Chapter 2: The Chemical Basis of Life

I. Basic Chemistry

A. Matter, Mass, and Weight

1. All living and nonliving things are composed of _____
2. _____ represents the amount of matter.
3. _____ is caused by the gravitational force acting on mass.
4. Kilogram
   a. How many pounds in a kilogram? _____
   b. How many grams in a kilogram? _____

B. Elements and Atoms

1. Atomic Structure - smallest particle of an element
   a. Which subatomic particle has no electric charge? _____
   b. Which subatomic particle has a positive charge? _____
   c. Which subatomic particle has a negative charge? _____
   d. Which subatomic particles are found in the nucleus? _____ and _____
2. Atomic Number and Mass Number
   a. The atomic number represents the number of _____
   b. The mass number of an element is the sum of _____ and _____
3. Isotopes and Atomic Mass
   a. Isotopes are _____ _____
   b. Isotopes of an element have different numbers of _____

C. Electrons and Chemical Bonding

1. Ionic Bonding
   a. An atom that lost or gained an electron is called an _____
   b. A positive charged ion is referred to as a _____
   c. A negative charged ion is referred to as a _____
   d. Describe how ionic bonding works: _____ _____

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2. Covalent Bonding
    a. Covalent bonding occurs when atoms share _____

    _____
    b. A single covalent bond means:
        1. _____ electrons are being shared
        2. A single covalent bond is represented by a _____
    c. A double covalent bond means:
        1. _____ electrons are being shared
        2. A double covalent bond is represented by a _____
    d. Nonpolar covalent bonds are formed when _____
    e. When two atoms do not share electrons equally they form

    _____

D. Molecules and Compounds
    1. Two or more atoms chemically joining together to form an independent unit create a _____
    2. When a molecule is composed of more than one type of atoms it is a properly referred to as a _____

E. Intermolecular Forces
    1. Hydrogen Bonds
        a. Results when a positive charged hydrogen atom of one molecule is attracted to the _____
        b. Describe what important role hydrogen bonds play: _____

        _____

        _____
    2. Solubility and Dissociation
        a. Solubility is _____
        b. Dissolving table salt (an ionic compound) in water will result in the ions separating from each other in the water. This is called _____
        c. Electrolytes are composed of what in water? _____

II. Chemical Reactions and Energy

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A. Synthesis Reactions
   1. Define what a synthesis reaction is: _____
      _____
   2. Synthesis reactions that result in the removal of water are _____
   3. Collectively synthesis reactions are referred to as _____
B. Decomposition Reactions
   1. Define what a decomposition reaction is: _____
      _____
   2. Synthesis reactions that use water in the reaction are _____
   3. Collectively decomposition reactions are referred to as _____
C. Reversible Reactions
   1. A chemical reaction in which the reaction can proceed from _____ to _____ or from _____ to _____
D. Oxidation-Reduction Reactions
   1. Chemical reactions that result from the exchange of _____
   2. The loss of an electron by a reactant is referred to as _____
   3. _____ refers to the gain of an electron by a reactant.
E. Energy
   1. Stored energy that is not doing work is called _____
   2. Energy that is actually working and moving matter is _____
   3. Mechanical Energy
      a. Results from _____
   4. Chemical Energy
      a. Potential energy stored _____
   5. Heat Energy
      a. Energy that flows _____
   6. Speed of Chemical Reactions
      a. The activation energy is _____
      b. Substances that increase the rate of chemical reactions without being used up in the reaction are called _____
         1. Enzymes are _____

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c. Increasing temperature _____

d. Increasing concentration of reactants _____

III. Inorganic Chemistry

A. Water

1. Stabilizing Body Temperature
   a. Water requires a relatively large amount of heat to raise its temperature it therefore has _____
   b. Water can rid the body of excess heat when it _____
2. Protection
   a. Water acts as a lubricant by preventing _____
   b. Water acts as a cushion by preventing _____
3. Chemical Reactions
   a. Reacting molecules must be _____ in water.
   b. Water is produced in a _____
   c. Water is required in a _____
4. Mixing Medium
   a. Substances that are uniformly distributed with no clear boundary between the substances form a _____
      1. The liquid that material dissolves in is a _____
      2. The material dissolving in the liquid is a _____
   b. A mixture of materials that separate from each other when the mixing stops are part of a _____
   c. Describe a colloid: _____
      _____
      _____

B. Solution Concentrations

1. A 15% salt solution contains how many grams of salt per 100 ml of water? _____
2. Osmoles express _____

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3. Osmolality represents _____
4. How many milliosmoles in an osmole? _____

C. Acids and Bases
1. Any substance that releases hydrogen ions is an _____
2. Any substance that binds to hydrogen ions is a _____
3. The pH Scale
   a. The pH scale refers to _____
   b. A pH of 7 is said to be _____
   c. Pure water is an example of a _____ and therefore has equal concentrations of _____ and _____
   d. Acidic solutions have _____
   e. Alkaline solutions have _____
   f. A change of 1 pH unit represents how much change in hydrogen ion concentration? _____
4. Salts
   a. Salts are formed by _____
      _____
5. Buffers
   a. Changes in pH are regulated by the action of buffers, which _____
      _____

D. Oxygen
1. An oxygen molecule consists of _____
2. What percent of the atmosphere is oxygen? _____

E. Carbon Dioxide
1. A molecule of carbon dioxide consists of _____

IV. Organic Chemistry

A. Carbohydrates
1. Carbohydrates are composed of _____, _____, and _____
2. For every oxygen atom in a carbohydrate there are _____ hydrogen atoms.
3. Functionally carbohydrates are important:

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a. _____ of other organic molecules
b. They can be broken down to _____
c. Undigested they _____

4. Monosaccharides - simple sugars
   a. _____ are five carbon monosaccharides
   b. _____ are six carbon monosaccharides
   c. Isomers are _____
   d. List 3 common hexoses: _____
   e. List 2 important pentoses: _____
5. Disaccharides
   a. Disaccharides are formed by _____
   b. Sucrose is composed of _____ and _____
   c. Maltose is composed of _____ and _____
6. Polysaccharides
   a. Polysaccharides consist of _____
   b. Glycogen is also known as _____
      1. It is composed of _____
      2. It is an important _____
   c. Starch and cellulose are found in _____
      1. Both molecules are composed of _____
      2. Starch is used for _____
      3. Cellulose is used for _____
      4. Which of these polysaccharides can humans digest? _____

B. Lipids
1. Lipids are composed of _____, _____, and _____
2. Functionally lipids are important:
   a. Provide _____ and _____
   b. Regulate _____
   c. Form _____
   d. Major _____
3. Triglycerides or Triacylglycerols

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a. Composed of:
    1. One _____
    2. Three _____
b. Fatty acids differ from one another in _____ and _____
    1. Saturated means _____
    2. Unsaturated means _____

4. Phospholipids
    a. One of the fatty acids is replaced by _____
    b. Which end is polar? _____
    c. Which end is nonpolar? _____
    d. Phospholipids are important _____
5. Eicosanoids
    a. Derived from _____
    b. Are important _____ with numerous effects.
6. Steroids
    a. Carbon atoms bound together into _____
    b. List several examples of steroids: _____
    _____

C. Proteins
1. All contain _____, _____, _____, and _____
    a. Most proteins also contain _____
    b. Some proteins contain _____, _____, and _____
2. Functionally proteins are important:
    a. Regulate _____
    b. Act as a _____
    c. Help _____
    d. Provide _____ and _____
3. Protein Structure
    a. Basic protein building blocks are _____
    b. Covalent bonds between amino acids are called _____
4. Structural Levels of a Protein

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a. Primary Structure
    1. Determined by the _____
b. Secondary Structure
    1. Results from _____ which is caused by _____
    2. The two common shapes are _____ and _____
    3. A change in protein shape that causes it to become nonfunctional is referred to as _____
c. Tertiary Structure
    1. Results from _____
    2. What is a domain? _____
    3. Why are domains important? _____
d. Quaternary Structure
    1. Refers to the _____ when two or more proteins join together to form a functional unit.

5. Enzymes
    a. Protein catalyst that _____
    b. The shape of the enzyme determines the structure of the _____
    c. Enzymes control _____

D. Nucleic Acids: DNA and RNA
1. DNA stands for _____
    a. DNA is the cell's _____
    b. DNA contains the information for _____
2. RNA stands for _____
    a. Three types of RNA play _____
3. Nucleic acids composed of _____, _____, _____, _____, and _____
4. Consist of building blocks called _____
    a. Each building block is composed of 3 parts:
        1. Phosphate Group
        2. Monosaccharide

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a. In DNA this is _____
b. In RNA this is _____

3. Nitrogenous Organic Base
   a. The single-ringed pyrimidines are:
      1. _____
      2. _____
      3. _____
   b. The double-ringed purines are:
      1. _____
      2. _____

5. DNA has _____ strands of nucleotides twisted together to form a _____
   a. The uprights of the ladder consist of _____
   b. The rungs of the ladder consist of _____
   c. Adenine always binds to _____ by _____ hydrogen bonds
   d. Guanine always binds to _____ by _____ hydrogen bonds
6. RNA has _____ strand of nucleotides.
   a. Thymine is replaced with _____

E. Adenosine Triphosphate - ATP
1. Composed of _____ and _____
   a. Adenosine is composed of _____ and _____
2. Important because of the energy stored _____
3. ATP is often called the _____ of cells because _____ _____

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