Ice Cream Lab & Application Questions

CLASS SET - DO NOT MARK

Overview

Have you ever wondered what it is about throwing salt on ice that makes it melt? And just why does it melt? Where does the heat come from to melt the water? Why does it freeze again on the road at night? These questions and many more about freezing and thawing will be looked at in this lab.

To start you off though let's talk about how energy flows in any system. When you studied the air and weather you found that things always flow from areas of higher concentration to areas of lower concentration. This automatic transfer of energy and material will always work to balance the amount of energy and material. This is a natural law. From this we can deduce that heat energy will always flow from areas of higher temperature to areas of lower temperature. Knowing this simple rule, let's look at a very tasty application of it.

Materials:

- 2 quart size Ziploc Freezer bags
- 1 pint of whole milk
- 12 ice cubes
- 2 teaspoons of coarse salt
- 1 thermometer
- 2 clean plastic spoons
- ½ teaspoon vanilla extract
- Paper towels
- 3-4 ounce cups for final product

Procedure:

1. Place ice cubes in one Ziploc bag and place thermometer among the cubes. Leave 30 seconds. Record temperature of ice in data table.
2. Place milk in second Ziploc bag and record temperature. Add flavoring and record temperature.
3. Add 2 teaspoons of salt in bag with ice. Seal and shake gently for 30 to 45 seconds. Record temperature of results. Record temperature and observations in the data table.
4. Empty most of air from bag with milk in it. Carefully seal this bag and place it inside the bag with the ice mixture. Seal the outer bag tightly to prevent leaks.
5. Gently shake the sealed baggies back and forth in your hands to make sure that the ice mixture coats the entire surface of the milk bag. Shake for 1 minute and then carefully open the two bags and take the temperature of the inner bag (milk) only. Seal both bags. Keep shaking back and forth for 3 to 10 minutes, recording the milk temperature every minute until a solid product forms. Record final time and temperature.
6. Carefully remove the inner bag and place on paper towels. Wipe salty water from around opening. Open baggie and squeeze solid product into two cups for final test.
7. Taste your product!
8. Be sure to dispose of the ice mixture and left over product as well as spoons and paper towels according to your instructor's directions.
9. Wash your hands and work area before leaving the lab.

Data Chart

Procedure Step	Description	Measurement
1	Temperature of ice in Ziploc bag	
2	Temperature of milk	
3	Temperature of flavor plus milk	
4	Temperature of ice with salt added	
5	Temperature of milk after shaking 1 minute	
6	2 minutes	
7	3 minutes	
8	4 minutes	
9	5 minutes	
10	6 minutes	
11	7 minutes	
12	8 minutes	
13	9 minutes	
14	10 minutes	

Observations:

Analysis & Application Questions

1. What happened shortly after you added the salt to the ice cubes? Was the temperature above or below the freezing temperature for water?

2. What is the only factor that could have caused the changes shown in question 1? What does this tell you about the freezing point temperature of salt water compared to fresh water?

3. Heat energy is needed to change phase from a solid to a liquid. List the possible sources of the heat needed for this phase change in your baggie. Which source do you think is the best possibility and why?

4. In looking at the temperature changes shown on your data table, explain how the energy flow of the baggie system resulted in your tasty treat for an end product. Where is the energy flowing from and where is it going to?

5. In the radiator of your car you put a combination of antifreeze and water to keep your car engine cool in the summer and prevent the radiator from freezing in the winter. Explain how you think this works in terms of what you saw in the experiment you just did.