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
  \[ \text{CH}_3\text{-OH} + \text{H-CH}_3 \rightarrow \text{CH}_3\text{-CH}_3 + \text{H}_2\text{O} \]

hydrolysis - break down molecule
  \[ \text{CH}_3\text{-CH}_3 + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{-OH} + \text{H-CH}_3 \]

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 = \(-\log [\text{H}^+]\)
  • 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 –NH2
  - 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