Ice

The Ice Hotel

Would you stay in a hotel made of ice?

There is a hotel in Sweden made out of ice and snow. It is called the Ice Hotel.

In winter, it gets very cold in Sweden. The river slows down and turns into ice. People take the ice from the river and mix it with snow. They call this mixture "snice." They make large blocks out of snice. Then they use the blocks to build the hotel. Even the beds are made of snice. The people who stay there sleep in special, warm sleeping bags.

Every spring the Ice Hotel melts. But in the fall, people build a new one!

COOL FACT:
How long does it take you to make one snowball? How about 700 million snowballs? That's how much snow is used to build the Ice Hotel!

The Great Melt Race

When ice is a problem, what's the fastest way to melt it? Find out here!

Materials

- ★ 5 ice cubes, same size
- ★ 5 zip-top plastic sandwich bags
- ★ ways to melt the ice: 1 tsp salt, something to crush ice with, what else?
- ★ permanent marker
- ★ "The Great Melt Race" data sheet

1. Put an ice cube in each bag.

2. How can you melt an ice cube fast? Try these:

- Leave one on your desk. (This is your "control." It shows how fast the ice will melt by itself.)
- Put salt on one ice cube.
- Crush one ice cube.
- Think of two other ways.

3. Use the marker to label the bags. Then close them.

4. **Predict:** Which way will melt the ice fastest? Slowest? Record your guesses on the chart in your data sheet.

5. Wait a few minutes. Check your ice cubes and record what happened.

6. Imagine you are in charge of keeping roads safe. If the roads were covered in slippery ice, what could you do to melt the ice?

Name: _____

The Great Melt Race

1. Do Steps 1–3 of the Task Card. **Predict:** Which way will make the ice melt fastest? Slowest? Number these from 1 to 5 (1 for the fastest, 5 for the slowest) on the chart below.

2. Wait a few minutes. Check your ice cubes. Which ice melted fastest? Slowest? Record in the chart. Number these from 1 to 5 (1 for the fastest, 5 for the slowest).

Ice Melters	My prediction	What happened
Control		
Ice with salt		
Crushed ice		
My 1st idea		
My 2nd idea		

3. If the roads were covered in ice, what could you do to melt the ice? Why? Write your answers on the back of this sheet.

task card 2

Ice Keeper

What could you use to keep ice from melting?

1. **Think:** What material could keep heat away from an ice cube and make the best Ice Keeper? Why?
2. Put one ice cube in each sandwich bag. Press out the air, then zip the bags closed.
3. Fill a cup halfway with crumpled aluminum foil. Push one bag into the foil. Then cover it with more foil.
4. Do Step 3 again with crumpled paper and again with the material you chose. Put the fourth bag in a cup by itself. (This is your "control." It shows how fast the ice will melt by itself.) Put all of the cups in a warm place.
5. After 30 minutes, take the ice out of each cup. Record your observations. Then repack the ice in each cup.
6. Look again after 30 minutes. Which Ice Keeper worked best? How can you tell? How could you make an even better Ice Keeper?

Materials

- 4 ice cubes, same size
- 4 zip-top plastic sandwich bags
- 4 plastic cups
- aluminum foil
- notebook paper
- inventor's materials: cotton balls, paper towels, craft feathers, scraps of fabric, foam packing material, empty chip bags, what else?
- warm place
- clock or watch
- "Ice Keeper" data sheet

Name: _____

Ice Keeper

1. What material do you think would make the best Ice Keeper? Why?

_____

_____

2. Do steps 2–6 of the Task Card.
Record your observations below.

Ice Keepers	After 30 minutes	After 1 hour
Foil		
Crumpled paper		
Your Ice Keeper		
Control		

3. Which Ice Keeper worked best? How can you tell?

_____

4. How could you make an even better Ice Keeper?
Write your ideas on the back of this sheet.

Background

The Ice Hotel is around only from December to April. Every year, the hotel is rebuilt with new architecture and themes. The ice used to build the hotel comes from the Torne River. Builders use 1,000 tons of ice and 30,000 cubic meters of "snice" to fortify the structure. The temperature inside the hotel is a frigid 23°F (–5°C).

Hands-On Hints

Task Card 1: The Great Melt Race

It's important to make the ice cubes the same size. We used 1 tablespoon of water for each ice cube.

Of the options suggested in the activity, we found that crushing the ice worked best. Why? By increasing the ice's surface area, it comes into contact with more warm air.

When salt is sprinkled on ice, as on an icy road, the small amount of pressure that it exerts causes a little of the ice to melt. Then some of the salt dissolves in the liquid water. This salt solution freezes at a lower temperature than pure water. (Other water-soluble solids also will act to lower the freezing point.) So using salt on icy roads helps melt the ice and keep it from refreezing. (Note: Salting ice can have an impact on soil and plants. While it is necessary for safety, it's important to use only as much as needed.)

Sand seemed to insulate the ice and kept it from melting. But the reddish-brown sand used on icy roads in some areas absorbs heat from the sun, helping to melt ice while providing traction for vehicles.

Next Generation Science Standards
PS1.A Structure and Properties of Matter
PS1.B Chemical Reactions
ESS3.B Natural Hazards
ETS1 Engineering Design

Of all the ways we tried, adding hot water worked fastest because heat came into direct contact with the ice.

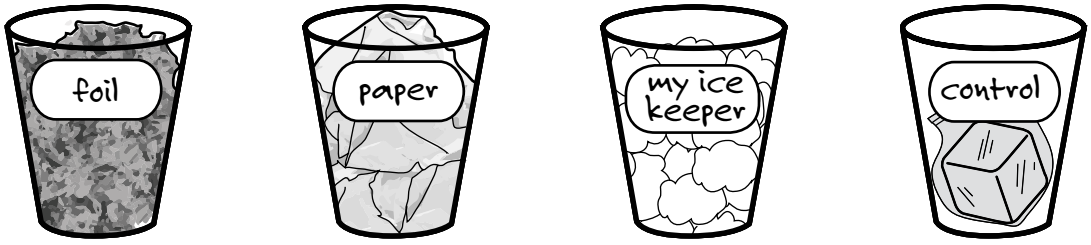
Task Card 2: Ice Keeper

Once again, it's important that the ice cubes be of the same size. When children put the ice cubes in the cups, have them make sure that each cube is surrounded by the "Ice Keeper" insulating material. You may want to have children put a piece of tape over each cup to keep the insulating material firmly around the ice cubes.

Aluminum foil is a good conductor of heat, so it is not a good material for keeping heat away from the ice cube. Air is a poor conductor of heat, so materials with air pockets are good at insulating the ice cube from heat.

Children may notice that good Ice Keepers would also make good winter coats. In that case, they trap heat inside instead of keeping it out.

How can students make a better Ice Keeper? They might think of adding more material, using a bigger cup, or using a combination of materials.



Photos ©: cover, chandelier room: Marco Regalia/Getty Images; hotel: David Clapp/Getty Images; people in ice room: Peter Unger/Getty Images; ice cubes: pioneer111/iStockphoto; bucket: karandaev/iStockphoto.

For optimal results, we suggest following these steps:

1. Introduce the topic by reading aloud the nonfiction acticle. The article helps build background knowledge and provides context for the hands-on activities. You can project it onto your interactive white-board as you read it aloud. There is also a printable version that you can distribute to students so they can read along.

2. Divide the class into small groups. Hand each group a Task Card, and give each student a Data Sheet. (We recommend starting with Task Card 1.) Together with the class, read aloud the steps of the activity to ensure everyone understands what to do. You may also want to have each group conduct an inventory of their materials to make sure they have everything they need.

3. Have students do the activity and record on their Data Sheets.

4. Make sure to leave enough time before the end of the period so you can have a class discussion about the activity. Invite groups to share their findings and results, including any challenges they may have faced.

5. Gather students' data sheets to assess for understanding.

If you plan to continue the unit in your next lesson with the second Task Card, you might want to review the article with the class. In some cases, Task Card 2 builds upon Task Card 1, so you may want to quickly go over the first activity as well.

At the end of a unit, consider asking students to evaluate the topic and activities. This can be as simple as a thumbs-up or thumbs-down. Engage them in a discussion about what they liked or did not like and why. You might find this feedback useful for future lessons.

The two Task Cards feature hands-on activities that incorporate the following eight science and engineering practices—identified by the NGSS as essential for all students to learn:

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

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