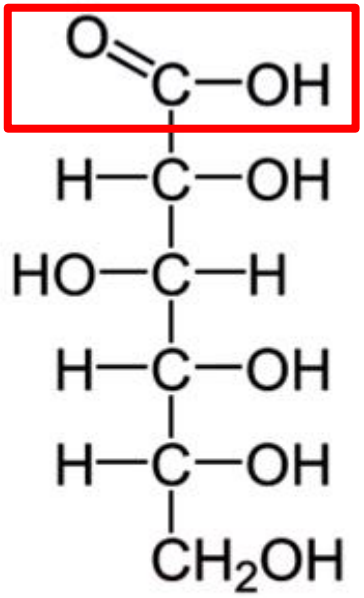
Reaction of monosaccharaides

1.Oxidation reaction:

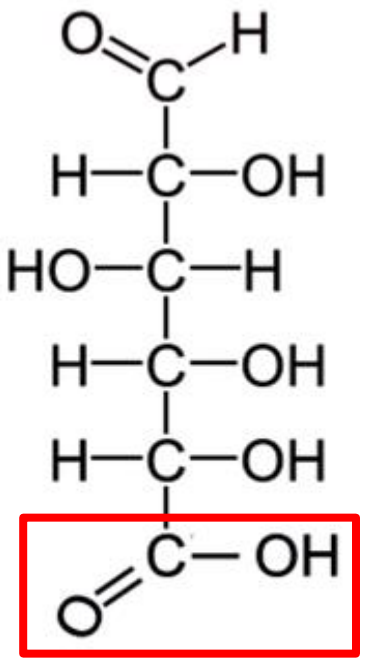
a. The carbonyl group of an aldose is oxidized to carboxylic acid by mild oxidizing agent to form **aldonic acid** , ex: gluconic acid.
b. Oxidation of the primary alcohol yields **uronic acid**, ex: Glucuronic acid , galacturonic acid .
c. Oxidation of both carbonyl group and primary alcohol in aldoses yields **aldaric acid** .



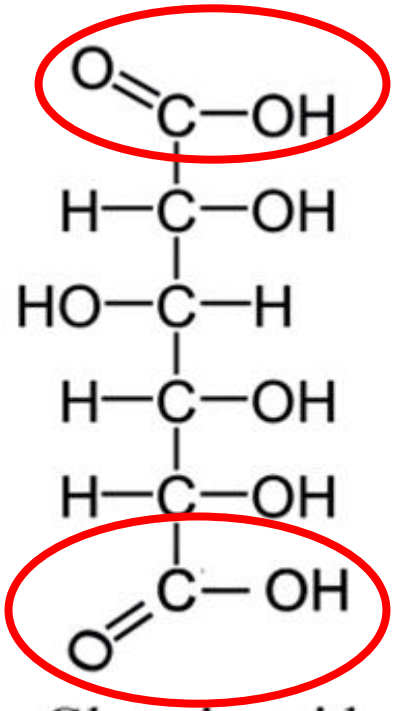
D-Glucose



Gluconic acid



Glucuronic acid

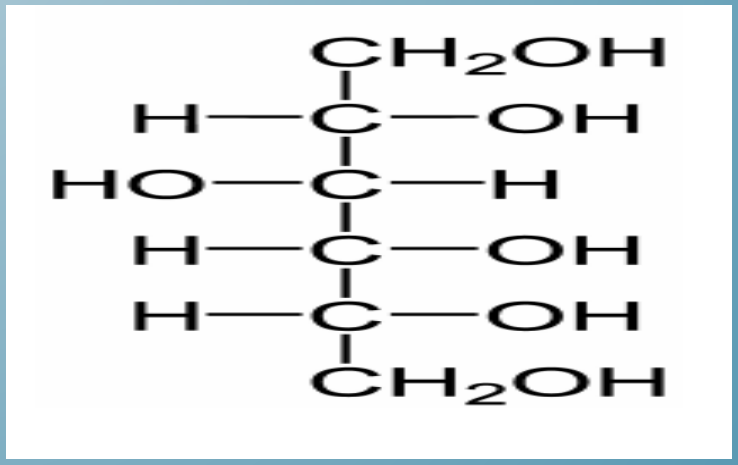


Glutaric acid

2.Reduction reaction: aldoses and ketoses can be reduced to form **Alditols (sugar alcohol).**

Biomedical importance :

Several of them are used as sugarless sweetening agents such as **Sorbitol(glucitol) and Mannitol.** They are also important components of lipid.



thanks