

Ice cream Shake

Activity 1

Making ice cream is a fun way for kids to explore liquids and solids. In this activity, kids learn about the effects of heating and cooling as they change liquid cream into solid ice cream. Yummm!

Prepare Ahead

- Set up a *mixing* station with the cups pre-filled with $\frac{1}{2}$ cup half-and-half (referred to as “cream” in the activity), spoons, quart-size bags, vanilla, sugar, and measuring spoons.
- Set up a *freezing* station with gallon-size bags, ice, salt, and measuring cups for salt and ice.

Lead the Activity

- 1 Introduce Ruff's challenge.** (5 minutes)
Tell kids that today's challenge is to turn liquid cream into solid ice cream. Ask:
 - How is a solid different from a liquid? (*A solid keeps its shape. A liquid takes the shape of its container.*)
 - What needs to happen for cream to turn into a solid? (*It needs to freeze.*)
- 2 Make predictions.** (5 minutes) Tell kids they will use ice to chill the cream. Have them predict what will happen to the ice and to the cream as they make ice cream. Record these predictions on the board or a chart to discuss later.
- 3 Test predictions by making ice cream.** (20 minutes) Organize the group into pairs. Distribute the activity sheets. Tell pairs to follow the directions on the sheet. During the activity, ask questions to help kids notice what's happening inside the bags.
 - How does the cream feel as time passes?
 - What's happening to the ice cubes?
 - Compared to the ice, the cream is warm. What's happening to the cream's temperature?

Materials

- Activity sheet for each kid
- Half-and-half ($\frac{1}{2}$ cup per pair)
- 1 bottle vanilla extract
- 1 pound sugar
- 1 box quart-size zip-lock bags
- 1 box gallon-size zip-lock bags
- 1 pound salt (table, kosher, or rock)
- Ice (an 8-pound bag is enough for six pairs)
- 50 8-ounce cups
- Measuring cups (1 cup, $\frac{1}{2}$ cup, $\frac{1}{4}$ cup)
- 3 teaspoons and 3 tablespoons
- Cooler (to store ice)
- Paper towels
- Scissors
- Spoons (for tasting)
- Cups or bowls (for tasting)

National Science Education Standards

Grades K-4

Physical Science: Properties of objects and materials

Grades 5-8

Physical Science: Transfer of energy



4 Taste the ice cream. (10 minutes) Gather as a group once everyone's cream has turned into ice cream. Make sure kids wipe the salty water off the outside of their small bags. Seal the large bags so the ice won't leak out, and put them aside. Hand out scissors, spoons, and cups or bowls. Have each pair cut a corner off the small bag and squeeze out two servings. Then, have them taste their ice cream. Ask:



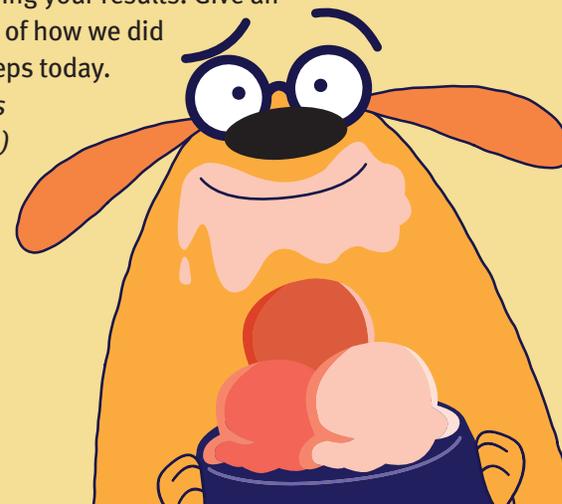
- How would you describe the texture of your ice cream?
- Would you want to add more or less of any ingredient?

5 Discuss what happened. (10 minutes) Review the predictions and see if they match what happened (e.g., ice would melt and the cream would freeze). Now is a good time to talk to kids about melting and freezing. Kids may say that the ice “gave” its coldness to the cream. What really happened is more like the cream “gave” its heat to the ice. Tell kids that for ice to melt, it needs to take in heat energy. For cream to freeze, it needs to lower its temperature by losing heat energy. (See *Chew on This!* for more details.) Ask:

- Melting and freezing can happen only when heat energy is transferred. Where did the cream's heat energy go? (*To the ice*)
- Where did the heat energy that melted the ice come from? (*From the cream, people's hands, and the room*)

6 Award points. (10 minutes) Time to rack up some points. Gather as a group. Review the activity's key ideas by asking the following questions. Each one is worth 50 points. Whenever you hear an acceptable answer, award 50 points to the entire group.

- What words do people use when something turns from a solid into a liquid (*melting*) and from a liquid into a solid (*freezing*)?
- Why did heat energy move from the cream to the ice? (*Heat energy moves from places with more heat energy to places with less. So, heat energy flowed from the cream to the ice.*)
- Name at least two things that got colder as you made ice cream. (*Anything that came in contact with the ice, including the cream mixture, the air around the bags, and kids' hands*)
- What would you have to do to make your ice cream firmer than it already is? (*Lower its temperature even more by putting it in a freezer or by continuing to shake the bag.*)
- Doing science involves making predictions, testing them (which includes doing something, making observations, and drawing conclusions), and sharing your results. Give an example of how we did these steps today. (*Answers will vary.*)



Activity Tips

- Ask if anyone is allergic to the ingredients used today. If so, make sure they are not exposed to the ingredients. Seek alternatives, such as soy milk.
- The noise level will get high as kids start shaking their bags. Establish a signal, such as flashing the lights on and off, to get their attention.
- To avoid spills, have kids mix everything in the cups and then pour the mixture into their bags.
- Stock extra bags in case bags rip during the shaking process.
- The bags get very cold. Have kids think of creative ways to protect their hands during the shaking stage (e.g., wrapping the bag in a sweater or passing it gently between partners).

Why the Salt?

Kids may ask why they used salt. Salt helps ice absorb more heat energy than it would without salt. And absorbing more heat energy means removing more heat from the surrounding environment. So, while cream that's next to ice (without salt) gets cold, the cream that's next to a mixture of ice and salt gets very cold. And, it has to be very cold to freeze cream. Another way to say this is that the cream needs to lose a lot of heat energy to freeze. Kids added salt to make sure the ice would draw enough heat energy out of the cream to freeze it.



Ice cream Shake



Okay, let's shake things up and turn a liquid into a solid. If you succeed, you'll have a tasty treat to enjoy at the end. Yummm!

What to DO

1 get what you need.

- ½ cup cream
- 1 tablespoon sugar
- 1 teaspoon vanilla
- Quart-size zip-lock bag
- Gallon-size zip-lock bag
- 2 cups ice
- ¼ cup salt
- Paper towels
- Cups/bowls and spoons (for tasting)

2 Mix the ingredients. Put the cream, sugar, and vanilla into the small bag. Squeeze out any extra air and zip the bag closed. Check it twice to make sure it's completely sealed.

3 Add ice. Put the small bag into the big bag. Add the ice and salt to the big bag. Then seal the big bag tightly.

4 Shake the mixture. Gently shake the bags for about 10 minutes or until the cream feels solid. What changes do you notice in the cream as you shake? What is happening to the ice and salt mixture?

5 Taste the results. When the cream feels solid, remove the small bag. Dry the outside of it with paper towels so the salty water doesn't get in your ice cream. Cut the corner off your bag. Squeeze the ice cream into cups or bowls. Enjoy!



Heat energy flows from the cream to the ice, cooling the cream and melting the ice.

Chew on This!

Cold doesn't exist by itself. Cold just means there's less heat energy around. Take a cold room, for example. It's cold because it doesn't contain a lot of heat energy. Some of its heat energy escaped!

To make ice cream, you must remove heat energy from the cream. That's why you use ice. Heat energy moves from places with more heat energy to places with less. So, heat energy flows from the cream to the ice, cooling the cream and melting the ice. Once the cream loses enough heat energy, it freezes and becomes a solid. Once the ice gains enough heat energy, it melts and becomes a liquid.

Dig Deeper

- * Find examples of freezing and melting. Look for things like food freezing or thawing or ice forming or melting. Decide in which direction the heat energy is moving.
- * Put half a cup of the cream mixture into the freezer. Don't shake it. When it's frozen, how does its texture compare to the ice cream you made in the bag?
- * Fill two cups with ice and water. Take the temperature with a thermometer. Is it the same? Add two tablespoons of salt to one of the cups and mix. After five minutes, measure the temperature in both cups again. Is it the same? If not, which is colder?
- * Build your own cooler and see how long it keeps an ice cube frozen. Get the Keep-a-Cube challenge from the ZOOM Web site at pbskids.org/zoom/activities.



Watch FETCH! on PBS KIDS GO! (check local listings) and visit the FETCH! Web site at pbskidsgo.org/fetch.

This is some MIGHTY fine ice cream! I wonder if I can sell this stuff. Make a little cash?



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Fold.

Fetch!

Ice cream Shake

Hey there! It's me, your favorite canine game show host—Ruff Ruffman! Did you know that I am a whiz in the kitchen? Yes, it's true. I make an awesome smoothie in the blender (oops—forgot the lid there). But enough about me. Today, your challenge is to make ice cream without any help from machines—no blenders, no freezers, just your sheer determination and a whole lotta shaking!

COOO
FETCH!

