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States of Matter: Ice Cream Science

Grade Level: 3rd

North Carolina Essential Standard: 3.P.2 Understand the structure and properties of matter before and after they undergo a change.

Time: 30-45 minutes

Background:

In a previous lesson, students learned about the properties of the different states of matter (i.e. solid, liquid, gas). Additionally, this ice cream activity is a follow-up to the butter making activity (see https://gk12.uncg.edu/curriculum/docs/States_of_Matter_2014.pdf). During the butter activity, the students learned how force (shaking) can turn a liquid (heavy whipping cream) into a solid (butter).

In contrast, the ice cream activity will show students how lowering the temperature (freezing) causes a liquid (half and half) to become a solid (ice cream). Freezing occurs when the molecules of a liquid slow down enough that their attractions cause them to arrange themselves into fixed positions as a solid. During the ice cream activity, salt is added to the ice which lowers the freezing point of the ice. Salt mixed with ice causes the ice to melt. Heat must be absorbed by the ice for it to melt. The heat that causes the melting comes from the surroundings (the warmer half and half mixture). By lowering the temperature at which ice is frozen, students are able to create an environment in which the cream mixture can freeze into ice cream.

Materials:

- Ice cubes (enough to fill half of a gallon-size ziplock)
- 1 cup half and half
- 1/2 cup salt (big granules such as Kosher or rock salt)
- 2 tablespoons sugar
- 1 pint-size ziplock bag
- 1 quart-size ziplock bag
- 1 gallon-size ziplock bag
- Flavor
 - Vanilla - 1/2 teaspoon vanilla extract
 - Mint - 1/2 teaspoon mint extract
 - Chocolate – 1 tablespoon chocolate syrup
 - Strawberry - 1 tablespoon strawberry syrup\
- Mix-ins
 - Sprinkles

- Chocolate chips

Serves 1

Instructions:

1. Combine the sugar, half and half, and flavor in the pint-size bag. Seal it up, getting rid of as much air as you can. Now double bag it inside a quart-size bag.
2. Place the salt and ice in the gallon-size bag. Then place the sealed quart-size bag inside as well. Seal the gallon-size bag. Wrap the bag in a tea towel, or use gloves. Now shake the bags until the mixture hardens (about 5-10 minutes). Feel the small bag to determine when it's done.
3. Take the smaller bag out of the larger one, add mix-ins, and eat the ice cream right out of the bag. When you remove the smaller bag, wipe it down carefully to get rid of all the salt on the outside.

Assessment:

After this activity, the students should be able to answer the following questions.

1. What state of matter was in the pint bag at the beginning? How do you know?
2. What state of matter did you end up with after shaking? How do you know?
3. How was this experiment similar to the butter experiment? How was it different?
4. Why did this experiment work for some students and not others? *During this activity, some of the students may not have enough ice in their bag. If this happens, their ice cream will not form.*

