Name: _____   Period: _____   Date: _____

SEMESTER 2 EXAM STUDY GUIDE – CHEMISTRY

VOCABULARY TERMS: Each of the following is a term that you need to be able to define/describe/have an understanding of on the Semester 2 Exam. You may want to make flash cards or a study sheet to help you work with these terms.

- Actual yield
- Anion
- Atmosphere
- Avogadro's number
- Balanced equation
- Boiling point
- Boyle's law
- Cation
- Charles's law
- Chemical equation
- Chemical reaction
- Coefficient
- Colligative property
- Combined gas law
- Concentration
- Condensation
- Covalent bond
- Dalton's law of partial pressures
- Diffusion
- Dilution
- Dipole-dipole forces
- Double bond
- Endothermic
- Equilibrium
- Evaporation
- Vaporization

- Excess reagent
- Exothermic
- Freezing point
- Gas
- Gay-Lussac's law
- Heat capacity
- Heating curve
- Hydrogen bonding
- Ideal gas law
- Immiscible
- Intermolecular forces
- Ionic compound
- Kelvin
- K_W
- Lewis dot diagram
- Limiting reagent
- Liquid
- London forces
- Melting
- Melting point
- Miscible
- Molar mass
- Molarity
- Mole
- Mole ratio
- Nonpolar covalent bond

- Octet rule
- Percent composition
- Percent yield
- pH
- Phase diagram
- pOH
- Polar covalent bond
- Product
- Reactant
- Representative particles
- Single bond
- Solid
- Solubility
- Solubility curve
- Solute
- Solution
- Solvent
- Standard temperature and pressure
- Stoichiometry
- Sublimation
- Temperature
- Theoretical yield
- Triple bond
- Unshared pairs
- Valence electron

CONCEPT QUESTIONS: You should be able to answer/describe each of the following on order to gain a real understanding of the different concepts we have covered this second semester. You can expect to see a majority of the questions on the exam similar to the ones below.

MOLE REVIEW
1. Convert each of the following to either moles or particles.
   a. 4.235×10^{24} atoms Ne

b. 12.98 mol Ge

2. Find the molar mass for each of the following compounds.
    a. $C_{12}H_{22}O_{11}$

    b. $FeCl_3$

3. Convert each of the following to either moles or mass.
    a. 23.54 g $HMnO_4$

    b. 0.091 mol $Ca_3(PO_4)_2$

4. Convert each of the following to moles or volume, assuming the gas is at STP.
    a. 21.32 mol SO_2

    b. 0.731 L Kr

UNIT 6: Bonding
1. What is the octet rule?

2. How can you tell how many valence electrons an atom of an element will have?

3. Describe the similarities and differences between ionic and covalent bonding.

4. What is the difference between a single, double, and triple covalent bond?

5. Construct a Lewis dot diagram for each of the following compounds:
   a. H_2

   b. $SrCl_2$

   c. K_3PO_4

   d. Li_3N

UNIT 7
1. Where do you find the products in a chemical equation? The reactants? What does the symbol (→) mean?

2. What do coefficients tell you?

3. Write a balanced equation for the reaction between each of the following:
   a. Copper (II) oxide reacts with hydrochloric acid to produce water and copper (II) chloride.

   b. Ammonia is produced in a reaction between nitrogen and hydrogen gases.

4. What information do you get from a balanced equation? Why is it always important to have it balanced?

UNIT 8

7. Elixirs, such as Alka-Seltzer, use the reaction of sodium bicarbonate and citric acid ($C_6H_8O_7$) to produce a fizz. As the reaction occurs, carbon dioxide, sodium citrate ($Na_3C_6H_5O_7$), and water are produced. What mass of citric acid should be used to react completely with 19.87 g of sodium bicarbonate? What mass of carbon dioxide could be produced by this mixture?

$$\_\_\_NaHCO_3 + \_\_\_C_6H_8O_7 \rightarrow \_\_\_Na_3C_6H_5O_7 + \_\_\_CO_2 + \_\_\_H_2O$$

8. When butane (C_4H_{10}) reacts with oxygen gas, a combustion reaction takes place. If 893.25g of butane mix with 2378.65 g of oxygen, which is the limiting reagent? How many cm^3 of each product is produced in this reaction? (HINT: 1 cm^3 = 1 mL)

$$\_\_\_ C_4H_{10} + \_\_\_ O_2 \rightarrow \_\_\_ CO_2 + \_\_\_ H_2O$$
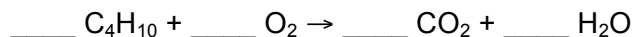
9. Hydrogen gas has been suggested as a clean fuel because it produces only water vapor when it burns in the presence of O_2. If the reaction has a 96.8% reaction yield, what mass of hydrogen forms from 874 g of water?

$$\_\_\_\_ \ H_2 + \_\_\_\_ \ O_2 \rightarrow \_\_\_\_ \ H_2O$$

UNIT 9

1. Describe a solid, liquid, and gas.

2. Convert the following pressure units.
   a. 1276 mmHg to psi

   b. 9.43 atm to kPa

   c. 89.78 kPa to torr

3. What is the difference between effusion and diffusion? Give an example of each.

4. How do pressure, volume, and temperature affect the properties of a gas? Give an example as a part of your explanation.

5. 768 mL of gas are under a pressure of 98.76 kPa. The pressure in the container is increased to 133.6 kPa. What is the new volume of the gas if the temperature remains constant?

6. What would be the mass of 876 mL of argon at -164.32 °C and a pressure of 1026 atm?

7. The total pressure of water vapor is 984 mmHg. If the partial pressure of hydrogen makes up 65% of the vapor, what is the partial pressure of oxygen?

8. Explain what is happening in the heating curve shown below.
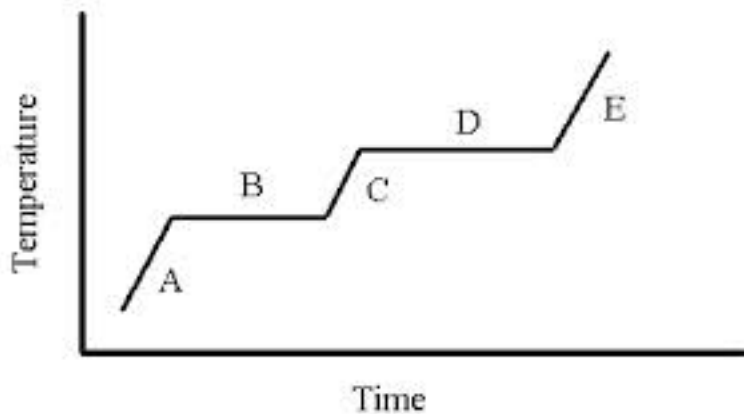
A.

B.

C.

D.

E.

9. Use the phase diagram below to answer the questions that follow.
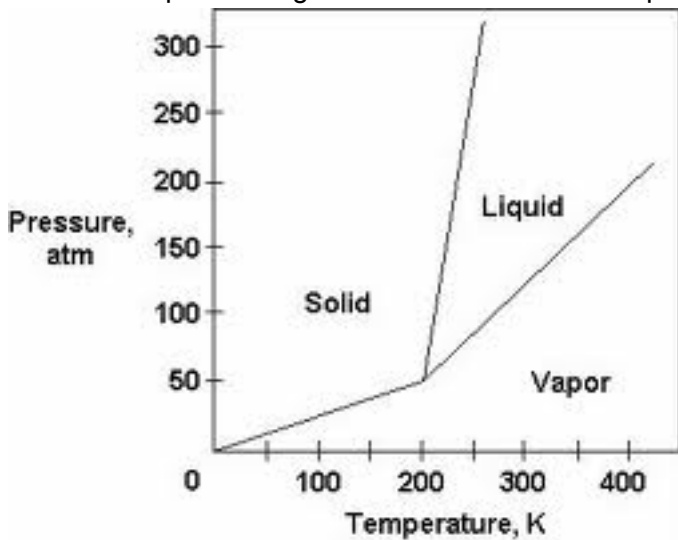
A. At what temperature and pressure does the triple point exist?

B. At a pressure of 200 atm, what process occurs as the temperature changes from 300 K to 100 K?

C. At what pressure does the critical point occur?

1. How does a solvent dissolve a solute? Which types of compounds work best in this process? What do they produce?

2. How does the addition of a solute affect the melting point and freezing point for a substance?

2. You place 34.5 g of Cr_2O_3 in 124 mL of water forming 128 mL of solution. Find the molarity for this solution.

3. Describe how to prepare 0.25 L of a 0.50 M solution of $Pb(NO_3)_2$. How could you dilute this solution to a final concentration of 0.10 M using all of the initial solution?

4. If the concentration of H^+ in a solution is 3.98×10^{-8}, what is the pH? What is the pOH? Is this an acid, base, or neutral?

5. If the concentration of OH^- in a solution is 1.75×10^{-12}, what is the H^+?

6. Describe the flow of heat between a system and its surroundings.

7. A Chipotle chicken burrito containing white rice, black beans, roasted chili-corn salsa, sour cream, and cheese produces 4518720 J of energy. How many Calories would you consume eating only this burrito?

8. A 0.07 mol sample of octane, C_8H_{18}, absorbed 3.5×10^3 J of energy when it's final temperature reached 298 K. What was the initial temperature of the octane if C = 254.0 J/molK?