

Mr. Freeze

The Action

An endothermic reaction will cause a flask to freeze to a block of wood.

Grade Level

Grade 6 - Chemicals and Reactions

Grade 7 - Temperature and Heat

Grade 8 - Energy Resources in Saskatchewan

Grade 10 - Physical Science and Chemical Change

Materials

- 32g barium hydroxide crystals, $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$
- 16g ammonium thiocyanate, NH_4SCN
- 150 mL flask
- (digital) scale and 2 small beakers for weighing chemicals
- water
- pipette or eye dropper
- wood block
- oven mitt

Instructions

- Make a small pool of water (~1-2 mL) on top of the wood block. Add barium hydroxide and ammonium thiocyanate in a 150 mL flask. Stopper the flask and shake vigorously until the crystals begin to liquefy.
- Place the flask on the pool of water on the wood block and allow to stand for a few minutes. Pick up the flask and the wood block will also be lifted because the water will have frozen the flask to the wood.

Safety

Care should be taken with handling and disposing of the chemicals. Eye protection is suggested. The flask also becomes very cold to the touch as a result of the reaction so using the oven mitt is recommended to keep your hand from getting too cold.

Hints

The barium hydroxide and ammonium thiocyanate should be measured prior to the demonstration. Let the flask sit in the water on the block for at least 3 minutes prior to the demonstration. Let the flask sit in the water on the block for at least 3 minutes to ensure the water "freezes".

Science Principle

The water and crystals are initially at room temperature. Heat energy was transferred from the water to the materials in the flask, increasing their internal energy. This is therefore an example of an endothermic reaction.