

Newton's Law of Cooling explains how substances change temperature when exposed to surroundings with different temperatures. The formula itself is somewhat complicated, but basically the description of the function is that a substance exposed to a different outside temperature will heat or cool (depending on the outside temperature) quickly at first and then slower until the temperatures reach equilibrium.

We will attempt to exhibit this cooling function by using canned soda.

Start by acquiring a large beaker (at least 1000mL) filled about half way with cold tap water. Add ice to the mixture and stir.

Next, setup your LabPro with two stainless steel temperature probes. Place one probe into the water and wait until the temperature of the water stabilizes (should be between 0 and 1 C).

If all of the ice melts, add more ice.

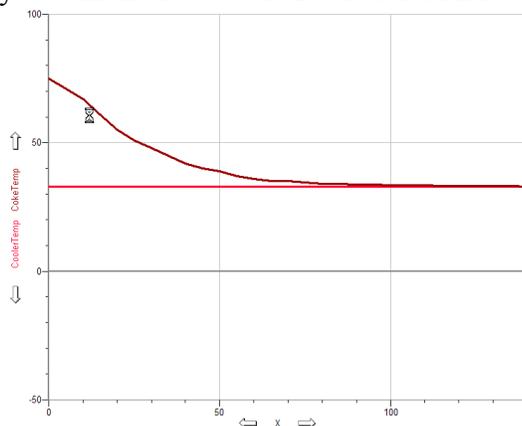
Next, acquire a can of soda, open the top, and place the other temperature probe into the soda (the other temperature probe is still in the ice water). **Make sure the probe is not in contact with the bottom or sides of the can throughout the experiment.**

Setup your experiment in LoggerPro so that the time of the experiment will be 900 seconds. Setup the data collection so that 1 sample is taken every 30 seconds.

Make sure there is enough room to place the can into the beaker so that the can will sit on the bottom of the beaker and not float. When the temperature of both probes has stabilized, start collecting data and place the can of soda into the beaker with the ice water.

Continue to collect data, making sure that there is always ice in the ice water. **DO NOT STIR THE WATER OR THE SODA**; if you have to add ice, do so gradually and with as little movement as possible.

You should notice that the soda cools rather quickly, but as it approaches the temperature of the ice water, the cooling process slows down. Your graph might look like this:



Continue to collect for the full 900 seconds, and then fill out the data table on the last page. Make sure to draw a circle around the words "Data Table" on the last page.

Store the data that you have collected by pulling down the Experiment window and choosing "Store Latest Run". Make sure to label your data table (Soda Temp and Ice Water Temp).



Newton's Law of Cooling

Name _____

Repeat this experiment with the water. The water is in a plastic bottle. Your data should plot on top of the previous experiment (with the soda). When you are done collecting data label the data "Water Temp" and "Ice Water Temp".

While you are waiting for the data collection to complete, you can answer the questions on the last page of this handout (below the data table).

After you have finished with the experiment, write the required information in the data table.

Print out your graph **ONLY** in landscape mode. Make sure your full names are on the printouts.

DATA TABLE

	Soda	Water
Starting Temperature of Ice Water		
Ending Temperature of Ice Water		
Difference between starting and ending temperatures of ice water.		
Starting Temperature of substance		
Ending Temperature of substance		
Difference between starting & ending temperatures of substance		

Use your text book or the Internet sites listed on the Lab Web Page for this lab to find the answers to questions 1-5.

1. What method of heat transfer is used to transfer the heat from the substance to the ice water (radiation, convection, or conduction)?

2. Would a container made out of wood (instead of aluminum) allow the substance to cool quicker or slower?

3. Heat we feel from the sun is transferred to our skin or clothes via what method of heat transfer?

4. What force makes cooler substances sink in A convection current?

5. What is the most efficient method of heat transfer?

RECORD YOUR ANSWERS USING THE LINK ON THE SCIENCE LAB PAGE