

## **Experiment 6: The Extraction of Caffeine from Tea Leaves**

### **Introduction**

Caffeine is an alkaloid present in tea, coffee, cola nuts, and several other plants. It is a mild stimulant and may be used medically for this purpose. Structurally, caffeine belongs to a class of nitrogen bases called purines. It is a colorless, crystalline solid that melts at 235 – 236°C. It is moderately soluble in water but more soluble in common organic solvents.

In this experiment you will extract caffeine from tea leaves in hot water. This treatment also extracts tannins, another class of compounds found in tea. It will therefore be necessary to separate the two, which you will do with sodium carbonate. Tannins are acidic and are precipitated out by the sodium carbonate. The caffeine is extracted with dichloromethane, which is then evaporated, leaving crude caffeine.

### **Procedure**

1. Measure 30 mL of water and 2.0 g of anhydrous sodium carbonate into a 150 mL beaker and place 2 tea bags in the beaker.
2. Cover the beaker with a watch glass and heat the water to boiling on a hot plate. Once boiling, turn the hot plate to "5" and boil for 20 minutes.
3. While boiling tea, place a 100 mL beaker of water on the hot plate.
4. Decant the hot liquid into a 50 mL Erlenmeyer flask. Wash the tea bags with 10 mL of hot water and add the wash to the tea extract.
5. Cool the tea to room temperature (20 - 25°) using a cool water bath.
6. Transfer the tea extract to a separatory funnel and extract with two 5 mL portions of dichloromethane, combining the dichloromethane extracts in a 25 mL Erlenmeyer flask.
7. Add 0.5 g of anhydrous sodium sulfate to the flask. Allow the flask to stand for 10 minutes, swirling occasionally.
8. Using the analytical balance, mass a 50 mL beaker and decant the contents of the 25 mL Erlenmeyer flask into the beaker. Try to leave as much solid as possible in the flask.
9. Place the beaker in the fume hood to evaporate off the dichloromethane.
10. Determine the mass of the caffeine.

### **Data Table**

Mass of beaker	_____
Mass of beaker and caffeine	_____
Mass of caffeine	_____
Theoretical yield of caffeine	_____
Actual yield of caffeine	_____

### **Data Analysis**

1. Calculate the percent yield of caffeine.
2. How could the purity of the recovered caffeine be determined?
3. Why is sodium carbonate added to the water used to extract the tea?
4. Why was anhydrous sodium sulfate used?