What Matters? Ice Cream!

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Change of State: Making Ice Cream is science!

Introduction: Believe it or not, the simple process of making ice cream involves chemistry! Today, you will be making your own ice cream, while toying around with these basic scientific principles.
And yes… you can eat the ice cream!

History of Ice Cream: The origin of ice cream is unknown, though most suspect it was originally discovered by the Roman emperor, Nero. Runners would carry snow and ice from the mountains and he would coat it with fruit and sweet toppings. Others believe ice cream was invented in China and brought to the US and Europe by Marco Polo. It has been changed and modified over the years, with many different recipes and ice cream parlors opening up. It is rumored that George Washington once paid $200 (a whole lotta money back then) for a secret ice cream recipe. In 1846, Nancy Johnson developed and patented the first hand-crank ice cream maker. Eventually, ice cream became commercialized and many new stores and entrepreneurs took advantage of its popularity.

Background Information: Remember what we learned about changing states. Freezing is the change of state when a liquid turns into a solid. Often, a liquid turns into a crystalline solid. In a crystalline solid, the particles are arranged in an orderly fashion. Salt is also called Sodium Chloride, or NaCl. This is because it is made up of 1 sodium atom and 1 chloride atom. When you add salt to ice, something interesting happens. You will be exploring this idea today.

Purpose: After completing this lab, every student will be able to explain the concept of state changes. Also, every student will be able to describe the effects of adding salt to water.

Materials

- 1 gallon-size zip lock bag
- 1 quart-size zip lock bag
- 1 sandwich-size zip lock bag
- 2 cups of ice
- 6 tablespoons of rock salt (NaCl)
- 1 tablespoon of sugar
- 1/2 teaspoon of vanilla
- 1/2 cup of whole milk

Procedure

<u>In the **small** (sandwich-size) bag, mix:</u>

1. 1/2 cup of whole milk
2. 1/2 teaspoon (tsp) of vanilla
3. 1 tablespoon (tbsp) of white sugar
4. Make sure the baggie is sealed TIGHT.
5. Place the small baggie into a **medium** (quart-size) baggie and seal tight.

<u>In the **large** (gallon-size) baggie, add:</u>

6. 2 cups (or 1 party cup) of ice
7. Record the temperature of the ice as best you can.
8. Add 6 tablespoons of rock salt (or one small Dixie cup) to the large baggie and place the sealed small bags in the large bag. Seal tight.
9. Holding the large bag by its seal, roll the baggies back and forth, over and over, until the milk/sugar/vanilla has hardened (may take 5-15 minutes). Please do this on a towel.
10. Once solidified, open bag, measure and record temperature of the ice.
11. Empty the ice into the sink and rinse it down. Throw your large and medium plastic bags in the trash.
12. Add "toppings" if you brought some. Grab a spoon and enjoy results!

Experimental Hypothesis

1. If rock salt is added to the ice, then the temperature change of the ice will be _____°C.
2. After 1 minute of mixing, I predict: _____
3. After 5 min. of mixing, I predict: _____
4. After 10 min. of mixing, I predict: _____

Observations

After 1 minute	
After 5 minutes	
After 10 minutes	

Results

	Temperature (°C)
Before rock salt	
After rock salt	
Change (Before minus After)	

Analysis

1. Why is salt added to the ice? _____
_____
2. What changes did you see and feel after salt was added to the ice? _____
_____
_____
_____
3. How did this affect the ice cream? _____
_____
_____
4. How is this related to state change? _____
_____
_____
5. Why are large crystals of salt (rock salt) used instead of small crystals (table salt)?
_____
_____
_____
6. Real Life: Why is sodium chloride placed on icy patches on highways and on steps in the winter?
_____
_____

Conclusion: What I liked, what I learned (3 sentences), what I would change (5+ sentences)

_____
_____
_____
_____
_____
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