AR Chemistry Review Notes 4

Carbon Based Chemistry (empty lines have hydrogens)

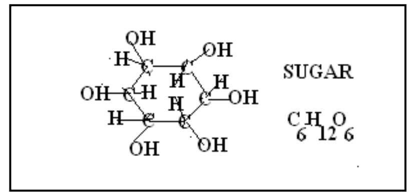
Simple Hydrocarbons

-- C -- (CH_4)

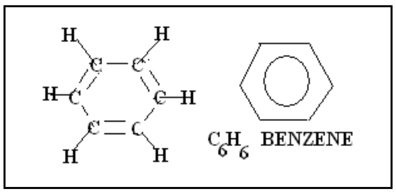
-- C – C -- (C_2H_6)

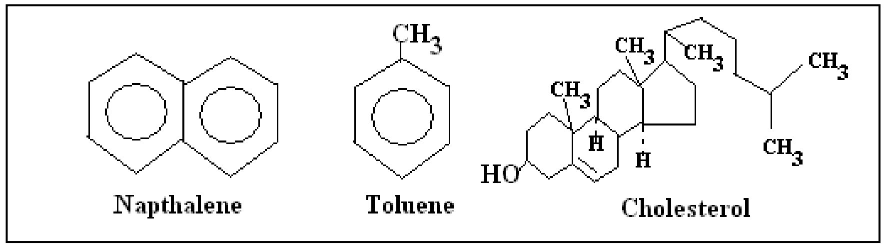
-- C – C – C -- (C_3H_8)

-- C – C = C -- (C_3H_6)



Aromatic Hydrocarbons





Functional Groups

Alkene: C = C (with \ / bonds on each carbon)

Alcohol: --- C – O – H (O with two lone pairs, xx)

Carboxylic Acid: -- C – O – H, with O (double bond, ||) on the C; xx lone pairs on each O

Amine: --C – N -- (N with lone pair xx)

Amide: -- C – N --, with O (double bond, ||) on the C; xx lone pairs on O and N

Proteins (about 50% of your body's dry weight!!!)

Amino Acids!!! One end has an AMINE group and the other a CARBOXYLIC ACID

Glycine: H_3N^{+1} and O (||) above; H – C – C – O^{-1}; H below

Alanine: H_3N^{+1} and O (||) above; H – C – C – O^{-1}; CH_3 below

Polypeptides and Proteins: Proteins are chains of amino acids linked with an AMIDE group—very, very, very large molecules.

Remove 1 H_2O and put 2 amino acids together: R – C – N -- R (O, ||, above the C; | below the N)

Polymers: wool, natural rubber. Polyethylene, 1000's of CH_2's in a row, plastics

Nuclear Processes

Protons, Neutrons, electrons, and Quarks

Quarks = subatomic particles   UP quark = +2/3 charge   Down quark = -1/3 charge

Protons: 2 up and 1 down quark   (+2/3) + (+2/3) + (-1/3) = +1 charge
Neutrons: 1 up and 2 down quarks (+2/3) + (-1/3) + (-1/3) = 0 charge
electrons: Independent subatomic particle

Forces:

Strong Nuclear Force: Holds quarks into protons and neutrons
Weak Nuclear Force: Holds Protons in the nucleus, overcoming repulsion
Electromagnetic Force: Positive and Negative charges, attraction and repulsion
Gravitational Force: Attraction between all particles of mass in the universe

Radioactivity: when nuclei change spontaneously, emitting radiation

3 Types of Radiation:

Alpha (α): A helium nucleus is emitted $_{2}^{4}He^{+2}$ (an actual particle)
Low energy radiation, blocked by a piece of paper

Beta (β): A Neutron "explodes", releasing a high energy electron, leaving a P^{+1}
High energy radiation, stopped by lead

Gamma (γ): Not a Particle, a form of EMR (electromagnetic radiation)
EMR released from the "explosion" of the Neutron in BETA radiation
Can pass through the entire earth.

			Atomic #	Atomic Mass
Examples:	**alpha**	$_{92}^{238}U \rightarrow {}_{90}^{234}Th + {}_{2}^{4}He$	2 lower	4 lower
	beta	$_{53}^{131}I \rightarrow {}_{54}^{131}Xe + {}^{0}e^{-1}$	1 higher	no change
			(gamma radiation released)	

Radioactive Decay: Half Life time for ½ of a material to radioactively change to another.
eg. 10 minute ½ life: 10 minutes, ½: 20 minutes ¼: 30 minutes 1/8:

Nuclear Fission: neutron breaks apart a Uranium atom, releasing energy and 2 neutrons, yada, yada creates a chain reaction of breaking uranium atoms apart. U^{235} has a critical mass of 1 kg – any more than that a the reaction becomes an atomic bomb

Nuclear Fusion: thermonuclear process, need 40 million Kelvin temperature / the sun's process
deuterium $_{1}^{2}H$ + tritium $_{1}^{3}H \rightarrow {}_{2}^{4}He + {}^{1}N^{0}$
a tiny bit of mass is lost in the reaction – $E = m c^2$
1 nickel = 5 g = 100,000,000,000,000 calories