Organic Compounds – those containing C (typically H, O and N as well)

Vitalism- belief in a life force outside the jurisdiction of chemical/physical laws

Early 19th century organic chemistry believed only living organisms could produce organic compounds

Mechanism- belief that all natural phenomena are governed by physical & chemical laws

Carbon

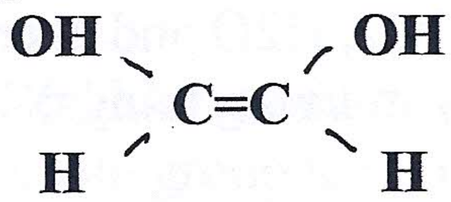
- atomic number #6; 4 valence electrons
- readily bonds with other C atoms forming straight chains, branched chains or rings

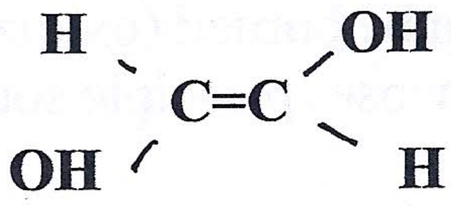
Hydrocarbons – molecules containing only C and H
-- fossil fuels
-- fats have hydrocarbon chains

Isomers – compounds with the same molecular formula but with very different structures and properties

3 Types of Isomers:

1. Structural – isomers differ in the covalent arrangement of their atoms
2. Geometric - share same covalent partnerships, but differ in their spatial arrangements





3. Enatiomers – mirror images of each other

Functional Groups

I. Hydroxyl group (--OH) called alcohols, polar, water soluble
II. Carbonyl group (--CO) found in sugars, polar,water soluble
III. Carboxyl group (--COOH) called carboxylic acids, donates protons, polar, water soluble
IV. Amino group (--NH2) called amines, polar, weak base, water soluble
V. Sulfhydryl group (--SH) called thiols, proteins
VI. Phosphate group (H3PO4) loses protons, acid properties, polar, water soluble
VII. Methyl group (--CH3) nonpolar, hydrophobic

Polymer – large molecule consisting of many identical or similar subunits connected together

Monomer – subunit or building block

Macromolecule – large organic polymer

Most polymerization reactions in living organisms are <u>condensation reactions</u> (dehydration synthesis) requires energy.

Hydrolysis – a reaction that breaks the covalent bonds between monomers by adding water molecules.

Four Groups of Organic Compounds:

1. Carbohydrates – sugars & starches $C(H2O)_n$

A. <u>Monosaccharides</u> – single or simple sugars (glucose, galactose, fructose)
-- can be burned (oxidized) to yield CO2, H2O and energy
-- glucose (principle source of energy in living things)

B. <u>Disaccharide</u> - a two unit or double sugar joined by a glycosidic linkage

Glycosidic linkage – covalent bond formed by a condensation reaction between two sugar monomers

Disaccharide	Monomers	INFO
Maltose	glucose + glucose	brewing beer
Lactose	glucose + galactose	present in milk
Sucrose	glucose + fructose	table sugar; transport form in plants

C. Polysaccharide – macromolecules that are polymers of a few hundred or thousand monosaccharides (starch, glycogen, cellulose, pectin and chitin)

- ✓ Starch – storage polysaccharide in plants
  Two common types:
  1. Amylose - the simplest starch, unbranched chains of glucose
  2. Amylopectin – large molecule with branched glucose chains
- ✓ Glycogen – "animal starch"
- ✓ Cellulose – plant cell walls, cannot be digested by most organisms
- ✓ Pectin – extracted from algae, used in jelly
- ✓ Chitin – forms the exoskeletons of insects & other arthropods

2. Lipids hydrophobic (fats, phospholipids, steroids & waxes)

3 Major Roles: store energy, form biological membranes and used as chemical messengers

Triglycerides: Fats & oils (3 fatty acids + glycerol head)

- Saturated – solid at room temp, no double bonds, most animal fats (bacon, lard, butter)
- Unsaturated – oily liquids, double bond (olive oil, peanut oil, corn oil)
- Polyunsaturated – have more than 1 double bond

Phospholipids: □□Cell Membranes□□
(2 fatty acids, phosphate group and glycerol head)
Cluster in water → forms a micelle

Steroids: 4 linked carbon rings (lanolin, cholesterol)

Waxes: help conserve water. Insects have waxy cuticles, leaves have wax, fruit skins