

Super Science Connections: Thwarting Thawing!

How long can you keep an ice cube from melting?

How fast can you make an ice cube melt?

This activity is intended for children entering grades K-4 in the next school year. To carry it out safely there must be a responsible older person to prepare materials, read directions aloud, and supervise the activity. This could be a parent, guardian, or older sibling. The supervisor should do the preparation steps below and consult the science background information on the penultimate page before leading children through the activity. There is a secondary activity on the last page. Pages 3 and 4 have prompts for the participants and a place to write.

Materials

- Ice cubes (all as close as possible to the same size)
- A timekeeping device (clock, smartphone, timer)
- Plastic plates or cups that can contain water (when the ice melts)
- Hair dryer, lamp, or sunny spot
- Salt to use as “deicer”
- Hammer, strong cooking pot, or other tool to crush ice (For safety, crushing ice should be done by the supervisor with the ice wrapped in a towel.)
- Styrofoam cup, Thermos, some other insulated container
- Empty milk carton/milk jug
- Wool fabric or other warm fabric
- Aluminum foil (small piece)
- Bubble wrap and/or packing peanuts
- Black or dark-colored paper; white or light-colored paper

This activity is courtesy of ICE, the Institute for Chemical Education at UW-Madison’s Chemistry Department. It is adapted for use at home from Thwarting Thawing in the Super Science Connections Section 2: Insulation activities offered by ICE at this link:

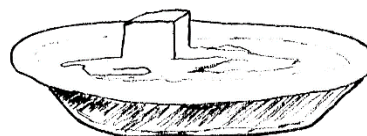
http://ice.chem.wisc.edu/sites/ice.chem.wisc.edu/files/images/Publications/SSC/SSC_Insulation.pdf

Preparation

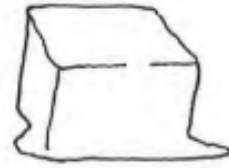
1. Make a list of materials you have that could be used to speed up melting an ice cube: hair dryer, lamp that can be placed close to the ice, sunny spot, darker background to absorb lamplight or sunlight, salt, hammer or pot to crush ice, anything else you think of.
2. Make a list of materials you have that will slow melting an ice cube: Styrofoam cups, thermos, picnic cooler, bubble wrap, packing peanuts, aluminum foil, containers such as a milk jug, and other things you think of.
3. If two or more children are participating, you can ask one to try to slow melting down and one to try to speed melting up.

Directions

1. Ask participants how they think an ice cube could be prevented from melting. Ask how the ice cube could be melted quicker. Lead the discussion toward doing experiments to find out which of the ideas work better.
2. For each idea a participant has about how to change the rate of melting, write a description on the data sheet “Changing times for melting”.
3. An experiment needs a control—something that shows the normal melting speed for an ice cube. A good control is an ice cube on a plastic plate or in a plastic cup where the ice cube is in contact with air in the room. Place the control somewhere that is at room temperature and not in direct sunlight.
4. After participants have chosen methods for speeding up or slowing melting, obtain the materials for each experiment and for the control.
5. Ask participants how many minutes they think it will take for each ice cube to melt.
6. Get an ice cube for each experiment and for the control. Place one ice cube on/in each setup and record the time when the experiment started.
7. Observe each setup periodically and record the time when each cube has completely melted.



Changing times for melting



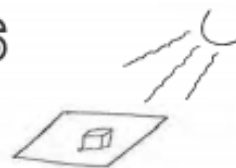
What we used:

What we did:

Names of the scientists _____



Changing times for melting



These things made
the ice cube melt
faster:

These things made
the ice cube melt
slower:

These things didn't change the time it took the
ice cube to melt:

Names of the scientists _____

Science Background

An ice cube melts because energy transfers to it from warmer things nearby. When two things are at different temperatures, energy transfers from the hotter thing to the cooler thing until both reach the same temperature. Because an ice cube is small compared to everything around it, an ice cube barely changes the temperature of the room where it melts, but it does make the room a tiny bit cooler.

You can't completely prevent the transfer of energy from a room to an ice cube, but you can slow it down. Also, there are way to speed up the transfer. Energy transfer requires contact between two objects or light shining on an object. (You can feel your skin get warmer when you hold a hot drink or when the sun shines on it.)

To slow melting of ice, you need to prevent contact with other materials. One way to do this is to surround the ice with air. A gas like air has very little material in it, so transfer of energy from air to ice is slower than transfer from a solid object. This is the idea of insulation. Wool, bubble wrap, and animal hair or fur all trap air near a warmer object (like you!), slowing transfer of energy. They also slow transfer of energy from a room to an ice cube.

To get an ice cube to melt faster, you want to increase the contact with the warmer room around the ice. Crushing the ice provides greater surface area and therefore more contact with surrounding air. (Crushing ice can be done safely by wrapping the ice in a smooth towel and pounding with a hammer or strong cooking pot. Do not just pound the ice cube with nothing to prevent shards from flying into someone's eye.)

Another way to melt the ice faster is to put it into a glass of room-temperature water where there is liquid water instead of air around the ice. Shining light on the ice provides an additional source of energy (the light) and therefore increases the speed of melting. The more light is absorbed, the greater the extra energy, so ice melts faster on a black surface than a lighter-colored surface.

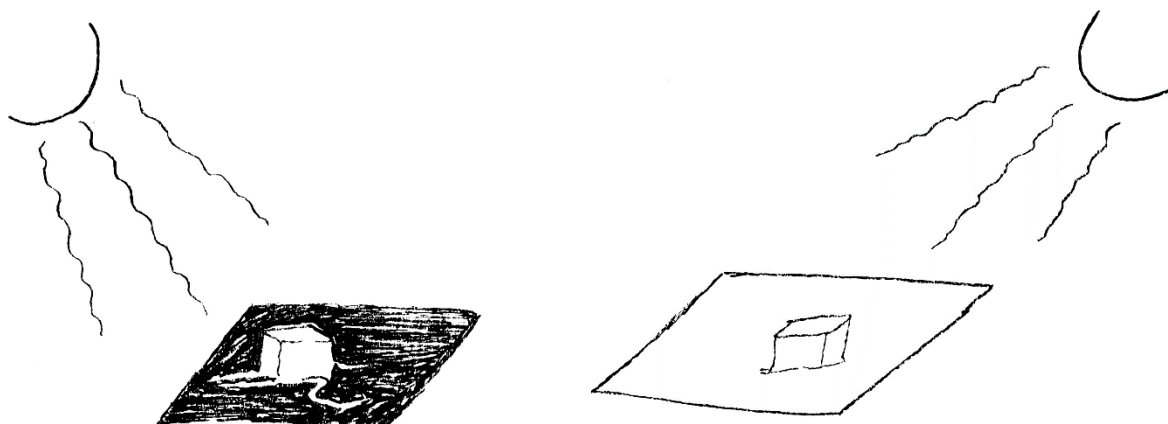
Sprinkling salt on an ice cube lowers the temperature at which the ice will stay frozen. The greater the temperature difference between two objects, the faster energy transfers from hotter to cooler, so salt speeds melting of the ice.

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http://ice.chem.wisc.edu/sites/ice.chem.wisc.edu/files/images/Publications/SSC/SSC_Insulation.pdf

Extension

Find out how the background color affects the melting time of an ice cube. You will need two ice cubes of the same size and one sheet each of white and black construction paper. You will also need a sunny day. Put one ice cube on each sheet of paper in a sunny spot outside. If you can't do this outdoors, put a plastic plate under each sheet of paper and put the plates in direct sunlight inside a window. Observe each ice cube



periodically and record how long it takes for each to melt completely. How did the color affect the rate of melting?