Module 10: Solutions
Topic 5 Application: Ice Cream Scientific Investigation

Before you begin the scientific investigation below, make sure to download the *Ice Cream Scientific Investigation Report*. As you complete this scientific investigation, fill in any needed information on the report template. If you need more information about each section of the report, please visit the Developmental module.

Introduction

Salt is a solute that not only has the ability to raise the boiling point of water, but also has the ability to lower the freezing point of water. This is a very important property because salt is needed in the making of ice-cream. In this application, you will make your own ice cream using your knowledge of colligative properties.

Objectives

In this scientific investigation, you will

- observe how a solute affects the properties of a solvent while by making ice cream

Hypothesis

Using the **Procedure and Data Collection** section below, read through the procedural information for this scientific investigation. Based on your understanding of the procedure, develop your own hypotheses which describe your expected results. You should consider the following question: How will salt affect the temperature of an ice solution used in the making of ice cream? Record these hypotheses in the Hypothesis section of your *Ice Cream Scientific Investigation Report*.

Equipment and Materials

- 1 quart zip seal bag
- 1 gallon zip seal bag
- ½ cup milk
- ½ cup heavy whipping cream
- ¼ cup sugar
- ¼ teaspoon vanilla
- ½ to ¾ cup of sodium chloride (table salt or rock salt)
- 2 cups of ice
- Thermometer

Procedure

1. Add ¼ cup of sugar, ½ cup of milk, ½ cup of whipping cream, and ¼ teaspoon of vanilla to the quartzip seal bag bag. Seal the bag securely.
2. Put 2 cups of ice into the gallon zip seal bag bag.
3. Use a thermometer to measure the temperature of the ice in the gallon bag. Record the measurement in the **Data** section of your *Ice Cream Scientific Investigation Report*. Also, record any observations about the appearance of the ice, salt, and/or ice cream mix.
4. Add ½ to ¾ cup of salt to the bag of ice.
5. Place the sealed quart bag inside of the gallon bag. Seal the bag securely.

6. Gently rock the gallon bag from side to side. It is important during this step that you do not touch the portion of the bag containing the ice. This part of the bag will be very cold. Continue rocking the bag back and forth for ten minutes or until the contents of the bag have solidified into ice cream.
7. Open the gallon bag and use the thermometer to record the temperature of the ice/salt mixture. Record the measurement in the **Data** section of your *Ice Cream Scientific Investigation Report*. Also, record any observations about the appearance of the ice, salt, and/or ice cream mix.
8. Remove the quart bag from the mixture. Using a spoon, serve the ice cream and enjoy!

Data

Use the data table provided on your *Ice Cream Scientific Investigation Report* to record your data from this scientific investigation. The data table is also shown below.

Solution	Temperature	Observations
Ice		
Ice and Salt Solution		

Data Analysis

In the **Data Analysis** section of your *Ice Cream Scientific Investigation Report*, provide the responses to the following questions:

1. Why did you add salt to the ice when making ice cream?
2. Which would lower the freezing point more, 100 moles of sugar or 100 moles of NaCl? Explain your answer.
3. Why must the ice cream be cooled below 0° C before it freezes?

Conclusion

Using the **Conclusion** section of your *Ice Cream Scientific Investigation Report*, compose three to four sentences describing how a solute affects the properties of a solvent. Base your conclusions on your data. Were your hypotheses true or false, and how do you know? Use the data and notes that you collected from your experiment to form your conclusion. Make sure that your include information that your gained from data analysis to support your conclusion.

Experimental Sources of Error

On your *Ice Cream Investigation Report*, provide responses to the following questions: Are there any sources of error? If so, what are they, and what could be done to minimize error?

Once you have completed your *Ice Cream Scientific Investigation Report*, please submit your work to the dropbox.