

Carbohydrates

Chapter 8 Learning Objectives

Key concepts: Monosaccharides are defined as polyhydroxyls, either as aldehydes or ketones. Sugars that contain 4 or more carbons exist primarily as ring structures known as hemiacetals (aldehydes) or hemiketals (ketones). Monosaccharides are single sugars examples are glucose, fructose and ribose. Disaccharides are two linked sugars examples are sucrose, lactose, cellobiose and maltose. Oligosaccharides are polymers of simple sugars linked together by O and N linked glycosidic bonds. Examples are cellulose, glycogen and glycosaminoglycans.

By the end of the chapter you should be able to:

1. Define carbohydrate and the groups of saccharides in chemical and descriptive terms
2. Relate the Fisher (open chain) and Haworth (ring) structures of glucose and fructose
3. Know the basic sugar derivatives and be able to predict the actual structure based on the nomenclature
4. Understand the concepts of enantiomers, diastereomers and epimers of simple sugars. Know the definitions of these terms
5. Know how the ring structures of aldehyde and ketone sugars are formed
6. Describe the role that mutarotation plays in intraconversion between the alpha and beta anomers.
7. Know the glycosidic bonds for the acetal and ketal bonds. Know the different positions for the alpha and beta linkage conformations.
8. Be able to convert the straight chain structure of any 5 or 6 carbon containing monosaccharide to its corresponding ring structure
9. Be able to recognize the structures of the modifications of sugars: glycosides, sugar alcohols, sugar acids, phosphate esters, deoxy sugars and amino sugars.
10. Understand the role saccharides play in biology
11. Tell the difference between the major sugar polymers in biochemistry
12. Know the differences between glycoprotein and proteoglycans.
13. Know the biochemical functions and differences between the various heteropolysaccharides
14. Be able to recognize the N and O linked polysaccharides

15. Know how dietary polysaccharides are digested by humans