

Who Says a Watched Pot Never Boils

ID: 13306

Time required: 1 class period
Suggested Grade Levels: 7–8

Activity Overview

This lab will give students the opportunity to explore what happens to temperature during a phase change. The lab setup using ice and water should give them the change to see temperature plateaus while the ice melts and the water boils. The plateau at the start of the lab may or may not occur right at 0 °C because they are starting with an ice and water mixture. Most students will probably see a small plateau at approximately 3 to 5 °C. The size of this plateau will depend in large part on how long they wait to turn their hot plate or burner on.

Math Objectives:

- *Interpret and analyze graphs*

Science Objectives:

- *To understand what causes phase changes in matter*
- *To be able to measure the temperature of a substance and identify visual clues to the phase changes*

Teacher Preparation and Notes

- *Demo the activity using the overhead calculator so the entire class can see the process. If you have only one CBL 2, have each group individually perform this activity. If you have enough CBL 2 units, have students work in small groups.*
- **To download the student worksheet, and procedure page, go to education.ti.com/exchange and enter “13306” in the quick search box.**

Associated Materials

- TI-73 Explorer™
- Unit-to-unit cable
- Calculator-Based Ranger™ (CBR 2™)
- Temperature sensor
- 400 ml beaker, hot plate, ring stand with clamp
- Ice, water
- SciAct01_WatchedPot_procedure_TI-73.doc
- SciAct01_WatchedPot_worksheet_TI-73.doc

Management

- ◆ Assign these student jobs for this lab:
 - o Materials/setup person (sets up beakers/lamp)
 - o Tech person (operates CBL 2™ and TI-73 Explorer)
 - o Data recorder (reads off temperatures from the emerging graph on the TI-73 at each collection interval)
 - o Runner (brings CBL 2 and TI-73 to the computer to print graphs with TI-GRAPH LINK™ or TI-Connect™ and brings Data Collection and Analysis pages to the teacher)
- ◆ Distribute the *Procedure* instructions to each group of students. Then distribute the *Data Collection and Analysis* worksheet to each student or each group depending on how students are to submit their work.
- ◆ Students can record temperature readings in their lab journals as they are displayed on the TI-73. This keeps them engaged throughout the data collection period and if they lose the data/graph later, they can still write up their lab reports. Students can also access the data in the TI-73 lists after data collection. You can send the lists to all students' calculators using **[APPS]** 1:Link:
 - a. Press **[APPS]**.
 - b. Press **[ENTER]** to select 1:Link.
 - c. Select 4:List and press **[ENTER]**.
 - d. Press **[↓]** to move the **▶** beside the list you wish to send. Press **[ENTER]**.
 - e. Repeat step d for each list you wish to send.
 - f. Set the receiving unit by pressing **[APPS]** **[ENTER]** **[▶]** to select RECEIVE. Press **[ENTER]**. Waiting... displays on the TI-73 screen.
 - g. On the sending unit, press **[▶]** to select TRANSMIT and press **[ENTER]**.

For more permanent storage of data, use TI-GRAPH LINK or TI-Connect to save the lists in a computer folder. However, students may inadvertently lose their data or overwrite it in the next trial, so recording data in journals is a good option.
- ◆ Students can assess each other using a teamwork rubric after the lab. Provide a check list of positive and negative behaviors. Copy these on quarter sheets of paper.
- ◆ Refer to the appendix (SciAct01_WatchedPot_procedure_TI73.pdf) for instructions on how work with the DATAMATE application and the TI-73 Explorer calculator.

Extension

To demonstrate the melting point plateau more clearly, place the end of a temperature sensor in a container of water and then freeze it. This Temperature Sensor Popsicle can then be placed in a beaker on a hot plate or over a burner. Set up the CBL 2™ following the procedures in the lab, collect the data while the ice melts around the sensor, and then as the water heats until it boils.

The length of time needed to reach boiling and see both plateaus will vary based on the size of the ice cube you begin with, so your data collection time may need to be adjusted to collect data for a longer time period than the lab currently allows.

Depending on the number of students performing this lab, you may want to use one of these Popsicles as a class demonstration rather than making up one for each lab group. Use a view screen to display the graph and data. If you wish, the students can use this class data in place of theirs for the beginning of their graphs.