Cool 'n Creamy

Purpose: To observe the effect of addition of a solute (rock salt) to a solvent (water).

Materials:
- thermometer
- 280 g rock salt
- 2 Ziploc bags - 1 large, 1 small
- hand towel
- ice

Edible Ingredients
- 240 mL milk
- 65 g sugar
- 1 mL flavoring (*see note below)
- 0.3 g salt

Introduction:

Milk is essentially water (an emulsion of butterfat droplets in water with casein as an emulsifier). It is healthy but could use some sweetness and flavor. Let's add some sugar, sweetening and flavoring and put it in the deep freeze and see what happens.

The deep freeze part is easy if you have a freezer but we don't. So let's generate some low temperatures chemically, the way it was done before there were refrigerators and freezers. Let's do it ***chemically!***

Procedure:

A. **WASH YOUR HANDS AND CLEAN YOUR LAB TABLE CAREFULLY!!!**

(Chem lab desks have been contaminated by students using all kinds of toxic chemicals, and since the ingredients and products in this lab are edible, we do not want any of their left over chemicals into our mixture, so keep all your work on the cafeteria tray.)

B. 1. Mix all the above **edible** ingredients in the smaller bag.
2. Zip the bag closed. (**Check the seal!**)

C. 1. Add enough ice to the large bag to half fill it.
2. Take the temperature of the ice and record it in the table on the next page. (Keep the thermometer direct contact with the ice until the temperature stops changing.
3. Add rock salt to the ice in the larger bag by distributing it over the ice surface. Wait at least one minute, and take the temperature again.

C. Put the small bag inside the large bag and seal. Seal it with as little air as possible inside.

D. Make sure the ice bag is ***sealed completely***.

E. Holding each of the corners of the bag, lay the bag down on the lab table and shake/agitate for 10 minutes. Try to keep the inner (edible) bag in as close contact with the salt/ice mixture as possible. (Use towel to protect your hands from the cold as you agitate the larger bag by the corners of the seal.)

F. Unzip the larger bag and take a final temperature reading and record it in the table.

G. Remove the smaller bag** and discard the ice/salt mixture in the sink. **Before** opening the bag, rinse off the top with water so that the salt mixture doesn't get into the ***ice cream*** when you open the bag!

H. Transfer the ice cream to cups being careful to keep salt on the outside of the small bag from contaminating the ice cream. Proceed to eat while you finish writing your lab report.

I. **Clean up! Wipe counter several times to remove any salt!!**

***Note:** use 1 mL for strawberry but less than 1 mL if using pure vanilla!

Data Table:

Temperature of ice (before adding salt)	C*
Temperature of ice/rock salt mixture after 1 minute	C
Temperature of ice/rock salt mixture after 10 minutes of agitation	C

Questions:

1. Do you know anyone who knows how to make ice cream without a freezer? (Or even with one?)

2. When and where was the first ice cream made? (Some questions beg to be answered using the web!)

3. How was ice cream made before electromechanical refrigerators and freezers were available? (Google is a good search engine.)

4. Who made the first refrigerators? When did they become common household appliances?

5. How were the 0 and 100 degree Fahrenheit temperatures chosen? (Of course you know that the freezing and boiling points of water are the 0 and 100 degree points on the Celsius scale.)

6. What phase changes did you observe in the "edible bag" and the rock salt/ice bag?

7. What is the difference between "rock" salt and "table" salt.

8. How did the temperature of the ice change?

9. Why do you think the temperature of the ice/salt mixture changed?

10. Is the ice cream a heterogeneous mixture or a solution? Explain.

11. Does the ice cream freeze at 0 C? Why or why not? (C - Celsius. The term and notation degrees - ^{o}C, is ***not*** acceptable scientific usage.)