

SALT AND ICE

Name: _____ Date: _____

When the roads or sidewalks get icy, people reach for the same thing they do to flavor their popcorn: salt. That seems strange, right? It seems odd that the substance cooks use to liven up their foods can be used to melt ice, but it works. There's actually a very simple scientific explanation for it.

First, let's look at what happens on the roads during a winter storm. Water freezes at 32°F. When it freezes, it changes to ice. At around 32°, your road or sidewalk looks like ice with a thin layer of water atop it. The molecules in these two layers are constantly interacting. The water melts some of the ice, and the ice freezes some of the water. This happens back and forth, back and forth. At a colder temperature, the ice gains a little more ground. If it's a bit warmer, there's more water in the equation.

Now, add some salt. Put simply, what salt does is lower the freezing point of water. With salt in the mix, the ice can no longer freeze the layer of water at 32°, its usual freezing point. However, the water can still melt the ice. The balance between ice and water shifts. More and more ice turns to water without an increase in air temperature.

Salt has this effect on water's freezing point because it makes it more difficult for water molecules to stay bonded together. When added to water, salt breaks into separate elements, or ions. Since it breaks down into smaller elements, it's more capable of disruption. Imagine opening up your phone or computer and pouring sand in there. Smaller elements can be just as destructive as big ones. They can really get into the works of something. That's just what these salt ions do to water molecules. This is why some cities use special salts that break down to more ions than regular table salt. With more elements scrambling around, there will be a greater the disruption to those water molecules on the roadways.

How does salt help roads and sidewalks during icy conditions?

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Name: _____ Date: _____

Question: Can we create the optimal conditions for frost to form?

Materials:

Empty metal cans

Ice or snow

Salt

Procedures:

1. Remove any sharp edges from the can before giving to children.
2. Fill each can with ice or snow.
3. Slowly start adding salt to the can and shake it gently to get things moving.
4. After several minutes, frost will start to form on the outside of the can.

The Science Behind Frost in a Can

Salt is often used to melt ice on roads and sidewalks during the winter. This is because salt temporarily lowers the freezing point of ice, allowing the ice to melt faster and preventing the water from re-freezing. However, when the salt is surrounded by a large quantity of ice or snow, the water vapor around the can also falls below freezing. This causes frost to form on the outside of the can as a form of icy condensation.

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Using details from the passage and the demonstration information to answer each.

Explain what causes the frost to form on the outside of the can.

If you completed the same demonstration again without salt, would it have an impact on the formation of frost? Explain.

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How does salt help roads and sidewalks during icy conditions?

The salt lowers the freezing point of water, which allows the water to melt the ice.

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Explain what causes the frost to form on the outside of the can.

The melting ice and the salt react to create a cooler temperature below freezing, causing the water vapor to turn to frost.

If you completed the same demonstration again without salt, would it have an impact on the formation of frost? Explain.

Yes, because the salt is needed to cause the water vapor around the can to fall below freezing.

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