

Ice Cream in a Bag

Suggested Age / Grade Level	Curriculum Covered	Duration
Grade 3 - 8 (8 - 13 years old)	<ul style="list-style-type: none">- Three states of matter- Phase transitions- Freezing point depression	1 hour

Overview

Campers will review the three states of matter and phase transitions, and will go in depth on how their molecules behave. They will then apply their understanding of the three states of matter and their molecular behaviour to the concept of freezing point depression. For the activity, campers will make their own ice cream by hand to demonstrate freezing point depression and to see the phase transition from a solid to a liquid.

Learning goals

- Review the three states of matter and phase transitions
- Understand the interaction and movement of molecules in solid state, liquid state and gaseous state
- Freezing point depression

Materials

- 1 cup milk of choice (example: regular milk, almond milk, coconut milk, soy milk, cashew milk)
- 2 tablespoon sugar
- 1.5 teaspoon of vanilla extract
- 1/4 cup salt
- 3-4 cups of ice
- 1 small ziplock (sandwich bag size)
- 1 large ziplock
- A cup (to hold smaller ziplock bag)

Instructions for Ice Cream in a Bag

1. Place the small ziplock bag into a cup. This will help when adding the ingredients
2. Pour in milk, sugar and vanilla extract into the small ziplock bag. Seal it tightly.
Optional: double up on the small ziplock bag to prevent losing ingredients if original ziplock bag does rip
3. Place ice into the large ziplock bag and add salt
4. Take the ziplock bag with the milk, sugar and vanilla extract and place it into the large ziplock bag with the ice and salt. Seal the large ziplock bag tightly.
5. Shake the bag for 15-20 minutes. **Tip:** wrap the ziplock bag with a kitchen towel so youth and won't hurt from how cold it will get.

Key Terms

Matter: anything that has a mass and takes up space

Kinetic Energy: the energy of movement

Phase Transition: the change from one state of matter to another state of matter

Freezing Point Depression: a phenomenon where if you add a solute (like salt) to water, it lowers the freezing point of the overall solution.

Lesson Summary

- Matter in the solid state has a fixed volume and shape. Molecules are closely packed together.
- Liquids do not have a fixed shape but they do have a fixed volume. Molecules are packed closely together but not as closely as molecules of a solid
- Gases do not have a fixed shape or a fixed volume. Molecules are very far apart
- Molecules in any state are always in motion; they have kinetic energy. Solids have the least amount of kinetic energy, gases have the most amount of kinetic energy.
- Phase transition occurs when the amount of pressure or temperature increases or decreases.
- Increase of kinetic energy in a solid results in a liquid. Removal of kinetic energy in a liquid results in a solid.
- Increasing kinetic energy of a liquid results in a gas. Removal of kinetic energy of a gas results in a liquid.
- If you take pure liquid water and freeze it, you remove its kinetic energy. The result is frozen water, where all the water molecules are closely packed together.
- However if you add table salt (NaCl) to the water and try to freeze, the salt molecules get in the way of water molecules so the water molecules are not able to be closely packed together.
- For salt and water to freeze together, the temperature must be even colder. This is an example of freezing point depression.