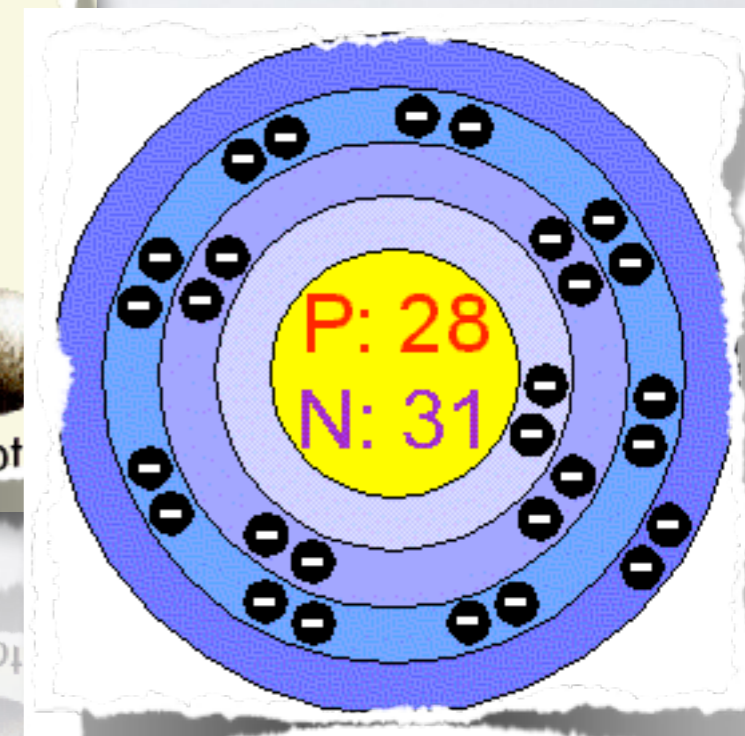
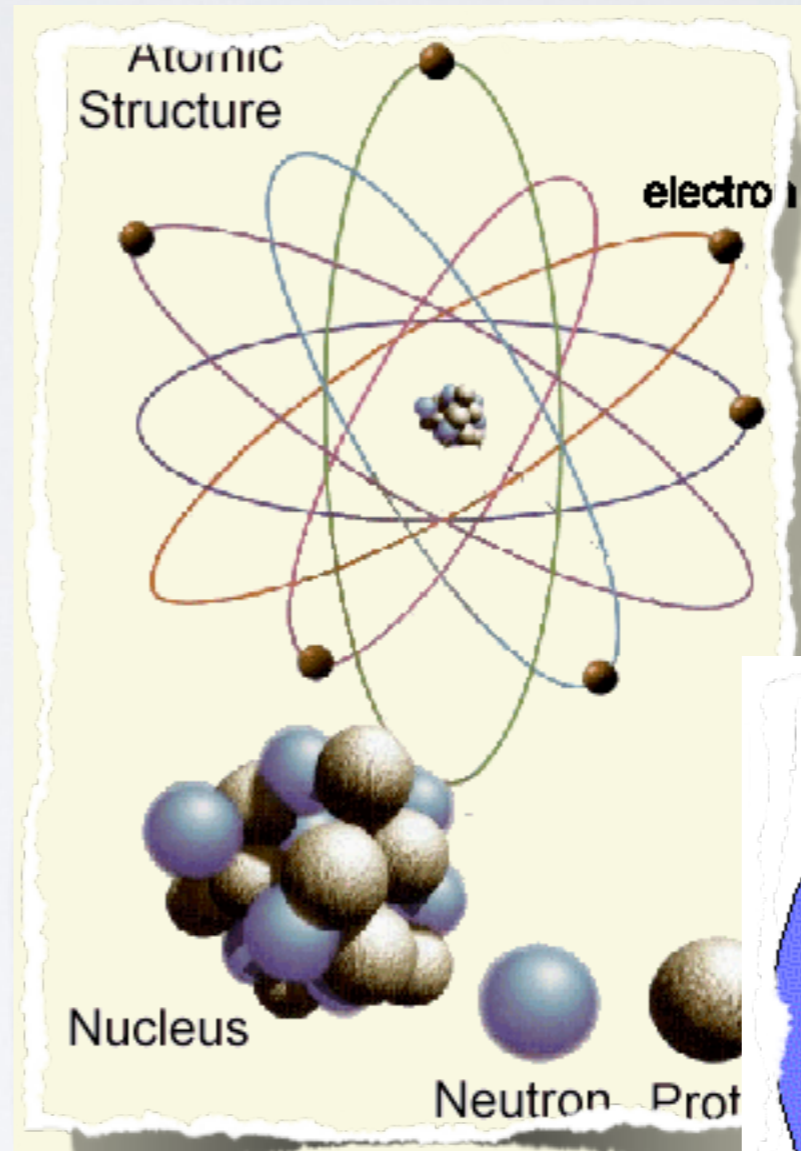


CHEMISTRY OF LIFE

Miller: Chapter 2

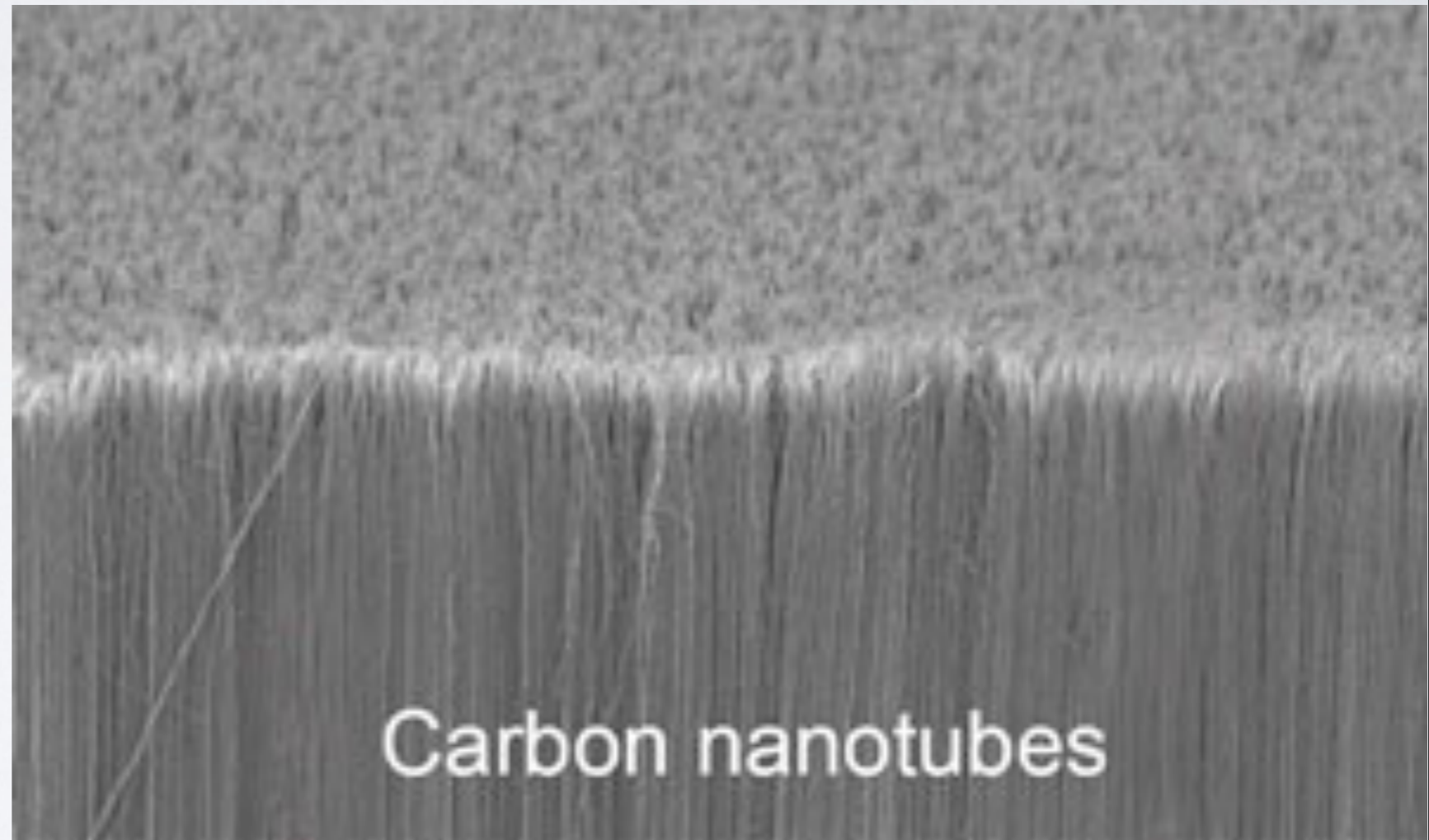
I. REVIEW: ATOMIC STRUCTURE

- center of an atom = _____
- in the nuc = ____ & ____
- surrounding the protons & neutrons = _____



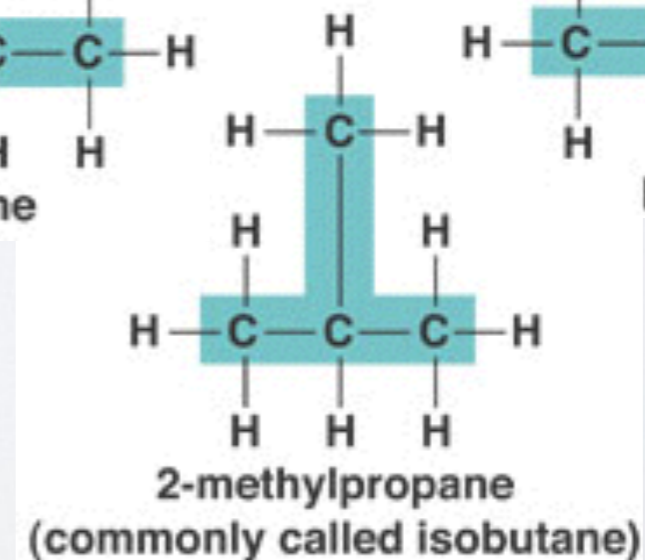
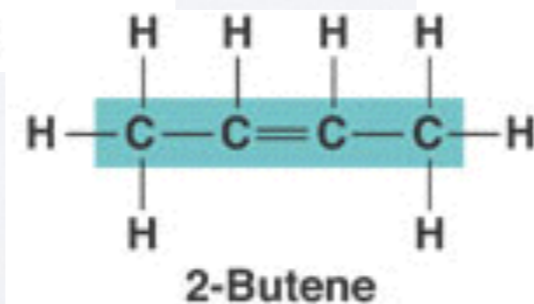
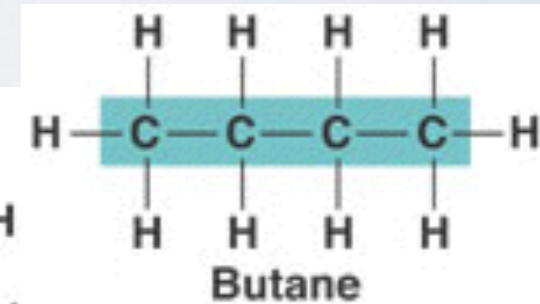
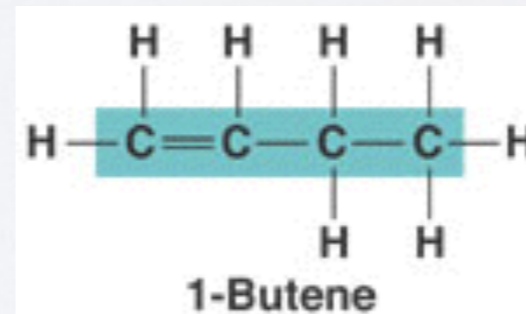
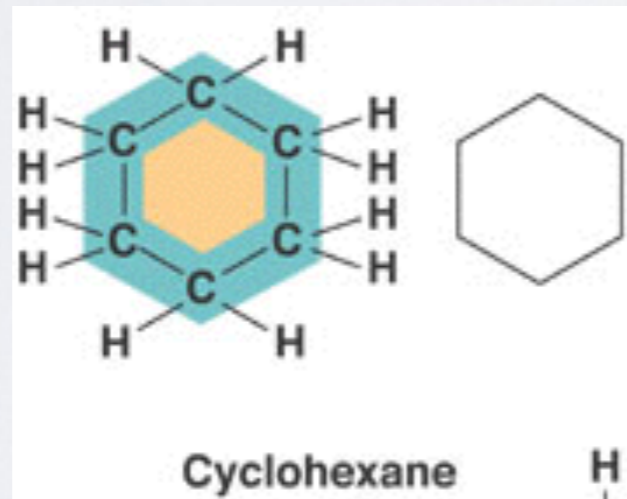
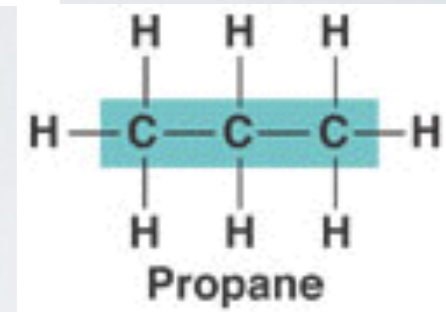
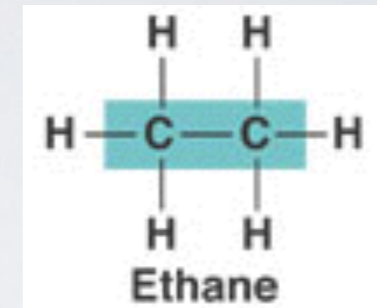
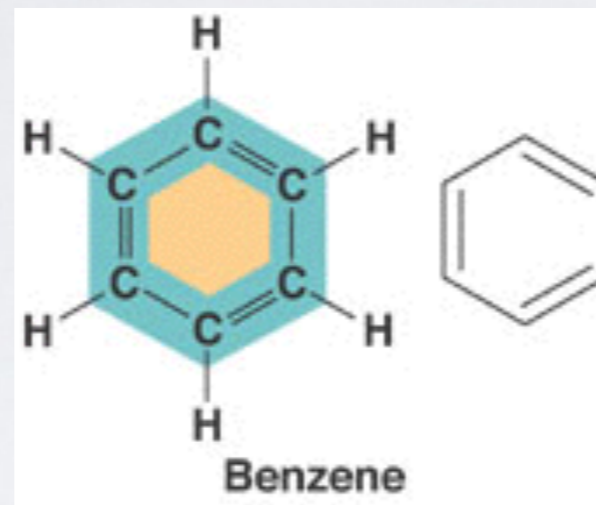
II. CHEMICAL BONDS

- Ionic Bonds
 - one (or more) e- gets transferred from one atom to another
- Covalent Bonds
 - sharing electrons
- Van der Waals Forces
 - attraction caused by charge changes in groups of atoms



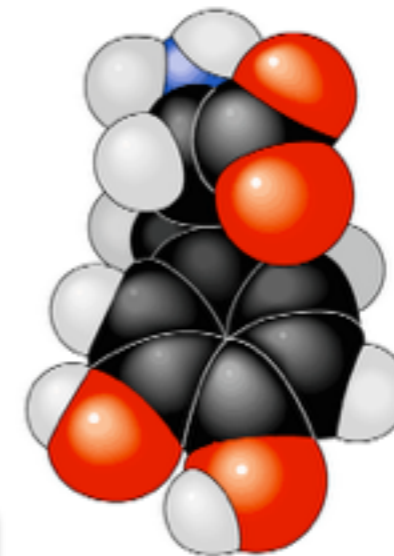
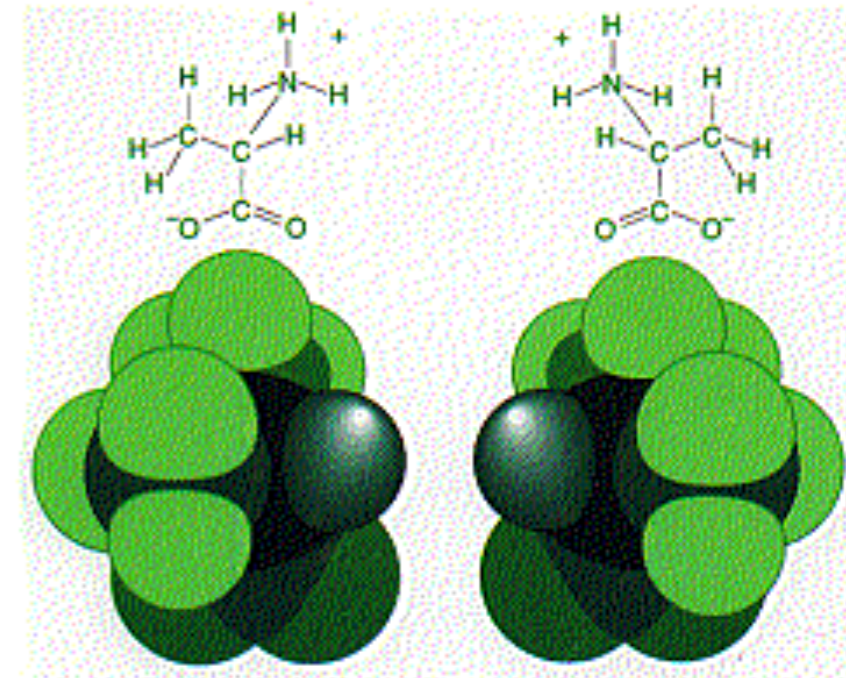
IV. MACROMOLECULES

- “Macro” molecule?
- Chemistry of Carbon
 - 4 valence e-
 - 4 bonds
 - makes structural chains:

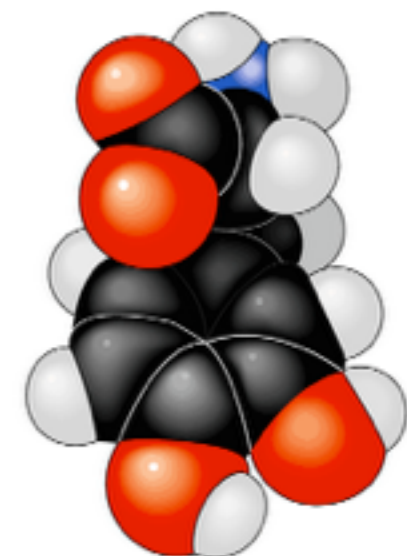


Form affects function

- **Structural differences create important functional significance**
 - ◆ amino acid alanine
 - L-alanine used in proteins
 - but not D-alanine
 - ◆ medicines
 - L-version active
 - but not D-version
 - ◆ sometimes with tragic results...



L-Dopa
(effective against
Parkinson's disease)



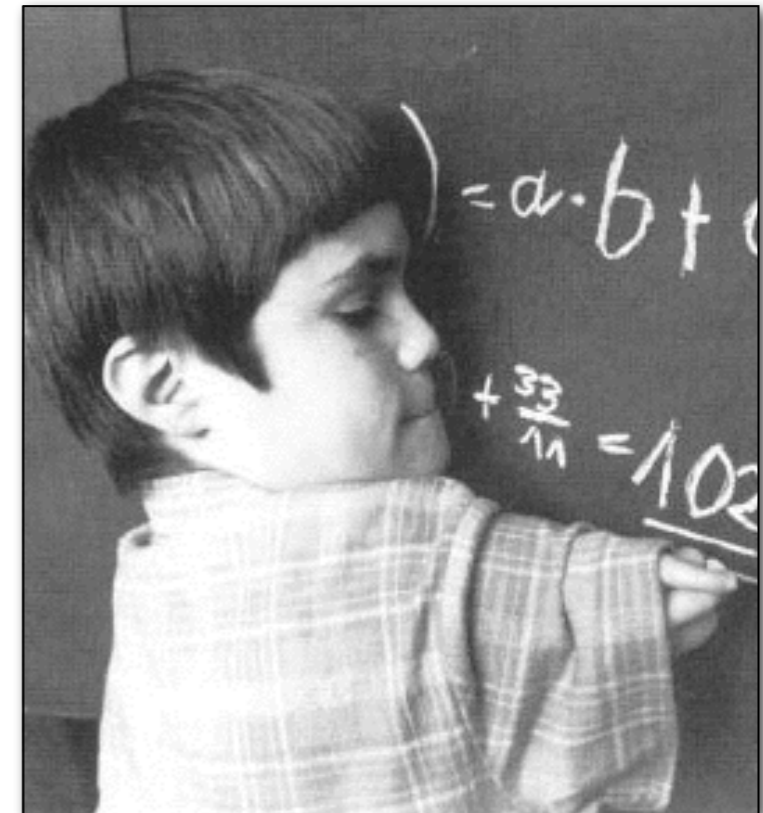
D-Dopa
(biologically
inactive)

stereoisomers

Form affects function

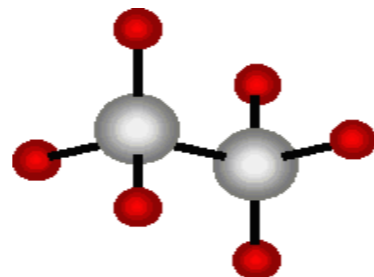
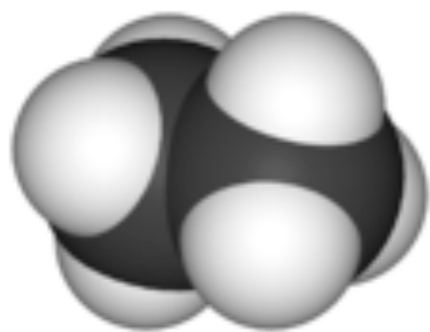
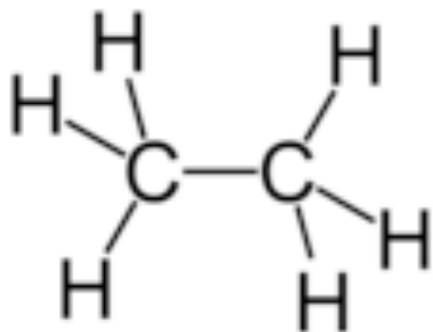
■ Thalidomide

- ◆ prescribed to pregnant women in 50s & 60s
- ◆ reduced morning sickness, but...
- ◆ stereoisomer caused severe birth defects

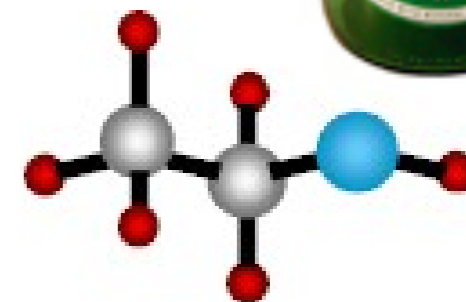
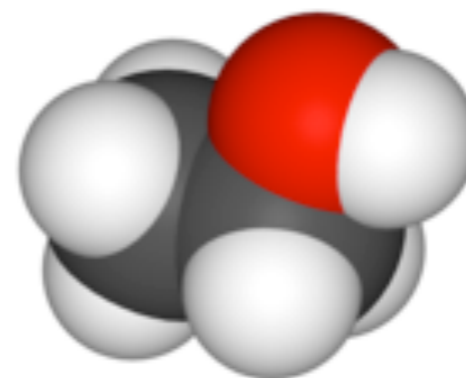


Diversity of molecules

- Substitute other atoms or groups around the carbon
 - ◆ ethane vs. ethanol
 - H replaced by an hydroxyl group (-OH)
 - nonpolar vs. polar
 - gas vs. liquid
 - biological effects!



ethane (C₂H₆)

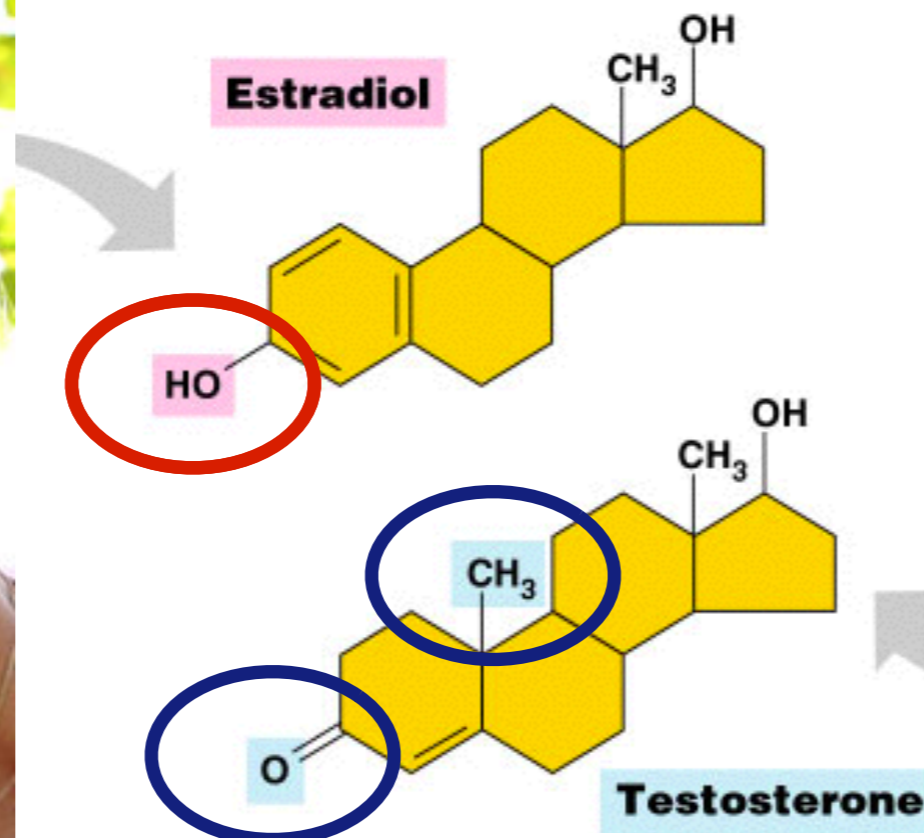


ethanol (C₂H₅OH)



Viva la difference!

- **Basic structure of male & female hormones is identical**
 - ◆ identical **carbon skeleton**
 - ◆ attachment of different functional groups
 - ◆ interact with different targets in the body
 - **different effects**

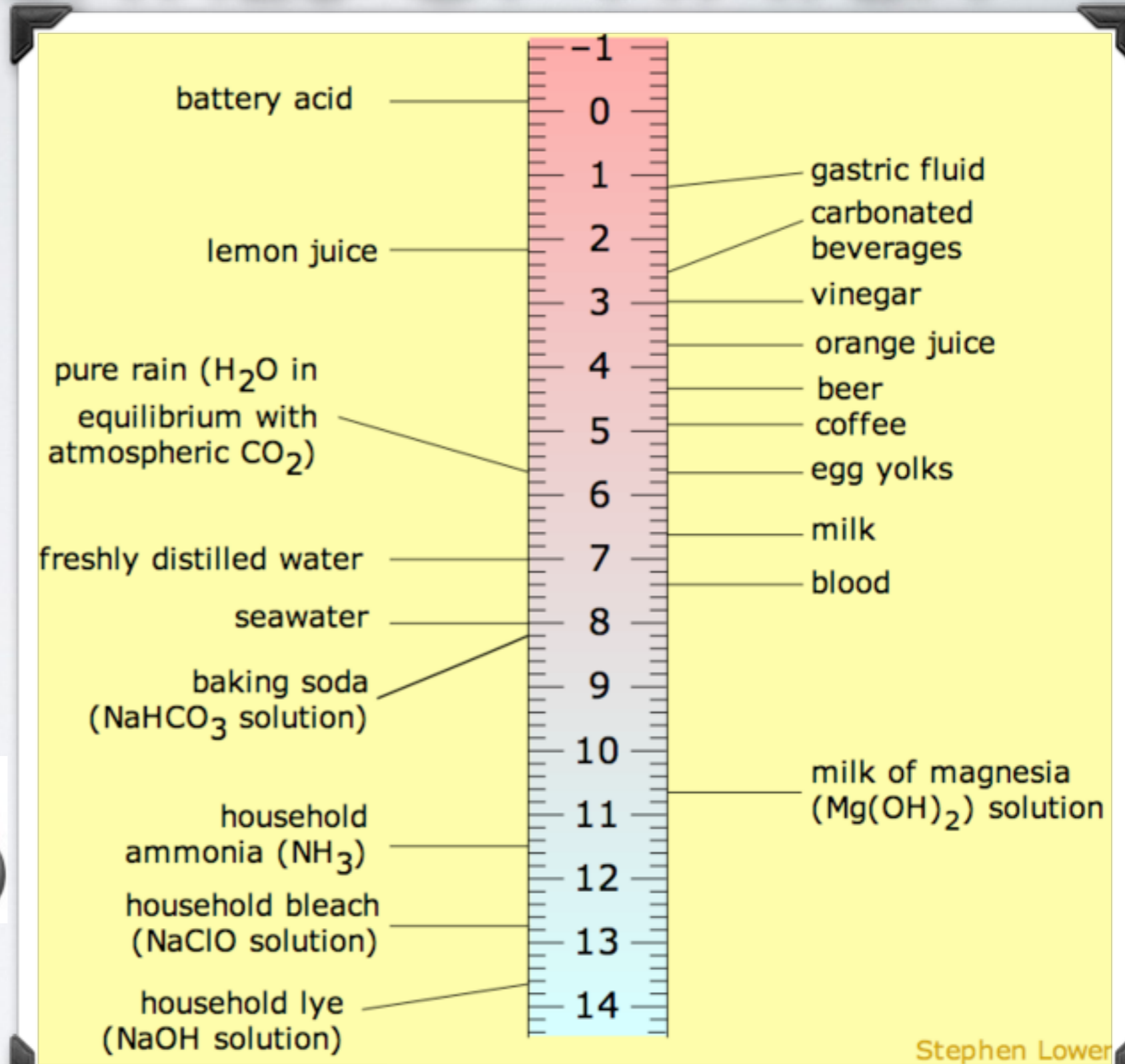
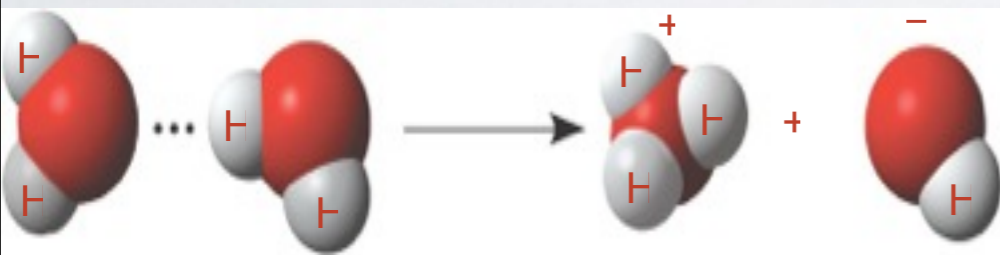


III. PROPERTIES OF WATER

- Polar Covalent Bonds
- electronegativity of O
- H-bonds between water molecules
- Water is weird...
 - cohesion
 - surface tension
 - evaporative cooling
 - insulation by ice
 - universal solvent
- ...lucky for us.

III. PROPERTIES OF WATER

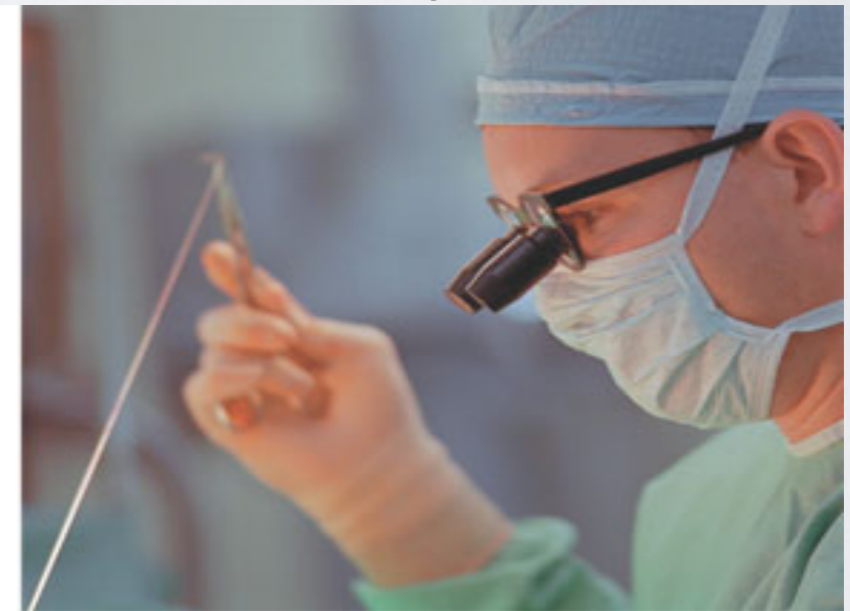
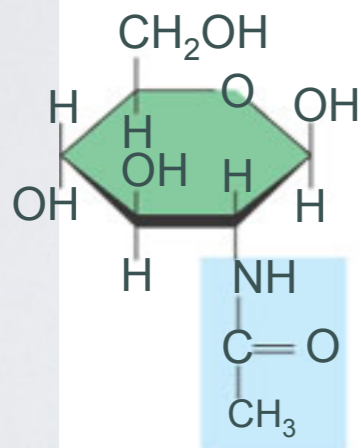
- Acid - Base
 - acid =
 - H^+ donor
 - base =
 - H^+ acceptor
- Measured using pH scale
 - $0 \rightarrow 7 \rightarrow 14$
 - each step is $\times 10$



Stephen Lower

V. MACROMOLECULES

- (polymer = _____, made of _____)
- **Carbohydrates**
 - monosaccharides, polysaccharides
 - fuel and building material
 - sugars broken for energy
 - glucose chains make glycogen, starch
 - sugar chains make cellulose, chitin (exoskeleton)



(a) The structure of the chitin monomer.

Parallel chains held together by bonds between groups attached to atoms 3 and 6

(b) Chitin forms the exoskeleton of arthropods. This cicada is molting, shedding its old exoskeleton and emerging in adult form.

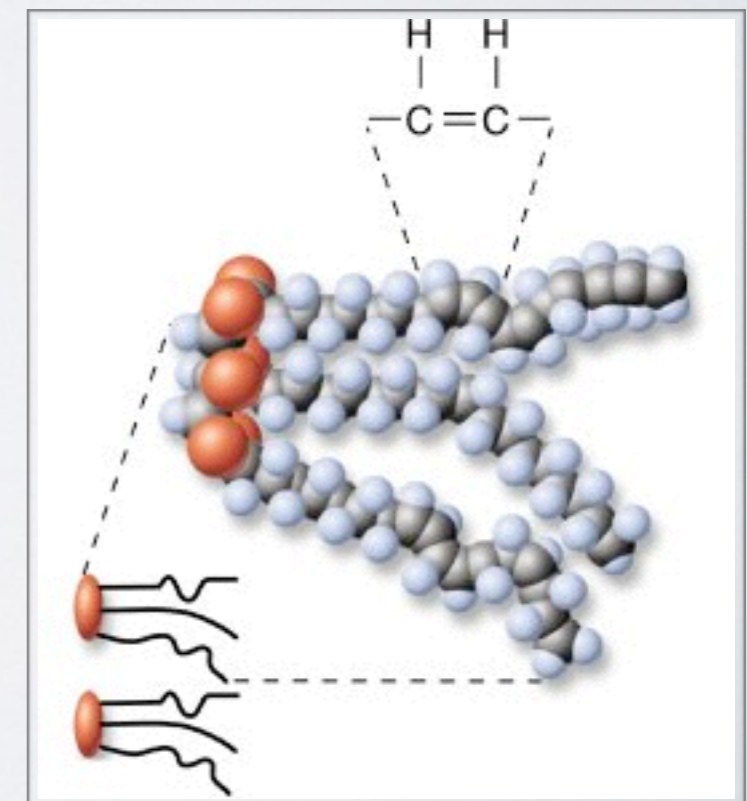
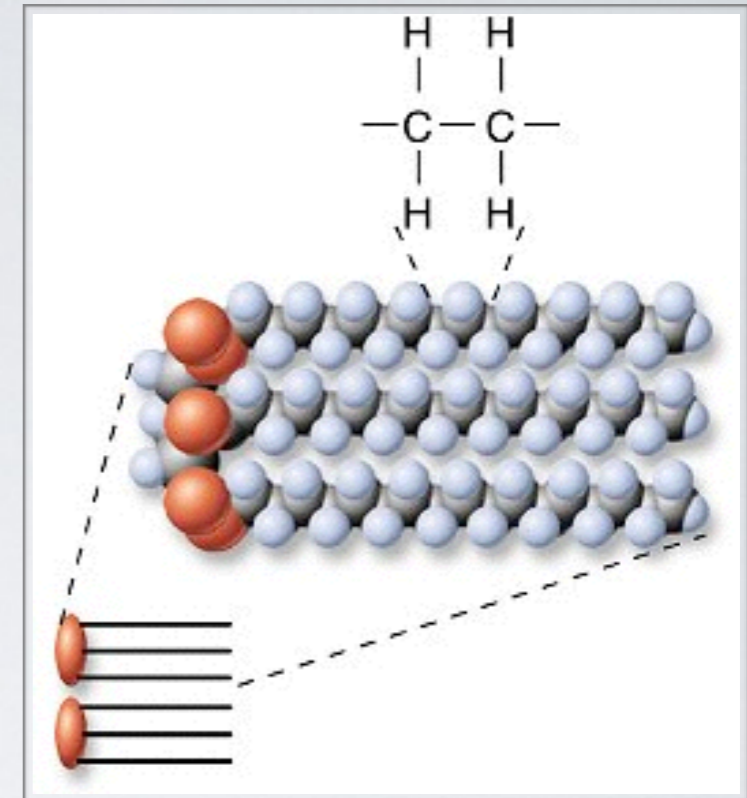
(c) Chitin is used to make a strong and flexible surgical thread that decomposes after the wound or incision heals.

MACROMOLECULES CONT'D

- **Lipids**

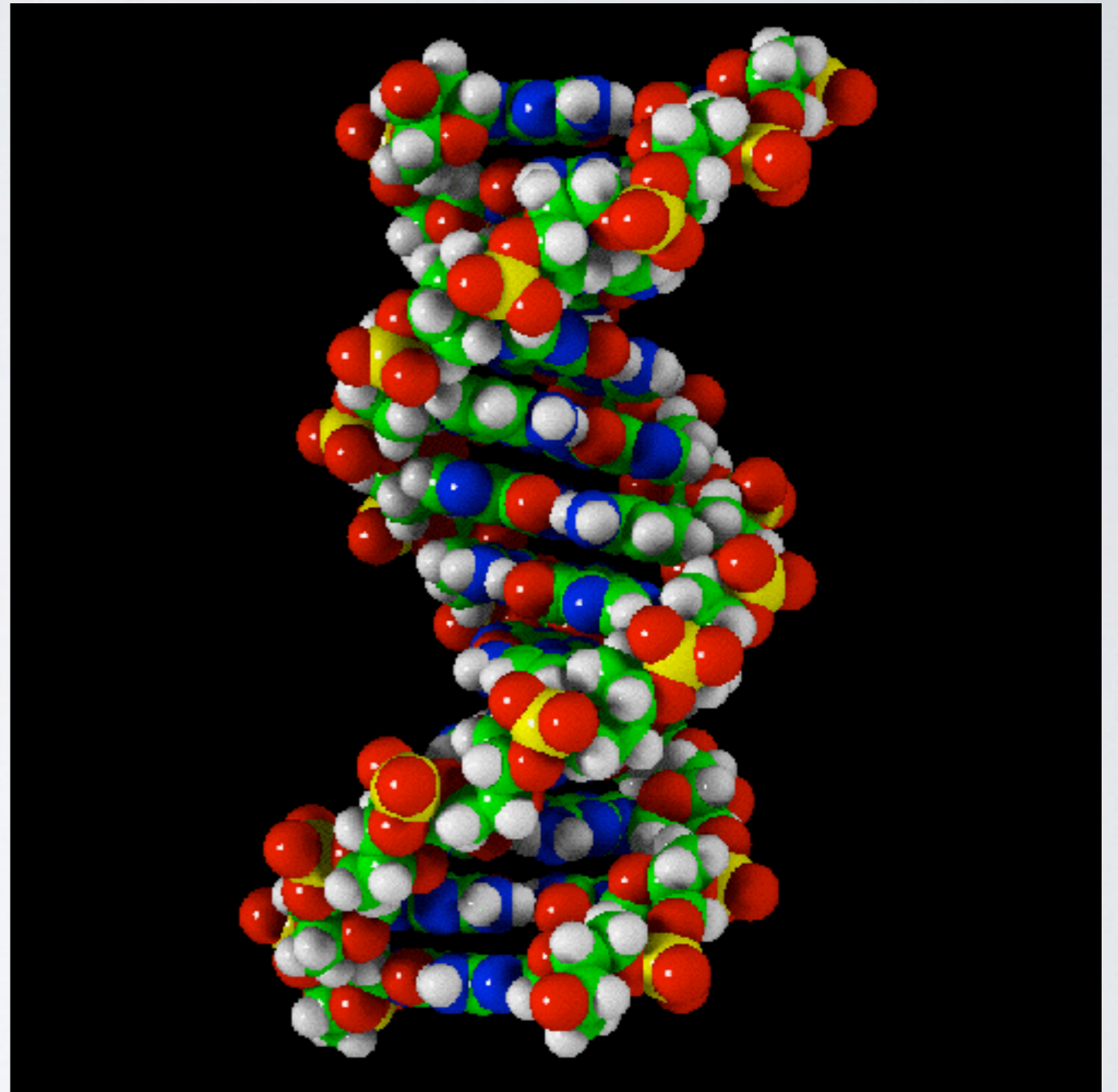
- uses:

- long term energy storage,
- insulation,
- bouyancy
- include long hydrocarbon chains
 - hydrophobic
- saturated, unsaturated



MACROMOLECULES CONT'D

- Nucleic acids
 - made of: _____
 - nucleotides
 - store info
 - DNA
 - RNA



MACROMOLECULES

- Proteins

- made of _____
 - amino acids connected by: covalent peptide bond
 - 20 different a.a.
- proteins do just about everything in living organisms
 - (book gives functions:
 -
 -
 -
 -

QUIZ CHECK

- You are either an A or a B.
- A: tell B four types of organic macromolecules found in living organisms.
- B: tell A how acids and bases differ. How do their pH values differ?
- A: tell B the order of strengths of organic bonds (weakest to strongest)
 - covalent, hydrogen, Van der Waal, ionic
- B: tell A the name of the monomers that make up:
 - proteins
 - carbohydrates

ENZYMES

- biological catalyst
 - lower E_A
- globular protein
- delicate 3D structure
- acts on substrates
- enzyme-substrate specificity
 - active site (shape and chemistry)
 - lock and key
- regulation of enzymes
 - effect of temp?
 - pH?
 - concentration?

