

Name: _____

Date: _____

What Makes the Best Hand Warmer?

Hand warmers can be slipped inside mitts to help combat cold conditions. One design has water on one side and on another side, a substance that dissolves in the water when the packet is squeezed. In this investigation, the class will determine which chemical, when dissolved in water, would make the most effective compound of a hand warmer.

Question

Which chemical makes the best component for a hand warmer?

Procedure

1. Your teacher will assign your group the chemicals to test. Design a procedure that identifies which of them, when dissolved in water, will make the most effective hand warmer. Your design should include the following considerations:
 - a. How quickly does the temperature change?
 - b. What is the maximum temperature that should be reached to ensure that the skin is not harmed?
 - c. What volume is needed?
 - d. How expensive is it?
 - e. How safe is it for the person as well as the environment?
2. Write out the procedure for how you will test the chemicals. Include all safety precautions you will take, as well as close-up and disposal instructions.
3. Have your teacher approve your procedure before proceeding.

Process and Analyze

1. What criteria did you use to assess which chemical was best?
2. Summarize your data in a table.

Conclude and Communicate

1. As a class, share your results. Which chemical was identified as the most suitable for a hand warmer, and what was the rationale.
2. Identify each process you studied as exothermic and endothermic. Explain your answer.
3. Find out more about why the dissolving of ionic compounds in water can be exothermic or endothermic processes.

Safety

- Wear safety goggles, gloves, and a lab coat or apron.
- Handle chemicals safely. Avoid touching all reactants and products.
- Wash your hands thoroughly after completing this investigation.

What You Need

- Test tubes or beakers
- Thermometer
- Water
- Calcium chloride
- Ammonium chloride
- Sodium chloride
- Other compounds your teacher may provide