



SALT & ICE



A yummy winter experiment!

Happy New Year!

Although we have had a mild winter so far this year, let us consider the next time there is snow or ice on our roads and sidewalks. Do you sprinkle salt on your porch and sidewalk? Have you ever traveled behind a snowplow that is spreading salt on the roads? Why do we put salt where we walk and drive? The quick answer is that salt lowers the freezing point of water - it makes the snow or ice melt.

HOW DOES SALT LOWER THE FREEZING POINT OF WATER?

Pure water freezes when water molecules of hydrogen and oxygen bond together to form a crystalline ice structure (32 degrees Fahrenheit). When salt is added, it is more difficult for the molecules to bond. Saltwater has a much lower freezing temperature. The greater the level of salt, the lower the freezing point gets. A salt solution at the point of saturation – the point at which it's not possible to dissolve any more salt in the liquid – reaches the freezing point at minus 6 degrees Fahrenheit. *Sciencing.com*

MATERIALS

- 2 heavy duty Ziploc bags (1 gallon and 1 quart)
- Sugar
- Vanilla or other flavor extract
- Rock salt (regular or kosher salt also works)
- Small bowls
- Towels (to insulate the bags during shaking)
- Spoons
- Whole Milk
- Ice

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Making Ice Cream!

METHOD

1. Place $\frac{1}{2}$ cup milk, $\frac{1}{2}$ tsp vanilla and 1T of sugar in the small Ziploc bag and carefully close it, try to get most of the air out and make sure there are no leaks.
2. Fill the large bag with ice to about $\frac{1}{2}$ the capacity (about 4 cups).
3. Add $\frac{1}{2}$ cup of salt to the ice (not the ice cream!)
4. Place the small bag inside the larger one, zip up the large bag and make sure there are no leaks.
5. Shake the bags until the ice cream freezes. (You will want to wrap the bag with a towel to protect your hands from getting too cold!)
6. Check on the ice cream every couple of minutes. It should start to freeze within a few minutes.

I CAN'T BELIEVE THIS MADE ICE CREAM!

There are a few factors at work to create ice cream in a bag. Firstly, milk consists mostly of water with some proteins and sugars mixed in. If you were to put a glass of milk in the freezer it would freeze solid. Second, as the ice mixes with the salt in the larger Ziploc bag, it creates a saltwater that is actually colder than 32 degrees Fahrenheit. By surrounding the bagged milk with this super cold liquid it allows the milk inside to freeze. Lastly, by mixing or agitating the milk while freezing, it both adds air and breaks the crystalline structures enough so that it does not form a solid shape, but rather a soft, spoon-able treat. Yum!

Tell us how your experiment goes by sharing photos and tagging The Works on social media: **#attheworks** and **#STEMActivity**

HOMEMADE ICE CREAM

If you have ever used a homemade ice cream maker, the same things are happening, just on a larger scale. An ice cream maker is typically two containers stacked inside one another. The inside container holds the liquid ice cream mix as well as a rotating paddle to keep the mixture moving and in continual contact with the frozen sides of the container. The outside container is packed with ice and rock salt. This again creates a saltwater that is colder than the freezing point, which forces the ice cream mixture to freeze. (Ask an older adult if they have ever used an old fashioned ice cream maker with a hand crank – it seems to take forever to get your frozen treat!)

Experiment More

Try another batch but do not use any salt, or try different kinds of salt, or crushed ice instead of cubes. Do any of these changes make the ice cream form faster or not at all?