

This extra credit assignment is *optional* and not required, but you are encouraged to complete it as a preparation tool for the upcoming midterm exam. This assignment is **worth up to five extra credit points**. To complete the assignment, show in *detailed steps* how to get the answer that is given for each of the five problems. This assignment is **due at the time of your second lecture exam**, and no late assignments will be accepted.

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Problem 1: You take an aspirin tablet (which contains only carbon, hydrogen and oxygen) with a mass of 1.000 g and burn it in air to collect 2.20 g of carbon dioxide and 0.400 g of water. A molar mass experiment shows a value between 170 and 190 g/mol. What is the molecular formula for aspirin?

*Answer to Problem #1: C<sub>9</sub>H<sub>8</sub>O<sub>4</sub>*

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Problem 2: The reaction of 23.1 g of NH<sub>3</sub> and 18.3 g of O<sub>2</sub> produces 4.10 g of NO. What is the percent yield for this reaction? The equation for this reaction is: **4 NH<sub>3</sub>(g) + 5 O<sub>2</sub>(g) → 4 NO(g) + 6 H<sub>2</sub>O(g)**

*Answer to Problem #2: 29.9%*

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**Problem 3:** What volume of 0.300 M NaCl is required to precipitate all the  $\text{Pb}^{2+}$  ion from 25.0 mL of aqueous 0.440 M  $\text{Pb}(\text{NO}_3)_2$ ?  
The reaction is:  $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2 \text{NaCl}(\text{aq}) \rightarrow \text{PbCl}_2(\text{s}) + 2 \text{NaNO}_3(\text{aq})$

*Answer to Problem #3: 73.3 mL*

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**Problem 4:** If 1.00 mole of ethanol,  $\text{CH}_3\text{CH}_2\text{OH}$ , at 22.0 °C absorbs 1.45 kJ of heat, what is the final temperature of the ethanol? The specific heat capacity for ethanol is 2.44 J/gK.

*Answer to Problem #4: 34.9 °C*

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**Problem 5:** The standard molar enthalpy of formation of  $\text{NH}_3(\text{g})$  is -45.9 kJ/mol. What is the enthalpy change if 5.38 g of  $\text{N}_2(\text{g})$  and 3.32 g of  $\text{H}_2(\text{g})$  react to form  $\text{NH}_3(\text{g})$ ?

*Answer to Problem #5: -17.6 kJ*