



**Grade Level:** K - 3

**Essential Skills:** 1, 5, 9

**NGSS:** 2-PS1-1

**Math:** MP.2, MD.5.C.3

**Time:** 1 class period

**Materials:**

Makes about 3 cups:

- 1 cup whole milk
- 1 cup half & half
- 1/2 cup sugar
- 1/2 tsp. vanilla
- 1 quart-size plastic bag
- 1 gallon-size plastic bag
- 3/4 cup rock salt
- crushed ice

Hand towels, duct tape, measuring cups and spoons, cups and spoons for tasting ice cream.

**Optional:** Peppermint oil (add 2 drops); or chocolate or strawberry milk instead of whole milk. If using this option, reduce sugar to 1/3 cup.

**AITC Library Resources:**

Check out these materials online at AITC's Lending Library:

**Books:**

- Alison Investigates: Does Chocolate Milk Come From Brown Cows?*
- Dairy on my Plate*
- Moo to You*
- Four Quarts Makes a Gallon*
- Make Mine Milk*
- My Cows*

**Instructional Unit:** *Science in your Food Supply*

**More Activities:** *Phase Changes of Cream into Butter, Pumpkin Math and Science*

# Lesson to Grow

## Physical Changes of Matter & Ice Cream

**Description:**

This lesson is a delicious way to teach students about one type of physical change that matter can undergo - liquids transforming into a solid. The extension possibilities for this lesson are nearly endless. You could explore the history of ice cream, math of the reaction, or run a relay holding the bag to keep the ingredients shaking. No matter what happens, this is a lesson students will remember.



**Set the Stage:**

Before you begin, instruct students on the physical changes of matter. In this lesson, the milk (liquid) will be converted into ice cream (solid) with the help of the ice and rock salt. Shaking the milk mixture with rock salt lowers the temperature of the ice, 'supercooling' it and making it possible for the milk to form into ice cream. The ice cream (solid) will convert back into milk (liquid) as it warms up to room temperature. A physical change of matter does not produce a new substance. Changes in state or phase (melting, freezing, vaporization, condensation, sublimation) are physical changes. Idea: Compare this to the phase changes that happen in the AITC lesson [Phase Change of Cream into Butter](#).

**Directions:**

- 1) Divide the class into groups and provide each with ingredients for making 3 cups of ice cream. Have them hypothesize and record how shaking the mixture will make ice cream.
- 2) Have students measure the first four ingredients and place them in a quart-size plastic bag. Seal the bag and tape over the opening (duct tape works well). Taping shut the quart bag keeps the rock salt from getting into the ice cream.
- 3) Place the quart bag inside a gallon bag then pack crushed ice around it. Pour at least  $\frac{3}{4}$  cup of rock salt evenly over the ice. Close the gallon bag, removing as much air as possible. Have students hypothesize about what will happen to the liquid mixture once they start shaking it.
- 5) Wrap a towel around the bag. Have the students take turns shaking the ingredients for 5-10 minutes. Open the outer bag. Remove the inner bag containing the ingredients.
- 6) If it is still soupy after 10 minutes, the temperature may not be cold enough. Drain excess water, add more ice and rock salt, and shake the mixture for about 5 minutes more or until it becomes firm. Scoop out ice cream into small cups and enjoy.

**Extension Activities:** Your class can explore the history of ice cream and dairy products, and delve into the chemistry of ice, salt and exothermic reactions. Hypothesize what would happen if you make the recipe without using rock salt to cool the ice?

**What does the salt do?** Just like we use salt on icy roads in the winter, salt mixed with ice in this case also causes the ice to melt. When salt comes into contact with ice, the freezing point of the ice is lowered. Water will normally freeze at 32 degrees F. A 10% salt solution freezes at 20 degrees F, and a 20% solution freezes at 2 degrees F. By lowering the temperature at which ice is frozen, we are able to create an environment in which the milk mixture can freeze at a temperature below 32 degrees F into ice cream.