The Basics of Life

Carbohydrates

University of Idaho

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Carbohydrates and Organisms

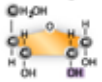
Carbohydrates, including those found in breads and pastas, occur in all organisms, and are a very diverse class of molecules.

Roles:

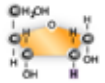
1) **energy source/storage**
2) **carbon skeletons**
3) **cell signaling**
4) **structure**

Simple Sugars - Monosaccharides

Five-carbon sugars

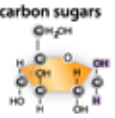


Ribose



Deoxyribose

Six-carbon sugars



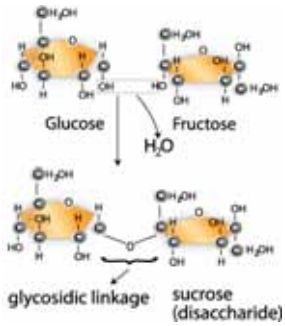
β-Glucose

Fructose

Most monosaccharides have the general formula $C_nH_{2n}O_n$ (carbon, hydrogen, and oxygen atoms are in the ratio of 1:2:1).

ribose: $C_5H_{10}O_5$
glucose: $C_6H_{12}O_6$
fructose: $C_6H_{12}O_6$

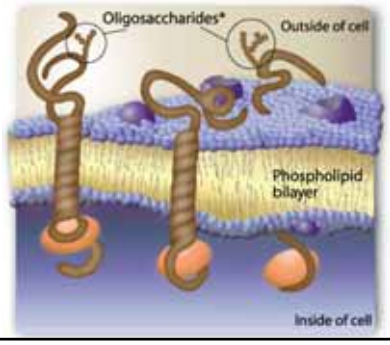
Monosaccharides as Monomers



Monosaccharides are covalently linked through condensation reactions, forming a glycosidic linkage.

4

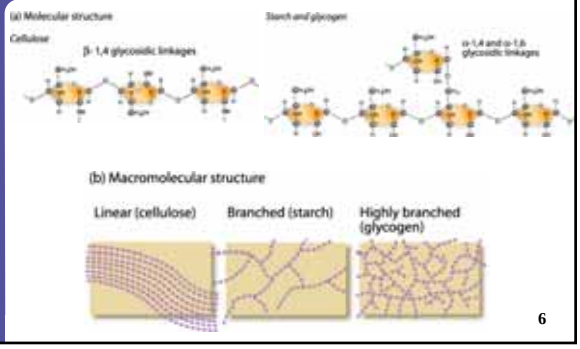
Oligosaccharides



Oligosaccharides bound to cell membrane, here used in cell signaling.

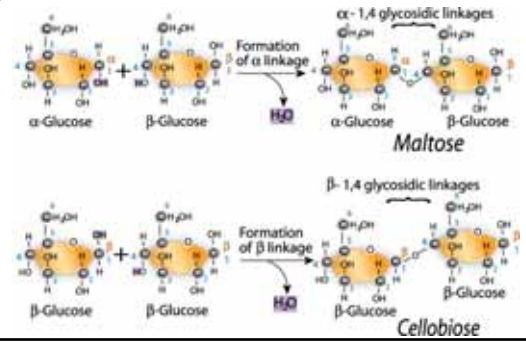
5

Polysaccharides

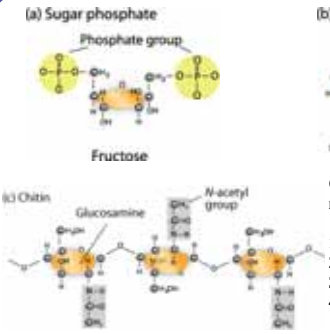


6

The Importance of Glucose



Chemically Modified Carbohydrates



Carbohydrates are chemically modified in several ways:

1) **addition of oxygen**
2) **addition of phosphate groups**
3) **addition of amino groups**
4) **addition of N-acetyl groups**