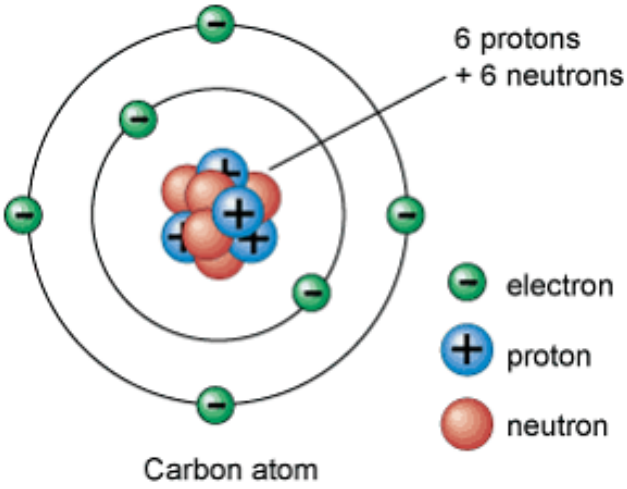
Ch. 4 Organic Compounds

Cells are 70-95% water; rest is mostly carbon-based compounds

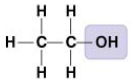
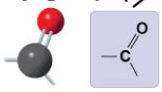
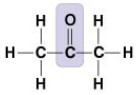
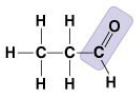
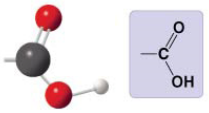
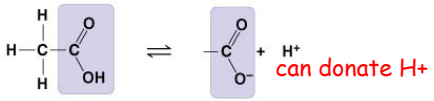
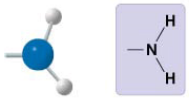
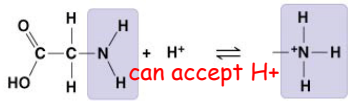
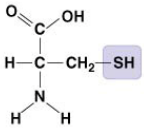
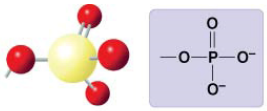
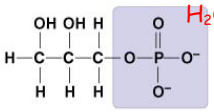
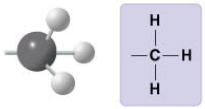
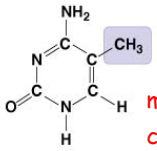


1. PROPERTIES OF CARBON
   - Has 4 valence electrons
   - Tetravalence of carbon makes large, complex molecules possible by bonding COVALENTLY to FOUR other atoms
   - Living matter-mainly of carbon (C), oxygen (O), hydrogen (H), and nitrogen (N) with smaller amounts of sulfur (S) and phosphorus (P). (CHONPS)

2. HYDROCARBONS = Molecules containing only carbon and hydrogen
   - Hydrocarbon chains are hydrophobic/nonpolar
   - major components of fossil fuels produced from the organic remains of organisms living millions of years ago
   - some biologically important molecules may have regions consisting of hydrocarbon chains

   EX: FATS-long carbon tails attached to a non-hydrocarbon component

Biologically Important Chemical Groups

Chemical Group	Compound Name	Examples	Group Props.
Hydroxyl group (—OH) 	Alcohol	 Ethanol	Polar due to electronegative oxygen. Forms hydrogen bonds with water.
Carbonyl group ($>C=O$) 	Ketone Aldehyde	 Acetone  Propanal	Sugars with ketone groups are called ketoses; those with aldehydes are called aldoses.
Carboxyl group (—COOH) 	Carboxylic acid, or organic acid	 Acetic acid can donate H^+	Acts as an acid.
Amino group ($—NH_2$) 	Amine	 Glycine can accept H^+	Acts as a base.
Sulfhydryl group (—SH) 	Thiol	 Cysteine	Two —SH groups can react, forming a "cross-link" that helps stabilize & determine protein structure.
Phosphate group ($—OPO_3^{2-}$) 	Organic phosphate	-also seen in ATP reacting with H_2O to make ADP  Glycerol phosphate	Contributes negative charge. When attached, confers on a molecule the ability to react with water, releasing energy.
Methyl group ($—CH_3$) 	Methylated compound	 5-Methyl cytosine methyl group added to cytosine changes the structure of chromosomes = changes gene expression	Affects the expression of genes. Affects the shape and function of sex hormones.

Functional groups:

- Specific combinations of bonded atoms attached as a group to other molecules
  - Always react the same way
  - Determine activity and polarity of large organic molecules