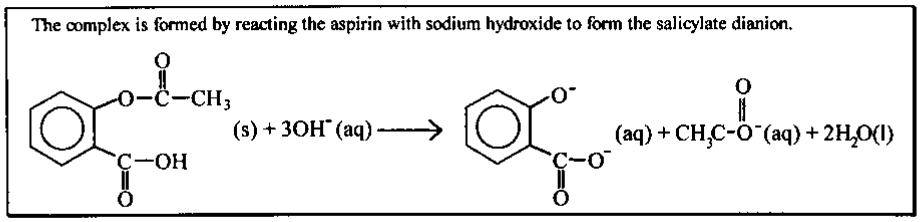
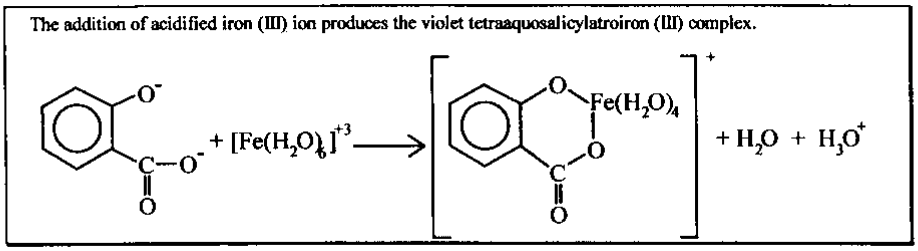
SPECTROPHOTOMETRIC ANALYSIS OF ASPIRIN

Introduction:

A colored complex is formed between aspirin and the iron (III) ion. The intensity of the color is directly related to the concentration of aspirin present, therefore, spectrophotometric analysis can be used. A series of solutions with different aspirin concentrations will be prepared and complexed. The absorbance of each solution will be measured and a calibration curve will be constructed. Using the standard curve, the amount of aspirin in a commercial aspirin product can be determined.





Purpose:

The purpose is to determine the amount of aspirin in a commercial aspirin product.

Equipment / Materials:

6 - 125 ml erlenmeyer flasks
10 ml graduated cylinder
250 ml volumetric flask
100 ml volumetric flask
5 ml pipet
2 cuvettes
analytical balance (opt.)
commercial aspirin product or aspirin the student has made acetylsalicylic acid
1 M NaOH
0.02 M iron (III) buffer
spectrophotometer
DI water

Safety:

- Always wear goggles and an apron in the lab.
- Be careful while boiling the sodium hydroxide solution. NaOH solutions are dangerous especially when hot.

Procedure:

1. Mass 400 mg of acetylsalicylic acid in a 125 mL Erlenmeyer flask. Add 10 mL of a 1 M NaOH solution to the flask and heat to boiling.
2. Quantitatively transfer the solution to a 250 mL volumetric flask and dilute with distilled water to the mark.
3. Pipet a 2.5 mL sample of this aspirin standard solution to a 50 ml, volumetric flask. Dilute to the mark with a 0.02 M iron (III) solution. Label this solution "A" and place it in a 125 mL Erlenmeyer flask.
4. Prepare similar solutions with 2.0, 1.5, 1.0, and 0.5 mL portions of the aspirin standard. Label these "B, C, D, and E."
5. Using a commercial aspirin product, follow steps 1 through 3. Label the final solution by brand. If using aspirin from the Microscale synthesis of Acetylsalicylic Acid lab, skip to optional procedure.
6. Measure the absorbance of each solution with a spectrophotometer set at 530 nm. Use the iron (III) solution as a blank. Record the results on the data sheet.
7. Measure and record the absorbance of the unknown. Record it on the data sheet.

Optional:

A. Mass the amount of product. Record this number in the data table.

B. Repeat steps 1 & 2 using all of your product, then go to C.

C. Pipet 5.0 mL of the solution made in 2 to a 100 mL volumetric flask. Dilute to the mark with 0.02 iron (III) solution.

D. Procede to steps 6 & 7.

Data:

Solution	Concentration (mg/L)	Absorbance
A		
B		
C		
D		
E		
unknown		

For commercial Product:

amount of aspirin in unknown _____mg

accepted value _____mg

percent error _____%

For microscale lab product:

mass of impure product _____mg

mass of aspirin in product _____mg

% purity of product _____%

Questions:

1. Explain why the wavelength of 530 nm was used.

2. How did the concentration of your aspirin solution compare to the accepted value?

3. Is it better to buy generic or brand name aspirin? Support your conclusion.

Teacher Notes

Lab Time: 45 minutes

Preparations: Time: 25 minutes

Turn the spectrophotometers on at least 20 minutes before the lab.

0.02M Iron (III) Buffer - Dissolve 6.48g of $FeC1_3$ in 2 L of 0.1 M HCl

Answers to questions:

1. Solutions are purple in color and therefore absorb green colored light. The wavelength of 530 nm corresponds to green light.

2. Answers will vary according to results.

3. Answers may vary according to results, however, students should conclude that generic brand aspirin contains the same amount of aspirin as brand names without the higher cost.

Considerations:

Orange baby aspirin does not work well with this lab. This is not available with aspirin anymore because of Reye's syndrome risks, but just in case any student might have some from the past, its use is not recommended.

The procedure states that 400 mg of reagent grade acetylsalicylic acid is to be used in preparing the standard solution. If this is not available, an Anacin tablet may be used. The label states that this brand contains 400 mg of aspirin.

This experiment is a good follow-up after performing the microsynthesis of aspirin lab to calculate the % yield of aspirin produced.

Another variation of this experiment is to study the effects of time and temperature on the degradation of aspirin. Aspirin tablet solutions are heated for various amounts of time to determine how much of the aspirin had decomposed.

DO NOT use anhydrous iron (III) compounds for this experiment.

Reference:

This experiment is an adaptation of a lab taken from *Experiments in General Chemistry* by Weiss, Wismar, and Greco (MacMillan Publishing Co., 1983). This is the laboratory manual to accompany Petrucci's *General Chemistry,* 3rd Ed.