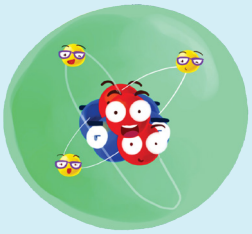
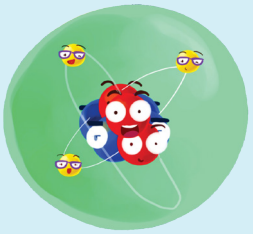


States of Matter



Grades: Pre-K–3

Subject: Structure and properties of matter, chemical changes

Skills: Constructing an argument with evidence, recalling past information, understanding cause and effect

NGSS: 2-PS1-4: Matter and its Interactions
2-ESS2-3: Earth's Processes

Materials: *My First Science Textbook: Protons and Neutrons*, ice cubes, cups, rulers

BACKGROUND

While there are three distinctly recognizable states of matter in the world, the phase of matter is not always consistent. Students who have studied the Water Cycle should be familiar with this. The easiest way to discuss states of matter is by using liquid water/water vapor/ice as an example.

Changes in state depend upon the temperature in the surrounding environment. When solids are exposed to heat, they may change to liquids. When liquids are heated, they may change to gases. Usually, solids can become gases if they are first melted down into liquids and then heated. Solids can also become gases without the intermediate liquid stage through a process called sublimation. Lastly, when liquids are exposed to freezing temperatures, they may turn to solids.

When a solid turns into a liquid, it is because increased temperature makes the slow-moving molecules in the solid start to move faster and spread out. The reverse is true for a liquid turning into a solid: decreased temperature makes the molecules in the liquid slow down and move closer together. When a liquid turns into a gas, the molecules fly apart and become too spaced out for the matter to hold any form.

ACTIVITY

1. Divide students into pairs and hand each pair an ice cube. Tell students that you would like for them to find the fastest way to melt an ice cube, and hint that temperature has something to do with it.

2. Once the ice cubes are melted and students have wiped their hands/spaces, hand each pair of students a cup. Have students fill the cups halfway with water, then use a ruler to measure the water level.

3. Head outside as a class and place the cups of water in a sunny spot.

4. Return to the cups later in the day (or in class the next day) and have students measure the water level again.

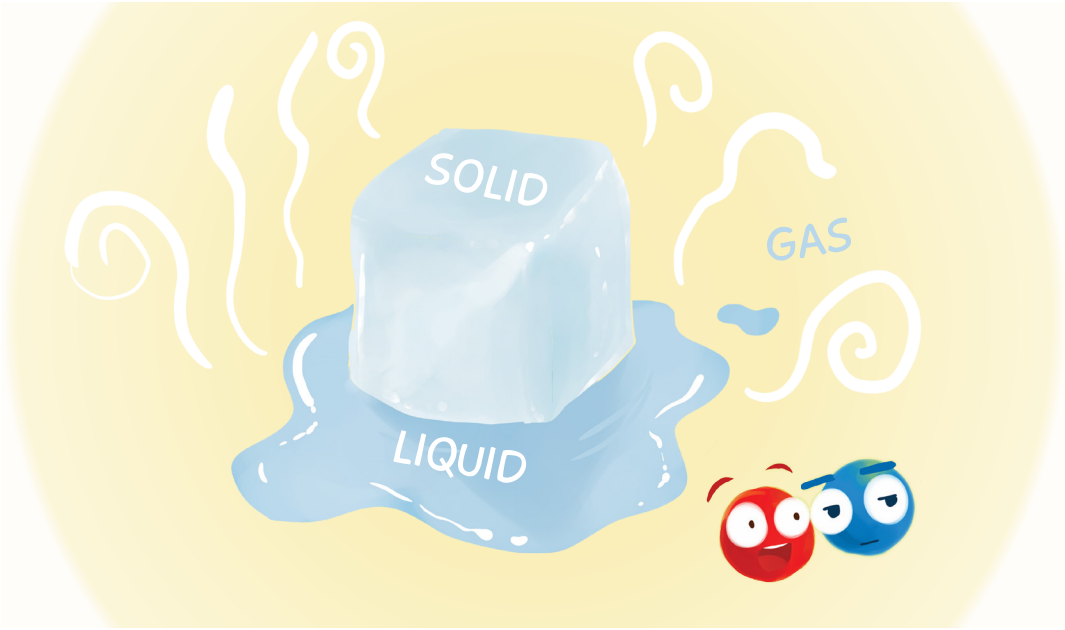
DISCUSSION

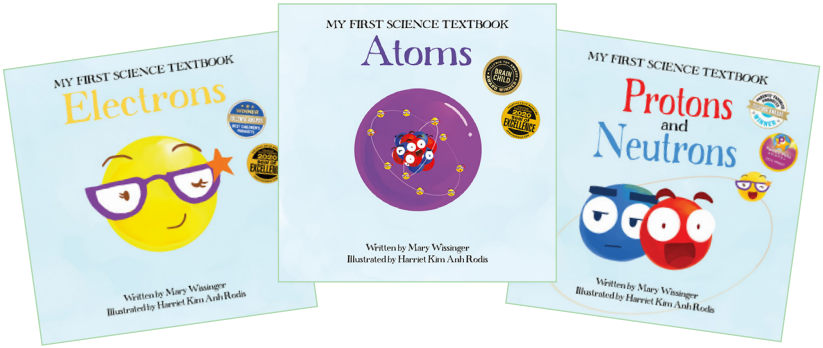
Request observations from students about how much time it took them to melt their ice cube and what they or their partner did to make it melt faster. ***What strategies worked and did not work? Was this change reversible or irreversible, and why?***

From there, circle back around to the idea that temperature can cause the state of matter to change. Explain that the ice cubes melted because heat can make a solid turn into a liquid, and add that the students just made the molecules in the ice cubes spread further apart and move faster to melt them down. You can then introduce the reverse process of a liquid turning into a solid by asking them to tell you what could happen when a liquid is exposed to freezing temperatures.

Either later in the day or in class the next day, have students return to check their cups and measure the water level—there may be none left. Ask students whether the change was observable or not. This will prompt them to recall the previous class, when they were able to see the ice cubes melting in real time. ***What do the students think happened? What is the scientific name for the process of the water disappearing (evaporation)?*** Ask them to tell you in terms of molecules, and direct them toward the correct answer.

Further questions: ***Was this a reversible or irreversible change? What are some examples of changes to matter that are observable or unobservable? What are some other examples of changes to matter that are reversible or irreversible?***





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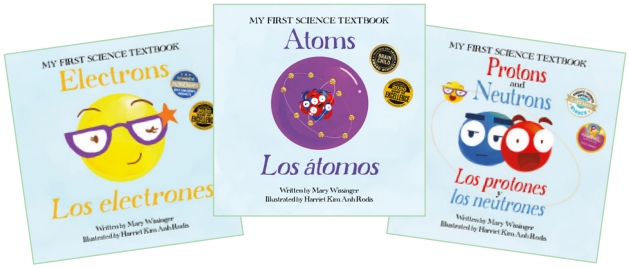

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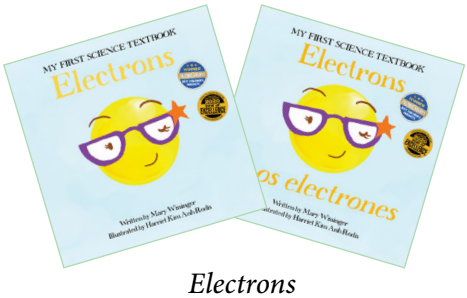

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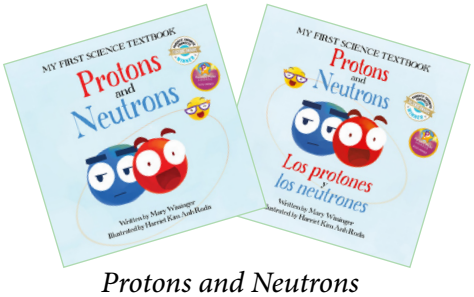

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