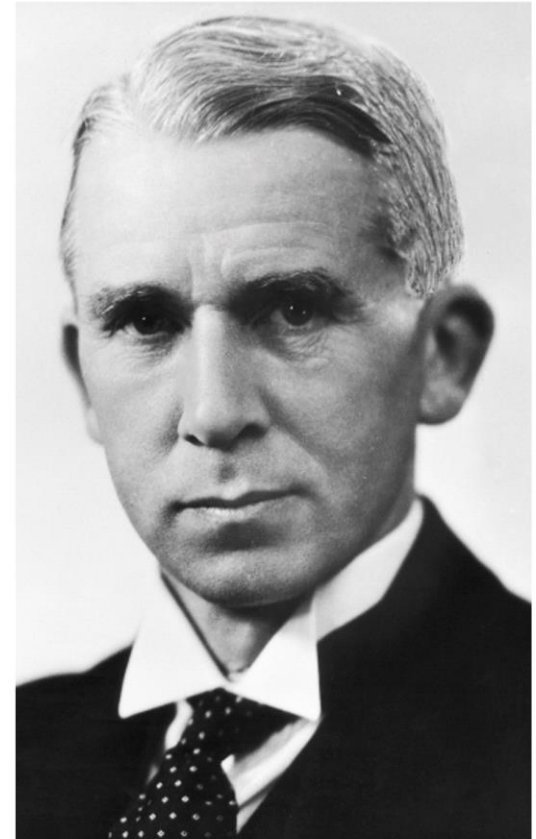


Derivatives of Monosaccharides

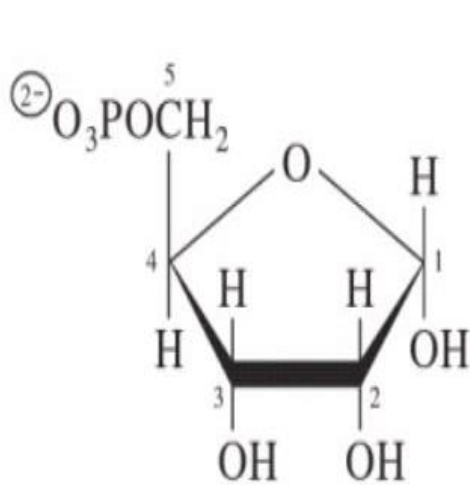
Assist. Prof. Dr. Usama H. Ramadhan



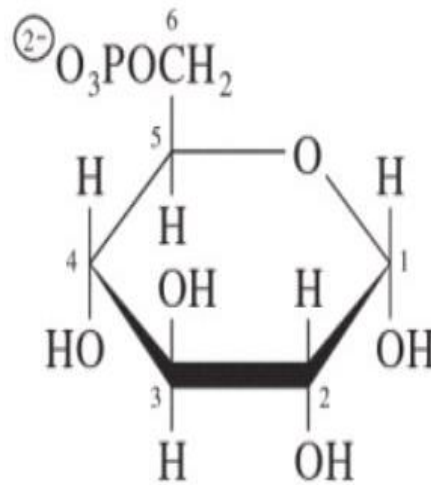
▲ Sir Walter Norman Haworth (1883–1950). Haworth received the Nobel Prize in Chemistry in 1937 for his work on the structures of carbohydrates and the synthesis of vitamin C.

A. Sugar Phosphates

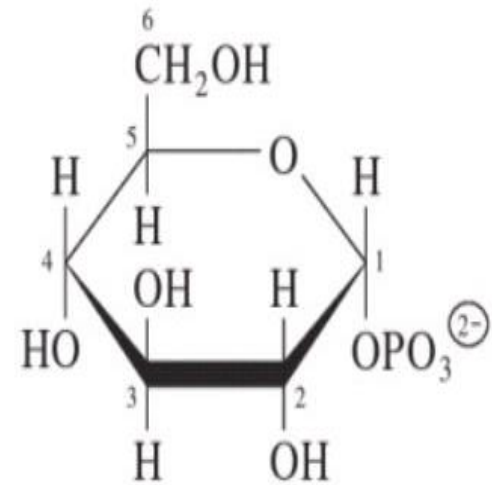
Monosaccharides in metabolic pathways are often converted to phosphate esters. The triose phosphates, ribose 5-phosphate, and glucose 6-phosphate are simple alcohol-phosphate esters.



α -D-Ribose 5-phosphate



α -D-Glucose 6-phosphate

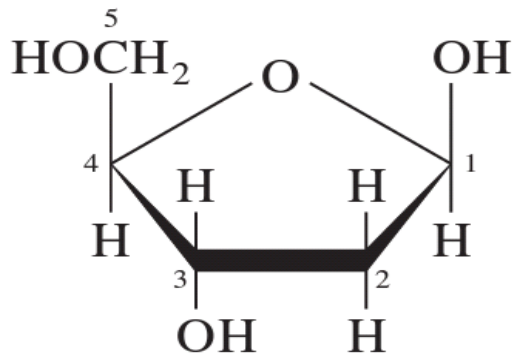


α -D-Glucose 1-phosphate

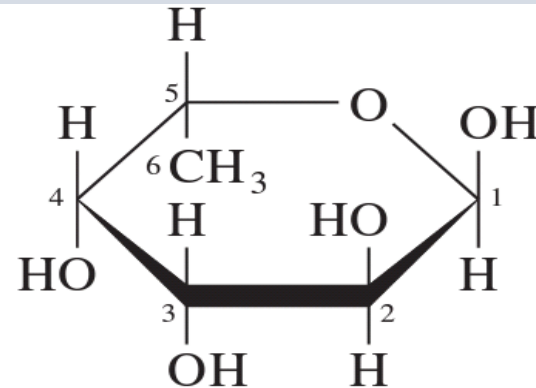
B. Deoxy Sugars

A hydrogen atom replaces one of the hydroxyl groups in the parent monosaccharide. 2-Deoxy-D-ribose is an important building block for DNA.

L-Fucose (6-deoxy-L-galactose) is widely distributed in plants, animals, and microorganisms.



β -2-Deoxy-D-ribose

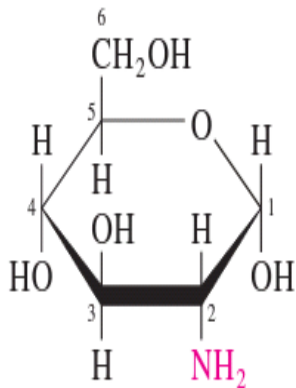


α -L-Fucose
(6-Deoxy-L-galactose)

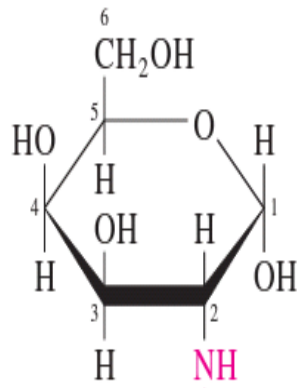
C.Amino Sugars

In a number of sugars, an amino group replaces one of the hydroxyl groups in the parent monosaccharide.

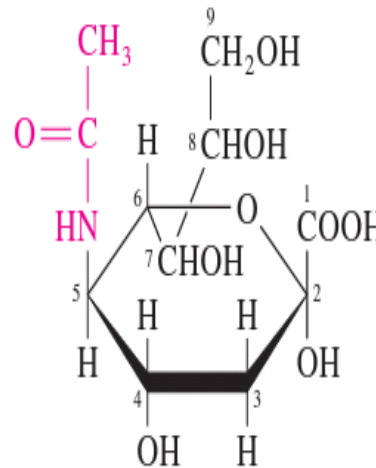
Sometimes the amino group is acetylated. Three examples of amino sugars are shown below:



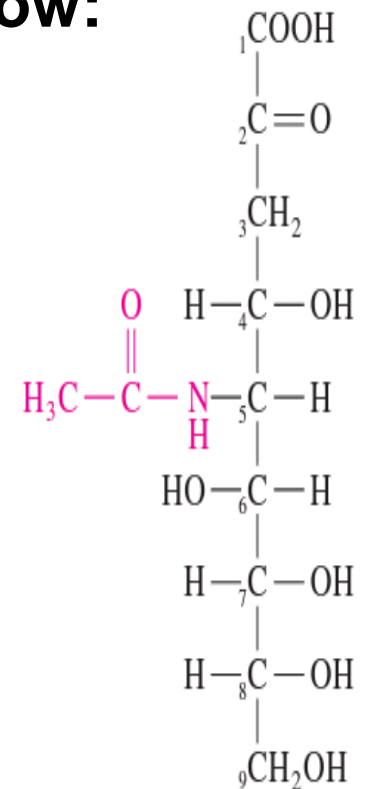
α -D-Glucosamine



N-Acetyl- α -D-galactosamine



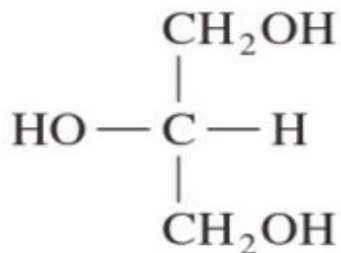
N-Acetyl- α -D-neuraminic acid



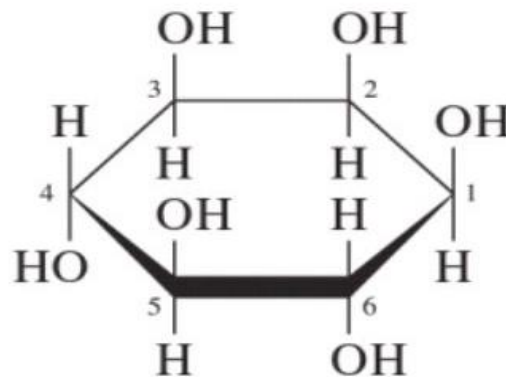
N-Acetyl-D-neuraminic acid

D. Sugar Alcohols

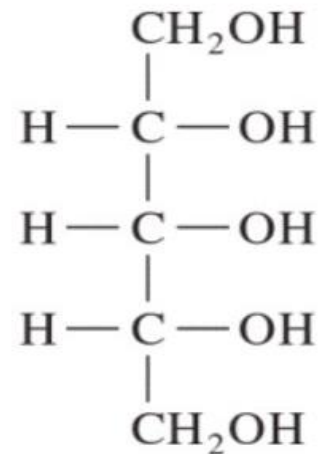
In a sugar alcohol, the carbonyl oxygen of the parent monosaccharide has been reduced, producing a polyhydroxy alcohol. Three examples of sugar alcohols. Glycerol and myo-inositol are important components of lipids Ribitol is a component of flavin mononucleotide (FMN) and flavinadenine dinucleotide (FAD) In general, sugar alcohols are named by replacing the suffix –ose of the parent monosaccharides with -itol.



Glycerol



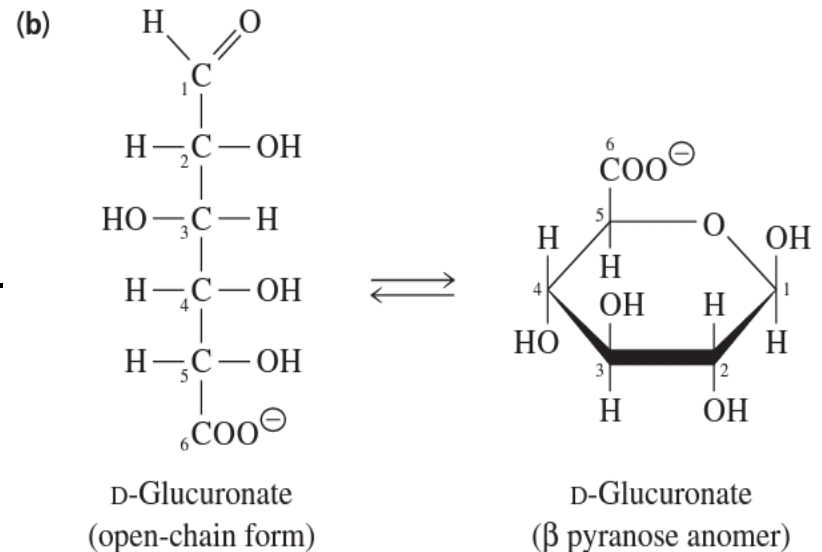
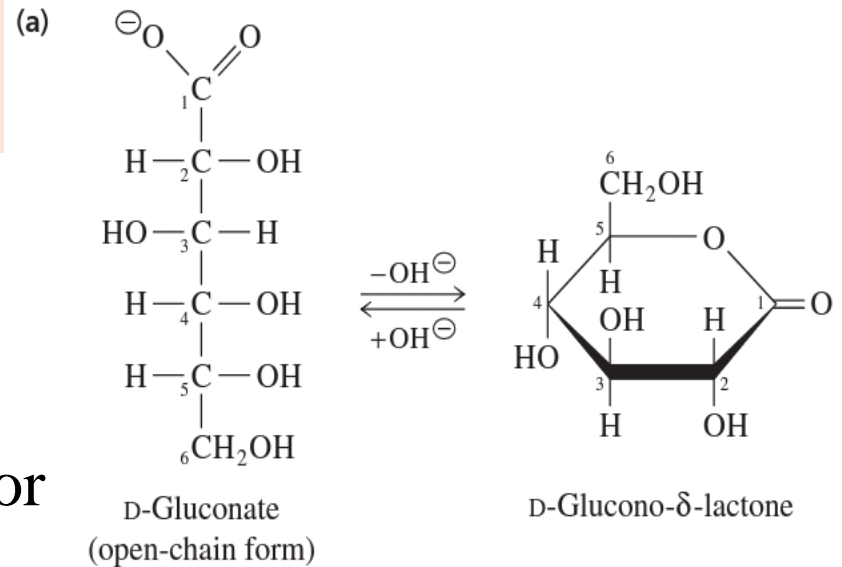
myo-Inositol



D-Ribitol

E. Sugar Acids

Sugar acids are carboxylic acids derived from aldoses, either by oxidation of C-1 (the aldehydic carbon) to yield an aldonic acid or by oxidation of the highest-numbered carbon (the carbon bearing the primary alcohol) to yield an alduronic acid. The structures of the aldonic and alduronic derivatives of glucose—gluconate and glucuronate.



F. Ascorbic Acid

L-Ascorbic acid, or vitamin C, is an enediol of a lactone derived from D-glucuronate. Primates cannot convert glucuronate to ascorbic acid and must therefore obtain ascorbic acid from the diet. Ascorbic acid is an essential cofactor for the enzymes that catalyze the hydroxylation of proline and lysine residues during collagen synthesis

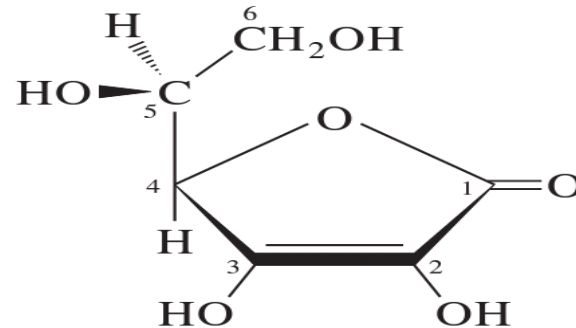


Figure 8.18 ▲
L-Ascorbic acid (vitamin C).

Reference

Principles of Biochemistry

FOURTH EDITION

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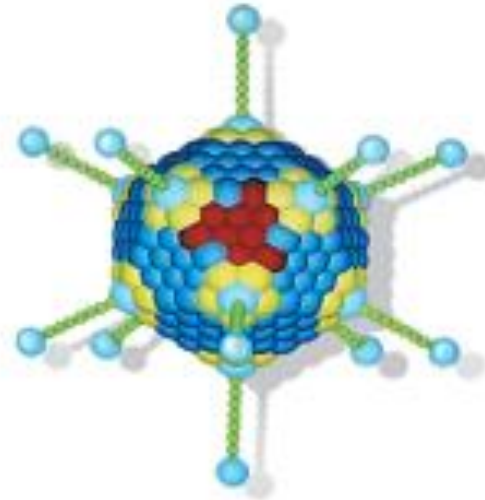
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Thank you

Any questions?

