

How SALT Melts

Materials Required

Dish of salt (NaCl - sodium chloride)

4 oz. of water (1/4 cup)

16 oz. cup of crushed ice

Thermometer which can reach 0°Fahrenheit

2 tongue depressors

Plastic teaspoon

This experiment was provided by Charles Jones, Ph.D., Principal Scientist, Consumer & Industrial Specialties, Spring House Technical Center, Rohm and Haas.

Procedure

1. Add **4 ounces of water** to a **16 ounce cup of ice**. Stir the mixture with a **tongue depressor** only. **DO NOT STIR WITH A THERMOMETER.**
 2. Insert the **thermometer** into the mixture for at least **one minute**. *This gives the liquid level in the thermometer time to come to rest or stop moving. When this occurs, we say that the thermometer has reached "equilibrium."*
 3. Use the **thermometer** to observe and record the **temperature** of the ice-water mixture.
 4. Add **one LEVEL teaspoon of salt (NaCl)**. **Stir** with the tongue depressor for **two minutes** allowing the salt to dissolve. Observe what happens when the salt is mixed into the ice water mixture.
 5. Wait **one minute**, then use the thermometer to observe and record this temperature, allowing the thermometer to come to equilibrium again. With each subsequent temperature measurement, allow the thermometer to come to equilibrium.
 6. Add **two more LEVEL teaspoons of salt**, stirring with the tongue depressor for **two minutes**. Wait one minute, then observe and record the temperature in the same manner. This makes a total of three teaspoons of salt that were added.
- Repeat this entire procedure again** (total of five teaspoons of salt now). Continue to observe the effect that the salt has on the ice.
7. Now add **three more LEVEL teaspoons of salt** (total of eight now), stirring with the tongue depressor for **two minutes**. Wait one minute, then observe and record the temperature.
 8. Finally, add **two more LEVEL teaspoons of salt**, stirring with the tongue depressor for **two minutes**. Wait one minute, then observe and record the temperature. A total of 10 teaspoons of salt have been added to the ice water mixture.

Questions to consider:

1. What happens to the ice-water mixture when salt is added to this mixture?
2. What happens to the temperature when salt is added to the mixture?
3. What do you think would happen if you added **HEAPING** teaspoons of salt instead of **LEVEL** teaspoons of salt?

(Answers appear upside down at the bottom of the page)



A Really Cool Experiment!



Do you know how salt melts the ice and snow on your sidewalk and on the roadways during winter storms? You may be surprised at the answer! This simple experiment will show you how it works.

Understanding the Science

When you put rock salt, which is sodium chloride (NaCl), on an icy sidewalk or road, it melts the ice. But how? Most people think that salt heats the surface or raises the temperature of the ice, but the reverse is true. Salt actually mixes with water to lower the temperature at the surface of the ice and, at the same time, the salt lowers the point at which water will freeze – the freezing point. The effect of salt on ice is called “freezing point depression.”

How freezing point depression works

When you add salt to water, you introduce dissolved foreign particles (called ‘ions’ by scientists) into the water. The freezing point of water becomes lower as more particles (ions) are added. The ions interfere with the ability of the water molecules to ‘associate’ (hydrogen bond) and consequently, freeze. At some point, because of saturation or temperature (salt does not dissolve well in cold water), the salt stops dissolving and no longer has an effect on the freezing point.

Without salt, the freezing point is 32°F. With salt, ice on a sidewalk or road will melt as long as the temperature is about 10°F or higher; it stops working when the temperature becomes very low. On snow and ice covered roads, the amount of traffic also affects how fast the ice will melt and the temperature at which it will melt.

Where else do you see the effect of salt on ice?

The ocean. You rarely see the ocean freeze because it consists of salt water. Two places on Earth where the ocean does freeze are the Arctic Circle and Antarctica. In these locations, the temperature dips below 10°F — too low for the salt to melt the ice. As a result, ice forms even though salt is present in the water.

Ice cream. When you make ice cream, you can use ice to cool the ingredients. Adding salt to the ice lowers the freezing point and allows the ingredients for ice cream to be “super-cooled” so the ingredients freeze into ice cream.

Watch for an ice cream experiment in the next issue of Eureka!



Morton SAFE-T-SALT® Helps Keep Roads Safe

It’s likely that some of the salt you see on local roads after a winter storm is

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