

Experimenting with Warming Ice



Challenge

Have a look at this video of [glaciers](#) in Patagonia.

1. What is happening to the glaciers in the video?
2. Try to explain the change of state of the ice.

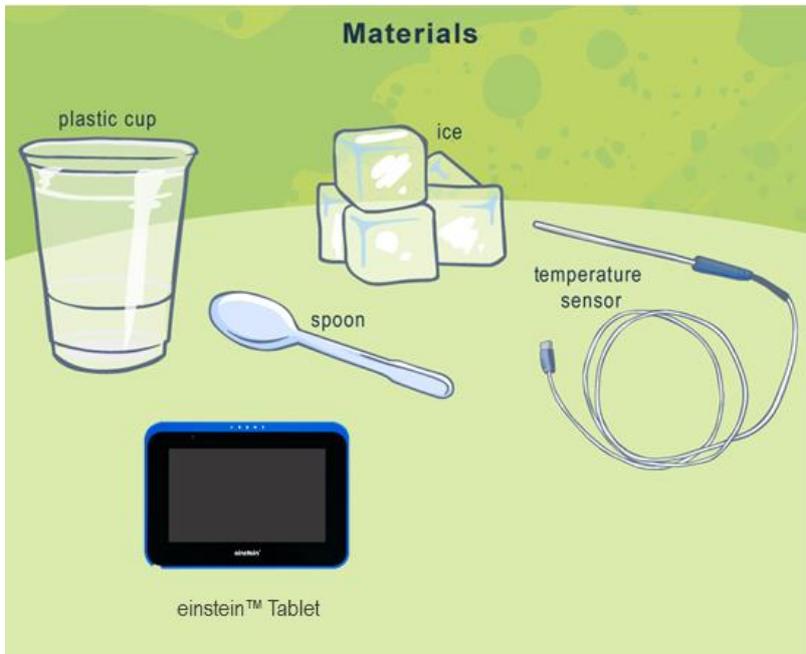
What will we investigate?

We will observe the change in **temperature** as ice warms up.

We will follow the **physical changes** as the ice changes state from a **solid** to a **liquid**.

Equipment and Materials

- einstein™Tablet+ or einstein™Labmate+™ paired with a tablet
- Temperature sensor (-40 to 140 °C)
- Spoon
- Clear glass or plastic cup
- Ice cubes or crushed ice
- Hot plate (optional for speeding up the process)



123 Experimental Setup

Group Work

1. Turn on the einstein™Tablet+ or einstein™Labmate+™ paired with a tablet.
2. Tap the MiLAB  icon to open the application.

Sensor Setup

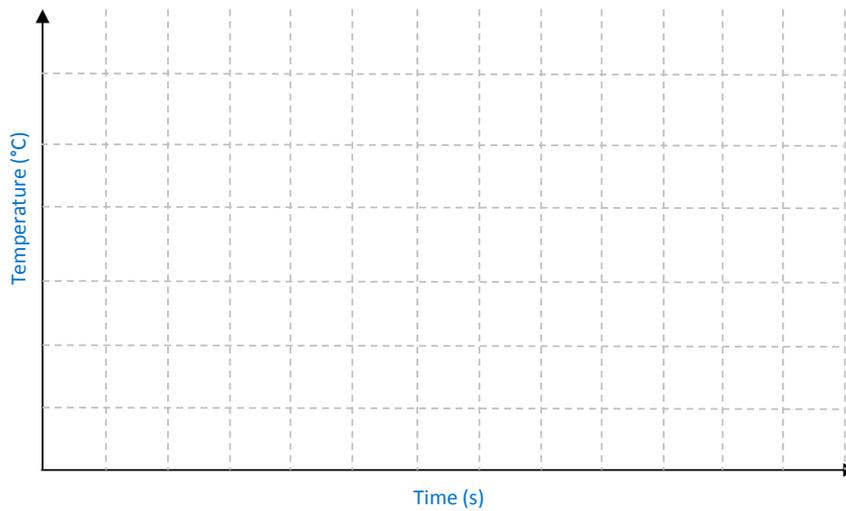
Tap the **Setup** cog () and use the table below to set up the measurement parameters:

Sensor:	Temperature (-40 to 140 °C)
	Camera
Rate:	10 / sec
Duration:	10 minutes

Before You Begin

1. What do you expect to happen to the ice?
2. Do you expect the temperature to go up, down or remain the same?

3. Sketch the graph of temperature vs time which you expect to observe.



Experimental Procedure

1. Connect the Temperature sensor to your einstein™ device.
2. Select the external Temperature sensor (-40 to 140 °C).
3. Add two spoonfuls of crushed ice or a few ice cubes to the cup.
4. Stick the Temperature sensor in the cup and make sure that it is making contact with the ice.
5. Tap **Run** (🟢) to begin collecting data.
6. Observe the graph of the temperature of the ice in the cup vs time.
7. Use Video Synch to film the experiment.
8. Tap **Save** (📁) to save your data.

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Tab stops: Not at 1 cm



Understanding the Measurements

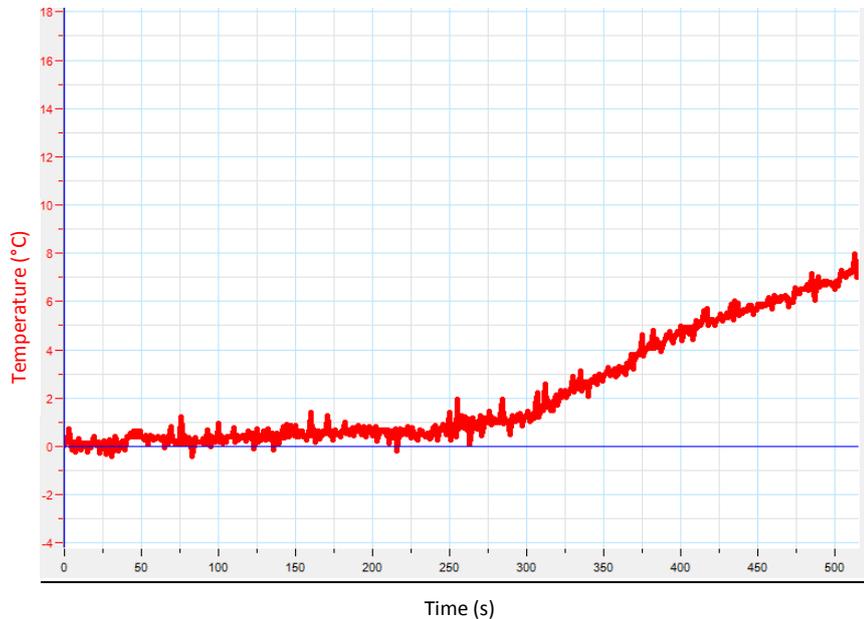
1. What label should you give to the *y*-axis?
2. What are the units of the *y*-axis?
3. Using data from your graph, fill in the table below:



Observations of Melting of Ice

	State of Matter (circle one)	Temperature (°C)	Picture
At the beginning of the experiment	Solid Liquid Solid and Liquid		Add your picture here
After 3-4 minutes	Solid Liquid Solid and Liquid		Add your picture here
At the end of the experiment	Solid Liquid Solid and Liquid		Add your picture here

Sample Graph: What Happens to Ice When it is Warmed?



? Understanding the Experiment

Have a look at your table of results and use it to give an explanation of the melting process.

🗨️ In Depth Learning

1. How much did the temperature change from the beginning of the experiment until the end?
2. What can we learn about the melting process? Complete the following statements:
 - **During melting:** Adding heat causes a change of state in the ice from _____ to _____
 - The temperature of the ice changed from _____ to _____
3. Compare your results to the predictions you made before the experiment.

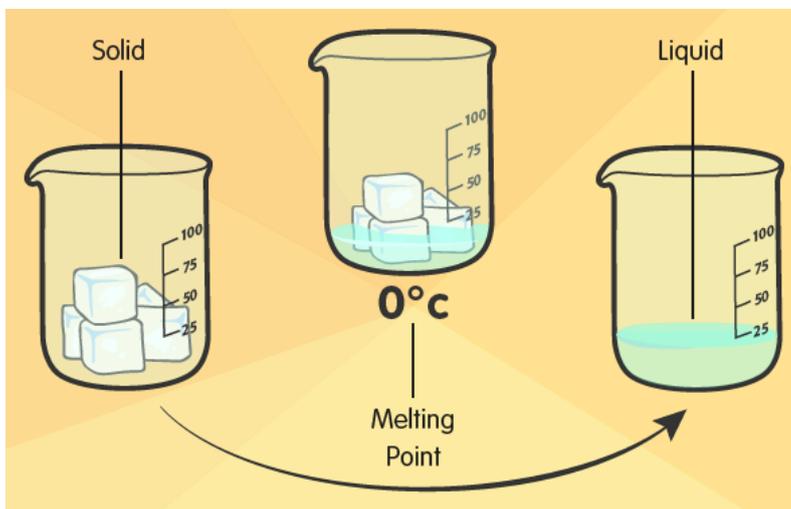
+ Using What You Learned

Choose one of the following options:

1. Try this Science Kids activity about [Changing the State of Water](#).
2. Warm up chocolate squares and measure their temperature until they melt. You may want to try this with both white chocolate and dark chocolate and compare your results. Describe the melting process of the chocolate. Think about the physical changes in the chocolate and the changes in temperature.

Continuing the Investigation

1. **Melting Point:** Go back to look at your graph and video. What was the temperature of the ice while it was melting?
2. What was the state of the matter up to the point when the temperature began to rise?
3. What was the temperature at the end of the experiment?
4. How did the state of the matter change after the rise in temperature?
5. Explain the idea of a **melting point** in your own words. Make sure to mention both the change of state and the change in temperature.
6. Think of another solid and search sources of information to find its melting point. Write down the melting point and describe the melting process using the idea of the change of state.



Understanding the Science

Most matter can be found in one of three states: **solid** (for example, iron or ice), **liquid**, (for example, oil or water) and **gas** (for example, oxygen or steam). The state of matter describes the physical state. A change of state is caused by a change in temperature. The change of state from solid to liquid is called **melting**. The change of state from liquid to solid is called **freezing**. The change of state from liquid to gas is called **vaporization**. The change of state from gas to liquid is called **condensation**.

