Name: _____

Locker Number: _____

CHEMISTRY 354-355

Experiment 12

ISOLATION OF CAFFEINE FROM TEA OR COFFEE

1. Report the **weight** of tea leaves used: _____ grams

2. Report the mass (**grams**) of caffeine that you isolated *prior* to the sublimation step:

   _____ grams

3. Calculate the **weight percent recovery** of the crude caffeine isolated prior to the sublimation step. Show your calculation, including cancellation of units.

4. Report the following for the caffeine that you isolated after the sublimation step.

   a) the mass (**grams**) of pure caffeine obtained _____

   b) the **melting point range** of your product _____

   c) the **color** of your product _____

5. Calculate the **weight percent recovery** for the purified caffeine (after sublimation). Show your calculation, including cancellation of units. Base your calculation on the mass of solid that you had *prior to* sublimation.

6. Be sure to submit your sample of caffeine. Use a properly labeled sample vial.

7. Outline a **separation scheme**, showing how pure caffeine is isolated from a tea bag (do this on a separate sheet of paper attached to this laboratory report.

ANSWER THE FOLLOWING QUESTIONS

1. The crude caffeine isolated from tea has a green tinge. What impurity causes the color?

_____

2. What would happen to the caffeine if the sublimation step were performed at atmospheric pressure? Why is reduced pressure used?

3. Using aqueous hydrochloric acid, sodium bicarbonate, or sodium hydroxide solutions, devise a separation scheme using the style shown in Figure 12.10 (p 687) to separate the following two-component mixtures. All of the substances are soluble in ether. The structures are shown on pp 692 - 693. *Be sure to show how you would recover each component of the mixture.*

   a) 3,4-dibromophenol and tributylamine

   b) benzoic acid and 1-hexanol

   c) 3,4-dibromophenol and benzoic acid

4. Solvents other than those shown in Table 12.1 (p 673) may be used for extractions. Determine the relative positions of the organic layer and the aqueous layer in a conical vial or separatory funnel after shaking each of the following solvents with an aqueous solution. You will need to find the densities for each of these solvents in a handbook (Technique 29, Section 29.1, p 942). Simply circle the correct answer

   a) 1,1,1-trichloroethane UPPER LAYER LOWER LAYER

   b) hexane UPPER LAYER LOWER LAYER

5. Under what conditions of temperature and pressure can one have **liquid** carbon dioxide? Please answer with specific values of temperature and pressure.

6. A solid substance has a vapor pressure of 800 mmHg at its melting point (80 °C). Will this substance *sublime* or will it *melt*?

7. A solid substance has a vapor pressure of 100 mmHg at the melting point (100 °C). Will this substance *sublime* or will it *melt*? (Assume an atmospheric pressure of 760 mmHg)

8. A substance has a vapor pressure of 50 mmHg at the melting point (100 °C). Describe experimentally (*i.e.*, describe the apparatus) how you would sublime this substance.