CHEMISTRY (Ch. 1 & Appendix)

1. ATOMS

atom - individual unit of matter

nucleus - center of atom
- proton - charge = +1, mass = 1
- neutron - charge = 0, mass = 1

electron - charge = –1, mass = 0

mass = no. protons + neutrons

charge = no. protons – electrons

2. ELEMENTS

element - atoms with same no. protons

periodic table - list 106 elements (92 natural + 14 lab)

atomic number = no. protons

atomic mass = no. protons plus neutrons

neutrons = atomic mass minus atomic no.

life - 25 elements (6 form 99% tissue)
- 1 Hydrogen
- 6 CARBON
- 7 Nitrogen
- 8 Oxygen
- 15 Phosphorus
- 16 Sulfur

isotope - different no. neutrons (different mass)
- same no. electrons (same chemical reactions)

3. MOLECULES & BONDS

molecule - 2 or more atoms joined together

chemical bond - holds atoms together in a molecule
- a pair of shared electrons

bond energy - released when break bond

ionic bond - weak inside molecule
- share electrons unequally (transfer)

covalent bond - strong inside molecule
- share electrons equally

hydrogen bond - weak & temporary between molecules

4. CHEMICAL REACTIONS

metabolism - all chemical reactions in body
- reactants become products

synthesis - build larger molecule
$CH_3\text{-}OH + H\text{-}CH_3 \rightarrow CH_3\text{-}CH_3 + H_2O$

hydrolysis - break down molecule
$CH_3\text{-}CH_3 + H_2O \rightarrow CH_3\text{-}OH + H\text{-}CH_3$

exchange - $AB + CD \rightarrow AC + BD$

5. IONS

ion - charged molecule
- anion - negative ion
- cation - positive ion

ionization - reaction releasing ions

salt - neutral molecule releasing ions
- acid - salt release H^+, burns
- base - salt release OH^-, slimy

6. pH

pH - measure of acidity = $-\log [H^+]$
- neutral = pH 7
- acidic = pH 2 to 6.9
- alkaline or basic = pH 7.1 to 14

buffers - absorb excess H^+ or OH^-
- stomach 2, urine 5-7.8, blood 7.4

7. ORGANIC MOLECULES

inorganic - lack carbon atoms

organic - with carbon (plus hydrogen)
- carbohydrates
- lipids
- proteins
- nucleic acids

8. CARBOHYDRATES

functions - principle source of energy (4 kcal / g)
- also structure in plants

atoms - C H O

structure - ring or chain of 5-6 C's

- monosaccharide - single sugars (example: glucose)

- disaccharide - double sugars (example: sucrose)

- polysaccharide - polymer of 100's sugars
  - starch & cellulose (mostly plants)
  - glycogen (animals esp. liver)

9. LIPIDS

functions - energy storage (9 kcal / g)
- also animal structure (blubber)

atoms - C H O

structure - glycerol + 3 fatty acids

- oil - liquid, unsaturated (missing H's)

- fat - solid, saturated (numerous H's)
  - increases heart disease

- others - steroids, phospholipids, waxes

10. PROTEINS

functions - energy (4 kcal / g)
- structure in animals
- enzymes (speed up & regulate chem reactions)

atoms - C H O N

amino acid - central C–H
- amino group –NH_2
- carboxyl group –COOH
- R-group (20 different)

• polypeptide - polymer of amino acids

• protein - 1 or more polypeptides

11. NUCLEIC ACIDS

functions - **not** energy
- heredity & genetics (chromosomes)

atoms - C H O N P S

structure - chain of 100's nucleotides

examples - DNA, RNA, ATP