

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: _____

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

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 _____

- 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 _____

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:

- 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

- 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

- 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

- 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 _____
