

**Chem 10113, Exam 1**

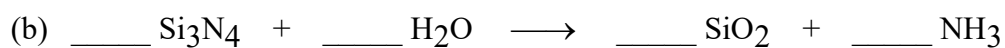
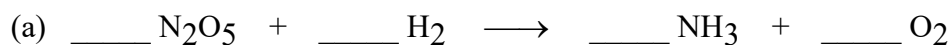
September 19, 2018

Name: \_\_\_\_\_

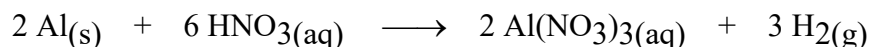
(Please Print)

1. (7 points) **SHOW ALL WORK.** The density of a solution of  $\text{H}_2\text{SO}_4$  in water is 1.26 g/mL. The solution is 30.0 %  $\text{H}_2\text{SO}_4$  (by mass). Determine the molarity of the  $\text{H}_2\text{SO}_4$  solution. (molar masses:  $\text{H}_2\text{SO}_4 = 98.1$ ,  $\text{H}_2\text{O} = 18.0$ )

2. (5 points) Balance the following chemical equations.



3. Most metals react with acids to produce a metal salt and  $\text{H}_2$  gas. In a simple lab experiment, when 35.0 g Al was added to 1.60 L of 2.50 M  $\text{HNO}_3$ , the chemist was able to isolate 3.70 g of pure  $\text{H}_2$ .



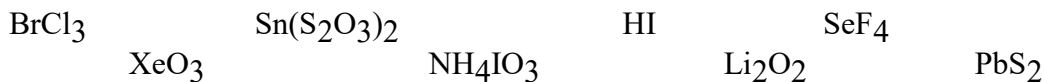
- (a) (10 points) **SHOW ALL WORK.** Determine the percentage yield of the reaction.

- (b) (7 points) **SHOW ALL WORK.** Determine the molarity of  $\text{HNO}_3$  in solution after the above experiment is completed.

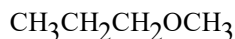
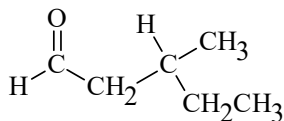
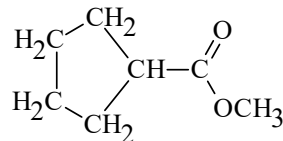
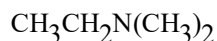
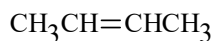
4. (10 points) **SHOW ALL WORK.** A mixture of  $\text{CH}_4$  and  $\text{C}_5\text{H}_{12}$  has a mass of 24.0 g. It is burned completely in excess  $\text{O}_2$  to form a mixture of  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . The product mixture contains 1.50 times as many moles of  $\text{H}_2\text{O}$  as of  $\text{CO}_2$ . Determine the mass of  $\text{CH}_4$  in the original mixture. (*Hint:* Write the **two** combustion reactions and **think moles** as well as grams! Use the approximate molar masses,  $\text{CH}_4 = 16$  and  $\text{C}_5\text{H}_{12} = 72$ , to simplify the math.)

5. (3 points) Write the complete symbol of the specific **atom or ion** that has 36 electrons, 42 neutrons, and a mass number of 75.

6. (4 points) Circle any of the following that are **ionic compounds**.



7. (8 points) Complete the following statements for the substance  $\text{C}_2\text{B}_8\text{H}_8$ . (Work need not be shown!) This substance has a molar mass of \_\_\_\_\_ g/mole and is \_\_\_\_\_ % boron by mass. The **empirical formula** of this substance is \_\_\_\_\_. The number of **boron atoms** in 0.50 mole of  $\text{C}_2\text{B}_8\text{H}_8$  is \_\_\_\_\_.
8. (7 points) For the following organic molecules, write the appropriate family name (i.e., alkane, alcohol, etc.) below each one.



9. Write a **complete, balanced chemical equation** for each of the following processes.

(a) (2 points) The addition of hydrogen iodide gas to water.

(b) (3 points) The preparation of barium nitrate by a **neutralization** reaction.

10. (19 points) Write the chemical formula for each of the following compounds.

Name	Formula
butane	
rubidium oxalate	
triantimony heptasulfide	
potassium hydrogen tellurate	
aluminum acetate	
hypoiodous acid	
cobalt(II) phosphate octahydrate	
calcium peroxide	
sodium thiocyanate	
magnesium nitride	

11. (7 points) **SHOW ALL WORK.** An aluminum-containing compound has the formula  $\text{Al}_x\text{S}_y\text{O}_9$  and is 36.9 % oxygen by mass. Determine x and y.

12. (8 points) **SHOW ALL WORK.** Determine the number of sulfate ions in 10.0 aL of a dilute solution that is  $1.50 \times 10^{-5}$  M  $\text{Fe}_2(\text{SO}_4)_3$ . (Remembering the metric prefixes, you'll note that an attoliter (aL) is an extremely small volume.)