Chemistry - MACROMOLECULES

Carbohydrates & Lipids

Carbohydrates – C H & O

Definition - Carbohydrates are sugar polymers
Carbohydrate = Carbon + Water

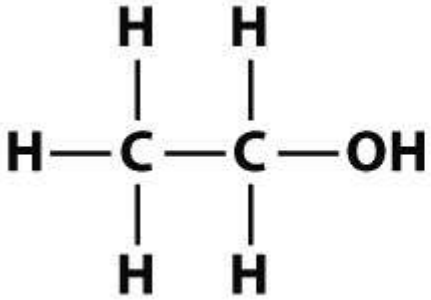
$C_n(H_2O)_n$

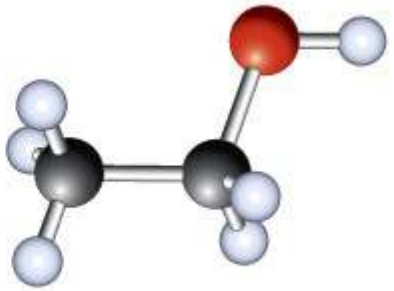
or $C_6H_{12}O_6$

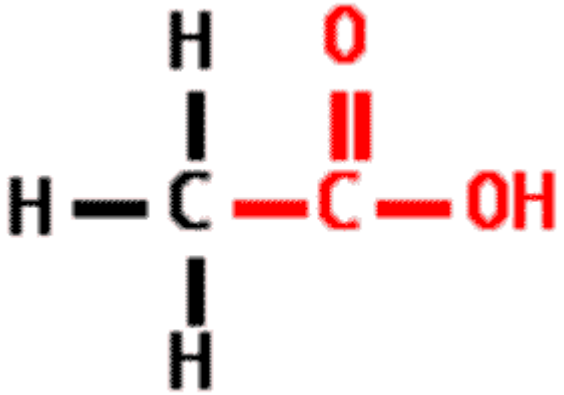
- Examples of your diet that are Carbohydrates:
  - Milk fruit, bread, Potatoes, Pasta, Grains, Beans, and Yogurt
- Function of Carbohydrates:
  - Energy
    - Immediate & Stored
- 45 – 65% of Diet

Carbohydrate Groupings

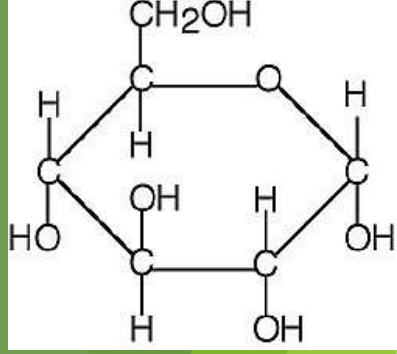
- Hydroxyl Group (-OH)
- Carbonyl Functional Group (C=O)



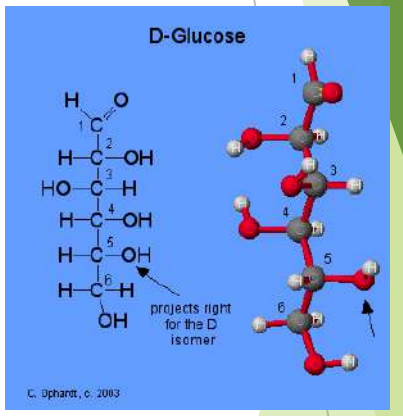




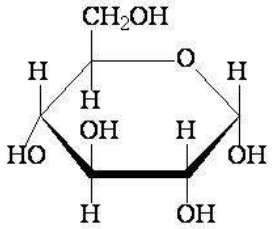
Types of Carbohydrates



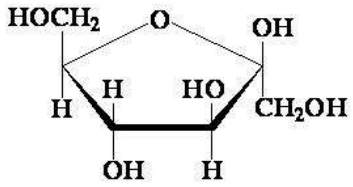
- Monosaccharide -
  - Single Molecule (C6H12 O6) – Glucose (Blood sugar), Immediate energy
- Disaccharide –
  - Two molecules – Lactose & Sucrose (Table Sugar)
    - Lactose = Glucose & Galactose
    - Sucrose = Glucose & Fructose
- Polysaccharide – Complex Carbohydrates
  - Starch - Pasta
  - Cellulose – Fiber (Wood)
  - Glycogen – made by animals to store energy in the liver and muscles



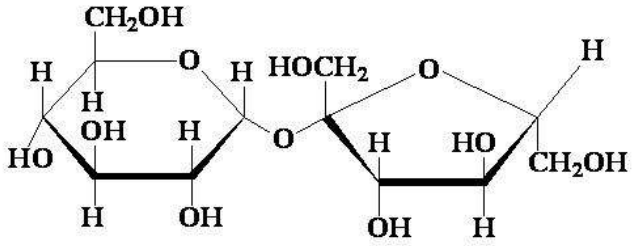
Sucrose is a disaccharide



glucose



fructose



sucrose

Digestion of Carbohydrates

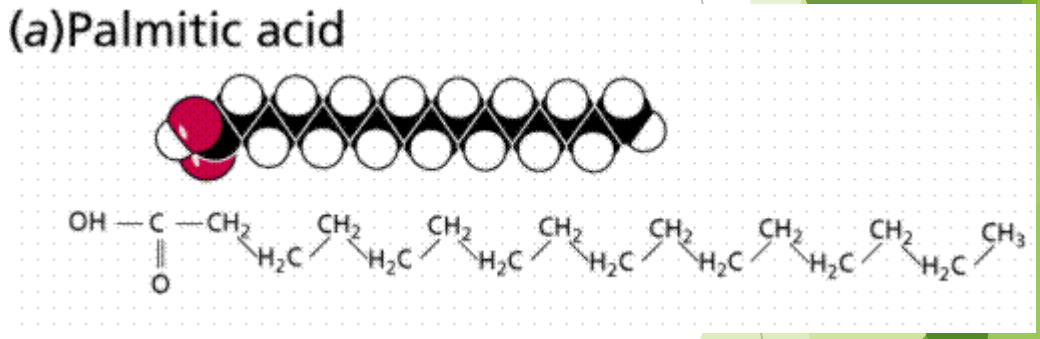
- Starts in the mouth with enzymes & mechanical digestion
- Then continues in the stomach with more enzymes
- Finally in the Small Intestine, Sucrase enzymes breaks down disaccharides into monosaccharides
  - Lactase breaks down lactose into glucose and galactose

Activity – Use the molecules to make a Carbohydrate

- pHET Activity
  - Biology
    - Eating & Exercise

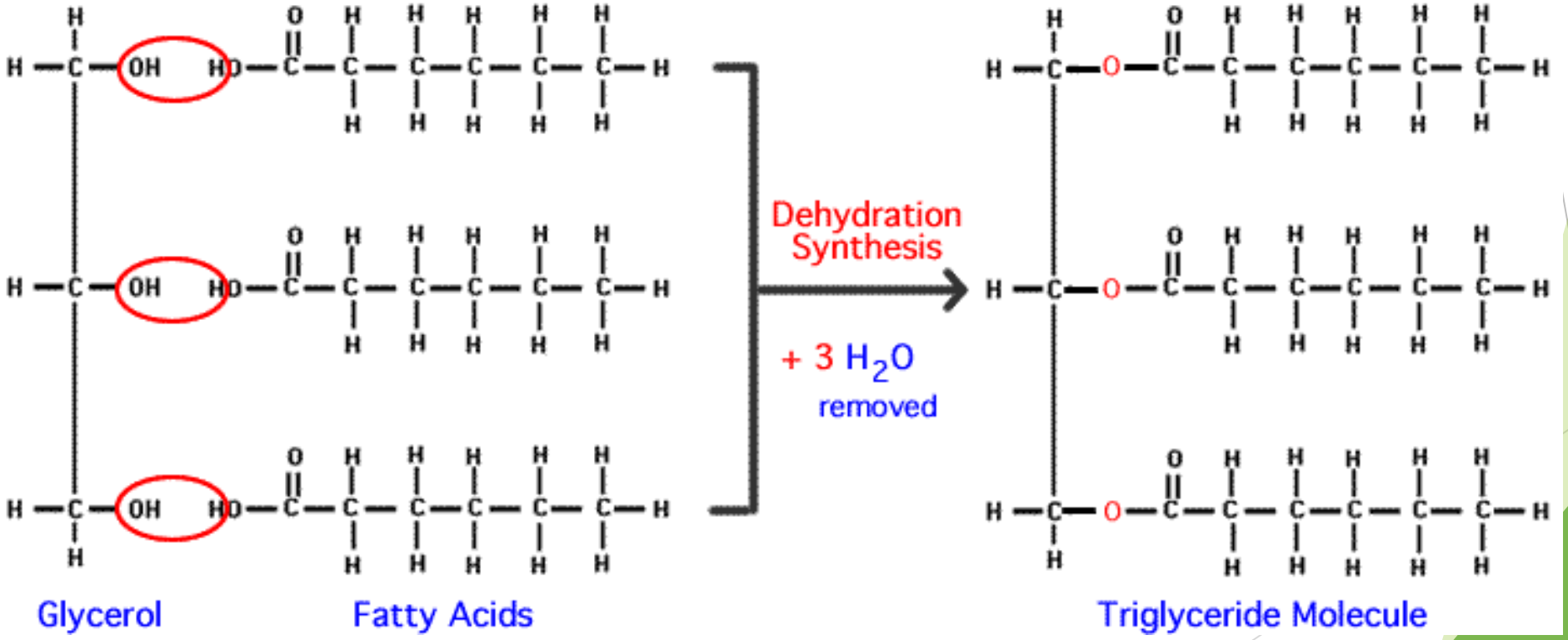
Macromolecules – Fats
20 – 35% Diet

- Examples: Meat, Fish, Poultry, Oils, Dairy, Nuts, Grains
- Excess food energy is stored in the body as fat.
- Fats are nonpolar – hate water
  - Have long hydrocarbon chains - Fatty Acids – COOH
  - Palmitic Acid
  - Linolenic Acid



Triglycerides

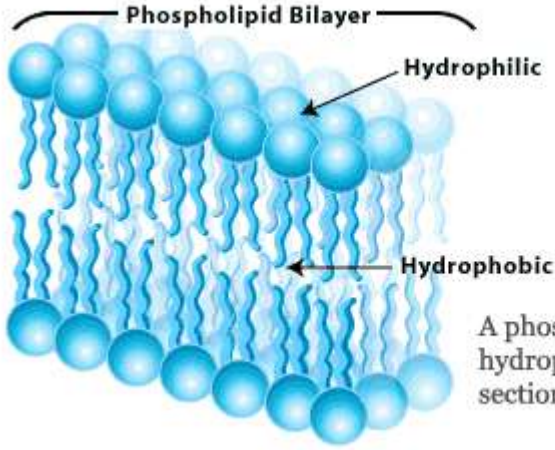
- Glycerol molecules + 3 Fatty Acids



Saturated & Unsaturated Fats

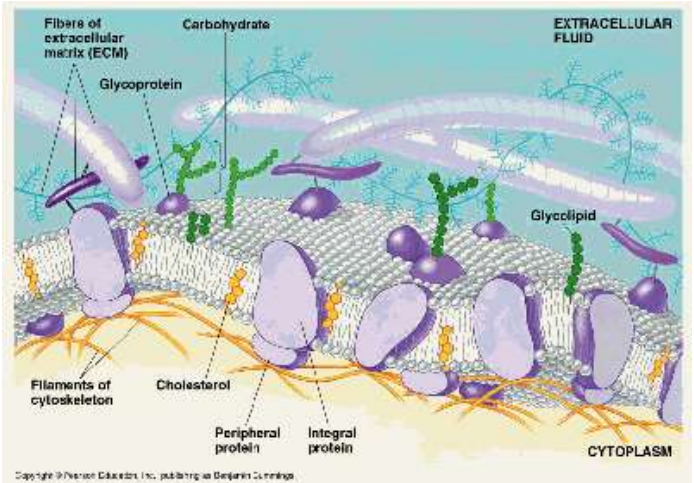
- Saturated – No double bonds - Coconut Oil
  - Mostly from animal fat, solid at room temperature
  - Arterial plague
  - Hardening of the arteries
  - Atheroscrosis
  - Coronary Artery Disease
    - Heart & Brain
- Unsaturated – has a double or triple bond
  - Plants, oils, Liquid at room temperature

Good Fats in the Body



A phospholipid bilayer with hydrophobic and hydrophilic sections indicated.

- Phospholipid Bilayer
  - You must have fat in your plasma membranes of your cells – all 3 Trillion of them.
- Steroids
  - Sex Hormones
  - Cholesterol – creates stability in the plasma membrane
  - Vitamin D – helps with the formation of bone and the absorption of Calcium



Energy in Food

- Carbohydrates = 4 Cal/gram — 45 – 65 % Diet Carbohydrate
- Fat = 9 Cal/ gram — 30% Diet Fat
- Protein = 4 Cal /Gram — 12 – 20% Diet Protein

Activity – Use the molecules to make a Fat

- pHET Activity

Project – Macromolecules Monitoring your Diet .5 Credits

- For three days make a diary of everything you eat.
- Make a column for the Food you ate, the quantity, the calories, & the macromolecule (Protein, Carbohydrate, or Fat)
- Calculate how much of your diet is Protein, Carbohydrate, and Fat
- 12 – 20% Diet Protein
- 45 – 65 % Diet Carbohydrate
- 30% Diet Fat

	Day 1	Day 2	Day 3
Foods you ate/ drank			
Size of portions (grams)			
Calculate the calories: Carbohydrate (4 Cal/gram) Fat (9 Cal/ gram) Protein (4 Cal/ gram)			
What % of your daily diet was Carbs, Fat, Protein?			

Works Cited

- Chemistry – Matter & change P. 781 – 786
- Chemistry in the Community P. 583 - 601