

Unit 1: Biochemistry

Section 1-3: Carbohydrates and Lipids

Book Reading: Chapter 5 pages 68-77

Introduction to Macromolecules

❖ Macromolecules

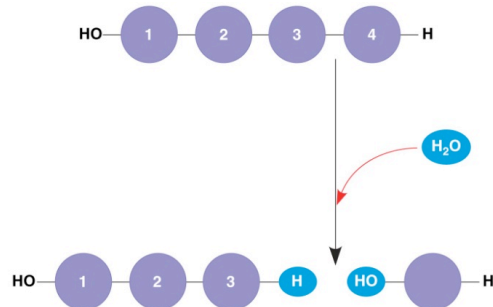
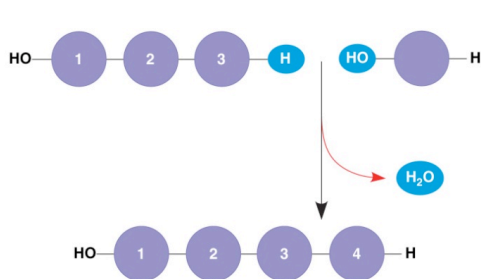
- *Define*
- Macromolecules are polymers of single subunits known as monomers
- There are 4 classes of biological macromolecules
 - *list*
 -
 -
 -

❖ Condensation/Dehydration Reactions

- AKA dehydration synthesis reactions
- *define*
 - One monomer contributes the -OH while the other contributes the -H
 - *Where does the bond form?*
 - *Do dehydration reactions require energy? Do these reactions require enzymes?*

❖ Hydrolysis Reactions

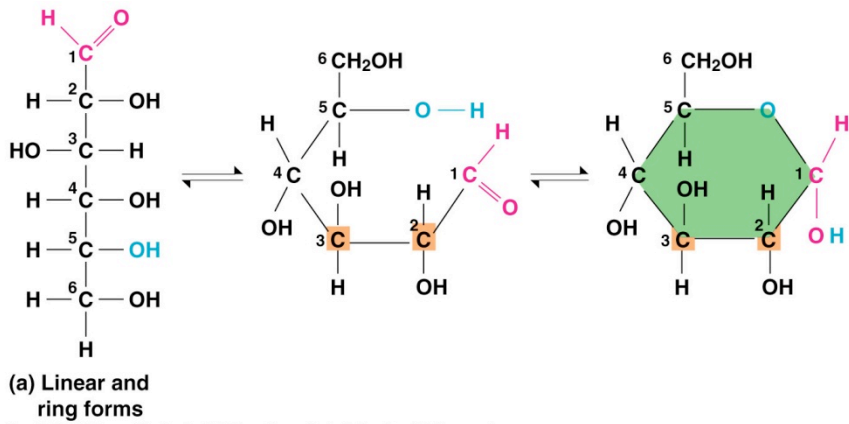
- "hydro"= *define*
- "lysis"= *define*
- *Define hydrolysis reaction*
 - One monomer gets the -OH while the other gets the -H
 - *Do these reactions require enzymes?*



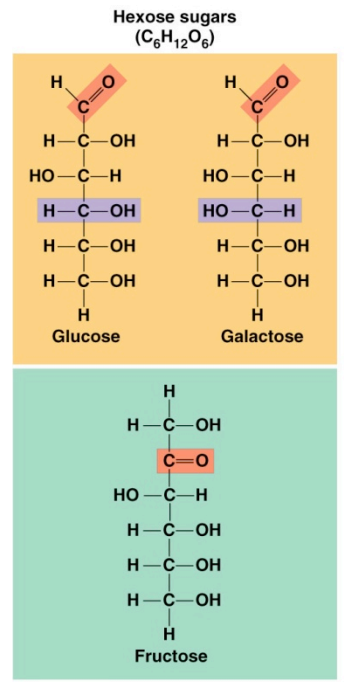
Carbohydrates

❖ Monosaccharides

- General formula CH_2O
- General Structure
 - *One identifying characteristic*
 - *Another identifying characteristic*
 - *How are they usually found when in solution?*



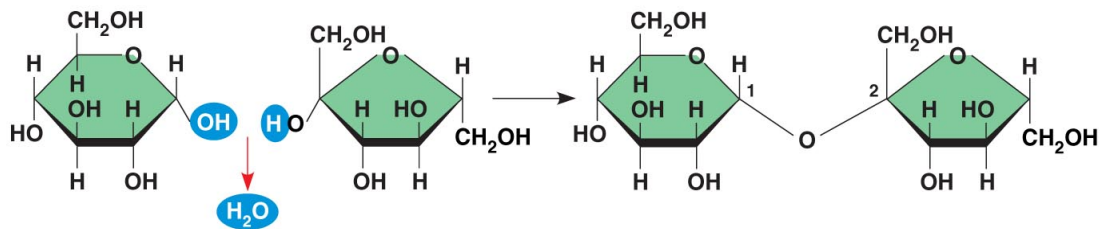
Copyright © 2005 Pearson Education, Inc. Publishing as Pearson Benjamin Cummings. All rights reserved.



- Categorized by several factors
 - Placement of the carbonyl groups
 - At the end of the structure= *what kind of sugar?*
 - In the middle of the structure= *what kind of sugar?*
 - Number of carbons
- Function
 - *List two functions*
 -

❖ Disaccharides

- *Define*
- Glycosidic linkage- *define*



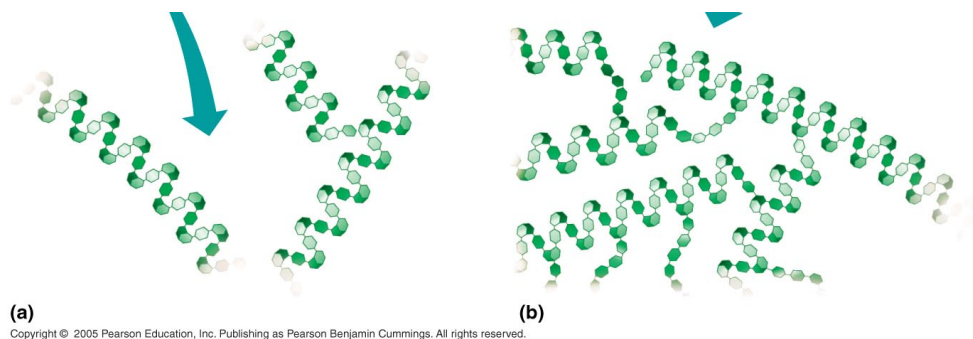
- “glyco”= sugar attached
- Examples of disaccharides
 - Maltose- *what two monomers make up this sugar?*
 - Sucrose- *what two monomers make up this sugar?*
 - Lactose- *what two monomers make up this sugar?*

❖ Polysaccharides

- *Define*
- Structure and function is determined by the monomers it contains and the position of its glycosidic linkages
- Polysaccharides are used for *what are their two main functions?*

❖ Storage Polysaccharides

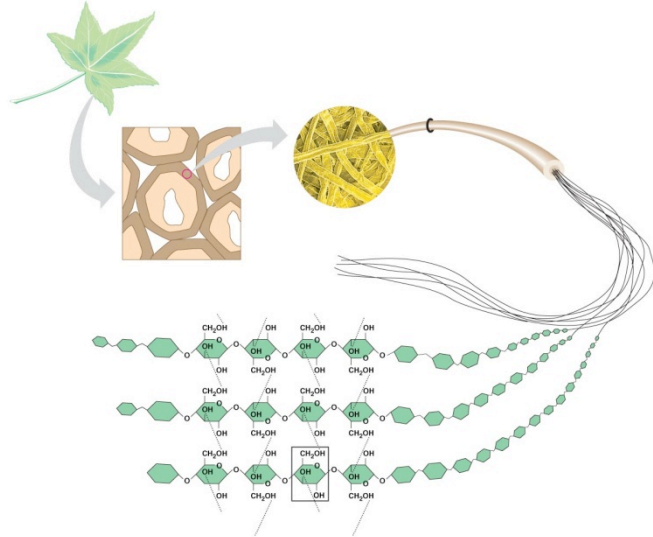
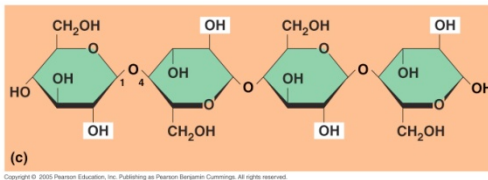
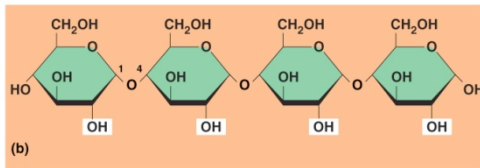
- Starch
 - *What kind of organisms use starch as storage?*
 - Consists of all glucose arranged by linkages that make the polymer helical
 - *Where is it stored?*
 - Can be broken down quickly by hydrolysis reaction when needed
- Glycogen
 - *What kind of organisms use glycogen as storage?*
 - Polymer of glucose that is extensively branched
 - *Where is it stored?*
 - Hydrolysis of glycogen releases glucose
 - Short term storage reserves are depleted quickly (humans 24 hours) if not replenished by consuming food



❖ Structural Polysaccharides

• Cellulose

- *In what organisms is it found?*
- Polymer of glucose that is mostly straight and never branched
- Each strand is hydrogen bonded to the next and grouped into microfibrils, making it extremely strong
- *Where in the organism is it found?*
- Not able to be digested without special enzymes (humans don't have them)



• Chitin

- *In what organisms is it found?*
- *Where in the organism is it found?*

Lipids (Fats)

❖ General Characteristics

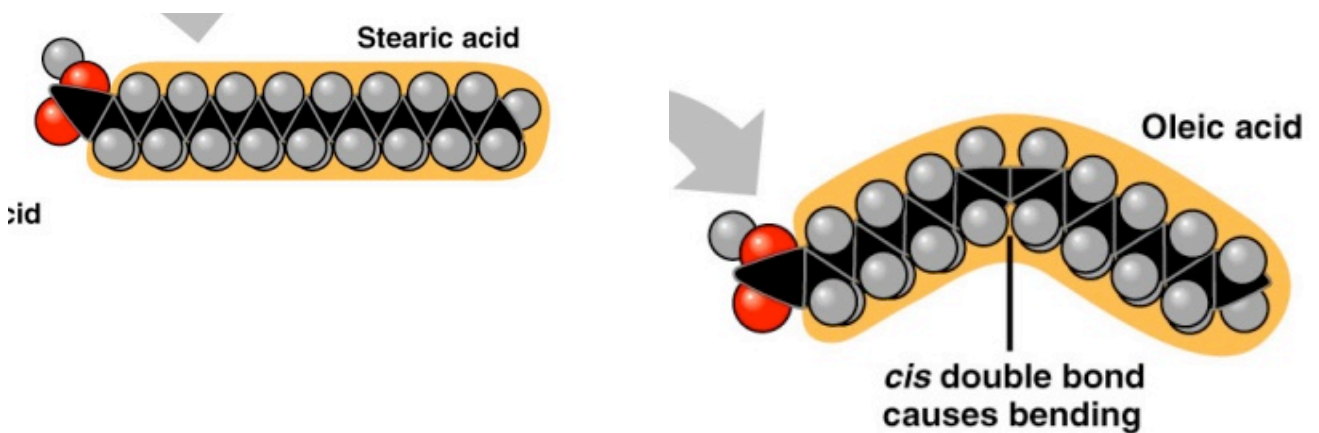
- Not true polymers
- Form groups because they are all *hydrophobic or hydrophilic?*
-

❖ Functions Include

-
-
-

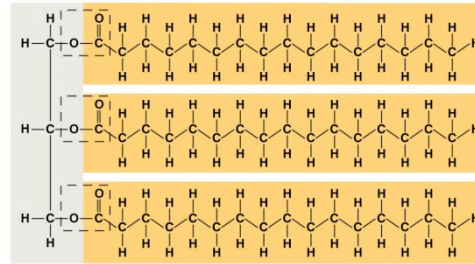
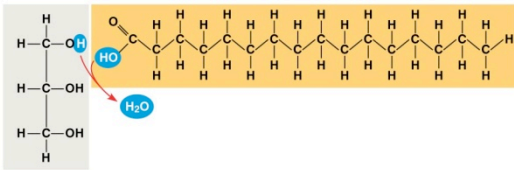
❖ Saturated vs. Unsaturated

- Saturated lipids
 - Contain fatty acid chains that are completely saturated with hydrogen
 - *Do they contain double bonds anywhere in the structure?*
 - They are able to stack nicely, side by side
 - *State at room temperature?*
 - *In what organisms is it found?*
- Unsaturated lipids
 - *Do they contain double bonds anywhere in the structure?*
 - Causes kinks in the chain that allow spaces between one lipid and the next
 - *State at room temperature?*
 - *In what organisms is it found?*



❖ Fats/Triglycerides

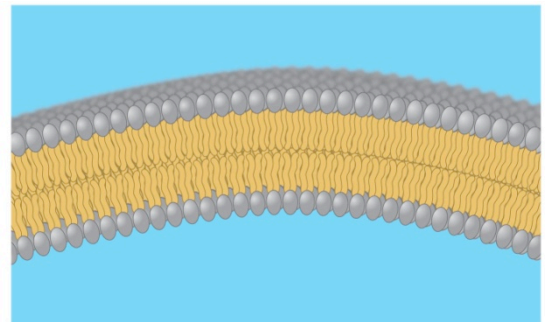
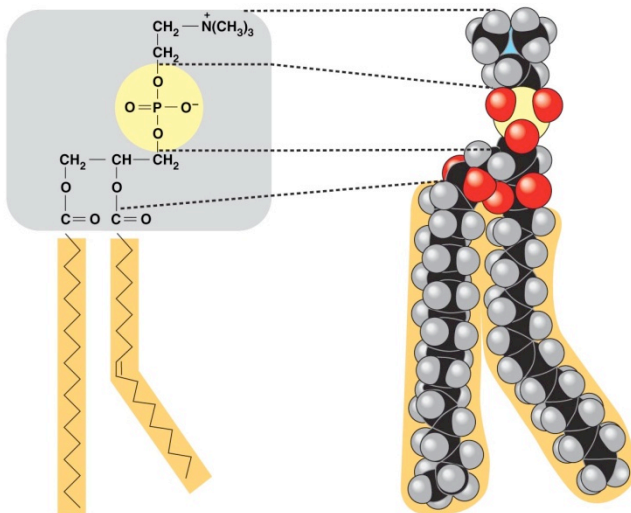
- Structure
 - 1 glycerol- *describe*
 - 3 fatty acids- *describe*
 - Esther linkages- *define*
 - *What kinds of reactions form ester linkages?*
 - Occurs between the hydroxyl group of the glycerol and the carbonyl group of the fatty acid
- Function: *what is the function of fats?*



(b)
Copyright © 2005 Pearson Education, Inc. Publishing as Pearson Benjamin Cummings. All rights reserved.

❖ Phospholipids

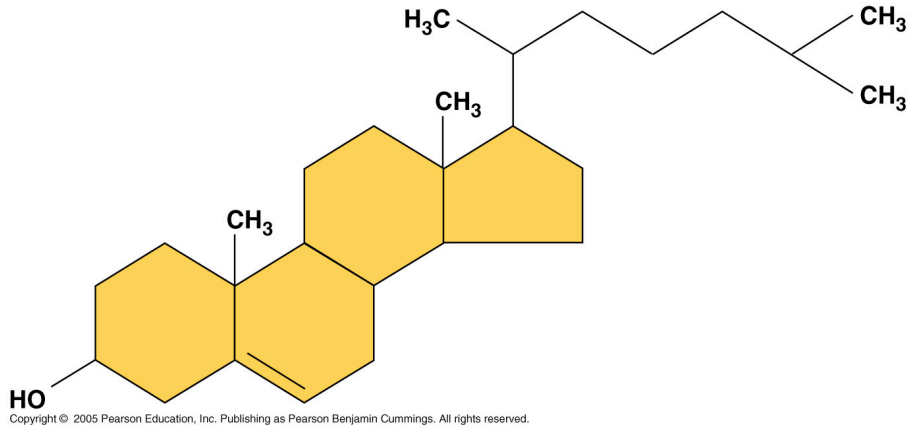
- Amphipatic-
- Glycerol connected to:
 - Two fatty acid tails- *hydrophobic or hydrophilic?*
 - One phosphate group- *hydrophobic or hydrophilic?*
- When placed in water phospholipids self-assemble into bilayers
- *Where in organisms are they found?*



Copyright © 2005 Pearson Education, Inc. Publishing as Pearson Benjamin Cummings. All rights reserved.

❖ Steroids

- *Describe their structure?*
- Colesterol
 -
 -
 -



- Steroids can serve as short distance (attached to the membrane) or long distance (hormone) cellular signals