

ICE CREAM IN A BAG

Have you ever made homemade ice cream? It's super easy and very, very tasty. This activity is all about chemistry, so get ready to learn some cool stuff and then enjoy a delicious, creamy treat! Let's go through the recipe first, then we'll look at the science behind it.

To make ice cream in a bag, you will need:

- 1 cup half and half (that's a mixture of milk and cream but you can use whole milk or heavy whipping cream)
- $\frac{1}{4}$ cup white sugar
- $\frac{1}{2}$ teaspoon vanilla extract
- $\frac{3}{4}$ cup rock or kosher salt (table salt will work but may give slightly different results)
- 2 cups of ice
- 1 gallon size sealable plastic bags
- 1 quart size sealable plastic bags
- Oven mitts or a dish towel
- Timer
- Sprinkles, whipped cream, cherries, chocolate syrup, and/or other favorite toppings
- Bowls or cones, plus spoons and an ice cream scoop for your finished product

(This recipe is for vanilla ice cream. Make chocolate ice cream by using chocolate milk instead of half and half.)

Add the sugar, half and half, and vanilla to the quart size plastic bag. Zip the bag up securely to make sure that nothing leaks out.

Pack the ice and salt into the gallon size plastic bag. Place the sealed quart bag containing the half and half mixture inside the gallon bag of ice and salt. Zip the gallon bag up securely.

Rock the gallon bag from side to side and back and forth. Hold it along the zipped edge while you work so that the ice doesn't freeze your hands. Use the oven mitts or dish towel to protect them from the cold.

Continue to rock the bag for 10-15 minutes or until the half and half mixture inside the quart bag has become solid.

Open the gallon bag and notice how much colder the ice and salt mixture feels than ice does on its own. You can compare it side by side with some additional unsalted ice from your freezer.

Serve your ice cream from the quart bag into bowls or onto cones, add toppings, and enjoy the results of your hard work!

There is a lot of interesting chemistry that goes on while making ice cream. Milk is a liquid, just like water is. Water can exist in three **states of matter**: solid, liquid, gas. Each of these states, has different physical properties. The particles in **liquids** are packed close together with no regular pattern. The particles in **solids** are tightly packed in a regular pattern, and the particles in **gases** are well separated with no regular pattern

Water has a **freezing point** of 32 degrees Fahrenheit (0 degrees Celsius). That's the temperature where water changes from a liquid into a solid and becomes ice.

Salt is a **mineral** made of mostly sodium chloride (NaCl). **Minerals** occur naturally in rocks, sands, and soil. It lowers the freezing point of water and makes the temperature drop. That's why we add "ice melt" products containing salt to our sidewalks in winter. The ice melt mixes with ice and snow on the ground and, because its freezing point is lower than the temperature of unsalted ice, the ice on the sidewalk melts and is much safer for us to walk on.

When making ice cream, the lower temperature of the ice and salt mixture that surrounds the cream and sugar mixture is colder than just the ice would be without salt added. The lower temperature is enough to change the state of the cream from a liquid to a solid.

Congratulations! You just used a mineral to lower the freezing point of a liquid and performed a change of state by turning a liquid into a solid. Well done!

ADDITIONAL RESOURCES:

<https://kids.britannica.com/students/article/ice-cream/275028>

<https://www.pbs.org/food/the-history-kitchen/explore-the-delicious-history-of-ice-cream/>

<https://www.usdairy.com/news-articles/10-incredible-things-you-didnt-know-about-ice-cream>

<https://www.southernliving.com/food/entertaining/homemade-ice-cream-recipes>