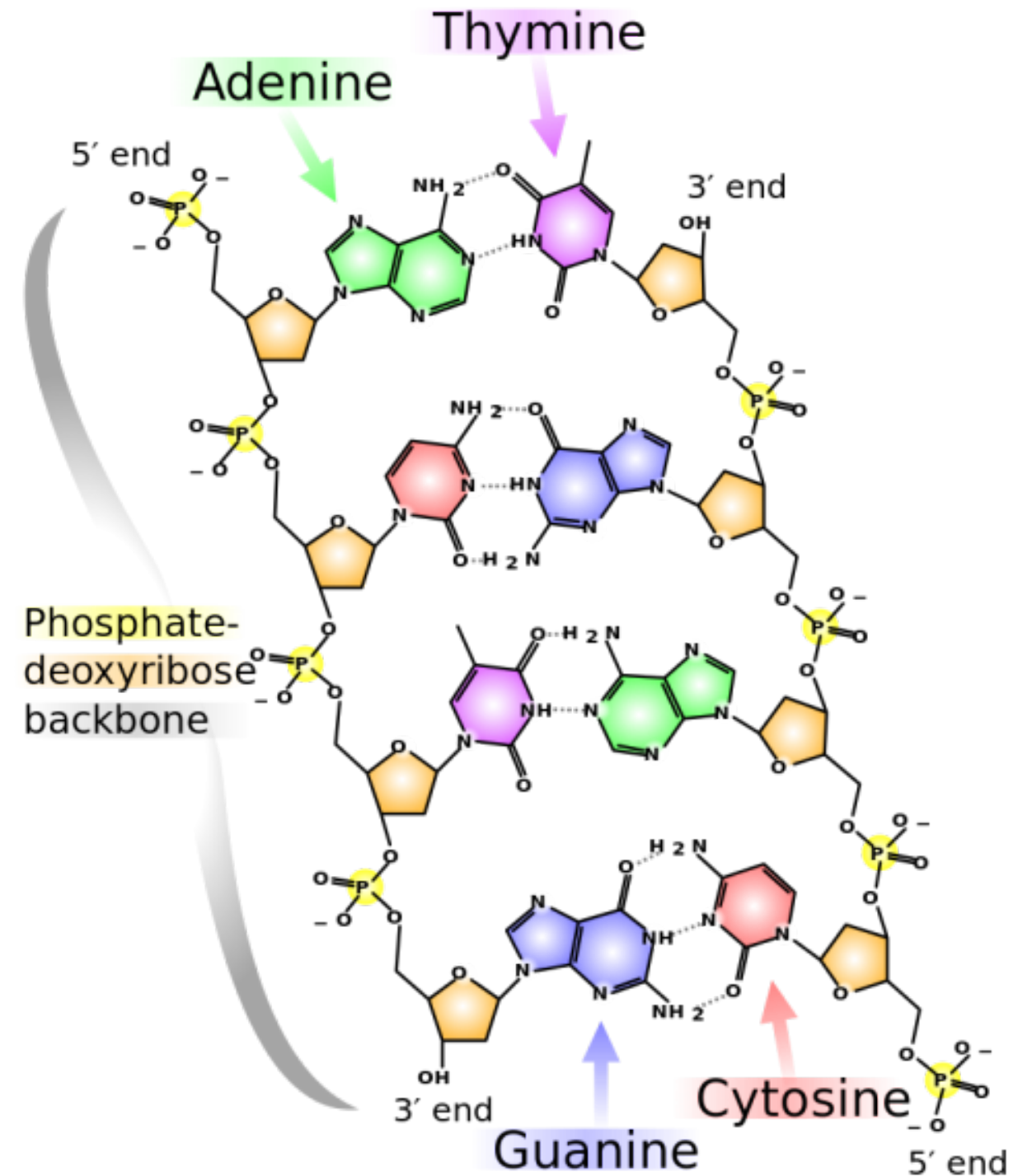
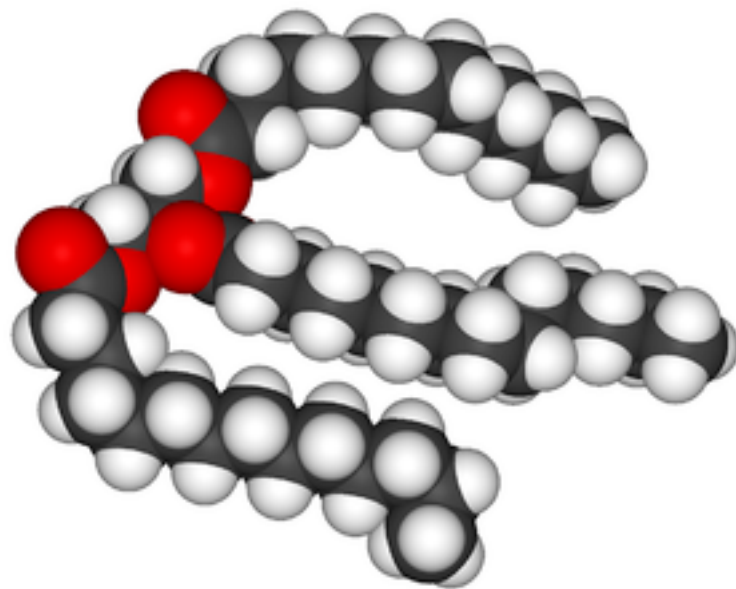
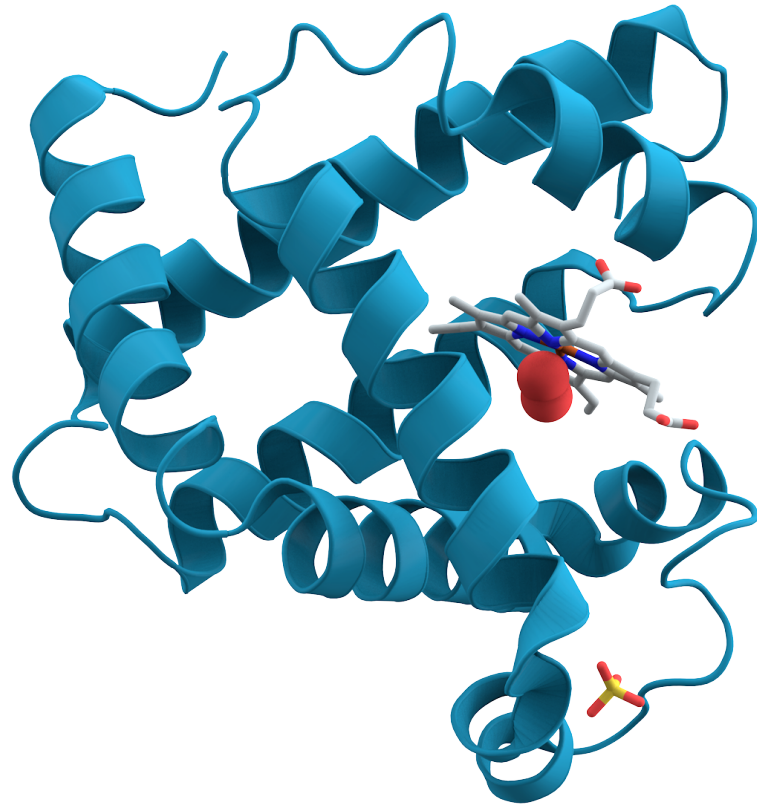


Macromolecules:



Macromolecules

- **macromolecules** (*Polymers*) are large molecules that are often composed of repeating sub-units (*monomers*)
- some of the biologically important macromolecules are:
 - carbohydrates
 - lipids
 - proteins
 - nucleic acids



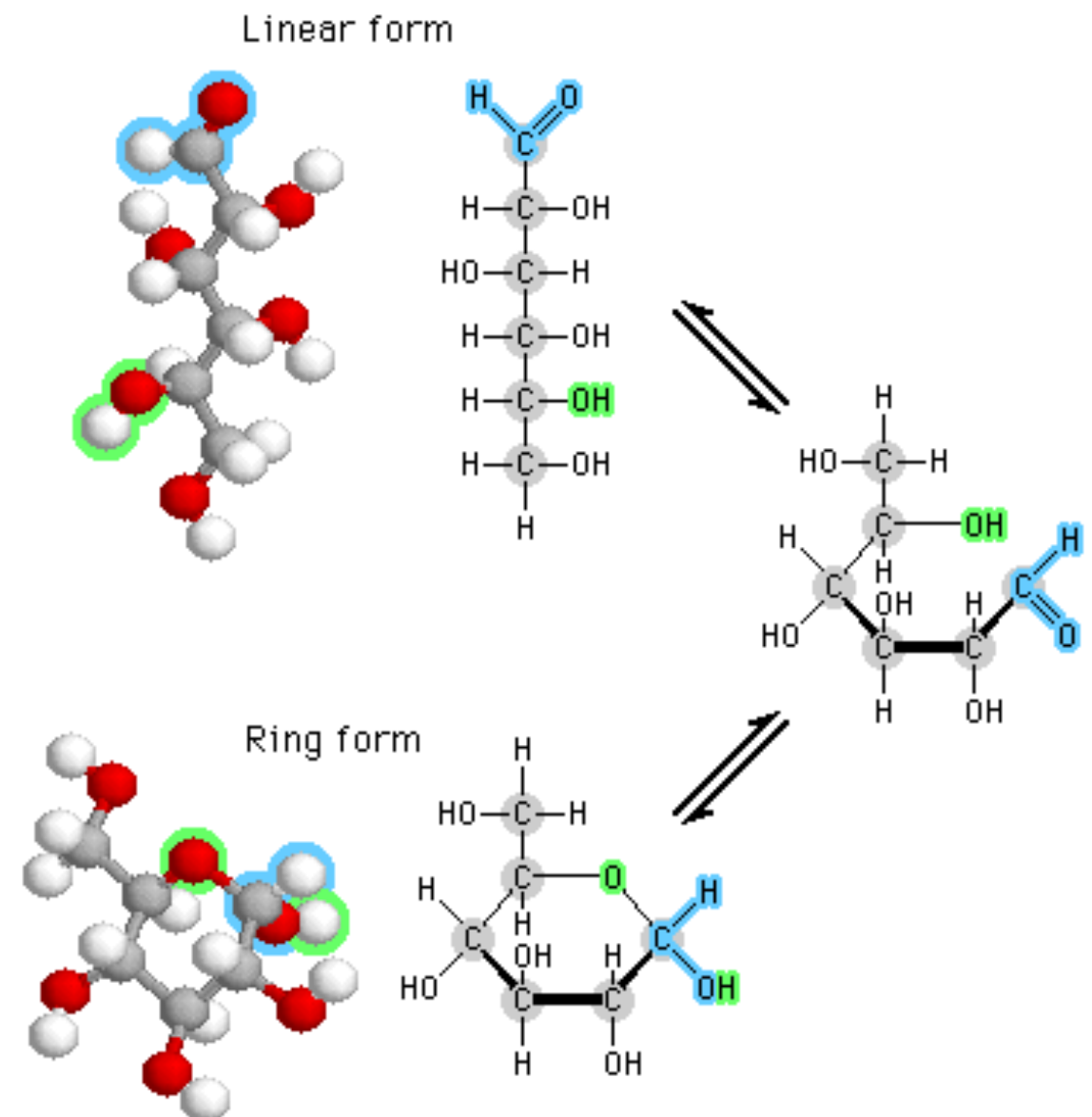
Carbohydrates

- Two Basic functions
 - Structural - Plant wall, arthropod shells
 - Energy/Storage
 - carbohydrates are our most important energy source
 - can be simple (*mono- or disaccharides*) or complex sugars (*polysaccharides*)



1. Monosaccharides

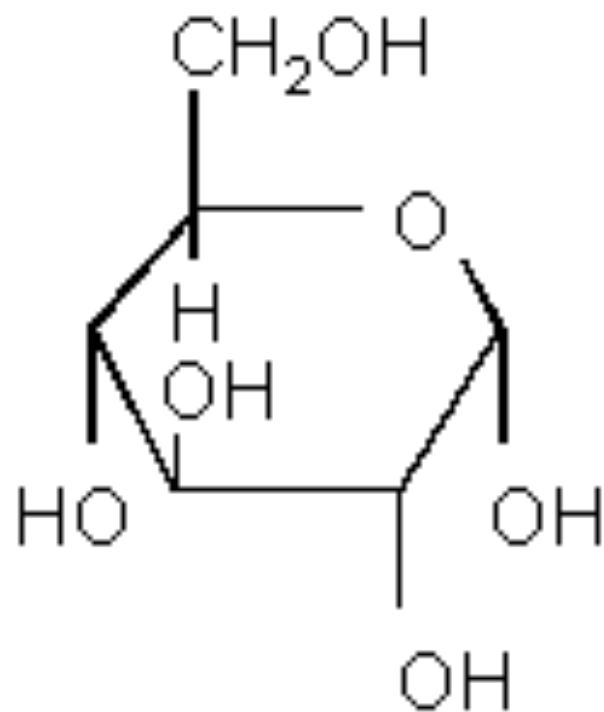
- single sugars in straight chain or ring form
- C:H:O usually in 1:2:1 ratio (*glucose is $C_6H_{12}O_6$*)
- examples: glucose, fructose, deoxyribose



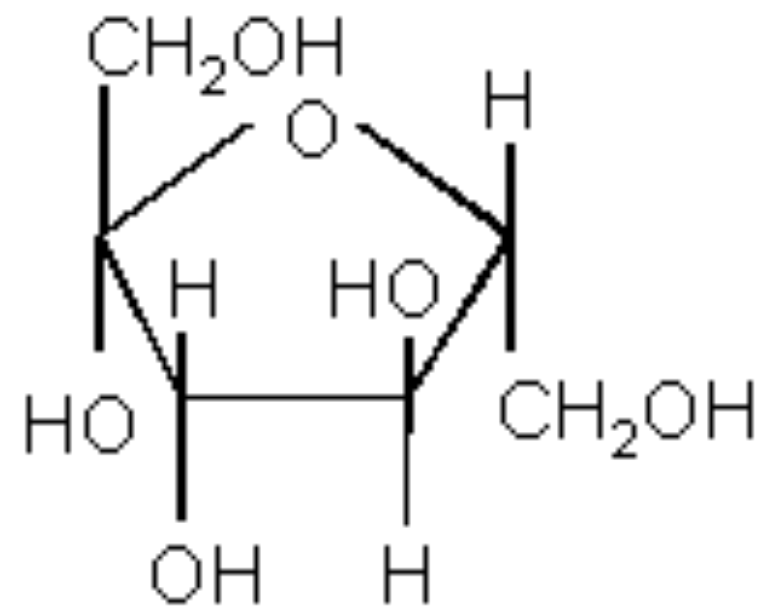
1. Monosaccharides

- some monosaccharides are **isomers**, e.g., glucose & fructose

(same formula- $C_6H_{12}O_6$, different structure)

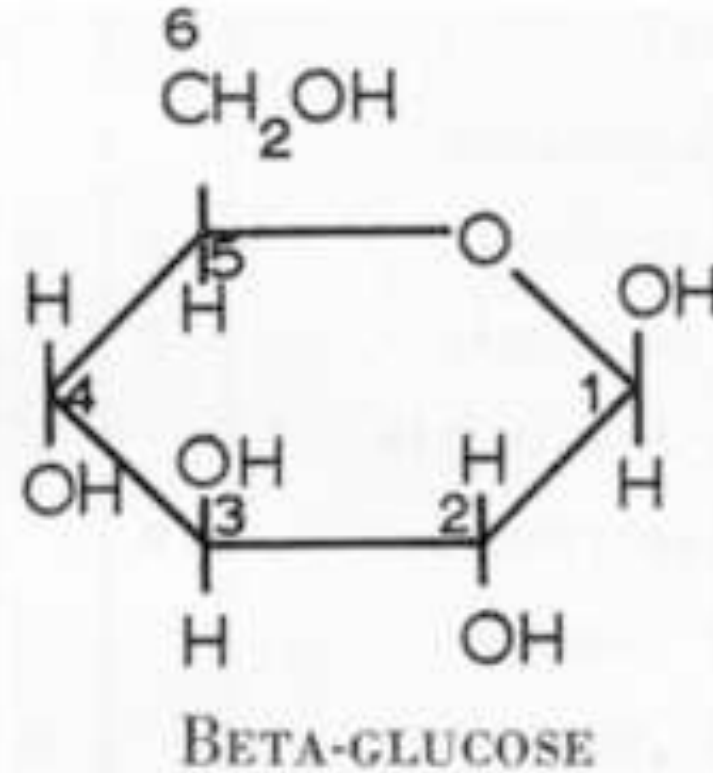
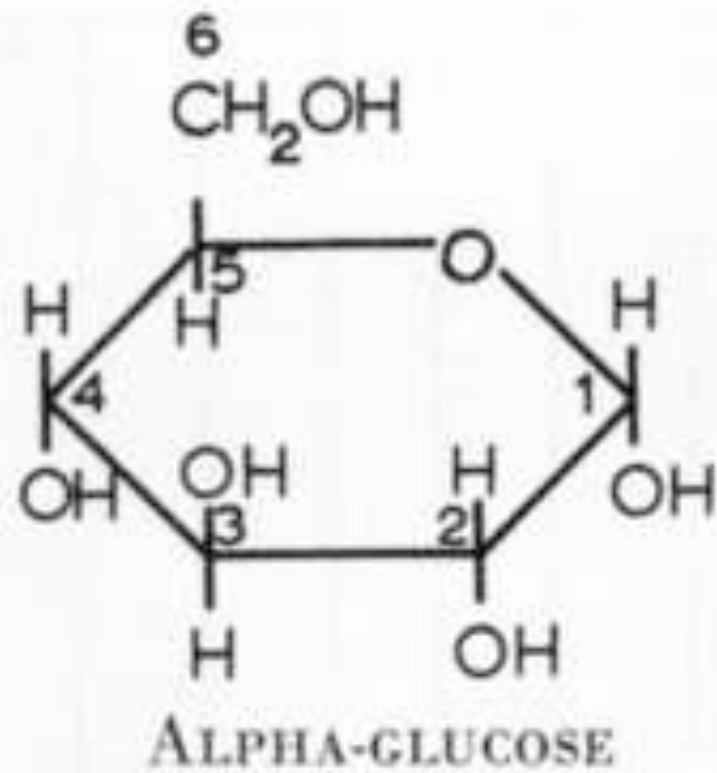


glucose



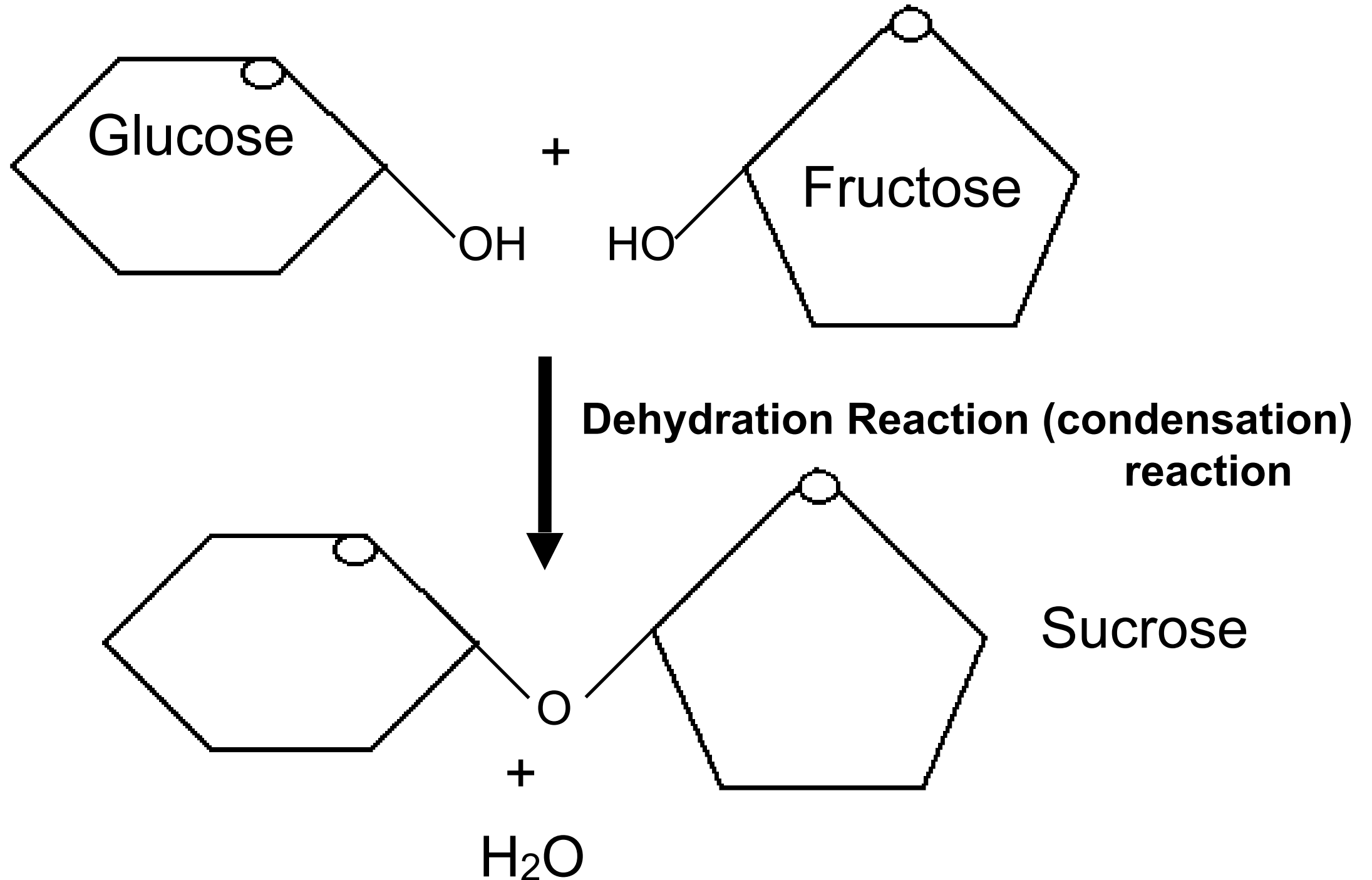
fructose

Isomers of Glucose - α & β



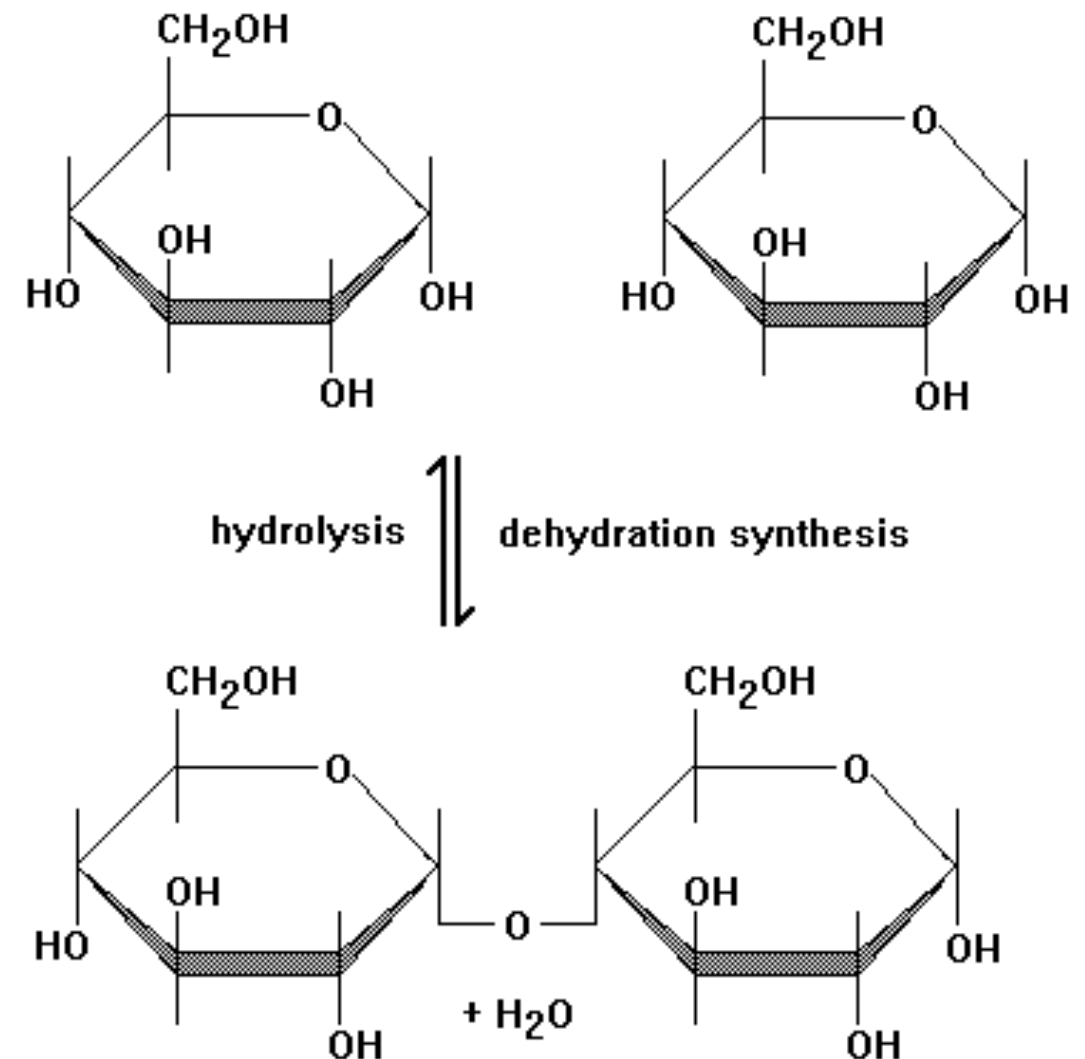
2. Disaccharides

= double sugar



2. Disaccharides

- sugar molecules made from 2 single sugars
- formed by a **condensation** reaction



Dehydration reactions

- a chemical reaction where monomers are joined by the removal of water (H^+ & OH^-)
(aka condensation)

Hydrolysis Reactions - reverse of dehydration

- H^+ & OH^- are added to molecules to break them into smaller subunits





Strawberry Yogurt

INGREDIENTS: ROLLED OATS, HIGH MALTOSE CORN SYRUP, SUGAR, HIGH FRUCTOSE CORN SYRUP, CRISP RICE (RICE FLOUR, SUGAR, MALT, SALT), WHEAT FLAKES (WHOLE WHEAT, SUGAR, SALT, MALT), PALM KERNEL OIL, DEGERMED YELLOW CORN MEAL, FRUCTOSE, CANOLA OIL, YOGURT POWDER (CULTURED WHEY PROTEIN CONCENTRATE, CULTURED SKIM MILK, YOGURT CULTURES), CORN BRAN, MALTODEXTRIN, CALCIUM CARBONATE, NONFAT MILK, SOY LECITHIN, SALT, HONEY, RED 40 LAKE AND OTHER COLOR ADDED, NATURAL FLAVOR, DRIED STRAWBERRIES, CITRIC ACID, BAKING SODA, MIXED TOCOPHEROLS ADDED TO RETAIN FRESHNESS, SUNFLOWER MEAL, PEANUT FLOUR, ALMOND FLOUR.
CONTAINS WHEAT, MILK, PEANUT, ALMOND AND SUNFLOWER INGREDIENTS.

DISTR. BY **General Mills Sales, Inc.**

GENERAL OFFICES

MINNEAPOLIS, MN 55440 USA

Made in U.S.A. © 2007 General Mills

Carbohydrate Choices: 2

Nutrition Facts

Serving Size 1 bar (35g)

Servings Per Container 6

Amount Per Serving

Calories 140

Calories from Fat 30

% Daily Value*

Total Fat 3.5g **6%**

Saturated Fat 2g **10%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 130mg **5%**

Total Carbohydrate 26g **9%**

Dietary Fiber 1g **5%**

Sugars 13g

Protein 2g

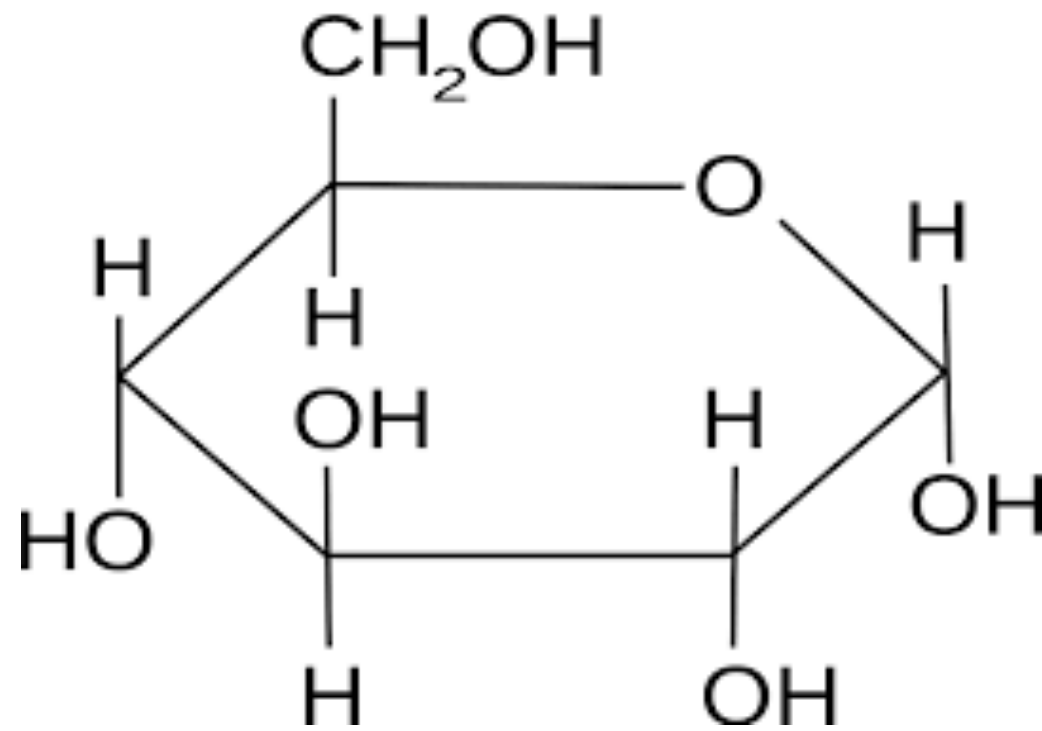
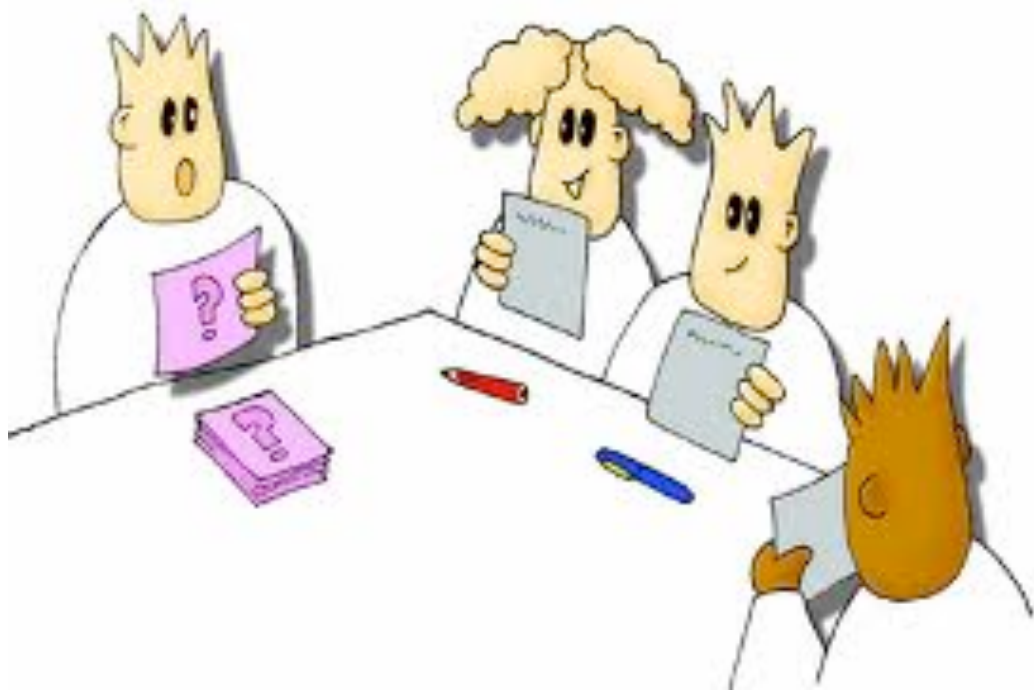
Vitamin A 0% • Vitamin C 0%

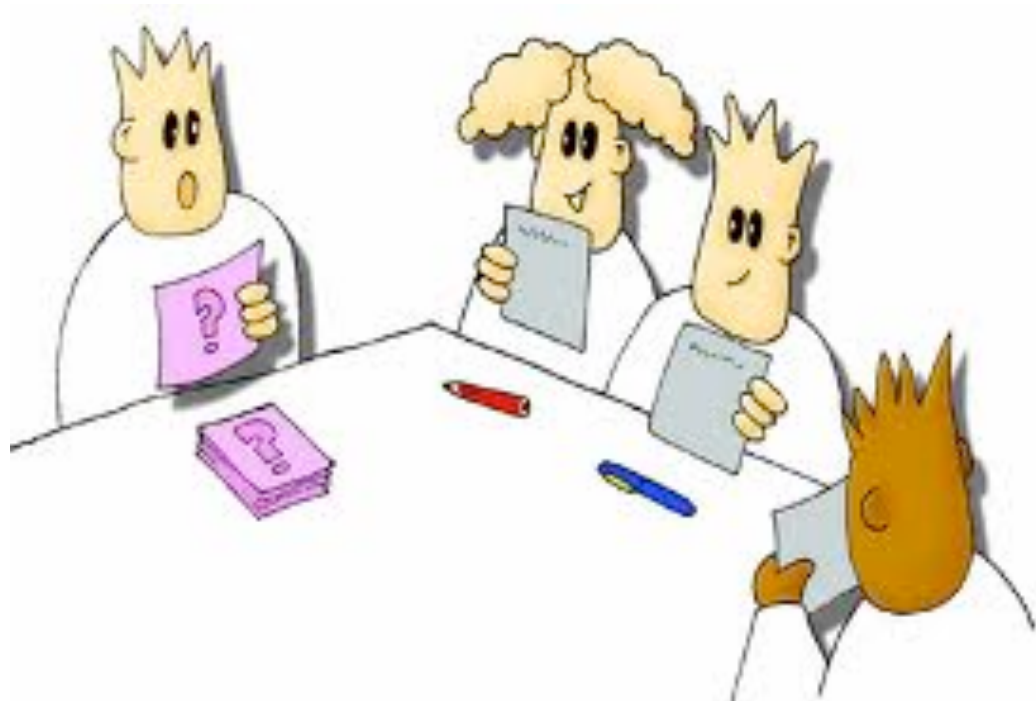
Calcium 10% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

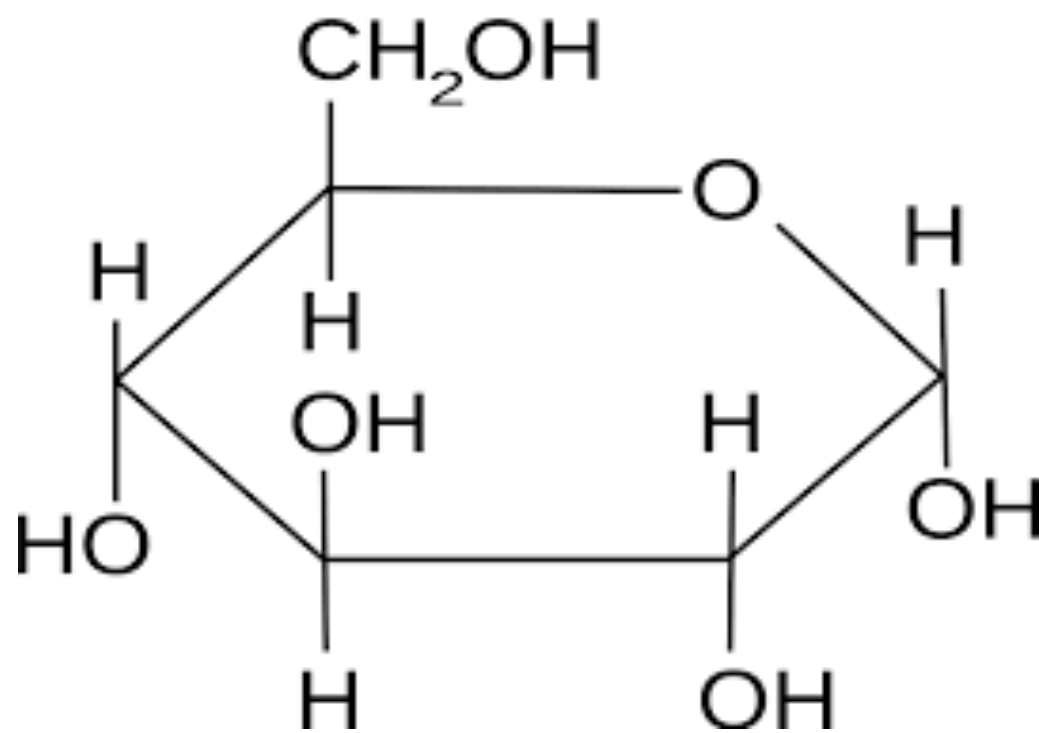
	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

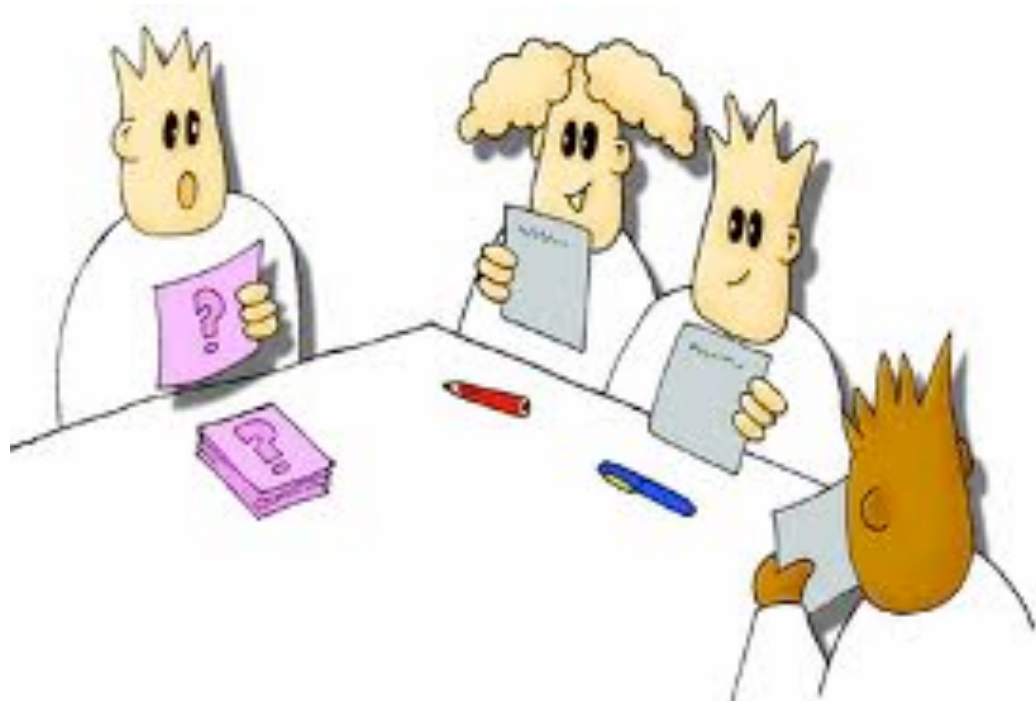
» Identify



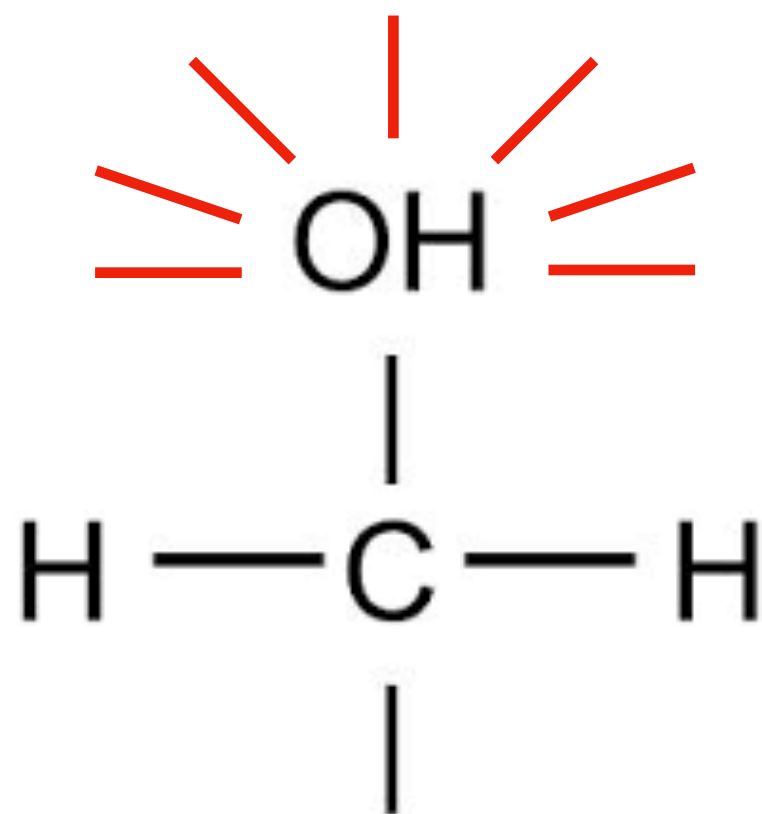


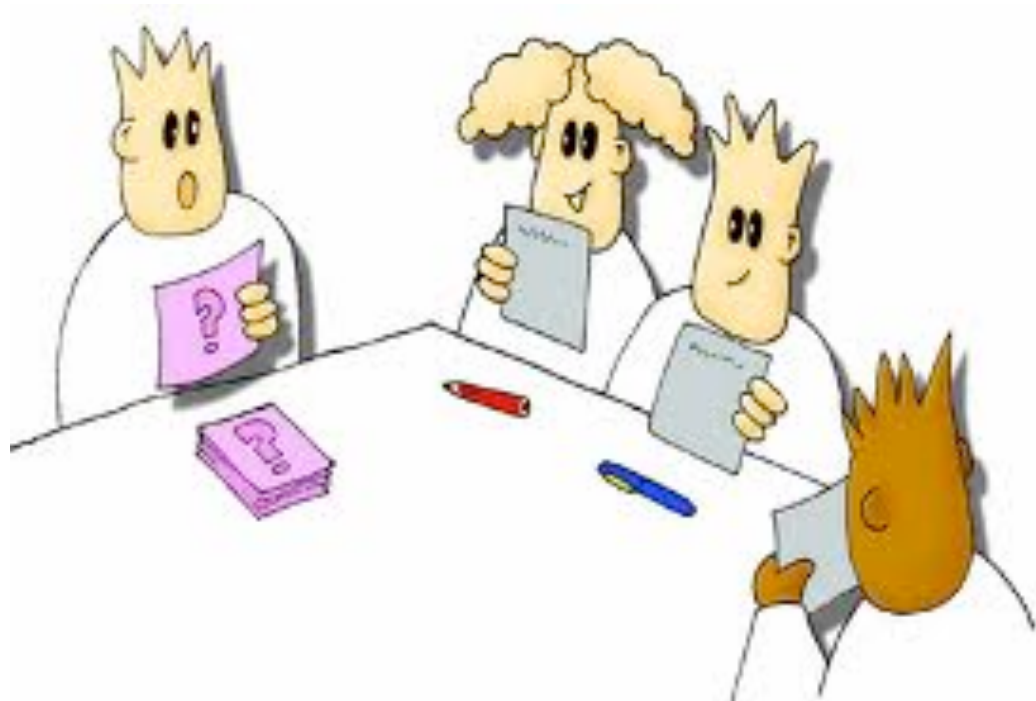
» Identify the following.



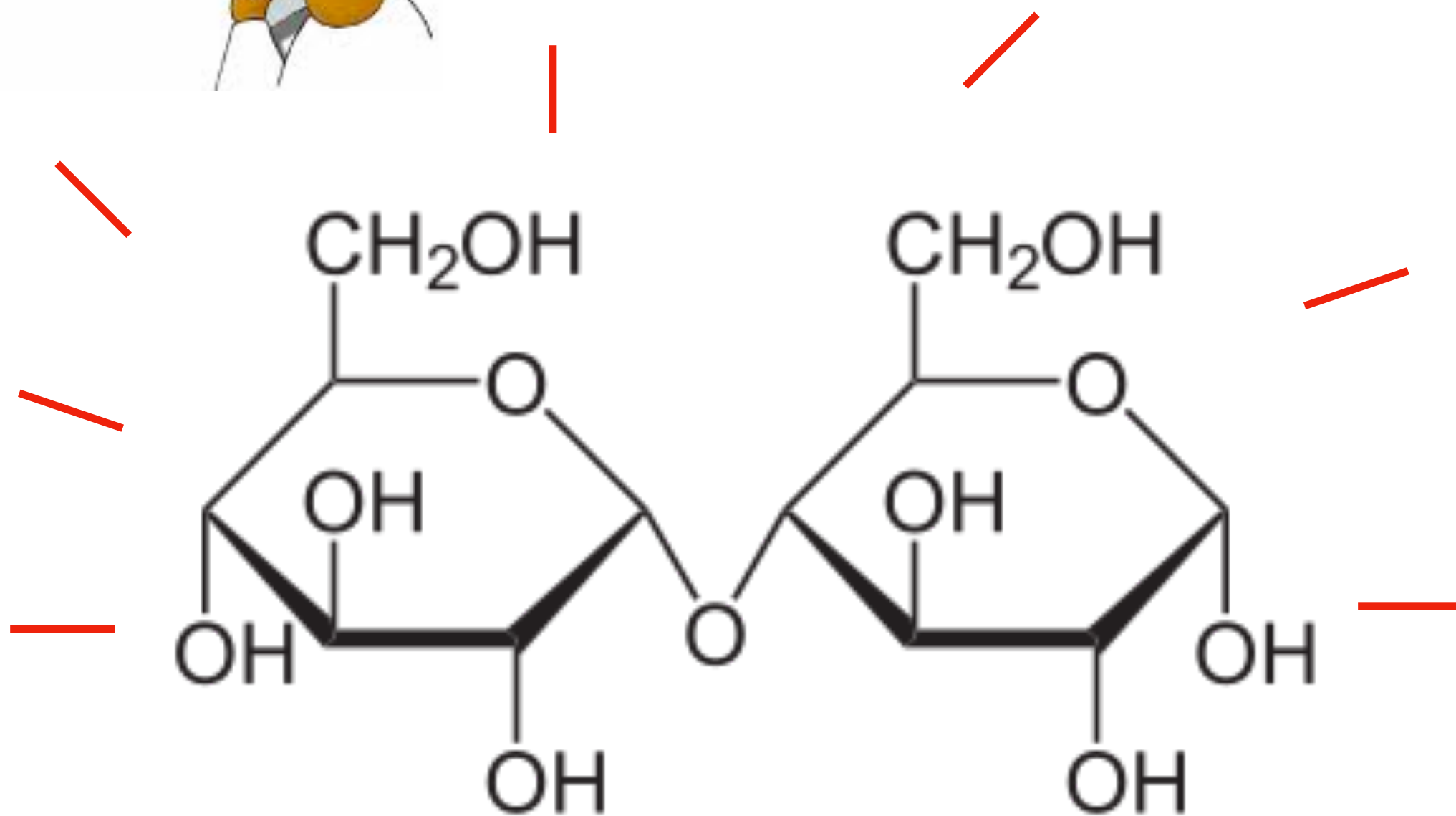


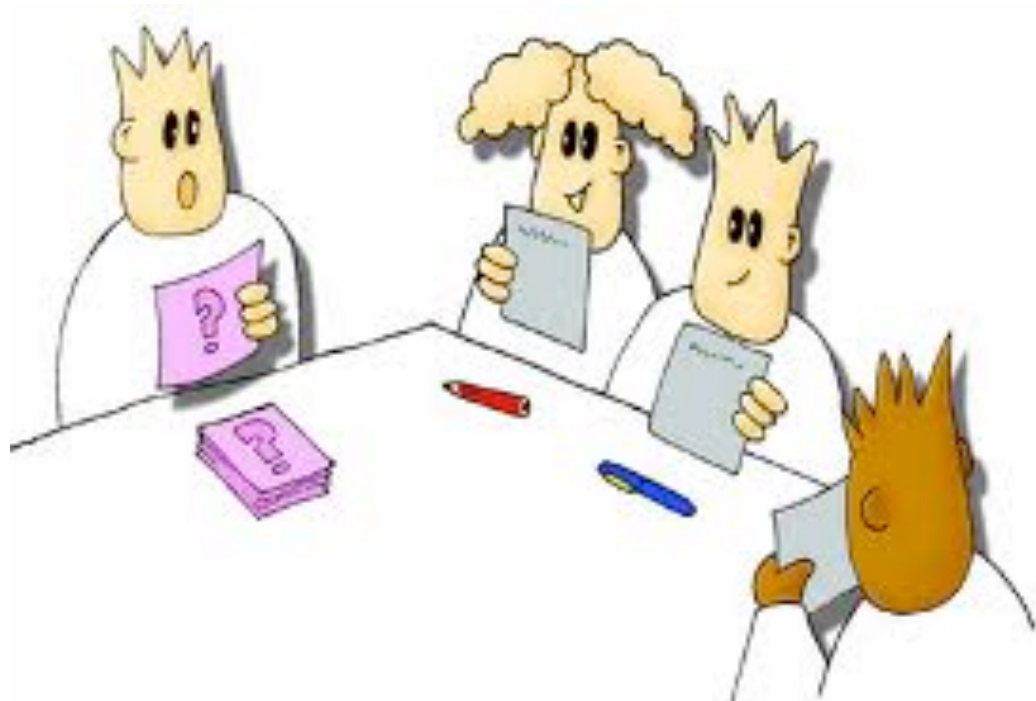
» Identify the following.



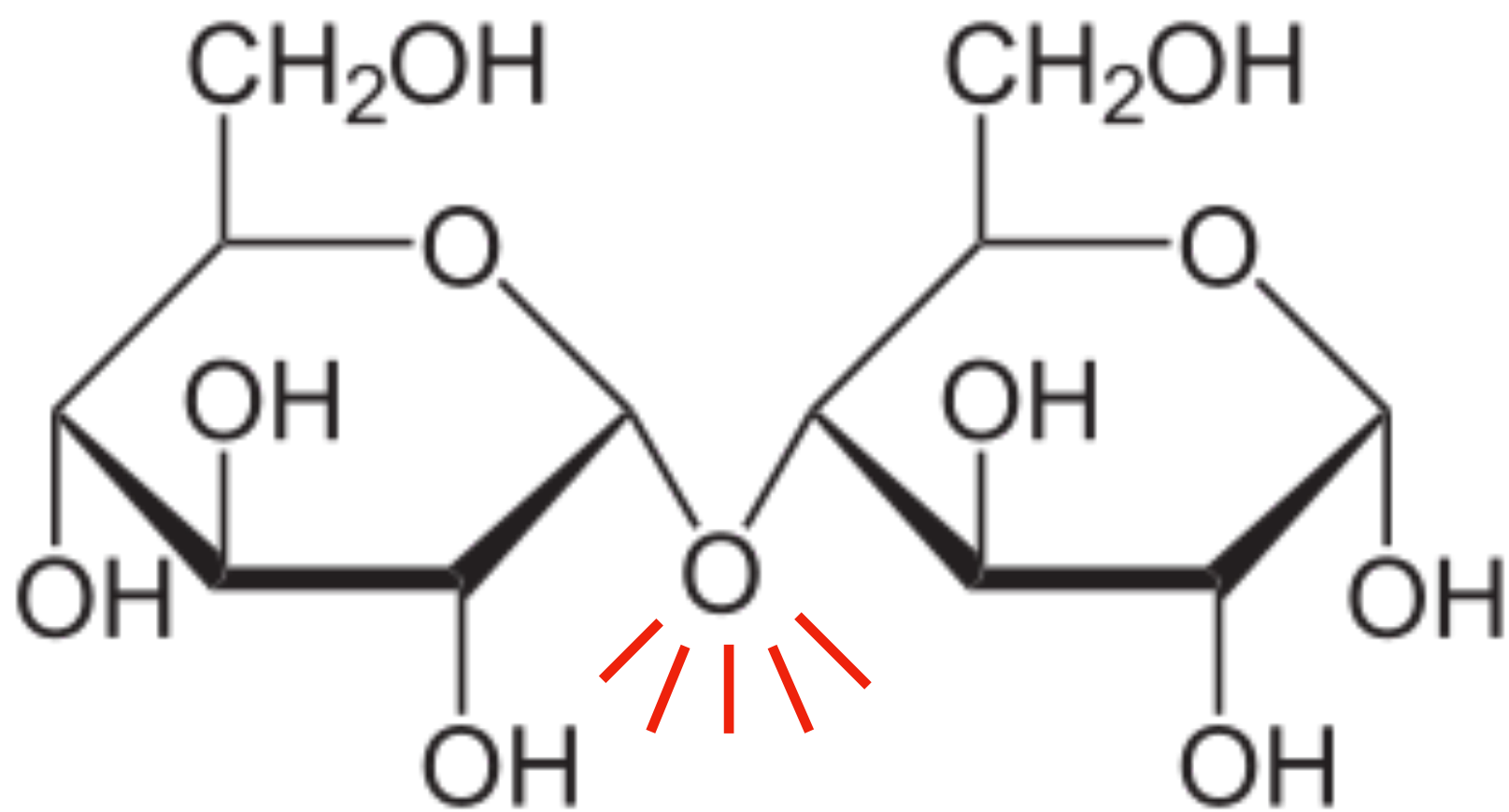


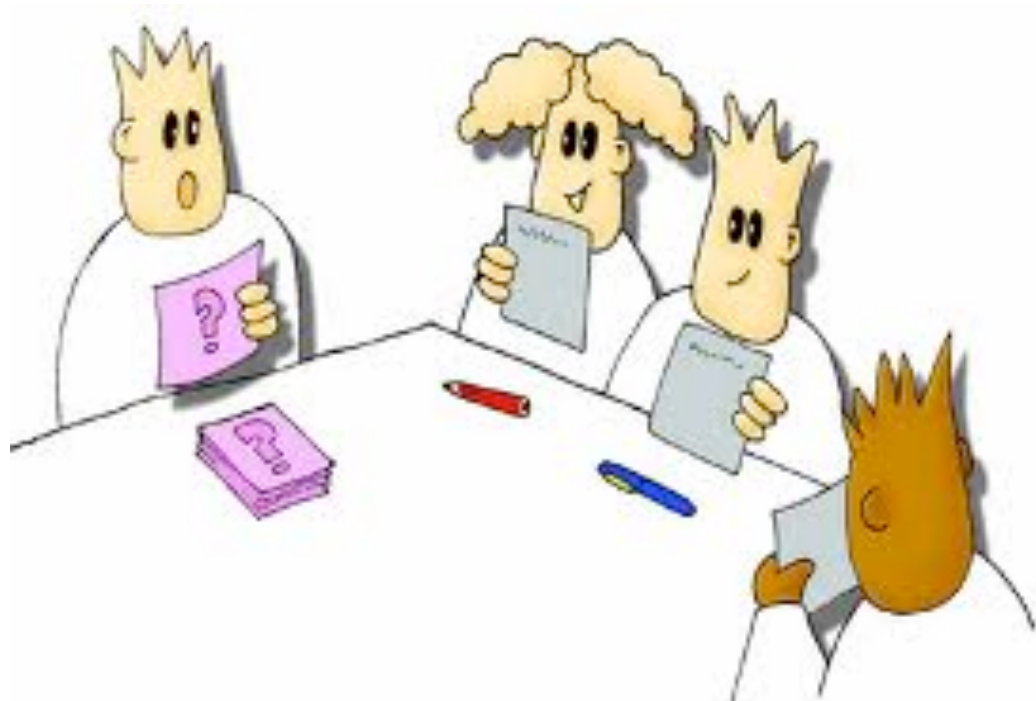
» Identify the following.



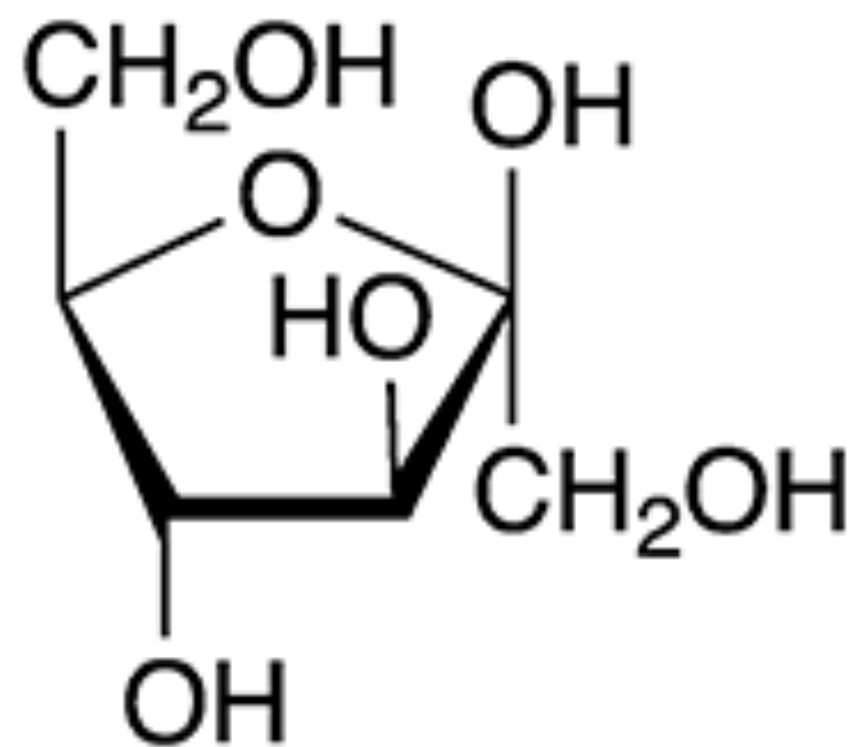


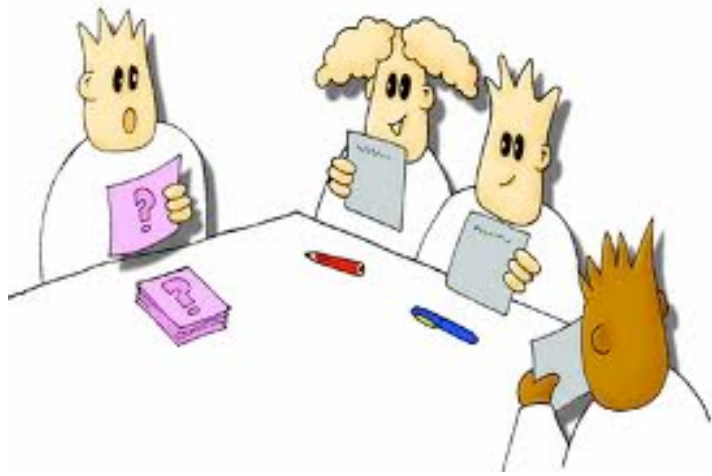
» Identify the following.



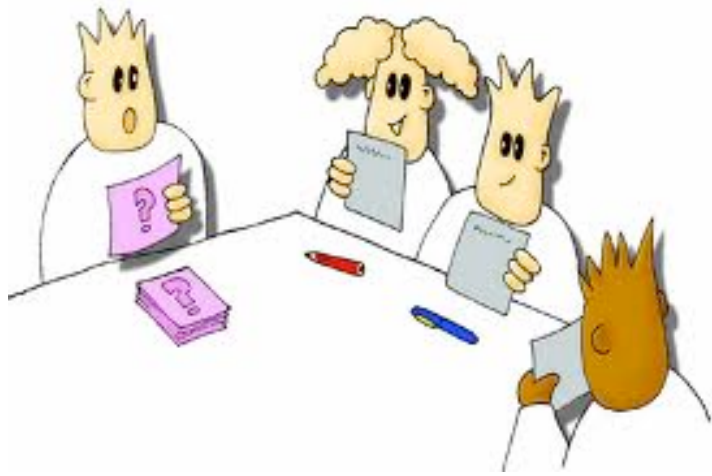


» Identify the following.





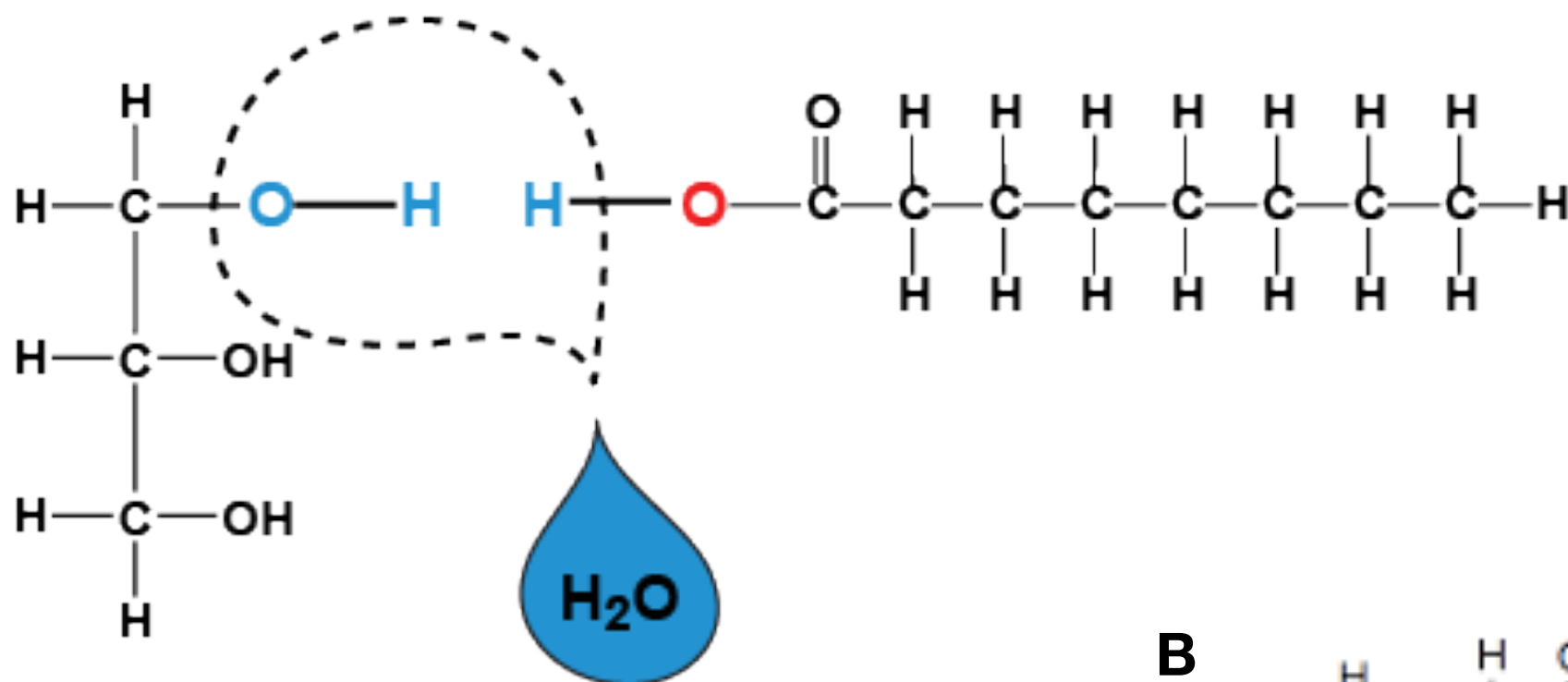
1. What is the difference between a monosaccharide and a disaccharide?
2. What is an isomer? Give an example of biological isomers.



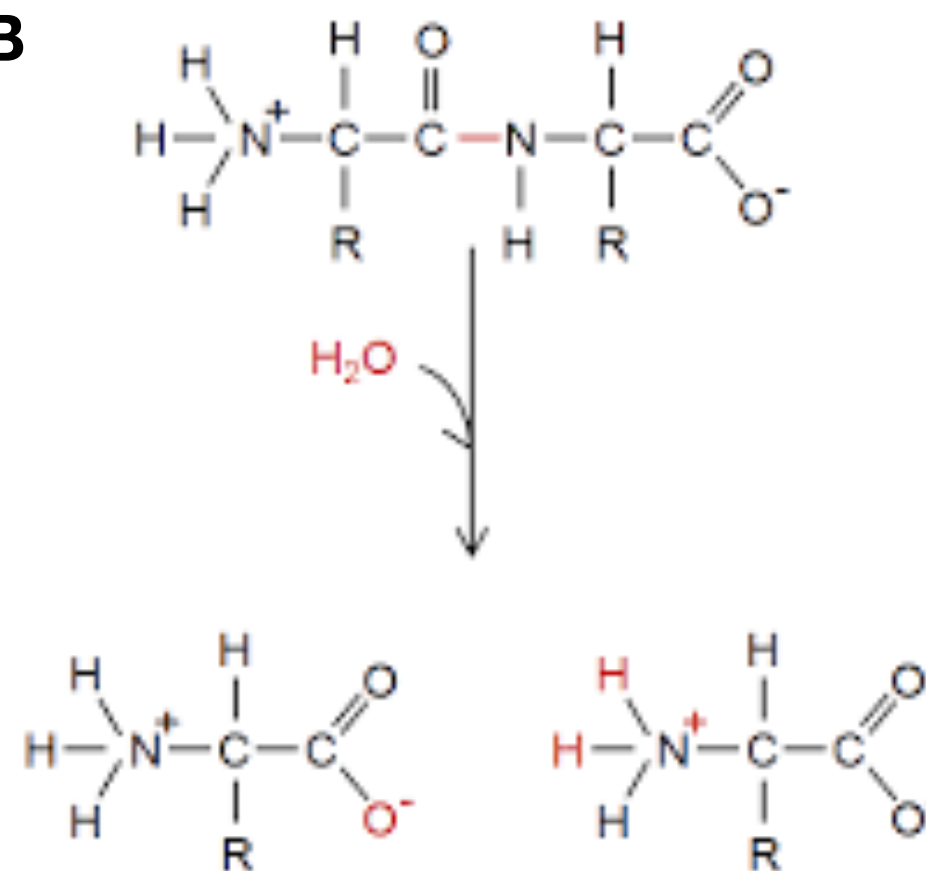
3. What is the formula of glucose? (Draw a simple structure.)
4. What is the formula of fructose? (Draw a simple structure.)
5. When are carbohydrates in chains versus rings?

6. What type of reaction is this?

A

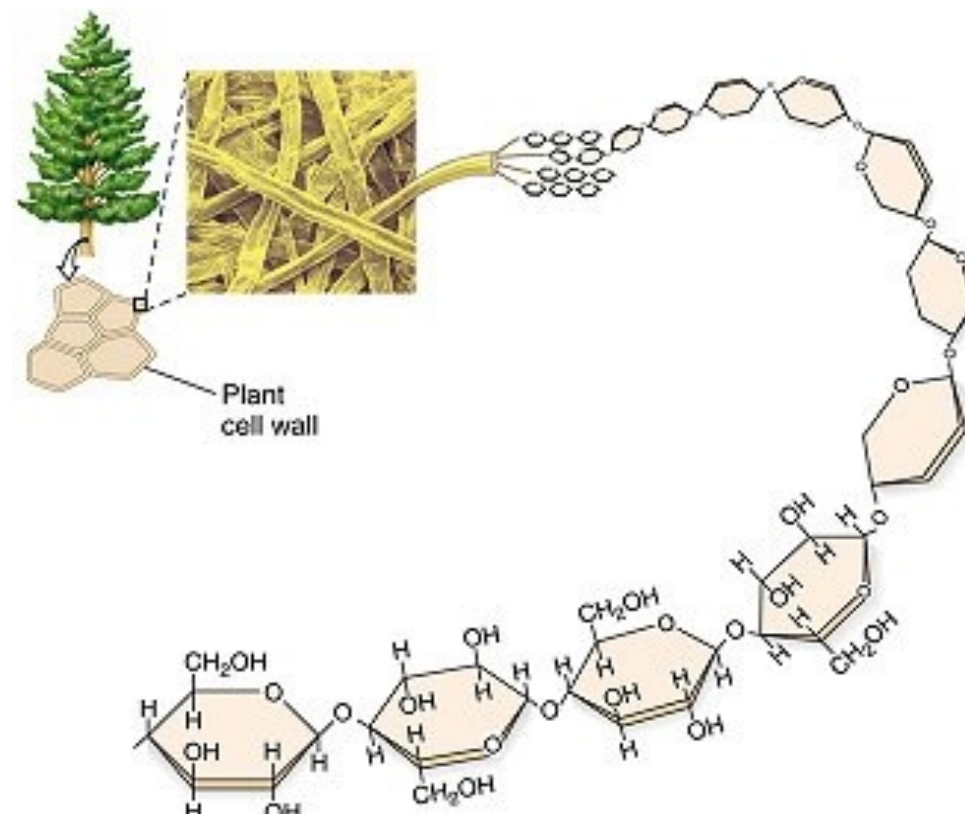


B



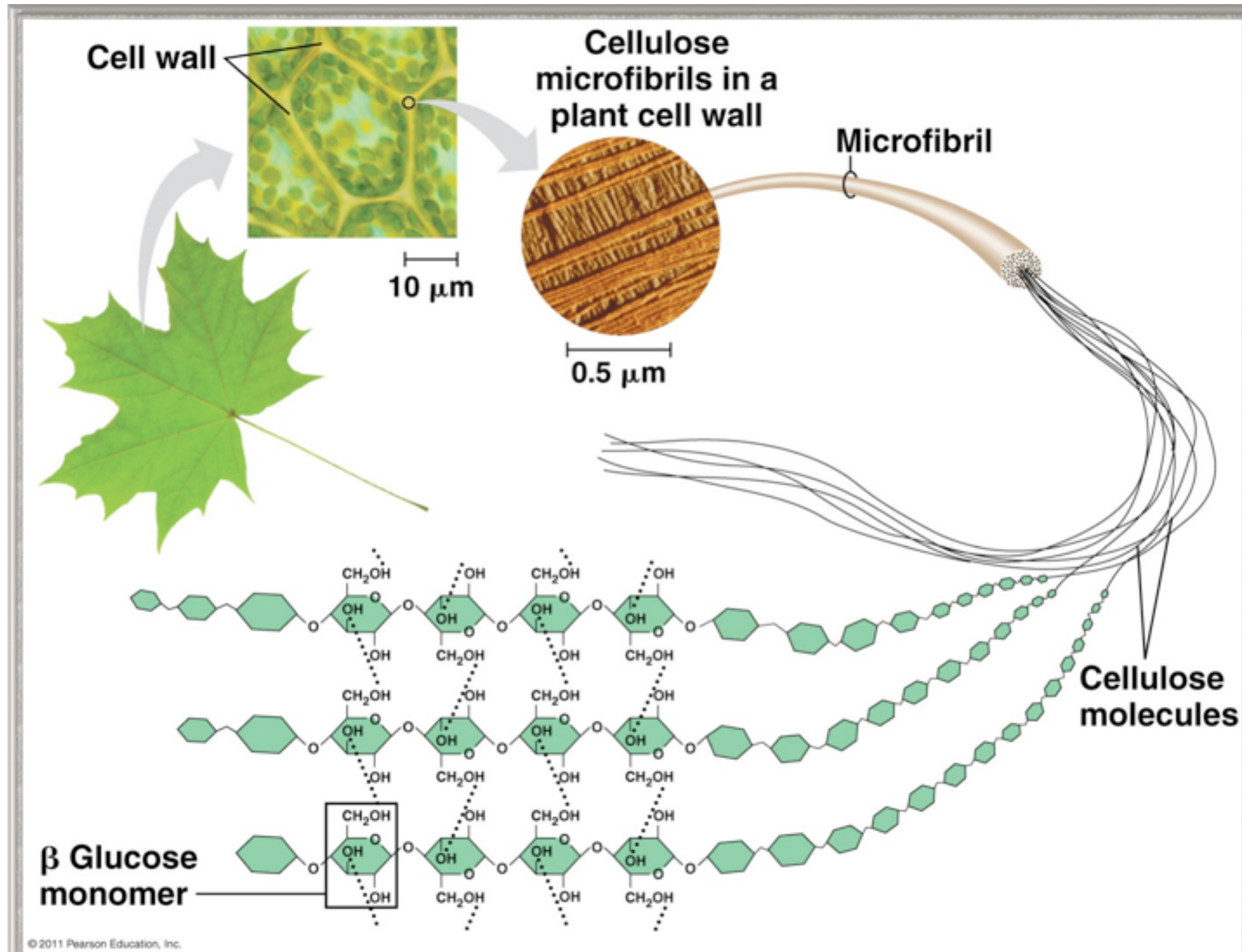
3. Polysaccharides

- **oligosaccharides** are shorter-chain sugars with 3-10 single sugars
- longer chain carbohydrates are called **polysaccharides**
- examples: starch, cellulose, glycogen, chitin
- **Polymerization**- linking identical subunits (i.e., monomers) to make a larger molecule



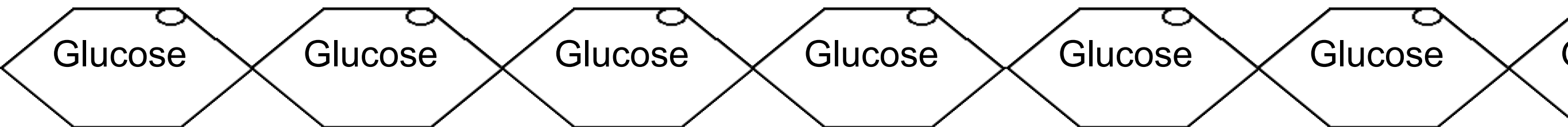
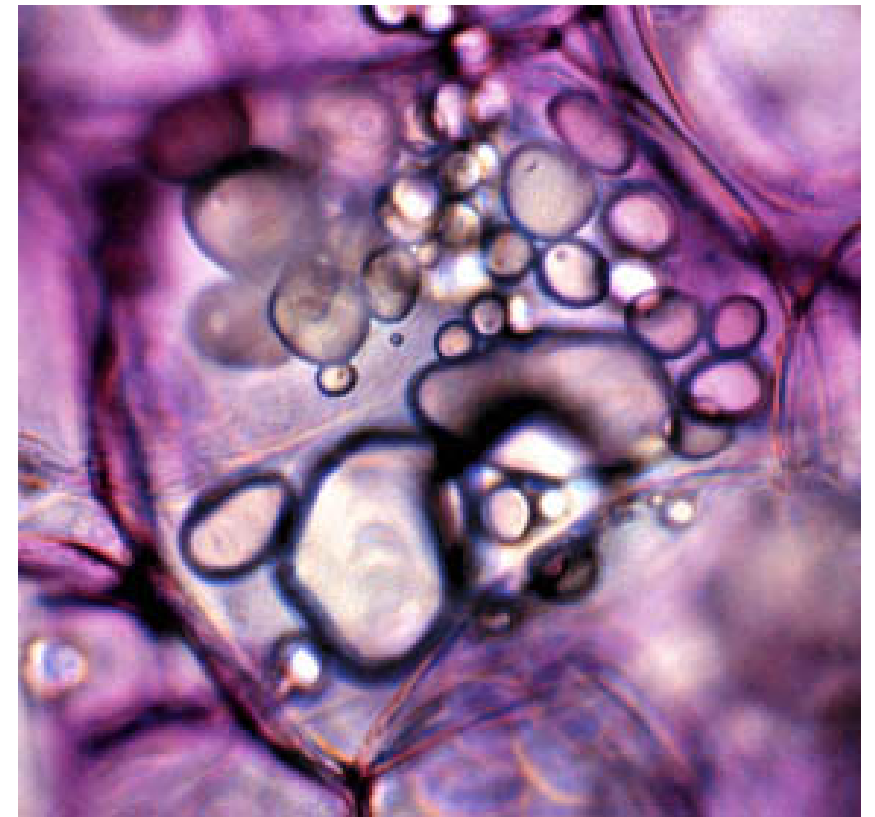
1. Cellulose

- humans cannot digest this cellulose (=fibre)
- long chains of β -linkages
- structural molecule in plants (cell wall)



2. Starch

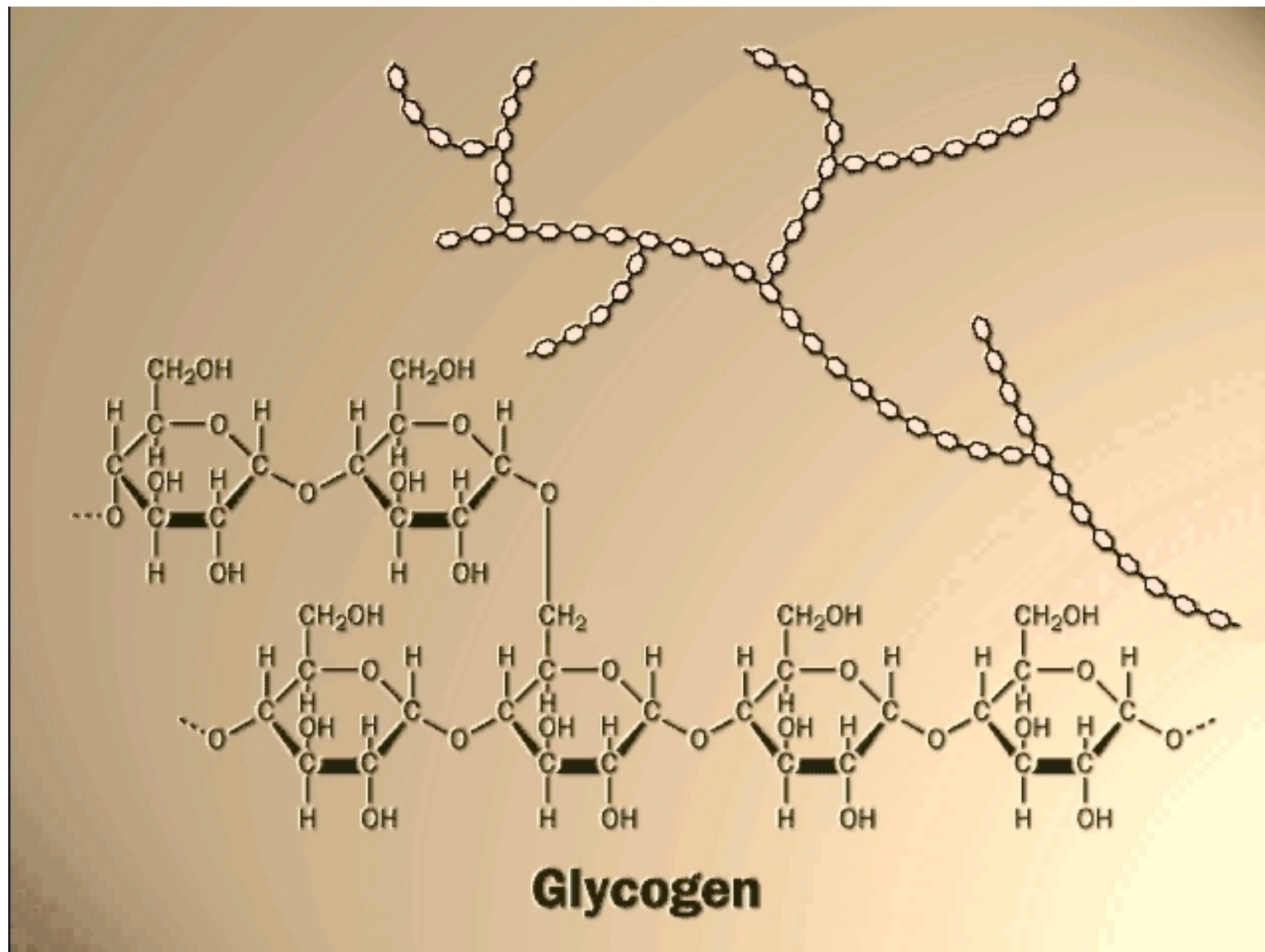
- very easy for humans to digest
- alpha-linkages in sugars
- fast source of energy
- storage molecule for plants



(Note: all sugars line up the same way)

3. Glycogen

- a large molecule that is used by humans to store energy
- found in muscles & liver cells
- similar in structure to starch (i.e., alpha links) but branching molecule



Mol View Website

- Get a worksheet
- Open up the website <http://molview.org/?cid=2519>
- Examine the structure of the molecules Cellulose, Chitin, Glycogen, and Starch
-