

Chemical Level of Organization

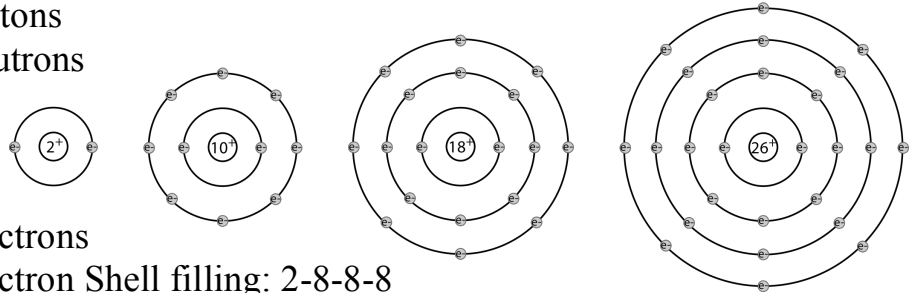
Section #1 - Basic principles of chemistry and bonding

1. Introduction to Atoms and Molecules

A. Atoms

i. Nucleus

- a. Protons
- b. Neutrons



ii. Shells

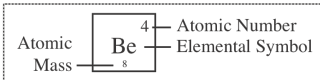
- a. Electrons
- b. Electron Shell filling: 2-8-8-8

iii. Examples

H = hydrogen C = carbon Na = sodium
 N = nitrogen Ca = calcium Fe = iron
 K = potassium Cl = chlorine P = phosphorus

Periodic Table

1	Shaded elements are of particular nutritional significance to health																2											
	H																	He										
3	Li	Be											B	C	N	O	F	Ne										
11	Na	Mg											Al	Si	P	S	Cl	Ar										
19	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr										
37	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pb	Ag	Cd	In	Sn	Sb	Te	I	Xe										
55	Cs	Ba											Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
87	Fr	Ra																										



Macrominerals

Calcium (Ca)
 Magnesium (Mg)
 Sodium (Na)
 Potassium (K)
 Chlorine (Cl)
 Sulfur (S)

Questionable

Fluorine (F)
 Silicon (Si)
 Nickel (Ni)
 Tin (Sn)
 Arsenic (As)
 Vanadium (V)
 Boron (B)
 Cadmium (Cd)
 Aluminum (Al)

Trace Minerals

Iron (Fe)
 Zinc (Zn)
 Selenium (Se)
 Manganese (Mn)
 Iodine (I)
 Copper (Cu)
 Molybdenum (Mo)
 Chromium (Cr)
 Cobalt (Co)

Toxic Metals

Cadmium (Cd)
 Lead (Pb)
 Mercury (Hg)
 Silver (Ag)
 Gold (Au)

Mineral Antagonists

Some minerals can compete with other minerals for absorption, excretion, or simply interfere with normal functionality. We call such minerals, "mineral antagonists". In terms of nutrition, this can become a problem when one takes a supplement, "just to be on the safe side," not realizing that it could cause deficiency problems. Below are several mineral antagonists that affect the absorption of the associated minerals listed. This is a partial list. Clearly, there is no substitute for a well balanced diet; and use of supplements needs to be done

Ca	Fe	P	Mn	F	Co	Mg	Zn	I	Sn	Na	Cu	F	S
P	Mn	Ca	Cu	Al	Fe	Ca	Fe	Co	Fe	K	S	Al	Se
Al	Cu	Mg	P	Ca		P	Ca		Cu		Ag	Ca	Zn
Zn	Co	Mn	Fe	Mg			Cu				Cu	Mg	
Mg	Mn		Co				Pb				Fe		
	Zn		Mg				Cd				Mo		
											P		
											Cd		
											Zn		
											Pb		
											Se		

B. Compounds

i. Inorganic Compounds

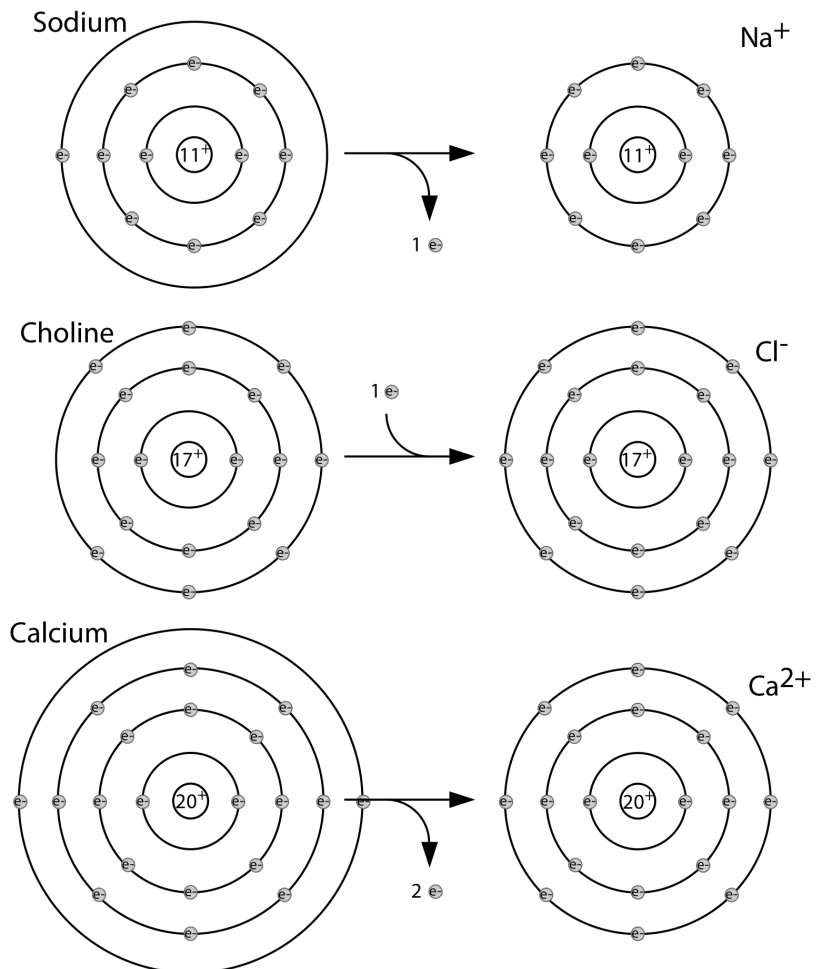
ii. Organic Compounds

a. Carbon

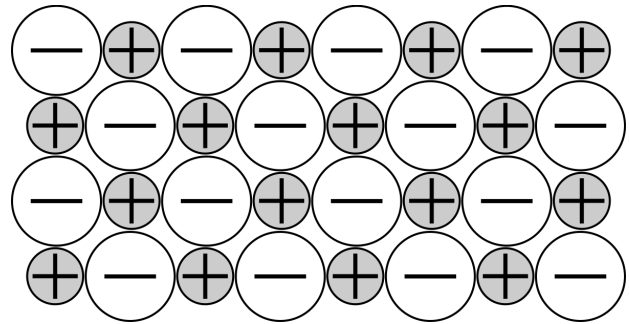
C. Bonding

i. Ionic

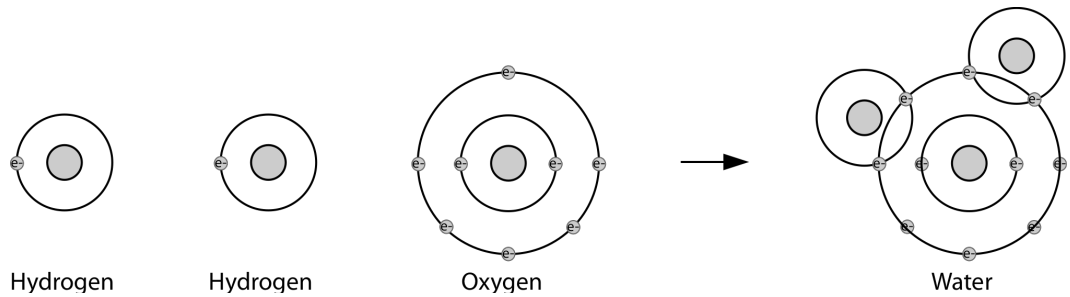
ii. Atomic Stability



a. Example:
Table Salt

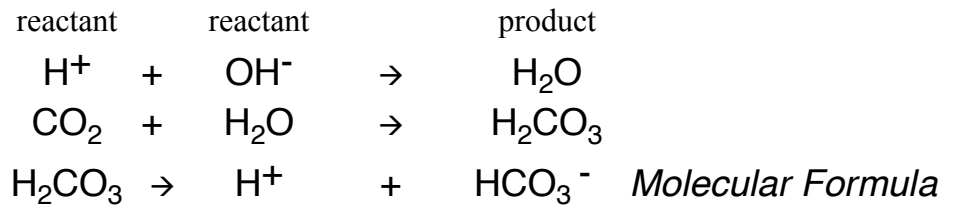


ii. Covalent Bond



2. Chemical Reaction

- chemical equation*



Note: arrow (\rightarrow) indicated direction of reaction.

A. Common Chemical Reactions

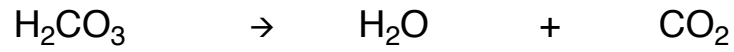
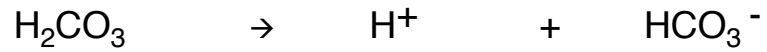
i. Synthesis Reaction

- anabolic ($A + B \rightarrow AB$)



ii. Decomposition Reaction

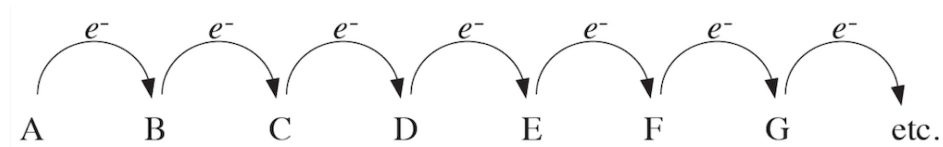
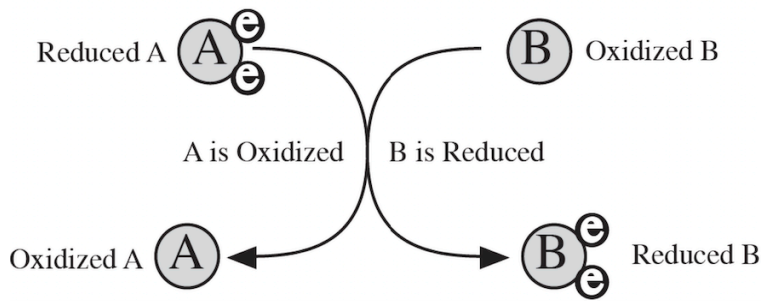
- Catabolic ($AB \rightarrow A + B$)



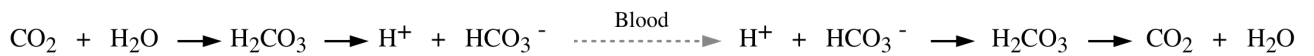
iii. Oxidation-Reduction Reactions

a. Oxidized

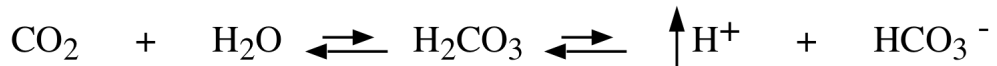
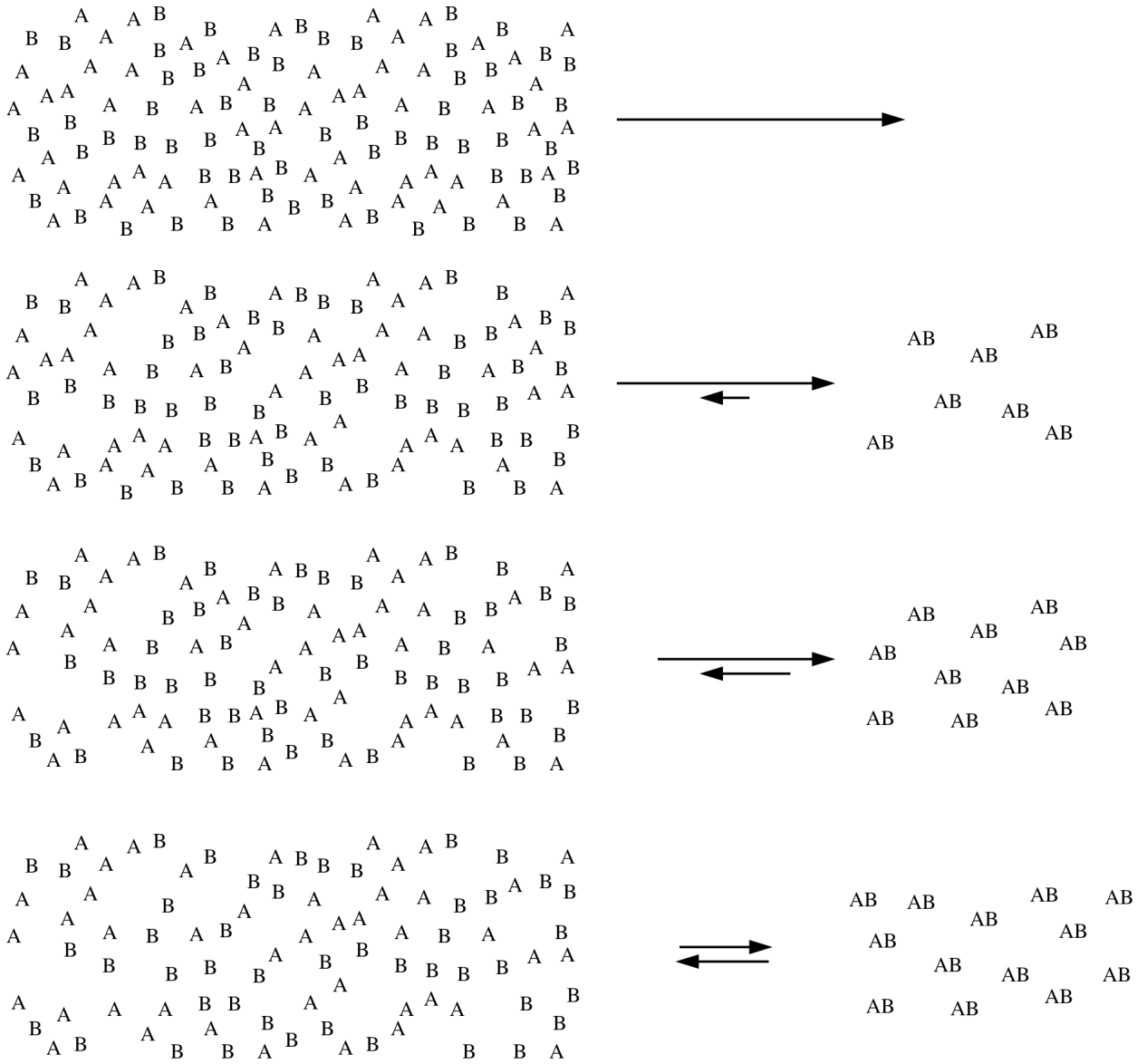
b. Reduced



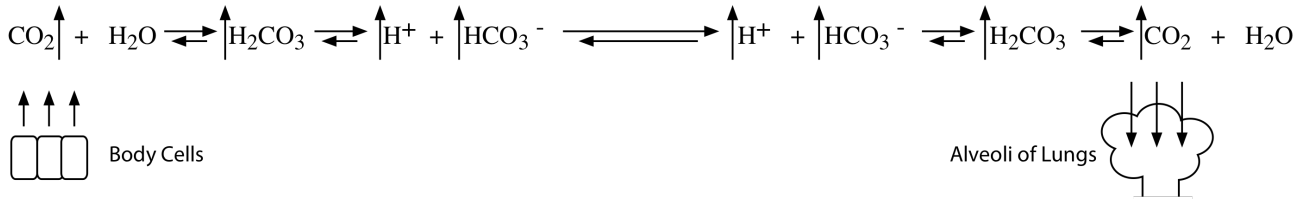
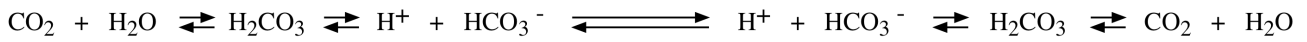
B. Chain Reactions



C. Reversibility of Reactions



D. Reaction Rate

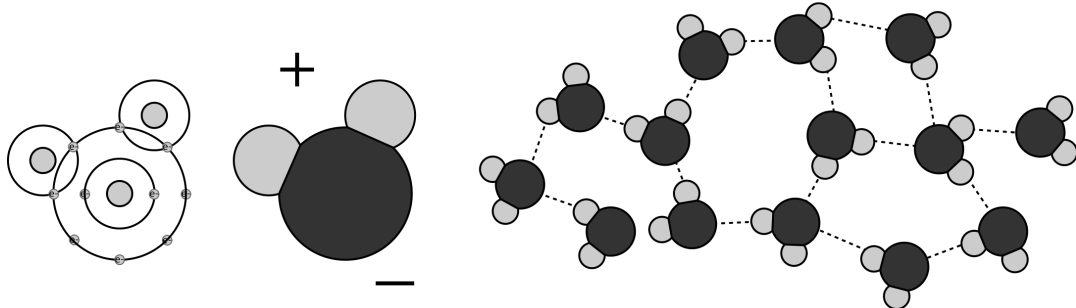


- i. Temperature
- ii. Concentration
- iii. Enzyme Catalysts (Pull out *handout* on enzymes)
 - a. Enzyme
 - b. Substrate
 - c. Enzyme-Substrate Complex
 - d. Products

Section #2 – Inorganic Chemistry

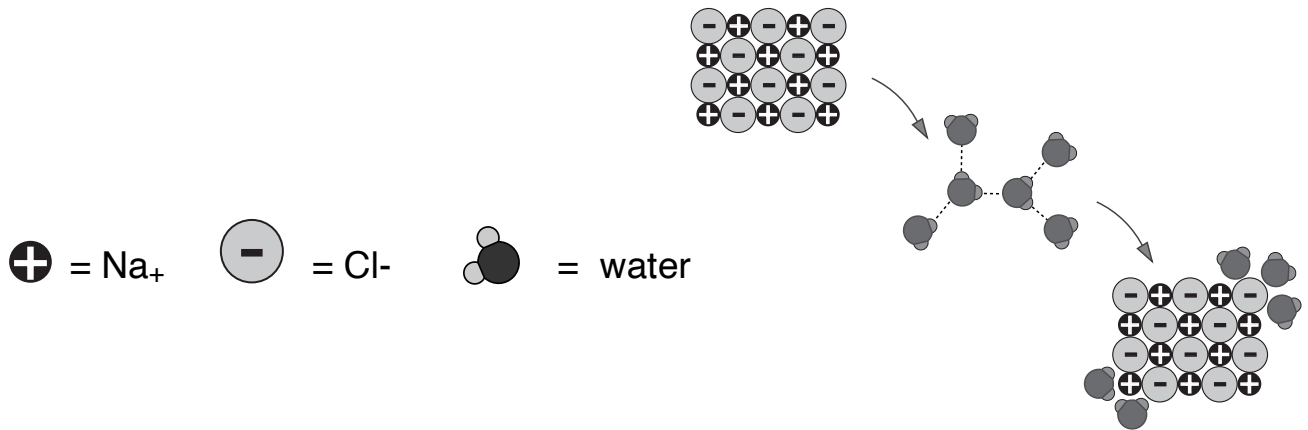
3. Inorganic Compounds

A. Water



- i. Polar
- ii. Hydrogen Bonds

iii. Water as a “Universal Solvent”

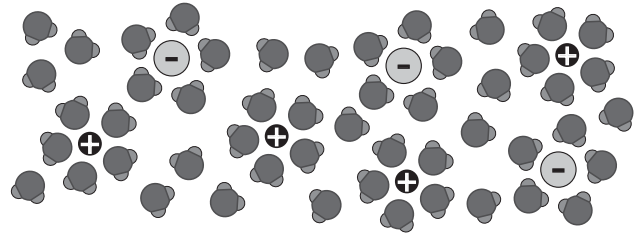


B. Water Characteristics

i. “Universal Solvent”

- a. Solvent
- b. Solute
- c. Solution
- d. Suspension

- ii. Lubricant
- iii. Heat Distribution
- iv. High Heat of Vaporization



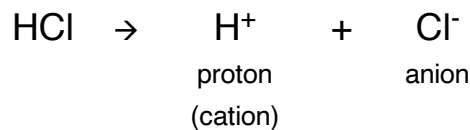
C. Salt

- Electrolytes

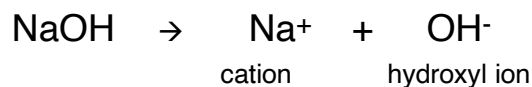
D. Inorganic Acids and Bases (see handout on Acids and Bases)

- Ionization or Dissociation
- Electrolytes

i. Acids - If the cation is a H^+



ii. Base - If the anion is an OH^-



iii. Neutralization

E. Buffer Systems (See handout and video)

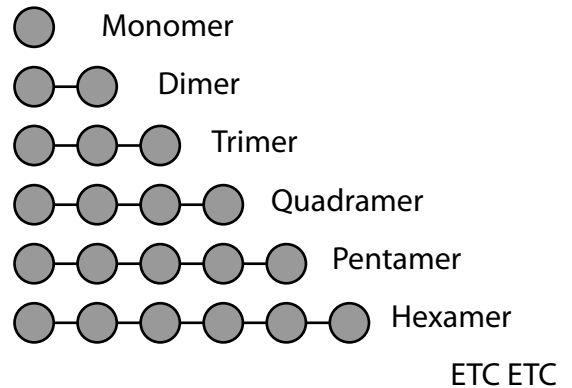
If we do not cover this topic in lecture,
do this on your own using the video.

There will be a guided essay on this topic.

Section #3 – Organic Chemistry

4. ORGANIC COMPOUNDS

5. Organic Compound



Classifications

A. Carbohydrates (Pull out your “Carbohydrate” handout)

i. Monosaccharides (see handout)

- a. Glucose
- b. Fructose
- c. Galactose

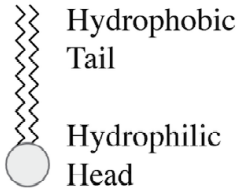
ii. Disaccharides (see handout)

- a. Maltose – glucose + glucose
- b. Sucrose – glucose + fructose
- c. Lactose - glucose + galactose

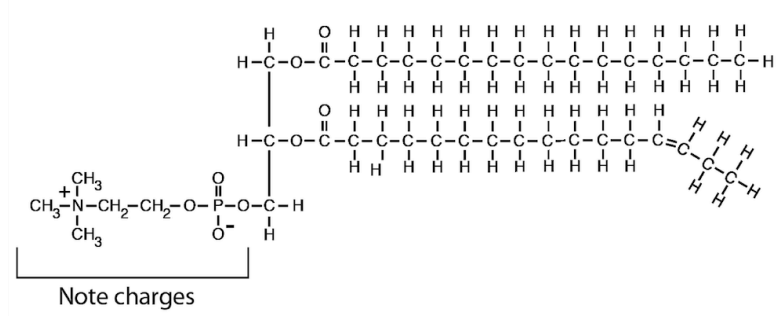
iv. Polysaccharides (see handout)

- a. Starch
- b. Glycogen
- c. Cellulose
 - Fiber

- ii. Classifications
 - a. Fats
 - b. Oils
 - c. Saturated Fat
 - d. Monounsaturated Fat
 - e. Polyunsaturated Fat



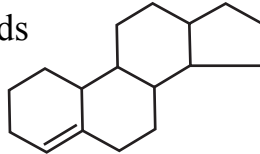
iii. Phospholipids



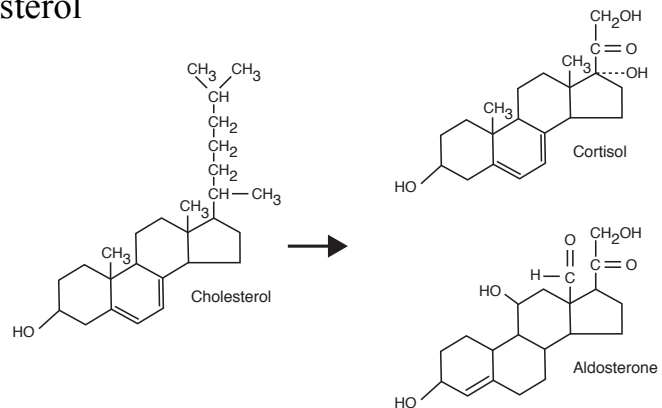
**** ESSAY ****

Emulsification (SEE “EMULSIFICATION” Handout)

iv. Steroids



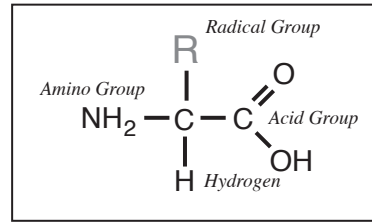
- Cholesterol



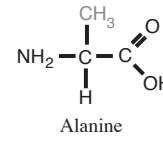
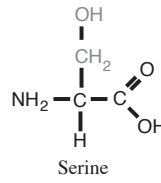
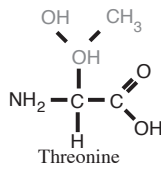
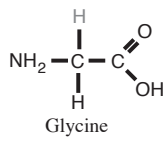
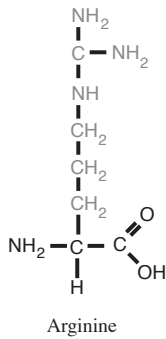
D. Proteins (**SEE HANDOUT: “PROTEIN AND DENATURATION”**)

i. Classifications

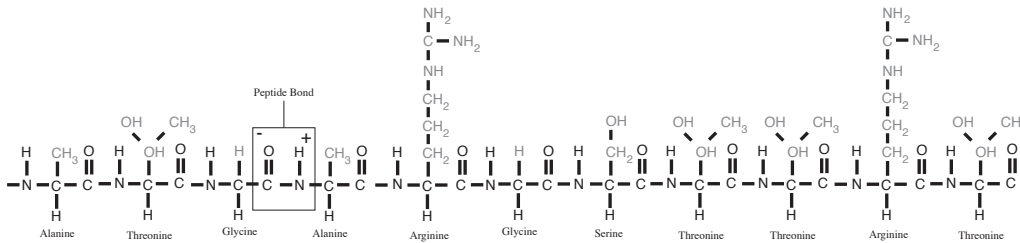
- a. Dipeptide
- b. Tripeptide



Basic Amino Acid



c. Polypeptides



ii. Functions

iii. Structural Organization

- a. Primary structure
- b. Secondary Structure
- c. Tertiary Structure
- d. Quaternary Structure

v. Denaturation (See handout on Protein)