SFU SCIENCE IN ACTION

Title of Workshop: Why Does Ice Melt?

Objective/s:
- Understanding the effect of temperature on melting ice
- Understanding the effect of salt in forming ice as well as melting it

Learning Outcomes:
- The effect of temperature (from BC Curriculum)

Target Audience: For Grade 4 Students, these activities can be done individually with the help of a guardian but if grouping up 2-3 people is more than enough.

Duration of Workshop: 2 Hours

Delivery Method: Online Instruction

Allergy risks/Safety Protocols: Do experiments with the presence and help of an adult
**Introduction:**

“Temperature” is the measure of how hot or how cold something is, and it is measured using a thermometer or a thermostat. We use a thermostat to measure the temperature inside our house (what is the temperature in your house right now?) and we can also use it to control machines (AC or heater) that change the temperature to what makes us feel the most comfortable.

The normal temperature of a human is between 36.5 to 37.5 degrees Celsius or 97.7-99.5 degrees Fahrenheit. Celsius and Fahrenheit are two different units for measuring temperature depending on where you’re from. Room temperature is around 20-22 degrees Celsius.

On a deeper level, **temperature is a measure of how fast atoms are moving in a molecule.** Consider water, when it’s boiling it bubbles like crazy! The movement of the water molecules is what makes it so hot! Another example is ice. When we freeze water, we greatly slow down the movement of the water molecules, making a cold, hard ice cube. In the freezer, the water molecules are moving much slower than at higher temperatures. At room temperature, water behaves normally and the temperature of it is also normal, meaning the water molecules must be moving at a regular pace.

The movement of molecules depends on the type and arrangement of atoms in a chemical. For example, oil and water are two different chemicals and they behave differently at different temperatures.

One way that we know they are different is because they boil, melt, and freeze at different temperatures. **A boiling point is the temperature at which something turns from a liquid into a gas.** For example, the boiling point of water is 100°C, and the boiling point of oil is 300°C.

**A melting point is the temperature at which something turns from solid to liquid.** For example, the melting point of ice into water is 0°C and the melting point of oil is 24°C.

**A freezing point is the temperature at which something turns from liquid to solid.** This is the opposite process of melting, and the value for this is the same as the melting point.
**Why does ice melt?** This is caused by the change in temperature of the object’s surroundings. For example, when we take ice out of the cold environment of the freezer, it experiences an environment that is much warmer. The water molecules will start “taking” heat from the air around it and that makes them move faster than they were in the freezer. Remember, there is much less heat energy in the freezer! The molecules, as we discussed before, start moving faster and faster and that additional movement makes the ice melt into water.

There are ways that we can make the ice melt faster or make it melt slower, just by changing the temperature. For example, if we take the ice out from the freezer and put it into the fridge, it will melt slower than if we put it outside. There is more heat energy available in the fridge than in the freezer, but still less heat energy than in a warm room. If we take the ice out of the freezer and into a hot pan, it will melt faster because the pan has more heat energy than the air.

Another way ice can melt faster is by adding salt to it! **Salt lowers the freezing point of water.** It does this by getting in between water molecules that are trying to slow down and freeze stopping ice from forming.

**Real World Applications:** Before it snows you can see trucks that put salt on the roads. The salt stops the ice from forming and makes the roads less slippery, and safer, for drivers. However, when it snows a lot, like in a blizzard, the salt doesn't help because there is much more snow than salt. In other words, the temperature of a lot of snow has a larger effect than the salt that we put on the road.

**Like true scientists, we now have to confirm what we learned today by doing some experiments!**

*Figure 3: A Truck Putting Salt on the Icy Roads*
### Activity Worksheet:

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>METHOD &amp; QUESTIONS</th>
<th>OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXPERIMENT 1 - HOW LONG DOES IT TAKE ICE TO MELT?</strong></td>
<td>Make a prediction: ___________ minutes</td>
<td>Write anything cool that you see and don’t want to forget over here!</td>
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<tr>
<td><strong>YOU WILL NEED:</strong></td>
<td><strong>Steps:</strong></td>
<td></td>
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<tr>
<td>o 2 ICE CUBES</td>
<td>- Get an ice cube from your freezer and place it in a glass- as soon as you do this time how long it takes for the ice cube to melt. Make sure not to hold the ice cube for too long!</td>
<td>Time it took for regular ice cube to melt: ___________</td>
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<tr>
<td>o SALT</td>
<td>- Get another ice cube but this time put salt over it once it’s in the class and record how long it takes to melt it.</td>
<td>Time it took for ice cube with salt to melt: ___________</td>
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<tr>
<td><strong>Concluding questions:</strong></td>
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<tr>
<td>1. Why did the ice melt when you took it out of the freezer?</td>
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<td>2. What effect did the salt have on the ice, and why did it have this effect?</td>
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<td>3. List 2 other ways that you could make the ice melt faster</td>
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<tr>
<td><strong>EXPERIMENT 2- WHAT EFFECT DOES SALT HAVE ON ICE PT. 1</strong></td>
<td><strong>Steps:</strong></td>
<td>Write anything cool that you see and don’t want to forget over here!</td>
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<td><strong>YOU WILL NEED:</strong></td>
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<tr>
<td>o PAPER TOWEL</td>
<td>- Get a piece of paper towel and cut it into half. Get an adult to cut for you and make sure that the pieces aren’t too big - about 10cm² is perfect.</td>
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<tr>
<td>o COLD WATER</td>
<td>- On each piece of the paper towel add 1 teaspoon of cold water. Don’t make the paper towel soaking/ dripping wet, only add enough water to dampen it.</td>
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<tr>
<td>o BAKING TRAY/FLAT SURFACE</td>
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<td></td>
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<tr>
<td>o SALT</td>
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</tbody>
</table>
- Place the damp paper towels on a baking tray or any other flat surface you can find
- On one of the pieces sprinkle with salt and use your finger to rub the salt around. Make sure to indicate which sheet has the salt on it
- Put both the sheets into the freezer for 30 minutes
- Take the sheets out and state what you observe (i.e. what happened to the sheet with the salt on it and what happened to the sheet without salt?)

**Concluding Questions:**
1. Why was the paper towel with salt on it still soft?
2. Is there a way we can use this relationship in the real world?

<table>
<thead>
<tr>
<th>EXPERIMENT 3- WHAT EFFECT DOES SALT HAVE ON ICE PT. 2 (OPTIONAL)</th>
<th>LET'S MAKE SOME ICE CREAM!!!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write anything cool that you see and don’t want to forget over here!</td>
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</table>

**Watch this video for some additional information and instructions on how to make ice cream!** (Don’t worry about the temperature measuring part) – [https://www.youtube.com/watch?v=s1CpSrXa1E1](https://www.youtube.com/watch?v=s1CpSrXa1E1)

The equipment and ingredients you will need are:
- ½ cup Milk
- ½ cup whipping cream
- ¼ cup sugar
- ¼ teaspoon vanilla
- 2 cups of ice
- ½-1 cup of kosher salt or rock salt
- Measuring cups and spoons
- Mixing bowl
- 1 Medium Ziploc bag and 1 Large Ziploc bag
- Goggles
- Apron

(this list is from the description of the YouTube video)

Make sure to share with your family and let us know how it tastes!

**Feedback/Discussion**

- What did you learn about temperature today that you didn’t know before?

**Resources used for Experiments:**

https://www.google.com/search?q=salt+and+ice+experiment+worksheet&rlz=1C5CHFA_enCA898CA898&sxsrf=ALEk03ggvDpteQUunBUF_Z9YCYnqTOoH2Sg:1590705019498&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjOm4T9zdfpAhVKejgKHX3cDgQ_AUoAXoECAwQAw&biw=1440&bih=789#imgrc=AKPiicYE2EP9bM

https://www.teacherspayteachers.com/Browse/Search:ice%20cube%20melting%20experiment


https://www.weatherwizkids.com/weather-temperature.htm#:~:text=Temperature%20is%20a%20degree%20of,%2Celsius%20and%20Kelvin%20scales.