Chemistry 103 Objectives

Chapter 1

1. Show how the terms experiment, hypothesis, theory, and law fit into the scientific method.
2. Name and characterize the three states of matter.
3. Identify properties and changes of matter as physical or chemical.
4. Classify a sample of matter as a pure substance or a mixture.
5. Distinguish between an element and a compound.
6. Write symbols for common elements and write the names of common elements given their symbols.
7. Further classify a sample of matter as a homogenous or heterogeneous mixture.
8. Distinguish between the accuracy and the precision of a measurement.
9. State the advantages of the metric system.
10. Name the metric units of length, mass, and volume.
11. List and define the commonly used metric prefixes.
12. Convert measurements within the metric system.
13. Distinguish between the mass and weight of an object.
14. Find the mass, volume, or density of a substance when any two of these values are given.
15. Convert between Fahrenheit, Celsius, and Kelvin temperature scales.
16. Name and define the units of heat energy.
17. State some useful applications of the measurement of specific gravity.

Chapter 2

1. Summarize Dalton's atomic theory.
2. Distinguish between protons, electrons, and neutrons in terms of their relative masses, relative charges, and location in the atom.
3. Use the atomic number and mass number of an element to find the number of protons, electrons, and neutrons.
4. Define an atomic mass unit.
5. Use the concept of isotopes to explain why the atomic weights of elements are not whole numbers.
6. Describe the Thomson, Rutherford, and Bohr models of the atom.
7. Distinguish among principal energy level, energy sublevel, and atomic orbital.
8. Describe the shapes of s, p, and d orbitals.
9. Use the Aufbau principle, the Pauli exclusion principle, and Hund's rule to explain the electron configuration of representative elements.

Chapter 3

1. Distinguish between a period and a group in the periodic table.
2. State the periodic law.
3. Write the electron configuration of elements by using the periodic table.
4. Rationalize (in terms of the modern model of the atom) trends in the periodic table with respect to atomic radii and ionization energies.
5. Relate these terms to the periodic table: representative element, noble gas, alkali metal, alkaline earth metal, halogen, transition metal, inner-transition metal.

Chemistry 103 Objectives

Chapter 4

1. Define chemical bonding, stating the importance of the noble gas electron configurations.
2. Determine the charge of Group A element cations and anions.
3. Define an ionic bond and give examples of ionic compounds.
4. Name ionic compounds when given their chemical formulas.
5. Define a covalent bond and give examples of covalent compounds.
6. Draw electron dot structures for simple covalent molecules containing single, double, or triple bonds.
7. Describe nonpolar and polar covalent bonds.
8. Use electronegativity values to determine whether a bond is ionic, polar covalent, or nonpolar covalent, and describe the weak attractive forces that hold molecules to each other.

Chapter 5

1. Define formula weight, gram formula weight, and mole, and show the relationship between these terms.
2. Recognize Avogadro's number and state its relationship to the mole.
3. Interpret a balanced chemical equation in terms of particles, moles, or mass.
4. Do the following types of stoichiometric calculations: mole-mole, mole-mass, and mass-mass.
5. Describe theoretical yield versus percent yield.

Chapter 6

1. List at least five assumptions of the kinetic-molecular theory for gases.
2. Discuss the significance of absolute zero, giving its value in Kelvin and degrees Celsius.
3. Define pressure and explain how it can be measured.
4. State and use Avogadro's hypothesis and number.
5. Define molar gas volume and give the values for STP.
6. Define partial pressure, state Dalton's law of partial pressure, and find the partial pressure for a gas in a mixture of gases.
7. Make calculations involving Boyle's law, Charles's law, Gay-Lussac's law, and the general gas law.
8. Define vapor pressure and explain how a change in temperature can cause a change in vapor pressure.
9. Define boiling point, normal boiling point, and melting point, and explain how these vary with the strength of intermolecular forces.

Chemistry 103 Objectives

Chapter 7

1. Use the concept of hydrogen bonding to explain the unusual properties of water and ice.
2. List three factors that determine how fast a soluble substance dissolves.
3. Distinguish among saturated, unsaturated, and supersaturated solutions.
4. Define solution concentration and work problems involving percent volume/volume, percent weight/volume, parts per million (ppm), and parts per billion (ppb).
5. Define and work problems involving the molarity of a solution.
6. Distinguish among solution, suspensions, and colloidal dispersions.
7. Calculate the freezing point depression and the boiling point elevation of an aqueous solution.
8. Describe what happens to a red blood cell when it is placed into a hypertonic solution, a hypotonic solution, or an isotonic solution.
9. Explain how dialysis can be used to separate dissolved ions from large biologic molecules.

Chapter 8

1. State the law of conservation of matter and energy.
2. Define and give examples of exothermic and endothermic processes.
3. Distinguish between spontaneous and nonspontaneous reactions; exothermic and endothermic reactions; exergonic and endergonic reactions.
4. Use the collision theory to explain how temperature, catalysts, concentration, and particle size of reactants influence the rate of a chemical reaction.
5. Define oxidation and reduction reactions; describe an oxidizing agent and a reducing agent.
6. Distinguish between electrolytes and nonelectrolytes, giving examples of each.

Chapter 9

1. Write the equation for the self-ionization of water.
2. Given the hydrogen ion or hydroxide ion concentration, classify a solution as neutral, acidic, or basic.
3. Define and give examples of acids and bases.
4. Use the Bronsted-Lowry theory to classify substances as acids or bases, or as proton donors or proton acceptors.
5. Use the extent of ionization and the acid dissociation constant to distinguish between strong or weak acids and strong or weak bases.
6. Define pH and calculate the pH of a solution.
7. Calculate the gram equivalent weight of any acid or base.
8. Define and calculate the normality of a solution.
9. Explain why some salts give acidic or basic aqueous solutions.