

## The Freezing Point of Salol

### Introduction:

The freezing point of a substance is the temperature at which it turns from a liquid to a solid and is a characteristic physical property of a substance. This experiment will investigate the freezing temperature of salol, or phenyl salicylate. The Vernier temperature probe will be placed in the salol, and the computer will record data numerically and graphically.

### Purpose:

The purpose of this experiment is to use the Vernier temperature probe to determine the freezing point of salol.

### Equipment/Materials:

laptop	tap water
serial box interface	hot plate
LoggerPro	test tube of salol
Vernier Temperature Probe	test tube rack
400 mL beaker	

### Safety:

- Always wear safety glasses in the lab.

### Procedure:

1. Heat some tap water in the beaker. Place the test tube of salol in the beaker to melt.
2. Connect the temperature probe to port 1 of the serial box interface.
3. Double click on the LoggerPro icon. Go to the File menu and select Open. Open Chemistry with Computers and choose Experiment 3. Choose Exp 03 Another Look at Freezing. The vertical axis should have temperature scaled from 0 to 70 °C; the horizontal axis should have time scaled from 0 to 20 minutes. If the Collect button is not active, go to the Experiment menu, select Connect Interface and choose COM1: LabPro.
4. Set the test tube of melted salol into a test tube rack. Place the probe into the salol. After the temperature has stopped climbing, click Collect to begin data collection.
5. Allow the probe to sit undisturbed in the salol. If the salol has not begun to freeze after 10 minutes, inform the instructor.
6. Continue collecting data until a plateau is evident on the cooling curve or until 20 minutes have elapsed. When finished with the data collection, click Stop; the collection will automatically stop after 20 minutes.

7. If the probe is frozen in the salol, place the test tube and probe set-up into the hot water bath; remove the probe when the salol has melted. **Do not attempt to pull the probe out of the test tube while the salol is frozen!**
8. Wipe the probe clean with a paper towel.
9. Find the freezing temperature of salol from the plateau of the graph. Move the mouse pointer to the beginning of the plateau. Click and drag across the plateau to select it. Click on the statistics button, which is the fifth button from the right. The mean temperature value for the selected data is listed in the statistics box on the graph. Record this value in the Data section. To remove the statistics box, click on the upper right corner of the box.
10. If instructed to print, click on the graph window, go to the File menu, and choose Print. Enter your names and print the graph.

**Data:**

Freezing temperature of salol \_\_\_\_\_ °C

**Questions:**

1. What happened to the salol temperature during freezing?
2. According to your data and graph, what is the freezing temperature of salol? Express your answer to the nearest 0.1 °C.
3. How do you think the freezing temperature of salol compares to its melting temperature?
4. Tell if the kinetic energy of the salol in the test tube increases, decreases, or remains the same in each of these time segments during the experiment.
  - a. when the temperature is changing at the beginning of the experiment
  - b. when the temperature remains constant
  - c. when the crystals of salol are forming

**Source:**

*Chemistry with Computers*, Holmquist, D. and Voltz, D., Vernier Software, ©1997, (with slight adaptations for Advanced Instrumentation Workshop 2000).