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AP LAB 06E: Cooling Curves

Aim To generate a cooling curve and determine the freezing point of dodecanoic acid

Apparatus Test tube, 250 mL beakers, hotplate, LABQUEST and temperature probe

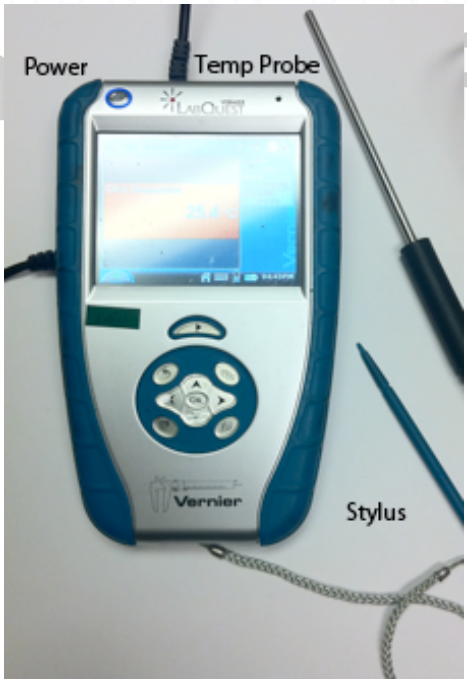
Chemicals Water, dodecanoic acid

Method

Part A: Setting up the LABQUEST and temperature probe

1. Plug-in the LABQUEST and turn it on (the power cord connects to left hand side of unit and the power button is in the top left hand corner).

2. Attach the temperature probe (the temp probe connects to the top of the unit). The LABQUEST will recognize the probe and start to display the temperature on the screen.



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3. Use the stylus on the touch screen to select '***Mode***';

    - Ensure the ***'Mode'*** is set to 'Time Based'
    - Change the '***Interval'*** to 2s/sample (this will automatically set ***'Rate'*** to 0.5 samples/s)
    - Set the '***Length***' to 600 s

4. Press OK.

At this point the LABQUEST is set up and ready to be used.

Part B: Collecting the data

1. Half fill a 250 mL beaker with cold water and place it on the hotplate.

2. Turn on the hotplate and place the test tube containing the solid dodecanoic acid into the beaker.

3. **Monitor the dodecanoic acid carefully**. When the acid has completely melted, leave the test tube on the hotplate for another 60 seconds, then carefully remove the test tube from the hot water and place it into a different, empty 250 mL beaker.

4. Insert the temperature probe into the liquid dodecanoic acid and stir constantly. When the temperature reaches 50.0°C, start the data collection by pressing the green button in the bottom left corner of the LABQUEST screen.

5. **Continue to constantly stir** the dodecanoic acid with the temperature probe throughout the experiment. Allow the data to be collected for the full, 600 s.

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Results

In the space below, *sketch* the cooling curve that you have generated, labeling axis carefully and using the data table to give relevant temperatures and times, plus label it as completely as possible.

(You can toggle between data and graph modes on the LABQUEST by using the buttons on the screen, below.)

Use your data to suggest a temperature for the freezing point of dodecanoic acid.

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Conclusion/Calculation

1 Calculate a percentage error in your result, given that the actual value for the freezing point of dodecanoic acid is 43.2 °C.

2. Use your graph to explain the meaning of the term, EXOthermic.

3. Carefully describe what is occurring in each section of the graph in terms of energy and temperature.

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