

Alternate CBL Instructions

Heating and Cooling

Safety Precautions



- Be careful when using a hot plate. It can burn the skin.
- Use caution when plugging in, using, or unplugging the CBL 2 unit's power supply.

Materials

CBL 2 unit

link cable

TI graphing calculator

DataMate program

temperature probe

hot plate (or Bunsen burner)

hot-mitt glove

250-mL ovenproof glass beaker

50–200 g of water

balance

beaker tongs

stopwatch (or timer)

Procedure

1. Set the hot plate to the highest setting, or as recommended by your teacher. Allow a few minutes for the plate to heat up.
2. Measure the mass of the empty beaker.
3. Pour 150 mL of water into the beaker and measure the combined mass of the water and the beaker.
4. Calculate and record the mass of the water in the beaker.
5. Create a data and observations table similar to the one in the textbook.
6. Connect the temperature probe to Channel 1 of the CBL 2 unit. Connect the TI graphing calculator to the CBL 2 unit with a link cable. Press the ends of the cable securely into each unit.
7. Turn on the graphing calculator. Start the DataMate program. Press CLEAR to reset the application program. The temperature probe should automatically be detected and begin displaying temperature on the display.
8. Select SETUP from the Main screen. Using the arrow keys, scroll to MODE and press ENTER.
9. From the SELECT MODE menu, select TIME GRAPH. Select CHANGE TIME GRAPH SETTINGS from the TIME GRAPH menu. Enter "15" as the time between samples, in seconds. Enter "60" as the number of samples so the CBL 2

collects data for 900 s (15 min). Select OK to return to the SETUP menu. Select OK again to return to the main screen.

10. Record the initial temperature of the air and then place the temperature probe into the beaker of water. Place the beaker on the hot plate and select START to begin data collection.
11. After 5 min, carefully remove the beaker from the hot plate using beaker tongs or a hot-mitt glove. Allow the beaker to cool. Turn off the hot plate.
12. After the CBL 2 unit is done collecting data, use the arrow keys to scroll through the graph and record the initial temperature and the temperature (on the y -axis) for each minute (on the x -axis). Alternately, print your graph as your teacher directs if you have TI Connect available.

Alternate lab procedure, using a CBL unit

1. Set the hot plate to the highest setting, or as recommended by your teacher. Allow a few minutes for the plate to heat up.
2. Measure the mass of the empty beaker.
3. Pour 150 mL of water into the beaker and measure the combined mass of the water and the beaker.
4. Calculate and record the mass of the water in the beaker.
5. Create a data and observations table similar to the one in the textbook.
6. Connect the temperature probe to Channel 1 of the CBL unit. Connect the CBL unit to the TI graphing calculator with a link cable. Press the ends of the cable securely into each unit.
7. Turn on the calculator and the CBL unit. Start the PHYSICS program and go to the MAIN MENU.
8. From the MAIN MENU, select the SET UP PROBES menu. Select ONE as the number of probes. From the SELECT PROBE MENU, select TEMPERATURE. Press ENTER to return to the MAIN MENU.
9. From the MAIN MENU, select COLLECT DATA. Select TIME GRAPH from the DATA collection menu. Enter "15" as the time between samples in seconds. Press ENTER. Enter "60" as the number of samples to collect data for 15 minutes. Press ENTER. Select USE TIME SETUP. From the TIME GRAPH menu, select NON-LIVE DISPLAY.
10. Place the beaker on the hot plate and press ENTER to begin data collection.
11. After 5 min, carefully remove the beaker from the hot plate using beaker tongs or a hot-mitt glove. Allow the beaker to cool. Turn off the hot plate.
12. After the data collection is done, press ENTER to retrieve the data. Use the arrow keys to scroll through the graph and record the initial temperature and the

temperature (on the y -axis) for each minute (on the x -axis). Alternately, print your graph as your teacher directs if you have TI Connect available.