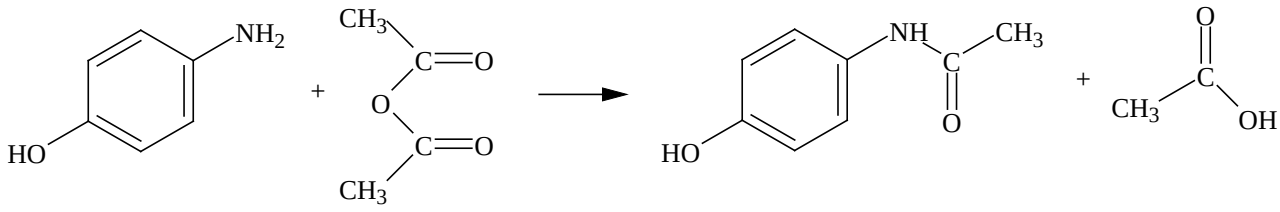
Department of Chemistry
University of Missouri-St. Louis

Name_____ Practice Exam
Chem 2633

Some useful information can be found at the end of the exam

1. A student dissolved 1.09 g of p-aminophenol in 10 mL of 0.1 M hydrochloric acid, added 10 mL of a 0.1 M sodium acetate solution to the mixture, heated and then added 2.04 mL of acetic anhydride to the heated solution. On cooling, 0.7 g of acetaminophen was recovered.

A. Write an equation for this reaction.



B. On the basis of the amounts of reagents used, what is the limiting reagent?

p-aminophenol = 1.09g/109.1 g/mol = 0.01 mol LIMITING REAGENT

acetic anhydride 2.0g/ 102 g/mol = 0.02 mol

C. Calculate the theoretical yield in grams.

0.01 mol * 151.6 g/mol = 1.52 g acetaminophen

D. What is the % yield?

0.7 g isolated/ 1.52 g theory = 0.46 or 46% yield

2. A student spots an unknown and develops it in CH_2Cl_2. Only one spot is observed with an R_f value of 0.5. Is the compound likely a pure sample? What additional experiments could you do using thin layer chromatography to test your hypothesis?

It certainly could be; use a different solid support, different solvent system

3. Name three criteria (or properties) that can be used to confirm the identity of a solid substance.

IR spectrum, melting point, rf value in TLC

4. A student was in a hurry and did not have time to filter the aspirin after acidification with HCl. The solid was left suspended in an aqueous environment until the following week when the solid was filtered. The compound melted sharply but not at the temperature expected. The IR spectrum was different from everyone else's. When the student ran the ferric chloride test a purple solution was obtained. Explain.

Aspirin can hydrolyse back to salicyclic acid which would give a positive $FeCl_3$ test

5. A student strted with compound A and made compound B in an 80% yield. In a following step, compound B was converted to compound C in 70% yield. What is the student's overall yield of C starting with compound A?

Compound B: 80% or 0.8
Compound C: 70% or 0.7

Overall yield: 0.8*0.7 = 0.56 or 56%

6. Water and chloroform are both colorless but immiscible liquids. How could you distinguish between the two if both are present in a separatory funnel.

By their density: chloroform has a larger density than water and wil be the lower layer

Take a test tube and add a small amount of the top layer. Add add a small amount of water and see if you get two layers.