Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Chem B Final exam review

***Nomenclature***

Ag2S \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Al2O3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

H2SO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Fe(OH)2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CrCl3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CaF2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PCl5 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

H2S \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(NH4)2SO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

HNO2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

NiBr3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

silicon dioxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nickel (III) sulfide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

manganese (II) phosphate \_\_\_\_\_\_\_\_\_\_\_\_\_ silver acetate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

diboron tetrabromide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ magnesium sulfate heptahydrate \_\_\_\_\_\_\_\_\_\_\_\_\_

potassium carbonate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ammonium oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

tin (IV) selenide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ carbon tetrachloride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Balanced Chemical Equations**

Write a balanced chemical equation with state symbols from the given information.

1. Sodium reacts with oxygen
2. Zinc reacts with hydrochloric acid
3. Chlorine reacts with sodium iodide
4. A solution of copper(II) phosphate and magnesium
5. Silver oxide is heated
6. Solutions of mercury(II) acetate and ammonium carbonate react
7. Cadmium and oxygen are combined
8. Aluminum chlorate decomposes with an electric current
9. Nitric acid is reacted with potassium hydroxide
10. Solutions of lead nitrate and sodium iodide react

**Percent Composition**

1. What is the percent composition of water, H2O?
2. What is the percent composition of glucose, C6H12O6?

**Empirical Formulas**

1. A compound consists of 72.2% magnesium and 27.8% nitrogen by mass. What is the empirical formula?
2. A compound is analyzed and found to contain 68.54% carbon, 8.63% hydrogen, and 22.83% oxygen. The molecular weight of this compound is known to be approximately 140 g/mol. What is the empirical formula? What is the molecular formula?

**Stoichiometry**

1. Write the balanced equation for the reaction of lead (II) nitrate with sodium iodide to form sodium nitrate and lead (II) iodide.
2. If I start with 25.0 grams of lead (II) nitrate and 15.0 grams of sodium iodide, how many grams of sodium nitrate can be formed?
3. What is the limiting reactant in the reaction described in problem 2?
4. What is the percent yield if 6.92 g of sodium nitrate were formed? (81.3 %)

**Phases of Matter**

1. What are the three assumptions that kinetic theory makes about the properties of gases?
2. Convert 892 mmHg to atm and to kPa:
3. A. Compare the average kinetic energy of a glass water bottle and the average kinetic energy of the liquid water *in* the bottle. (i.e. Do they have the same ave KE or are they different?)
	1. B. Why do we see a difference in phases if they are at the same temperature? What factor dictates the phase of a substance?
4. Arrange the states of matter with respect to their orderliness.
5. Draw a series of pictures (from memory if possible!) to show the process of heating a liquid to boiling.
6. Is the boiling point of water at the top of Mount McKinley (the highest point in North America) higher or lower than it is in Death Valley (the lowest point in North America)? (**Lower… but why?)**
7. Draw a heating curve for water and label the diagram with (Hint: axes should be labelled as Kinetic Energy vs. Time/heating):
	1. Melting point
	2. Boiling point
	3. Describe how the kinetic energy of the particles is changing/not changing from -50 degrees C to 0 degrees C.
	4. Describe how the kinetic energy of the particles is changing/not changing at 0 degrees C.



1. What phases are present at:
	1. Point A: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. Point B: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. Point C: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	4. Point D: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	5. Point E: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Given that your substance is under the conditions of Point D, what changes need to made to the system in order to bring that substance to:
	1. Point A: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. Point B: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. Point E: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Gases**

1. The pressure of a sample of gas was 97.8 kPa and the volume of the gas was 3.75 L. If the gas occupied a container with a volume of 8.00 L, what would the pressure in the container be? (ans. 45.8 kPa)
2. A gas is initially at a pressure of 225 kPa and a temperature of 245 K in a container that is 4.5 L. If the gas is compressed to a volume of 2.1 L and the temperature changes to 275 K, what is the new pressure?(ans. 540 kPa)
3. Under water where the temperature is 17oC and the pressure is 394 kPa, a diver inhales 2.1 L of air from his SCUBA tank. If the diver swims to the surface without exhaling where the temperature is 32oC and the pressure changes to 100.2 kPa, what will the volume of the air in his lungs be? (ans. 8.7 L)
4. At a pressure of 103 kPa and a temperature of 22oC, 52.9 g of a certain gas has a volume of 31.5 L. What is the identity of this gas? (ans. 40 g/mol, argon)
5. In a reaction, 24.9 L of N2 reacts with excess H2 to produce NH3. The pressure in the lab is 97.8 kPa and the temperature was 23.7oC. How many liters of NH3 were produced? (ans.44.2 L)
6. The combustion of a certain wax can be represented by the following balanced equation:

C22H44 + 33 O2 🡪 22 CO2 + 22 H2O

If 185g of wax (C22H44) burns, how many liters of oxygen gas were used up? Assume the conditions in the lab are 101 kPa and 25oC. (ans. 486 L)

1. Predictions
2. If the pressure of a gas increases, the volume \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. When the temperature of a gas is lowered, the volume \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. When the temperature of a gas is lowered, the pressure \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. If a container of gas is “squished” *(technical gas term)*, the pressure will \_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. For the reaction **2 H2(g) + O2(g)** 🡪 **2 H2O(g)**
7. How many liters of water can be made from 5 L of oxygen gas and an excess of hydrogen at STP? (ans. 10 L)
8. How many liters of water can be made from 55 grams of oxygen gas and an excess of hydrogen at STP? (ans. 77 L)
9. A sample of gas occupies 12.3 L at 21 oC and 1.75 atm. How many moles are present? (ans. .89 mol)
10. Determine the pressure change when a constant volume of gas at 1.00 atm is heated from 20.0 °C to 50.0 °C. (ans. 1.10 atm)
11. How much faster will a molecule of fluorine travel than a molecule of iodine? (ans. 2.58x)

**Solutions**

1. How many grams of K2S are required to make 425 ml of a 1.5 M solution of K2S? (ans. 7.0x101g)
2. How many moles of NaCl are in 325 ml of a 2.5 M solution? (ans. .81 mol)
3. If a chemist wanted to dilute 6.0 M HCl to make 550 ml of .5 M HCl, how many ml of the concentrated acid would she need? (ans. 46ml)
4. What is the *molarity* of 45.1 g CoSO4 in 250.0 mL of solution? (ans.1.16M)
5. What is the *molality* of a solution made by dissolving 36.5g of naphthalene (C10H8) in 425g of toluene (C7H8)? (ans. .670m)
6. A 4 g sugar cube (Sucrose: C12H22O11) is dissolved in a 350 ml teacup of 80 °C water. What is the percent composition by mass of the sugar solution? (ans. 1%)
7. A windshield washer solution is made of 36 mL of methanol and 56 mL of water. What is the concentration of methanol in the solution expressed as percent by volume of methanol? (ans. 39%)
8. What is the boiling point elevation of a solution made from 70.0 g of C6H12O6  and 425.6 ml of water? (ans. .47oC)
9. What is the freezing point of a solution containing 80.5 g CaBr2 in 525 ml H2O? (ans. -4.29oC)
10. Calculate the solubility of carbon dioxide in water at 0 C and a pressure of 3.00 atm. The solubility of carbon dioxide is 0.348 g/100 mL water at 0 C and 1.00 atm. (Henry’s Law) (ans. 1.04g/100ml)
11. List the two colligative properties and the effect on them when a solute is added to a solvent.
12. Which of the following compounds in solution will result in the greatest elevation in B.P.? Explain.

Na2SO4 C3H8O AgCl

1. Will more salt dissolve in water when the water temperature is high or when the water temperature is low? Explain.
2. Will more salt dissolve in water when the salt crystals are small or large? Explain.
3. Will more salt dissolve in water when the solution is agitated or left alone? Explain.
4. Will more gas dissolve in water when the water is warm or when the water is cold? Explain.
5. Use the terms unsaturated, saturated, and supersaturated solutions in explain a salt solution.
6. Which of the following would be electrolytes? LiF NO2 CCl4 CaO BeI2
7. What is a simple way of explaining the term *solvation*?
8. Be able to distinguish between a solution, colloid, or a suspension in terms of particle size, ability to be filtered, and effect on light.
9. Know what an emulsion is.
10. Understand what the terms vapor pressure, boiling point, freezing point are and why they differ for different substances.
11. Be able to understand the effect of hydrogen bonds on the surface tension of water and the properties of water.

Name the following hydrates: Write the formulas for the following hydrates:

FeCl3. 6 H2O barium chloride dihydrate

CuSO4 . 5 H2O magnesium sulfate heptahydrate

NiCl2 6H2O manganese (II) sulfate monohydrate