Sublimation

Replacement lab: This lab replaces the traditional naphthalene sublimation lab that teachers use.

Goals: To observe sublimation using common caffeine.

Objectives: Students will…..

- Observe sublimation (physical properties of matter)
- Explain the type of change that occurred

Time required: 1 x 45 – 60 minute class period

Materials:

- Caffeine Tablets, $C_8H_{10}N_4O_2$
- Hot Plate (must get to 178˚C)
- 250 ml Beaker
- Watch Glass
- Weigh boat/paper
- Centigram balance
- Glass Stirring rod

Procedure:

NOTE: If the tablet begins to burn, or turn brown, this is an indication that the hotplate is too hot. Remove beaker from heat immediately and turn temperature down on the hotplate. Restart the lab with a new caffeine tablet.

1. Form lab teams of three.
2. Review the student data sheet to make sure you are prepared to record the needed information.
3. Turn hot plate to approx 160^0 C.
4. Weigh and record the mass of the 250 mL beaker, and the beaker + caffeine tablet at 0 minutes (before tablet + 250 ml beaker are placed on hotplate).
5. CAREFULLY crush the tablet in the beaker using the glass stirring rod.
6. Spread crushed caffeine tablet in the center of the 250 ml beaker.
7. Cover caffeine beaker with watch glass so that it curves upwards.
8. Place caffeine beaker/watch glass setup on hot plate.

9. Let experiment run for 5 minutes at approx 160˚C. In 2 minute increments, take note of the appearance of the crushed tablet and time as the experiment progresses. Slowly elevate the temperature of the hotplate by 5˚C every 2 minutes up to a temperature of 185˚C. Record any other observations you make, specifically about the visibility of gas in the beaker covered by the watch glass.
10. Remove the beaker from the hotplate with remaining amount of solid caffeine and weigh it.
11. Record this mass, observe if there is a difference from your starting mass.
12. Turn off the hot plate, and clean up your working area.

Student Data Sheet:

Initial mass of beaker: _____ g

Time (minutes):	Approximate Temp (˚C):	Crushed Tablet Appearance:	Observations:
0	160		
5	160		
7	165		
9	170		
11	175		
13	180		
15	185		

Final mass of caffeine tablet: _____ g

1. Write a phase change equation for the change occurred.

2. Using a reference book, write the definition of **sublimation**.

3. Explain the changes in the appearances of the crushed tablet as the temperature was raised. What explains the changes in color and shape that occurred.

4. Explain how sublimation relates to this experiment. Include observations of the change that occurred.

5. Is tearing up a sheet of paper also a type of phase change? Explain your answer.

6. Are all phase changes also physical changes?

7. This caffeine tablet never fully sublimes. Can you make an educated guess as to why that is?