

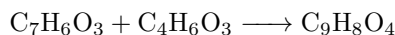
Problem Set 5: Percent Yield

HCHE 111L: Introduction to Elementary Inorganic Chemistry

Due Date: Friday September 29th, 2017

Problem 1

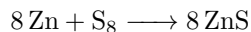
Aspirin ($\text{C}_9\text{H}_8\text{O}_4$) is produced by treating salicylic acid ($\text{C}_7\text{H}_6\text{O}_3$) with acetic anhydride ($\text{C}_4\text{H}_6\text{O}_3$):



- Balance the chemical equation
- If the synthesis has an 87% yield, what mass of salicylic acid should be used to produce 75 g of aspirin?

Problem 2

Calculate the theoretical yield of ZnS, in grams, from the reaction of 0.488 g Zn and 0.503 g S_8 .



If the actual yield is 0.606 g ZnS, what is the percent yield?

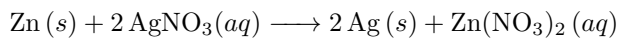
Problem 3

Hydrogen fluoride (HF) and calcium sulfate (CaSO_4) is produced industrially by the action of sulfuric acid (H_2SO_4) on CaF_2 .

- Write a balanced chemical reaction describing this process.
- If 365 kg of CaF_2 are treated with excess sulfuric acid and 155 kg of HF are produced, what is the percent yield of this reaction?

Problem 4

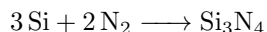
A strip of zinc metal having a mass of 2.00 g is placed in an aqueous solution containing 2.50 g of silver nitrate, causing the following reaction to occur;



- a) Identify the limiting reactant.
- b) How many grams of Ag will form?
- c) How many grams of $\text{Zn}(\text{NO}_3)_2$ will form?
- d) If you obtain 1.32 g of Ag from your reaction, what is the percent yield of silver?

Problem 5

Silicon nitride (Si_3N_4), a valuable ceramic, is made from the direct combustion of silicon and nitrogen at high temperatures



How much silicon must react with excess nitrogen to prepare 125 g of silicon nitride if the yield of the reaction is 95.0%?

Problem 6

Aspartame ($\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5$) is a sugar substitute in soft drinks. Under certain conditions, aspartame reacts with water to produce aspartic acid ($\text{C}_4\text{H}_7\text{NO}_4$), methanol (CH_3OH) and phenylalanine. Phenylalanine is 65.44% C, 6.71% H, 8.48% N, and 19.37% O by mass with a molecular mass of 165.19 g/mol.

- a) Determine the molecular formula of phenylalanine.
- b) Write out a balanced chemical equation to describe the process above.
- c) If 25.7 g of aspartame reacts with excess water to form 10.5 g of phenylalanine, calculate the percent yield of this reaction.