EXPLORATION 1

Hands On!

Explore Cooling

Activity Guide, pages 44–47

TIME ESTIMATE

day 1 30 min

day 2 30 min

SHORT ON TIME?

Instead of having children wait to see what happens to each object overnight, have a set of objects already frozen from the freezer.



POSSIBLE MATERIALS

- ☐ an ice cube
- ☐ a cup of water
- ☐ a wooden block
- ☐ a flower

PREPARATION

You will need access to a freezer for this activity. Be sure to have a paper plate to hold the ice cube while children make their observations. Lilies or carnations will work well. Check for any flower allergies before you begin. Plan to leave the flower in a place where it can be observed for several days after its removal from the freezer so that children can witness that freezing truly did cause an irreversible change. Freezing produces ice crystals inside the flower's cells, causing irreversible damage. A liquid can be seen coming from the flower after a couple of days.

INVESTIGATIVE PHENOMENON

Some materials change when heat is taken away, while others remain the same.

Phenomenon Explained Children explore the **investigative phenomenon** by observing changes that may occur when heat is taken away from items such as an ice cube, water, a wooden block, and a flower.

Ask a Question After observing the photographs, children should ask a question about how cooling can change matter. If children struggle, have them talk about how the two water fountains are alike and different and what might have caused the water to change. **Sample answer:** What happens to objects when they are cooled?

Everyday Phenomenon **When you put food into a freezer, it will undergo changes as heat is removed and it cools.**

Have children discuss their experience with frozen foods and what the food was like before and after it was put in the freezer.

STEP 1 After children observe the items, have them predict what might happen to each one when put in a freezer.

STEP 2 Assist children with putting the items in a freezer overnight.

STEP 3 Children should observe that the flower and the water in the cup froze, while the ice cube and the wooden block stayed the same.

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STEP 4 Children should talk about whether the changes are reversible or irreversible and how they can find out. They can leave all the items out for a day or two to see what happens. The ice in the cup melts, causing a reversible change. The changes to the flower are irreversible.

- **Make a Claim** Children's claims should describe what happened to each item when it was cooled and whether any change is reversible.
- **Evidence** Children should cite as evidence observations about how each item changed or stayed the same.
- **Reasoning** Children should explain their reasoning by describing how cooling affected some but not all of the items.



FORMATIVE ASSESSMENT

MAKING SENSE OF PHENOMENA

Children gain understanding that matter can change as they explore the **investigative phenomenon**. They should connect this to the **anchoring phenomenon** that cooling can cause reversible and irreversible changes. The water and the flower froze, just as water froze to form icicles. The change to the water was reversible. The flower underwent an irreversible change like the baked bread.

REMEDIATION If children struggle to connect the **investigative phenomenon** back to the **anchoring phenomenon**, have them discuss how water freezes into icicles outdoors and freezes to form ice cubes in a freezer. Guide them to notice that a frozen flower does not resemble a flower again as it defrosts, just as baked bread cannot be turned back into its ingredients.

Activity Outcome

Children should identify the effect of freezing on each of the items.

Performance Indicators	
	observe the items and then put them in a freezer overnight
	observe the effect of freezing on each item and record the results
	make a claim about how matter can change reversibly or irreversibly and support the claim with evidence

MAKING SENSE OF PHENOMENA IDEA ORGANIZER

After completing Exploration 1, children can fill in the **Idea Organizer** to summarize the connection between the changes that happen to the objects when heat is removed to the anchoring phenomenon that water freezes to form icicles.

SOCIAL EMOTIONAL LEARNING

Why it is important to follow the steps of your investigation in order?

Before children answer the question, have partners discuss reasons why it is important, such as following the steps helps ensure that the results are accurate and it may prevent accidents. Then have partners share their ideas with the class.

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