



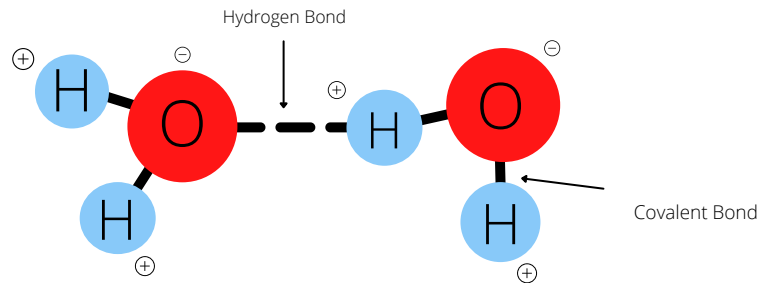
Freezing and Melting



Raccoon Creek Explorers Activity #15

Supplies:

- Snow or Ice (solvent)
- 1 tbsp. Salt (solute)
- 1 tbsp. Sugar (solute)
- 3 clear cups or containers
- Stop Watch
- Freezer



Vocabulary:

Freezing Point: The temperature in which a liquid freezes. The freezing point of water is 32°F or 0°C.

Solutes: A substance dissolved in a solvent to form a solution.

Solvents: A substance that dissolves a solute and is usually a liquid.

Hydrogen Bonds: Primarily an electrostatic force of attraction between a hydrogen atom which is covalently bound to a more electronegative atom.

Covalent bond: A chemical bond that involves the sharing of electron pairs between atoms

Background:

In the winter, it is cold enough that rain starts to fall as snow. Snow and Ice can cover the roads and make it difficult to drive a car. However, we put salt on the roads to stop ice from forming and to melt the snow. Without the salt, the roads would freeze over. Water molecules form when 1 oxygen atom and 2 hydrogen atoms covalently bond together. Water molecules (H₂O) form hydrogen bonds with other water molecules to create a crystal structure as it freezes and turns into solid ice. This occurs at 32°F or 0°C, which is the freezing point of water. When we add salt to the roads it acts as a solute and mixes with water which is a solvent and lowers the freezing point, so the water can't freeze as easily. The dissolved salt blocks the water molecules from forming the hydrogen bonds needed to turn to a solid.

In this experiment we will observe how different solutes effect the freezing point of water.



Let's Get Started:

- 1.) Collect snow in each of the 3 clean containers. If there is no snow on the ground, you can use ice.
- 2.) Add salt to 1 cup of snow/ice and add sugar to another cup. Leave 1 cup of snow/ice without a solute.
- 3.) With a stop watch, time how fast each cup melts.
- 4.) Once they are all melted, put each cup in the freezer and time how long it takes each cup to refreeze if they do.

WARNING: Do not touch the ice with bare hands once the salt is added, this may cause burns on the skin!

Reflect:

What cup of ice melted the fastest? Why?

Which was the last to melt? Why?

Did all the cups refreeze when put in the freezer?

Apply:

What else could be used as a solute to lower the freezing point of water?

Why doesn't the ocean freeze easily, but can form ice near the Arctic?

Why is ice cream or popsicles not as hard as ice when they are in the freezer?

Wrap-Up:

As you have learned, adding a solute to water/ice can cause the freezing point to lower and can cause ice to melt or water to not freeze on winter days. Oceans are also full of salt which can lower the freezing point. However, if it is much colder than the freezing point (32°F/0°C) then water can still freeze, like near the arctic.

