



Learning, Leading, Living

Freeze It!

A 4-H Adventure in Thermodynamics and Energy Flow

Mission Mandate/ Project

Connection:

Science and Technology/Foods and Nutrition

Topic:

Energy flow

Life Skills:

Learning to Learn

Audience:

4-H youth of all ages

Length:

20 minutes

Materials Needed:

- Single-serving flavored coffee creamers (one per participant)
- Containers with tight lids
- Rock salt (regular will work in a pinch)
- Ice cubes

Sources:

A special thanks to Southern Line 4-H'ers, Kolin Farrar and Amber Farrar for teaching us how to make creamer ice cream.

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Background

Here's all you need to know to understand about ice cream and how it is made. First:

Heat (or more accurately, energy) flows from a warmer object to a cooler one.

So, if you have ice and cream, the CREAM is the warmer object and ICE is the cooler object. Your energy (or heat flow) is going to look like this:

CREAM $\xrightarrow{\text{Energy}}$ ICE

And the cream will get colder as it loses heat and the ice will get warmer as it absorbs heat (and it will start to melt).

GREAT! The cream is getting colder and is approaching 32 degrees, but cream won't freeze at 32 degrees like water does, because it has a lower freezing point than water. Now if we could only make the ice COLDER (so it can pull more heat from the cream), we could freeze the cream!

Here's the other thing you should know:

Salt can be used to lower the freezing point of ice.

GREAT! Now we know how to make "super-cold" ice, so we can now freeze that cream, whose heat keeps flowing over to the ice, and with a little bit of shaking to add air and transfer energy and ... presto! It's ice cream.

WHAT TO DO

Discuss

Ask youth to think about what happens when they put an ice cube in a glass of warm soda. Answers may include: ice melts, the soda gets a little cooler.

Share that the heat is moving from a warmer object to a cooler object, so



that's why the ice melts (gains heat) and the soda (in losing heat) becomes cooler.

Display the first two ingredients (ice and creamer) and ask for predictions to explain what might happen if the two of them are put in the same container. (Answer: If we just used ice and creamer, we would have a milkshake-y treat because ice freezes at 32 degrees and at 32 degrees cream is just slushy, not frozen. Creamer will have a lower freezing point than water because of the solids in it.)

In order for the creamer to freeze, it has to become colder than the ice is right now. The only way to do that is to make the ice even colder than it normally is. How might we do that? (The secret weapon is SALT which lowers the freezing point of ice and makes it SUPER ice – ice with a lower freezing point than normal ice.)

Do the activity

Each youth will need the following:

- A flavored creamer (DON'T TAKE THE LID OFF -- Leave the creamer sealed!)
- A small container with a tight lid
- Ice cube
- Rock salt (2 - 3 tablespoons per container)
- Water, enough for ice movement

Have each youth fill their container with the above ingredients, layering ice and salt, and putting creamer in middle. Fill container half full with water. Secure lid and begin shaking. Shake for a few minutes. Retrieve creamer container, wipe the salt off the container lid, open and eat!

TALK IT OVER:

Reflect:

- As the creamer lost heat (energy), what happened to the creamer?
- How do you know that the creamer lost heat?

Apply:

- How about you? Can you lose heat? What happens to you if you sit on the damp ground?

ENCOURAGING YOUTH LEADERSHIP

Have youth leaders oversee the ice cream making process and encourage youth members.

ENHANCE OR SIMPLIFY

To simplify for younger children, only use the ice cube in the warm soda example and then start shaking the creamer!



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