# Ice Melting Blocks

Temperature and Heat

## Introduction

Discrepant event shows that heat and temperature are different, and that conductivity matters!

## Concepts

- Heat versus temperature
- Thermal conductivity

## Materials

"Ice Melting Blocks" product

Ice cubes

Digital thermometer (optional)

## *Safety Precautions*

*Although this activity is considered nonhazardous, please follow all normal classroom or laboratory safety guidelines.*

## Procedure

1. Obtain the Ice Melting Blocks product. Note that there are two identical-looking blocks. Touch the blocks—one feels cold to the touch, the other feels warm.
2. *(Optional)* Measure the surface temperature of each block using a digital thermometer. The temperature of both blocks should be the same, at or near ambient room temperature.
3. Discuss the difference between heat and temperature. Although the blocks have the same temperature, one block absorbs or transfers heat from its surroundings more readily than the other. This block feels cold to the touch because it absorbs heat from our bodies.
4. Place one or two ice cubes on each block. Observe whether the ice cubes melt.
5. The result is unexpected. The ice cubes on the "cold" block quickly melt, much faster than the ice cubes on the "warm" block.
6. Melting ice is an endothermic process—it requires heat. Where is the heat coming from to melt the ice? The "cold" block is a heat conductor and easily transfers heat energy to the ice cubes to melt the ice.
7. What do we call something that can be used to keep something cold or hot for a long period? An insulator will not easily lose heat to its surroundings. The "warm" block is an insulator and does not provide the heat needed to melt the ice cubes.
8. Discuss the principle of thermal conductivity, which is a characteristic physical property of a substance.

## Disposal

None required.



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## Tips

- Students often mistakenly assume that heat and temperature are the same thing. Part of the confusion stems from our common usage of the terms hot and cold. A drop of water from a boiling tea kettle and a cup of hot tea may be at the same temperature. They differ, however, in their heat content. The "Colorful Heat" activity in the Heat and Temperature eLearning product provides another good way to differentiate between these core concepts in thermodynamics.
- Ice Melting Blocks are a product of Transparent Devices, founded by a retired teacher to provide educational physical science products.

## Discussion

The "cold" block is made of aluminum, which has one of the highest thermal or heat conductivities of common materials. Like most metals, aluminum feels cold to the touch because metals are good conductors. They rapidly absorb heat out of our bodies. Body temperature (37ºC) is about 15ºC higher than ambient room temperature (22ºC). Heat transfer always occurs from an object at a higher temperature to an object at a lower temperature.

The warm block is made of a rigid plastic foam, similar to the polyurethane foam insulation that is used in building houses. Most plastics are good insulators, meaning they are poor conductors of heat. The low conductivity of the plastic means that it does not readily transfer the heat needed to the ice cubes in order to melt them. The insulating ability of the plastic foam is enhanced by the fact that it contains entrapped or dissolved air or gas bubbles (actually, carbon dioxide gas). Air is a great insulator because thermal conductivity or heat transfer occurs due to vibrations and other motions of neighboring atoms or molecules. Gas bubbles are mostly empty space—neighboring atoms or molecules are few and far between compared to metals, which are very dense.

## Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

***Unifying Concepts and Processes: Grades K–12***
Evidence, models, and explanation
Constancy, change, and measurement
***Content Standards: Grades 9–12***
Content Standard A: Science as Inquiry
Content Standard B: Physical Science, structure and properties of matter, interactions of energy and matter

## Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Ice Melting Blocks* activity, presented by Annis Hapkiewicz, is available in *Temperature and Heat* and *Discrepant Event—Physical Properties*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

## Materials for *Ice Melting Blocks* are available from Flinn Scientific, Inc.

| Catalog No. | Description |
|---|---|
| AP6488 | Ice Melting Blocks |

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.