

Ice Cream

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 Date Created: 1998
 Subject: Chemistry
 Level: All
 Standards: *New York State- Intermediate Science (www.emsc.nysed.gov/ciai/)*
 Standard 1- Analysis, Inquiry and Design
 Standard 4- The Physical Setting
 Standard 6- Interconnectedness: Common Themes
 Standard 7- Interdisciplinary Problem Solving
Schedule: One 40-minute class period

Objectives:

Students will think about the states of matter while observing the temperature at which water, liquid nitrogen, and cream freeze.

Students will:

- Learn about the history of Ice Cream
- Make their own ice cream using liquid nitrogen
- Answer questions about the freezing points of water, liquid nitrogen and cream
- Learn about emulsifiers and stabilizers
- Answer questions about stabilizers
- Review and discuss the concepts learned throughout the activity

Vocabulary:

Stabilizer
Emulsifier
Liquid Nitrogen

Materials:

For Each Pair:
 250mL (1c) cold 18% cream
 75 mL (1/4 c) white sugar
 2 mL (1/2 tsp) vanilla
 Small plastic bowl
 2 Styrofoam cups
 2 stir sticks
 Liquid Nitrogen

For Each Student:
 Safety goggles
 Safety gloves

Safety:

Students should use caution when working with Liquid Nitrogen. Safety equipment should be used when handling this chemical.

Science Content:

I Scream, You Scream, We All Scream for Ice Cream



Marco Polo brought the recipe for ice cream back to Europe when he went to China in 1295. The original recipe didn't have cream in it. It was a water ice, made with fruit juice, sugar and water, the same way ices are made today. Cream didn't get into the recipe until 300 years later in France.

You can guess some of the major ingredients in ice cream - cream, milk, sugar, and flavoring - but you'd probably never think of one of the most important ones - plain, unflavored, uncolored air.

Air is stirred into ice cream as it freezes. Without air, eating ice cream would be like chewing milky ice cubes. But you can have too much of a good thing. The more air ice cream has, the fluffier and warmer it seems (warmer because it contains less of the ice and icy liquid that makes you feel the coldness). Some ice creams, usually the cheaper varieties, have as much air in them as the other ingredients put together.

For most of its history, ice cream was homemade in a bucket or other container and the stirring was done by hand. Follow the instructions below to make your own brand of ice cream.

Preparation:

1. Photocopy print materials (*Activity Sheets 1 and 2*) for each student pair.
2. Distribute materials evenly to each student pair.



Classroom Procedure:

Engage (Time: 5 mins)

Ask students what they know about the history of ice cream or how it is made. Discuss the information outlined in the Science Content section with the students.

Explore (Time: 20 mins)

Distribute all materials including print materials (Activity Sheets 1 and 2). Allow the student pairs to begin making their ice cream. (Note: For younger grade levels, demonstrate how to make the ice cream and help them along as they make their own. For older grade levels, let them follow the directions on the activity sheets.)

Explain (Time: 15 mins)

Encourage discussion within each group as students complete Activity Sheets 1 and 2. Have students present their answers to the class, and answer any questions students may have regarding emulsifiers and stabilizers.



Assessment:

The following rubric can be used to assess students during each part of the activity. The term “expectations” here refers to the content, process and attitudinal goals for this activity. Evidence for understanding may be in the form of oral as well as written communication, both with the teacher as well as observed communication with other students. Specifics are listed in the table below.

- 1= exceeds expectations
- 2= meets expectations consistently
- 3= meets expectations occasionally
- 4= not meeting expectations

	Engage	Explore	Explain
1	Shows leadership in the discussion and shows a good understanding of the chemistry behind ice cream.	Completes work accurately while providing an explanation for what is observed. Works very well with partner.	Provides an in-depth explanation of findings. Fills out worksheet clearly.
2	Participates in the discussion, shows some understanding of the science at work.	Completes work accurately and works cooperatively with partner.	Provides clear explanation of findings. Fills out worksheet clearly.
3	Contributes to the discussion, but shows little understanding of the science behind ice cream.	Works cooperatively with partner, but makes some mistakes with the procedure.	Provides a limited explanation of findings. Fills out some of the worksheet.
4	Does not participate in discussion, shows no understanding.	Has trouble working with partner. Does little to complete the procedure.	Is not clear in explanation of findings. Does not fill out worksheet.

Extension Activities:

- Students should add different toppings to make different ice cream flavors!

Safety:

- Students should use caution when handling liquid nitrogen. Proper equipment, such as safety goggles and gloves, should be worn when working with this chemical.

