TOPIC LIST THREE

Chapter 05-06

The following is a list of important topics and objectives for students taking Chemistry 10. Exams and assignments will focus on helping students achieve these objectives. Additional topics may be added during the semester and not all will be tested for on any given exam or assignment. Students are encouraged to use this outline as a baseline for reviewing chapters, preparing for exams, and determining if Chemistry 10 meets the student's personal objectives in studying chemistry.

States of Matter
- ☐ Explain how the different properties of solids, liquids, and gases are related to the motion and spacing of atoms, molecules, or ions.
- ☐ Identify the properties that make each state of matter unique.

Molecular Mass
- ☐ Calculate the formula mass, molecular mass, or molar mass of a substance.
- ☐ Use Avogadro's number to determine the number of particles in a mass of a substance.
- ☐ Convert from mass to moles and from moles to mass of a substance.

Chemical Equations
- ☐ Understand the symbols for reactants, products, yield, state, and reaction conditions.
- ☐ Translate a description of a chemical reaction into a chemical equation.
- ☐ Interpret a chemical equation to describe a chemical reaction.
- ☐ Recognize single displacement, double displacement, combination, and decomposition reactions.

Balanced Equations
- ☐ Identify balanced and unbalanced chemical equations.
- ☐ Balance a chemical equation.
- ☐ Determine the mole ratio from a balanced chemical equation.
- ☐ Calculate the mass or number of moles of a reactant or product from the mass or number of moles of another reactant or product.

Yield
- ☐ Identify the limiting reactant and excess reactants in a given reaction.
- ☐ Calculate the theoretical yield of a reaction, using the concept of limiting reactants.
- ☐ Calculate the percent yield of a reaction, from the theoretical and experimental yield.
- ☐ Determine the quantities produced or consumed in a limiting reagent problem.

Condensed States
- ☐ Identify some differences between ionic and molecular substances.
- ☐ Classify forces between molecules as dipole-dipole forces, dispersion forces, or hydrogen bonds.
- ☐ Based on molecular shape and formula determine what intermolecular forces a substance has.
- ☐ Explain the effects that intermolecular forces have on melting and boiling points.
- ☐ Explain why nonpolar solutes tend to dissolve in nonpolar solvents and polar and ionic solutes tend to dissolve in polar solvents.

Solubility
- ☐ Know the definition of precipitation and solubility.
- ☐ Predict the equilibrium concentrations of strong and weak electrolytes in solutions.
- ☐ Understand the relationship between electrolyte concentrations and conductivity in solutions.
- ☐ Predict the equilibrium concentrations of strong and weak acid/bases in solutions.
- ☐ Predict the water solubility of nitrate, acetate, sulfate, bromide, chloride, and iodide salts.
- ☐ Predict the water solubility of sulfide, carbonate, phosphate, and hydroxide salts.
- ☐ Predict the water solubility of alkali metal and ammonium salts.

Concentration
- ☐ Calculate the molarity of a solute in a solution.

- ☐ Use molarity as a conversion factor between mass and moles.
- ☐ Relate the molarity and volume of a solution after to dilution the molarity and volume before. Given three solve for the other.

Reactions in Solution

- ☐ Recognize single displacement, double displacement, combination, and decomposition reactions.
- ☐ Understand gas evolution, precipitation and neutralization form non-electrolytes.
- ☐ Identify and give examples of combustion, acid-base, neutralization, and precipitation reactions.
- ☐ Write molecular, ionic, and net ionic equations given a description of a chemical reaction.
- ☐ Determine the net ionic equation from the molecular equation.

Gas State

- ☐ Describe how gases differ qualitatively from other states by compressibility, energy (per volume), and density.
- ☐ Describe how measurements of volume (V), temperature (T), and moles (n) per volume quantify these properties.

Pressure

- ☐ Define pressure (P).
- ☐ Qualitatively relate changes in volume to changes in pressure, if T and n do not change.
- ☐ Describe how a barometer and manometer are used to measure pressure.
- ☐ Convert between units of atm, torr, and mmHg.
- ☐ Define STP (standard temperature and pressure).

Simple Gas Laws

- ☐ State Boyle's law and use it to quantitatively solve before and after PV problems.
- ☐ Describe how J.A.C. Charles observations lead to the Kelvin temperature scale.
- ☐ Convert between units of Celcius and Kelvin.
- ☐ Qualitatively relate changes in temperature to changes in volume, if P and n do not change.
- ☐ State Charles' law and use it to quantitatively solve before and after TV problems.
- ☐ Qualitatively relate changes in temperature to changes in pressure, if V and n do not change.
- ☐ State Gay-Lussac's law and use it to quantitatively solve before and after PT problems.

Combined Gas Law

- ☐ Derive the combined gas law from Boyle's law, Charles' law, and Gay-Lussac's law.
- ☐ State the combined gas law and use it to quantitatively solve before and after PVT problems.

Ideal Gas Theory

- ☐ Describe how atomic theory explains the observations of the simple gas laws.
- ☐ State Avogadro's law, use it to compare the moles of different volumes of gas, at constant T and P.
- ☐ Derive the ideal gas law from Avogadro's law and Gay-Lussac's law.
- ☐ State the ideal gas constant (R) and describe why it is unique from the constants in the simple gas laws.
- ☐ State the ideal gas law and given three of T, P, V and n, determine the fourth.