I. Carbohydrates

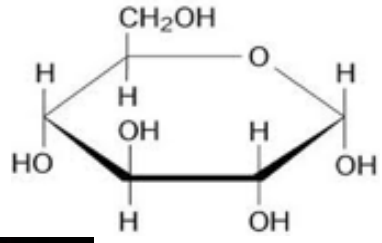
A) Structure

1. Building Block: single sugars (monosaccharides)

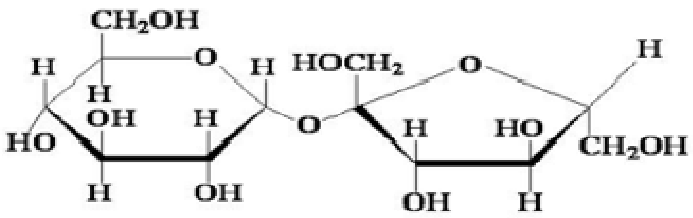
2. Made of elements:
   a. Carbon
   b. Hydrogen
   c. Oxygen

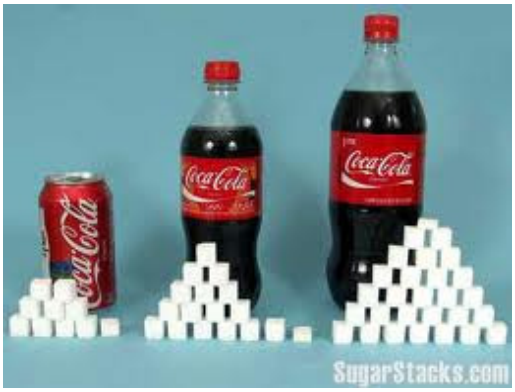
3. Classified into groups

a. Monosaccharides: single sugars (ex. glucose)

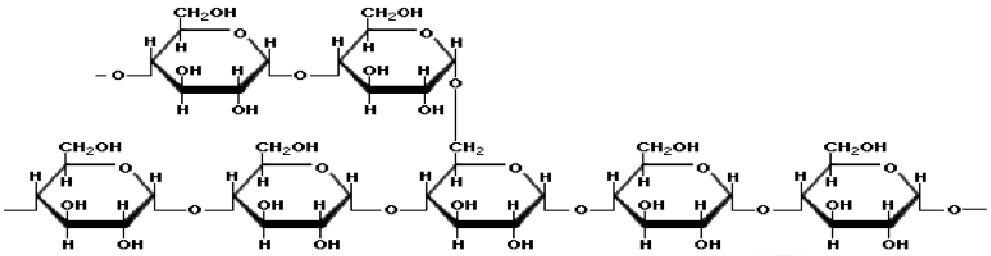


b. Disaccharides: double sugars (ex. sucrose)





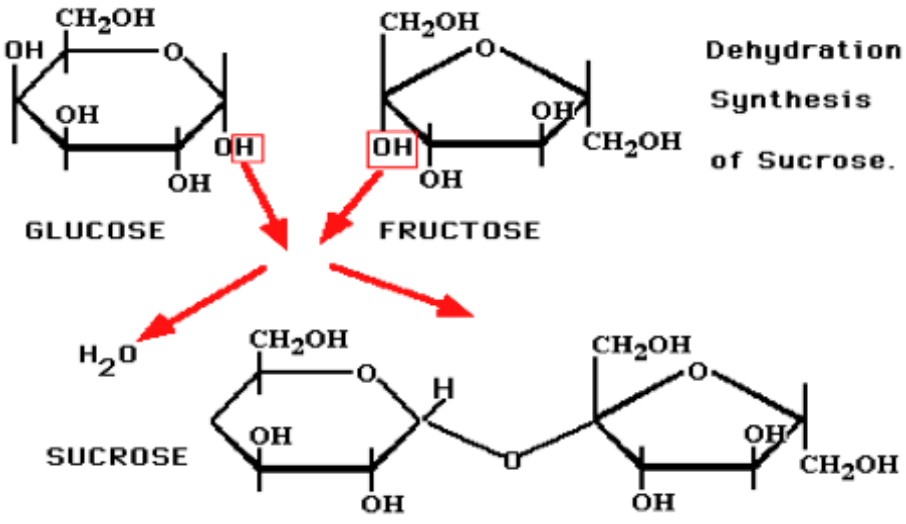
c. Polysaccharides: many sugars (ex. starch)
Also called complex carbohydrates.



4. Dehydration Synthesis: process of forming complex carbohydrates

   a. When two sugar molecules join, two hydrogens and one oxygen atom are released.

   b. The hydrogen and oxygen atoms combine to form a molecule of water.



B. Function

1. Provide energy: simple sugars provide quick energy while complex carbohydrates release energy bit by bit as they're broken down

2. Structural support: cellulose in plants provides rigid structure (wood)

3. Cellular recognition: carbohydrates stick out of the cell membrane like flags

II. Lipids (fats)

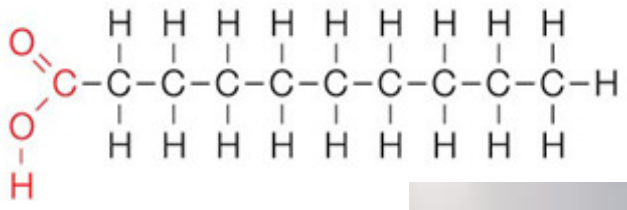
A. Structure

1. Building block: fatty acids (long chains of carbon and hydrogen)

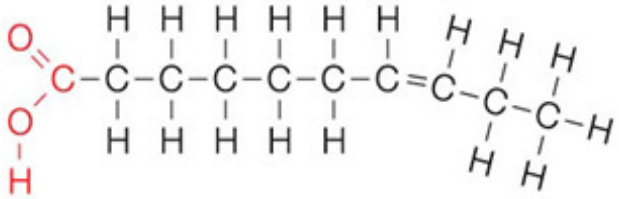
2. Made of elements
   a. Carbon
   b. Hydrogen
   c. Oxygen
   d. Sometimes Phosphorus

3. Classified into groups:

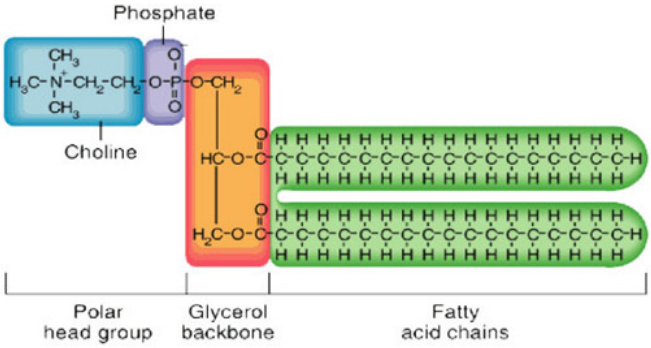
   a. Saturated fats: solid at room temperature (ex. butter, wax, lard)

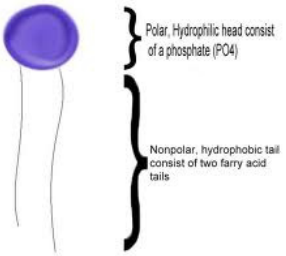


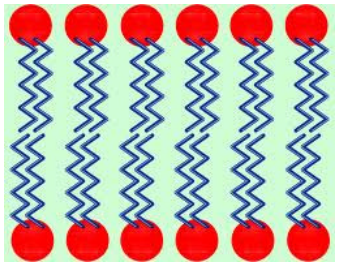
   b. Unsaturated fats: liquid at room temperature (ex. olive oil, omega-3 fatty acid)



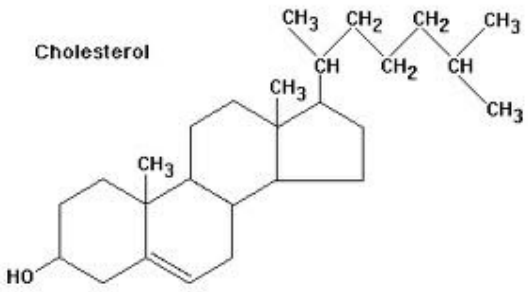
c. Phospholipids: make up cell membranes, have a polar "head" and nonpolar "tails"

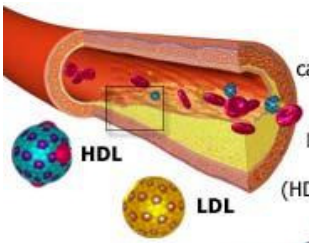




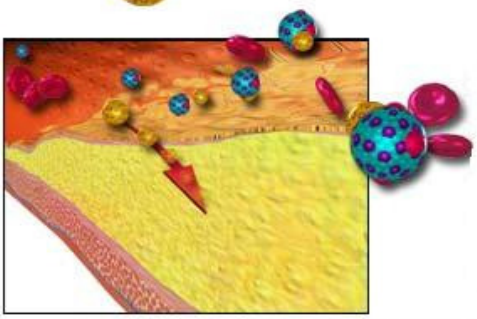


d. Steroids: carbon and hydrogen form rings instead of chains (ex. cholesterol)



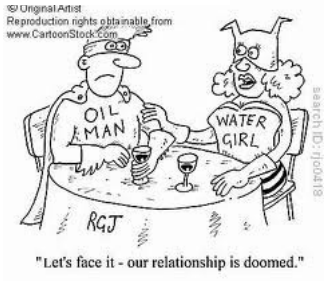


Cholesterol is a waxy fat (lipid) carried through blood by lipoproteins. The two main types of lipoproteins are high density lipoproteins (HDLs) and low density lipoproteins (LDLs).



HDLs (good cholesterol) carry LDLs (bad cholesterol) away from artery walls. LDLs stick to artery walls and can lead to plaque build-up (atherosclerosis).

4. Chains of carbon and hydrogen are ***nonpolar*** because they share electrons equally; being nonpolar is very important in the function of lipids.



B. Function

1. Water barrier: lipids are nonpolar so they repel water

2. Energy storage: excess food energy can be stored as fat to be used at a later date

3. Insulation: animals in cold climates have blubber to keep themselves warm

III. Nucleic Acids

A. Structure

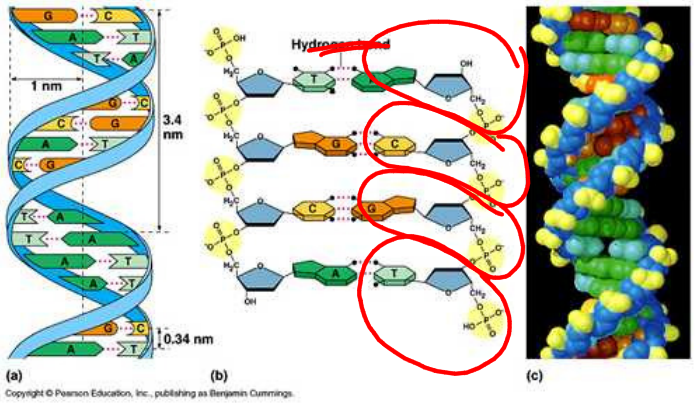
1. Building block: nucleotides

2. Made of elements:

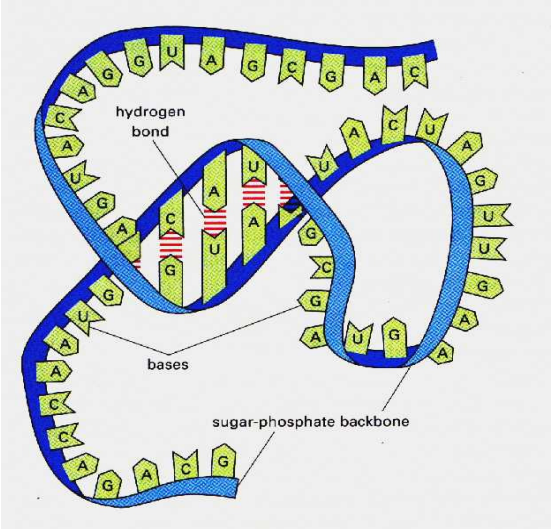
a. Carbon
b. Hydrogen
c. Oxygen
d. Nitrogen
e. Phosphorus
f. Sulfur

3. Classified into groups:

1. DNA (deoxyribonucleic acid): double stranded molecule found in the nucleus



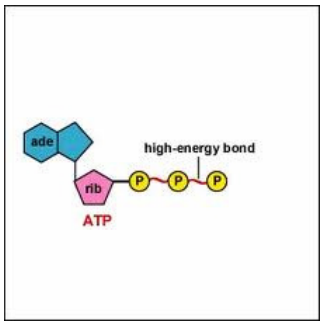
2. RNA (ribonucleic acid): single stranded molecule found in the cytoplasm



B. Function

1. Store genetic information: DNA contains genes that tell the cell how to function

2. Energy currency: the nucleotide ATP is used to provide energy for cellular functions



IV. Proteins

A. Structure

1. Building blocks: amino acids

2. Made of elements

a. Carbon

b. Hydrogen

c. Oxygen

d. Nitrogen

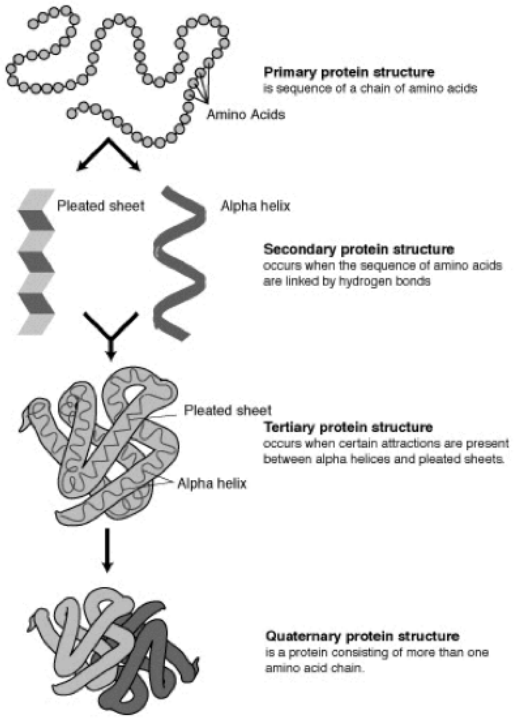
3. Formation of a protein

a. Primary structure: order of amino acids

b. Secondary structure: folding of the amino acid chain into regular patterns held together by hydrogen bonds

c. Tertiary structure: globular shape formed when the secondary structure begins to fold back on itself

d. Quaternary structure: final protein shape formed when multiple subunits come together



B. Function

1. Structure and support: collagen in skin
2. Enable movement: muscles are made of protein
3. Regulate what enters/leaves the cell: proteins make "tunnels" through cell membrane
4. Speed up chemical reactions: **enzymes** are proteins that work as catalysts