

Fizzy Melting Snowman

Target Grade: Grades 5-8, or used as introduction for younger students

Time Required: 15 minutes

Standards/Topics Covered:

NGSS Standards

- 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- MS-PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Central Focus:

In this activity, students will build an indoor snowman and see how it can still “melt” with the help of chemical reactions rather than a temperature increase. The activity could be used as a discussion starter for lesson on acids, bases, chemical reactions, acid/base reactions, and decomposition reactions.

Background Information:

A chemical reaction is a process in which substances undergo a chemical change to form a different substance. Mixing baking soda and vinegar will create a chemical reaction because one is an acid and the other a base. Baking soda is a basic compound called sodium bicarbonate while vinegar is a diluted solution that contains acetic acid (95% water, 5% acetic acid).

There are two separate types of reactions taking place when mixing baking soda and vinegar. The first is called an acid-base reaction. When the two substances are mixed together, hydrogen ions in the vinegar react with the sodium and bicarbonate ions in the baking soda. This initial reaction results in two new chemicals: carbonic acid and sodium acetate.

A decomposition reaction is the second reaction that occurs. The first reaction created carbonic acid which immediately begins to decompose into water and releases carbon dioxide gas (CO₂). The CO₂ rises to the top of the mixture and creates the bubbles that are a hallmark of the baking soda and vinegar reaction.

Melting a traditional snowman involves an increase in temperature which causes the snow, which is water in a solid state to undergo a phase transition to become liquid water. Melting is a physical reaction where this activity demonstrates a chemical reaction.

ORAU Activity

Materials

- 2 cups of baking soda
- 2 tablespoons of salt
- Clear hand soap
- 4 tablespoons of water
- Mixing Bowl
- Spoon
- Eyes (paper scraps from a hole punch, cheerios, etc.)
- Nose (single shredded carrot sliver, paper triangle, etc.)
- Arms (sticks, pipe cleaners, etc.)
- Other decorations like a miniature hat and scarf
- Bottle of white vinegar
- Tray, bowl, or dish to stand snowman in

Instructions

- Mix the baking soda and salt with the spoon in the mixing bowl until well combined.
- Add a squirt of clear hand soap to the baking soda mixture and stir again with the spoon. Small white balls will start to form on the surface of the mixture. The soap helps to give the mixture a good consistency when the water is added.
- Add the water a little at a time, continuing to stir it in. The powder will thicken and start to bind together. The mixture should resemble the texture of snow, a little firm but not too wet.
- Build a snowman with the mixture using one or two balls of snow for the body and a smaller ball for the head.
- Decorate the snowman by giving him eyes, a nose, arms, a hat, a scarf, etc.
- Place the snowman in the middle of the tray, ensuring the sides of the tray are high enough to hold the vinegar, once it is poured in.
- Slowly pour the vinegar over the top of the snowman and observe what happens.



This snowman was made with gold glitter mixed in with the baking soda.

Closure

1. What did you see happen to the snowman as the vinegar was poured on it? Why?
The snowman “melted” as the vinegar was poured on top because combining the baking soda with vinegar caused a chemical reaction.
2. What did you hear as the vinegar was poured on the snowman? Why?
The reaction produced a gas and could be both heard and seen in the form of bubbles. In the decomposition reaction of the carbonic acid, carbon dioxide was released as a product. The bubbling was the release of CO₂.
3. Is there still vinegar and baking soda in the tray now? Why or why not?
Possibly, but there is not enough of both of them continuing the reaction to be visible by the naked eye. Once stirred at the end, if no more bubbling occurs, then there is not enough of at least one of the reactants to continue the reaction.