

Biology 10 - Introduction to Biology

West Valley College - Norris

Chemistry Review

I. Definitions

A. Matter:

B. Energy:

II. Composition of Matter

A. Atoms: smallest unit of matter, cannot be broken down by chemical methods

1. Protons (nucleus, positive charge)
2. Neutrons (nucleus, no charge)
3. Electrons (orbit nucleus, negative charge, no mass)

The Elements / Periodic Table:

There are 92 naturally occurring types of atoms, each distinguished by the type and number of subatomic particles they are composed of. The periodic table systematically lists these elements.

11	<-- atomic number - number of protons in the nucleus
Na	<-- symbol
22.99	<-- atomic weight - average of masses of different isotopes { atomic mass - number of neutrons and protons in the nucleus }

B. Effect of changes in atomic makeup:

- neutrons - form isotopes (radioisotopes = unstable forms)
- electrons - form ions (positive = cation, negative = anion)
- protons - change of identity (new element)

III Chemical Interactions - Bonds:

Atoms bind to each other by interactions between the electrons in their outer shells (octet rule: atoms will interact in order to fill the outer shell completely or with a multiple of eight electrons - the most stable condition)

A. Ionic Bonds

B. Covalent Bonds

C. Other Types of Bonds: Hydrogen Bonds & High Energy Phosphate Bonds

D. Chemical reactions:

- synthesis - bonds are formed ($A + B \rightarrow C$) - *example: condensation rxn*
- decomposition - bonds are broken ($C \rightarrow A + B$) - *example: hydrolysis rxn*

Molecules are formed when atoms bind to each other

- elemental
- compound
 - a. organic
 - b inorganic

IV. Biochemistry - chemistry of living things

A. Four Major Elements in Living Things = C, H, O, N

B. Important Inorganic Compounds:

1. Water:

2. Salts:

3. Acids and Bases:

pH (measurement units for acidity):

4. Buffers - substances that oppose changes in pH (limit change)

C. Important Organic Compounds

1. Carbohydrates (means "hydrated carbon", composed of C, H, O in 1:2:1 ratio)

a. monosaccharide ("simple" sugar)

b. disaccharide ("simple" sugar)

- (examples: "sucrose" = glucose + fructose, "lactose" = glucose + galactose)

c. polysaccharide ("complex" sugar) - polymer of monosaccharides

- starch

- glycogen

- cellulose

2. Lipids (mostly C & H, little O)

a. neutral fats (triglycerides)

b. phospholipids (variation of triglycerides)

c. steroids

3. Proteins (10-30% cell mass, composed of C, H, O, N)

a. amino acids

b. polypeptide (short chain of amino acids, <100)

c. protein (long chain of amino acids, >100)

i. primary structure (sequence of amino acids)

ii. secondary structure (*maintained by hydrogen bonds*)

iii. tertiary structure (*maintained by hydrogen bonds*)

iv. quaternary structure (*maintained by hydrogen bonds*)

4. Nucleic Acids - made up of nucleotide monomers

- pentose sugar (ribose or deoxyribose)

- phosphate

- nitrogen base

double ringed (purines) adenine, guanine

single ringed (pyrimidines) thymine, cytosine, uracil

V. Additional Selected Key Terms

adhesion

catalyst

cohesion

enzyme

hydrophobic

hydrophilic

macromolecule

monomer

polar

polymer

Study Questions - Chemistry:

1. Define matter & energy.
2. Define atom, element & molecule.
3. What are atoms made of? What are the characteristics of each of these subatomic particles? Where are they found? What is their contribution to the atom?
4. What do each of the symbols / numbers on the periodic table represent? ----->
5. What would be the effect of changing the number of each subatomic particle?
6. What part of the atom is responsible for forming chemical bonds?
7. Compare and contrast ionic and covalent bonds. How do “polar covalent “ bonds fit in?
8. How do hydrogen bonds compare to ionic and covalent bonds? Where do hydrogen bonds form? What is the significance of hydrogen bonds in biology? (hint: this is important)
9. What is a chemical reaction? What factors influence the rate of chemical reactions?
10. Compare and contrast organic and inorganic molecules.
11. What type of molecule is water? Describe this molecule.
12. What are the properties of water? How might these properties be significant to living things?
13. What is a salt? What are the properties of salts? How might these properties be significant to living things?
14. What is an acid? What are the properties of acids? How might these properties be significant to living things?
15. What is a base? What are the properties of bases? How might these properties be significant to living things?
16. How is the concentration of acid measured?
17. What is a buffer? What are the properties of buffers? How might these properties be significant to living things?
18. What is a monomer? What is a polymer?
19. What is a carbohydrate? What are the properties of carbohydrates? How might these properties be significant to living things?
20. What are the “building blocks” of carbohydrates?
21. Describe three different types of polysaccharides.
22. What is a lipid? What are the properties of lipids? How might these properties be significant to living things?
23. What is a protein? What are the properties of proteins? How might these properties be significant to living things?
24. What are the “building blocks” of proteins?
25. Describe the three dimensional shape of proteins. What is responsible for the three dimensional shape of proteins? How might the shape of a protein be significant to living things? What can alter the shape of a protein?
26. What is a nucleic acid? What are the properties of nucleic acids? How might these properties be significant to living things?
27. What are the “building blocks” of nucleic acids?

6
C
12.011

“The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.”
Sir William Bragg (1862 - 1942)