Supplemental Instruction
CHEM 115a
Professor Reisler

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The FINAL EXAM.

This is it, guys. After this two-hour test next Monday, your semester with CHEM 115a will be over. You can do it! Yay! Also, I just wanted to take this opportunity to tell you what a smart and talented class you are, and how much fun I had being your SI leader for the semester. You guys continue to teach me new things every session, and I hope you have learned as much, if not more, than what I have learned from you. You guys are awesome, and thank you for an amazing semester. Now go on and rock that final!

% Composition, Empirical/Molecular Formulas

1. 427 grams of an odorless, colorless, liquid hydrocarbon is combusted and is found to produce 1320 g of CO_2 and 595 g of H_2O. Find the empirical formula, molecular formula, and % composition of carbon and hydrogen if the molecular weight of the hydrocarbon measures 142.32 g/mol. How many moles of compound were combusted?

Balancing Equations, Limiting Reactants, % Yield

2. 25 grams of iron (III) phosphate (150.82 g/mol) and 38 grams of sodium sulfate (142.065 g/mol) undergo a double replacement reaction in a 750. mL beaker.
    a. How many grams of iron (III) sulfate (399.885 g/mol) will be formed? How much of the excess reactant will be left?

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b. If 35 grams of iron (III) sulfate are formed, what is my percent yield? Does that answer make sense?

c. If I do this reaction with 15 grams of sodium sulfate and get an 85% yield, how many grams of sodium phosphate (163.974 g/mol) will I get?

Acid/Base Reactions/% Composition, Empirical/Molecular Formulas

3. A diprotic acid composed only of C, H, and O is found to be 40% C and 6.70 % H. A student mixed 7.063 grams of this acid with a little bit of water and titrated it with 75 mL of 2.09 M NaOH. Find the molecular formula of the acid.

Redox Reactions/Naming: Balance the following:

4. Nitrous acid (HNO_2) disproportionates in acidic solution to nitrate ion and nitrogen oxide.

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5. $ZrO(OH)_2$ (s) + SO_3^{2-} (aq) ➔ Zr (s) + SO_4^{2-} (aq) [basic solution]

Partial Pressures/Ideal Gas Law

6. A 1.50 L sample of CH_4 gas is collected over water at a pressure of 1011 torr at 37°C. When the sample dries, the remaining gas has a volume of 1.42 L at 37°C and 1011 torr.
   a. Find the vapor pressure of water at 37 °C.

   b. What mass of CH_4 do we have?

Enthalpy

7. Use Hess' Law to find ΔH for the following reaction: 2 N_2 (g) + 6 H_2O (g) ➔ 3 O_2 (g) + 4 NH_3 (g)
   NH_3 (g) ➔ ½ N_2 (g) + 3/2 H_2 (g) ΔH = 46 kJ
   2 H_2 (g) + O_2 (g) ➔ 2 H_2O (g) ΔH = -484 kJ