Ice and Salt
Teacher Notes

Introduction

Using a temperature probe is probably the easiest way to begin data logging with TI-Nspire. The Vernier EasyTemp probe can be plugged directly into a TI-Nspire handheld, and this causes software to open which allows temperature and time data to be collected and displayed.

In this activity salt is added to an ice-water mixture and TI-Nspire produces a clear and interesting display of the way the temperature behaves.

Resources

There is a TI-Nspire document entitled Ice&Salt.tns that provides an example of the sort of data you might expect.

The temperature probe

Switch on the TI-Nspire and open a new document. Plug in the temperature probe and a menu opens asking which application to use with the temperature probe. Choose *Data & Statistics* by pressing the tab button and selecting *OK*. Two windows will open, the control console at the bottom of the screen is active by default and the other the Data & Statistics window. You will notice that the *start* button is highlighted and pressing the *enter* button will begin datalogging. Pressing *tab* will toggle the through each of the buttons in the control console. Pressing *ctrl tab* will toggle between the two windows.

Notice that the temperature is displayed in the bottom window making the TI-Nspire plus a temperature probe a rather expensive digital thermometer! If you begin data logging the default time period is 3 minutes or 180 seconds. For this brief investigation a longer time interval will be needed, so while in the control console press *menu / Experiment / Set Up Collection / Time Graph*. You will then be able to adjust the time interval between samples collected and the length of the experiment. 5 second intervals and 300 seconds in total should be sufficient. Remember to scroll down or use the tab button to select *OK*.

Now toggle to the Data & Statistics window and press the *menu* button. Select *Window / Zoom* and change the y-range to, for example, -15 and 25. Toggle back to the control console and you are ready to begin data logging.

The activity

Place the temperature probe in about 20 ml—a small amount of water so that the temperature will drop quickly to zero. Set up the experiment for 10 minutes taking the temperature every 5 seconds.

Start recording then drop about six ice cubes into the beaker, stirring all the while. You will see the temperature drop to 0°C and remain there.

Why does the temperature not drop below zero?

After the temperature has been steady at zero for about a minute pour in about 20 cm^3 of salt, stirring all the while.

Why does the temperature start to fall again?

How much further could it fall?