

Who Says a Watched Pot Never Boils?

Introduction

Matter changes state as its temperature is increased or decreased. Water is the substance that we are probably most familiar with, and everyone recognizes ice, water, and water vapor (steam) as its states or phases. Ice melts at the same temperature that water freezes, also known as its melting point and freezing point. Water vaporizes (or boils) at the same temperature that water vapor condenses, which is its vaporization (boiling) point or condensation point.

Hypothesis

Before testing, complete the Hypothesis section on the *Data Collection and Analysis* page to predict what the temperatures will be when the water changes state.

Procedure: Collecting the Data






1. Put enough ice in the 400 ml beaker to reach the 250 ml line. Add water to the same line. Place the beaker on the hot plate, but DO NOT turn the hot plate on.
2. Place the ring stand and clamp behind the hot plate and put the temperature sensor in the ice water but make sure it is not touching the sides or bottom of the beaker.

CAUTION: Make sure that no part of the temperature sensor touches the hot plate.

This is very important since the sensor will be ruined if allowed to touch the hot plate for even a short period of time.

3. Plug the temperature sensor into Channel 1 (CH 1) on the CBL 2™.
4. Start the DATAMATE program.
5. The Main Screen is displayed. If **CH 1:TEMP(C)** is displayed at the top of the screen, go to step 9. If not, go to step 6.
6. Select **1:SETUP**.
7. Select **CH 1**. Select **1:TEMPERATURE**.
8. If you are using the TI stainless steel temperature sensor, select **4:STAINLESS TEMP(C)**. If you are using a different temperature sensor, select the appropriate item from the menu. Select **1:OK** to return to the Main Screen.
9. Select **1:SETUP**. Select **MODE**, and then select **2:TIME GRAPH**.
10. The TIME GRAPH SETTINGS are displayed. If the screen shows TIME INTERVAL: 10, NUMBER OF SAMPLES: 90, and EXPERIMENT LENGTH: 900, go to step 12. If not, go to step 11.

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11. Select **2:CHANGE TIME SETTINGS**. For ENTER TIME BETWEEN SAMPLES IN SECONDS, enter **10**. For ENTER NUMBER OF SAMPLES, enter **90**. The TIME GRAPH SETTINGS screen reappears, showing the new settings.
12. Select **3:ADVANCED**. If YMIN is -5 , YMAX is 110, and YSCL is 5, select **1:OK** and go to step 14. If the settings are not correct, go to step 13.
13. Select **2:CHANGE GRAPH SETTINGS**. Select **1:CH 1 TEMP(C)**. For YMIN=?, enter -5 . For YMAX=?, enter **110**. For YSCL=?, enter **5**. When the new settings are displayed, select **1:OK**.
14. Select **1:OK** twice to return to the Main Screen.
15. When you are ready to begin, select **2:START**. The CBL 2 beeps twice and displays a graph.
16. Turn the hot plate on and to the setting your teacher wants you to use. At the end of each 10-second interval, the data point is plotted on the graph.
17. Observe the ice and water as the temperature increases. Use the table on the Data Collection and Analysis page to record the temperature for any observations you make, such as when the ice is completely melted, when the bubbles start to form or rise to the surface, and when the water reaches a full boil.
18. After the 90 data samples have been collected and plotted, the CBL 2™ beeps. Turn off the hot plate.
19. A line graph is displayed showing the time and temperature for each 10-second interval. Use  and  to move to each data point to find the melting point and the boiling point. Record the values and sketch the graph on the *Data Collection and Analysis* worksheet.
20. To exit from the DATAMATE program, press  to return to the Main Screen. Select **6:QUIT** and press .
21. To display the lists showing the results, press . The dissolving times are stored in L1. The temperatures are stored in L2.

Data Analysis

After you complete the testing, answer the questions on the *Data Collection and Analysis* page to analyze your results.