Name _____ Period: _____

Title: Colligative Properties Lab - ICE CREAM

Purpose: To investigate the colligative property of freezing point depression through the creation of ice cream

Materials:

1 cup whole milk	2 tablespoons rock salt
2 tablespoons sugar	Plastic bowl
1 teaspoon vanilla extract	Plastic spoon
1 quart Ziploc bag	*Chocolate sprinkles
1 gallon Ziploc bag	*Chocolate syrup
Ice	* Peppermint extract

*optional ingredients

Procedure:

1. Spread newspaper over the work area
2. Fill Ziploc quart bag with sugar and vanilla extract first, followed by the milk. (*peppermint extract may be substituted in lieu of vanilla)
3. Make sure to squeeze as much air as possible out of the bag before sealing. Place aside for later use.
4. Fill gallon bag 1/4 to 1/3 full of ice. Add two tablespoons of rock salt.
5. Place the sealed quart bag INTO the larger gallon bag. Make sure the quart bag is closed securely or else you will have SALTY ice cream!!
6. GENTLY knead the bags so that the ice cream solution is thoroughly mixed as it freezes.
7. Knead the bags for 10 minutes or until the solution reaches "Ice Cream" consistency. It's going to get cold so be careful!
8. When finished, open the gallon bag and remove the quart bag.
9. Rinse the quart bag quickly under cold water to remove any excess rock salt.
10. Transfer your ice cream to a bowl. Top with desired condiments and enjoy!
11. Clean up after yourself!

Data:

Ice Cream Flavor: _____

Sweet or salty? _____

Explanation:

Ice has to absorb energy in order to melt, changing the phase of water from a solid to a liquid. When you use ice to cool the ingredients for ice cream, the energy is absorbed from the ingredients and from the outside environment (like your hands, if you are holding the baggie of ice!). When you add salt to the ice, it lowers the freezing point of the ice, so even more energy has to be absorbed from the environment in order for the ice to melt. This makes the ice colder than it was before, which is how your ice cream freezes. Ideally, you would make your ice cream using 'ice cream salt', which is just salt sold as large crystals instead of the small crystals you see in table salt. The larger crystals take more time to dissolve in the water around the ice, which allows for even cooling of the ice cream.

You could use other types of salt instead of sodium chloride, but you couldn't substitute sugar for the salt because (a) sugar doesn't dissolve well in cold water and (b) sugar doesn't dissolve into multiple particles, like an ionic material such as salt. Compounds that break into two pieces upon dissolving, like NaCl breaks into Na^+ and Cl^-, are better at lowering the freezing point than substances that don't separate into particles because the added particles disrupt the ability of the water to form crystalline ice. The more particles there are, the greater the disruption and the greater the impact on particle-dependent properties (colligative properties) like freezing point depression, boiling point elevation, and osmotic pressure. The salt causes the ice to absorb more energy from the environment (becoming colder), so although it lowers the point at which water will re-freeze into ice, you can't add salt to very cold ice and expect it to freeze your ice cream or de-ice a snowy sidewalk (water has to be present!). This is why NaCl isn't used to de-ice sidewalks in areas that are very cold.

For more information and labs about colligative properties:
http://chemistry.about.com/cs/howtos/a/aa020404a.htm
http://chemistry.about.com/cs/howthingswork/a/aa120703a.htm

Conclusion: Did your lab work? Did you share your ice cream with others or make it for other people? If you did it again what would you do differently? Don’t forget to take pictures or video!