Chemistry B Final Study Guide - Sample Problems

Ch.10

- How is the concept of energy defined?
- What does temperature measure?
- Explain what is meant by the terms exothermic and endothermic.
- What is meant by the specific heat capacity of a material
- Calculate the mass (in grams) of each of the following substances that could be warmed over the indicated temperature range by application of exactly 1.0 kJ of energy.
 - o water, from $15_{\circ}C$ to $42_{\circ}C$ s=4.184 J/g °C
 - o iron, from 25°C to 125°C s=0.45 J/g °C
 - o carbon, from -10_oC to 47_oC s= 0.71 J/g° C

Ch.11

- What are the causes of the colors of flame tests?
- Describe the structure of the atom, particularly the location of the electrons?
- Which orbital is the first to be filled in any atom? Which electrons are the valence electrons?
- Write the full electron configuration & shortcut configuration using Noble gases for the following:
 - o Calcium
 - o Phosphorous
 - o Yttrium
 - o Nobelium
 - o Mercury
 - o Radon
- What types of ions do the metals and nonmetals form?

Ch.12

- What types of elements react to form ionic compounds? Give examples
- What does electronegativity tell us about the atom? Identify the most electronegative elements:
 - o K, SC, Ca
 - o Br, F, At
- Draw an arrow indicating the direction of the bond dipole, include which end is positive. • P-F P-O P-C P-H
- Write the full electron configuration for the following atoms as their most common ion:
 - o Calcium
 - o Lithium
 - o Cesium
 - o Sulfur
 - o Bromine
- Write the Lewis structure for the following structures:

Ch.13

- Convert 1.20 atm to units of mm Hg, torr, and pascals.
- What does "STP" stand for? What conditions correspond to STP?
- A sample of gas in a 10.0-L container exerts a pressure of 565 mm Hg. Calculate the pressure exerted by the gas if the volume is changed to 15.0 L at constant temperature.
- A sample of gas in a 5.00-L container at 35.0°C is heated at constant pressure to a temperature of 70.0°C at constant pressure. Determine the volume of the heated gas.
- A 4.50 mol sample of a gas occupies a volume of 34.6 L at a particular temperature and pressure.
- What volume does 2.50 mol of the gas occupy at these same conditions of pressure and temperature?
- A sample of gas at 24°C occupies a volume of 3.45 L and exerts a pressure of 2.10 atm. The gas is cooled to -12°C and the pressure is increased to 5.20 atm. Determine the new volume occupied by the gas.

Ch.14

- Define molar heat of fusion and molar heat of vaporization.
- What is a dipole-dipole attraction? What is hydrogen bonding?
- Define London dispersion forces.
- What is vaporization? What is condensation?
- How are kinetic energy and temperature related?

Ch.15

- Define homogeneous and heterogeneous mixtures.
- What factors affect rate of dilution?
- How does concentration affect conductivity of a solution?
- What is a saturated, unsaturated, and supersaturated solution?
- What is molarity?
- A chemist prepares some standard solutions for use in the lab using 500.0-mL volumetric flasks to contain the solutions. If the following masses of solutes are used, calculate the resulting molarity of each solution.
 - o 4.865 g NaCl
 - o 78.91 g AgNO3
- What causes molecules to be polar?

Ch.16

- What are the properties of acids and bases?
- What are the Arrhenius and Bronsted-Lowry definitions of acids and bases?
- Know what a conjugate acid-base pair is.
- What is a buffered solution?
- Calculate the pH and pOH values a 0.00515 M HCl solution.

Ch.17

- What do we mean by an equilibrium position?
- Write the equilibrium constant expressions for each of the following reactions.
 - $\circ \quad 2NO(g) + O_2(g) \leftrightarrow 2NO_2(g)$
 - $\circ \quad N_2H_4(l) + O_2(g) \leftrightarrow N_2(g) + 2H_2O(g)$
 - \circ CO(g) + NO₂(g) \leftrightarrow CO₂(g) + NO(g)
- For the reaction: $2SO_2(g) + O_2(g) \leftrightarrow 2SO_3(g)$ at a particular temperature the equilibrium system contains $[SO_3(g)] = 0.42$ M, $[SO_2(g)] = 1.4 \times 10-3$ M, and $[O_2(g)] = 4.5 \times 10-4$ M. Calculate K for the process.
- Explain the collision model for chemical reactions. How does the collision model account for the observation that higher concentrations and higher temperatures tend to make reactions occur faster?
- What is LeChatelier's Principle?
- Suppose the reaction system: $2SO_2(g) + O_2(g) 2SO_3(g)$ has already reached equilibrium. Predict the effect of each of the following changes on the position of the equilibrium:
 - Additional SO₂(g) is added to the system.
 - \circ The SO₃(g) is liquefied and removed from the system.
 - A very efficient catalyst is used.
 - The volume of the container is drastically reduced.

Ch.20

- When a carbon atom is bonded to four other carbon atoms?
- What is an alkane, alkene, and alkyne and what suffixes do they have?
- What is a polymer and monomer?
- Know how to name alkanes, alkenes, and alkynes.
- What structures define the functional groups of alcohols, esters, and organic acids.