

## Student activity sheet

Name: \_\_\_\_\_

### Activity 6.1

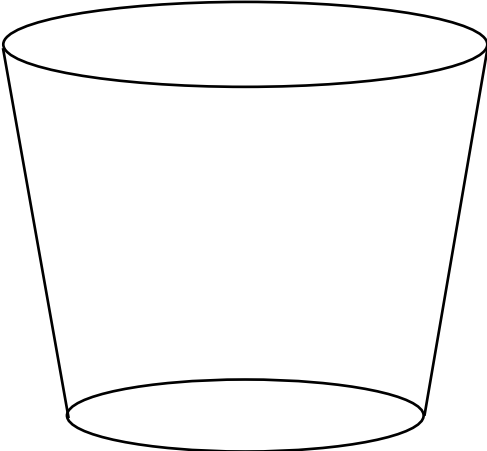
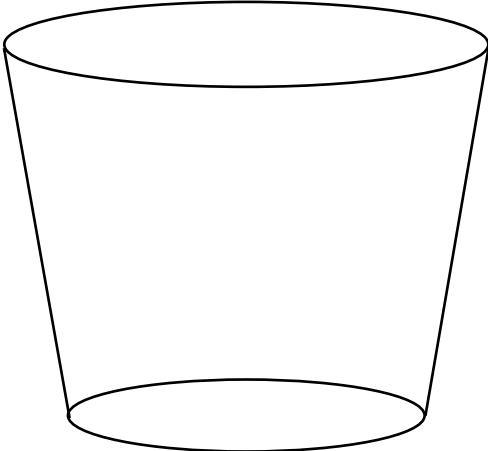
## Matter on the move

In art class the other day, we tried making our own watercolor paint. We had food coloring and were adding drops in different combinations to water. Some kids put their drops in and stirred, but I put mine in and just let them mix on their own without stirring. It looked pretty cool. I wondered if it would look any different in hot water, but I didn't get a chance to try it. Later in the day, by coincidence, we were also adding food coloring to water in science. We were seeing how fast colored water moves up a celery stalk. I couldn't try the food coloring in hot water because it might mess up the experiment. Finally, when I got home, I put some ice water in one cup and some hot tap water in another. I added a drop of blue and a drop of yellow food coloring to each. I didn't stir—I just watched. I saw a pretty interesting difference between them.

## Do heating and cooling have an effect on matter?

### Take a closer look

1. In the demonstration, you saw food coloring move in hot and cold water. What difference did you notice in the way the color moved and mixed in the water in each cup?

Hot water	Cold water
	
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Activity 6.1

**Matter on the move** *(continued)*

2. Adding heat energy makes water molecules move faster. Use this fact to explain your observations.

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3. In the second demonstration, you saw your teacher put a bottle with an upside down lid into hot water.

Describe what happened.

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4. Adding heat energy makes the gas molecules in air move faster. Use this fact to explain your observations.

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**Try this!**

5. You will do an activity like the one your teacher did with the bottle. But instead of using a lid, you will place a film of bubble solution over the opening of the bottle. What do you think will happen to this film of bubble solution when you place the bottle in hot water?

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What makes you think that?

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Activity 6.1

**Matter on the move** (*continued*)

**What happens to a film of bubble solution when the air inside a bottle is warmed and cooled?**

*Procedure*

*Heating a gas*

1. Add hot water to a wide cup until it is about  $\frac{1}{3}$  full.
2. Lower the open mouth of the bottle into the cup with detergent solution as shown. Carefully tilt and lift the bottle out so that a film of detergent solution covers the opening of the bottle.
3. Slowly push the bottom of the bottle down into the hot water.



*Cooling a gas*

4. Add cold water to a wide cup until it is about  $\frac{1}{3}$  full.
5. Re-dip the opening of the bottle in the detergent solution and place it in hot water again to form a bubble.
6. Then slowly push the bottom of the bottle into the cold water. Alternate placing the bottle in hot and cold water.



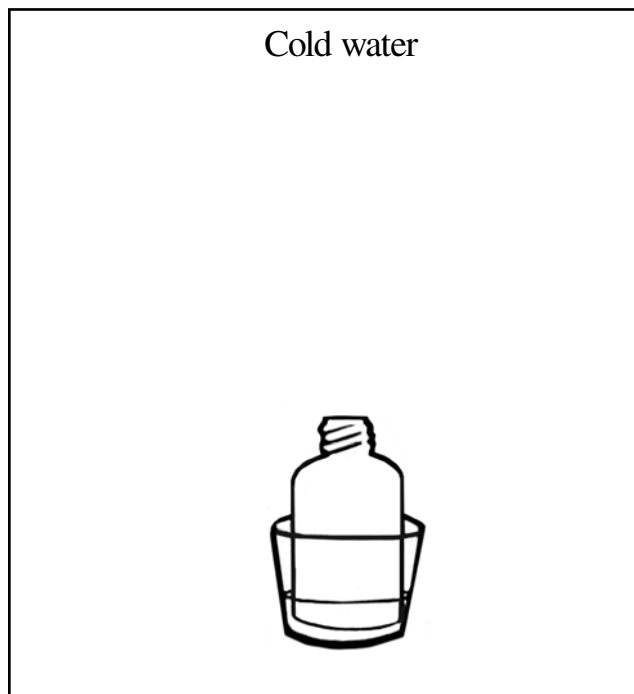
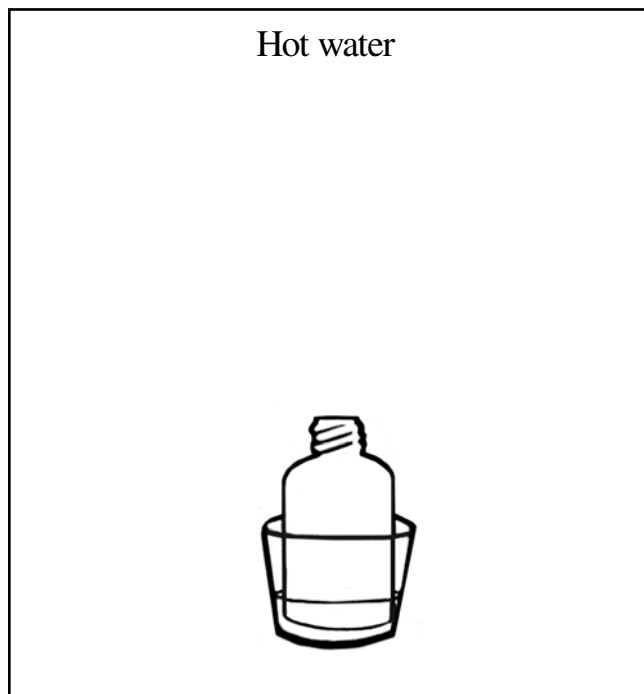
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**Activity 6.1**

**Matter on the move** *(continued)*

6. Draw what happened to the bubble film when the bottle was placed in hot and cold water.



7. Heating a gas makes molecules move faster. Cooling a gas makes molecules move slower. Use these facts to explain your observations.

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**Matter on the move** (*continued*)

8. Draw a line from each bottle to the picture of molecules that shows about how fast they are moving.

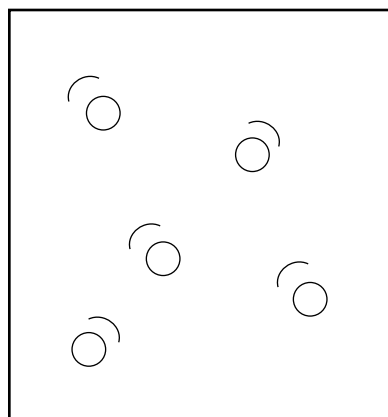
Room-temperature water



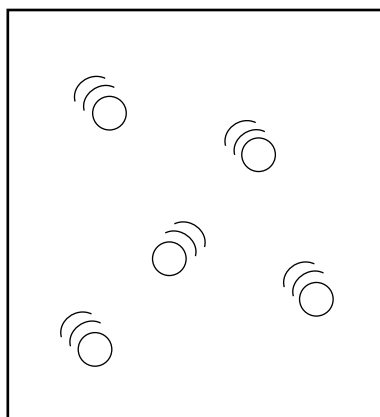
Cold water



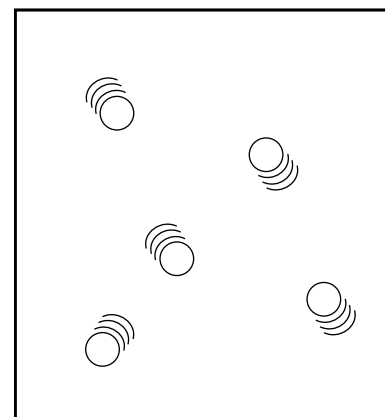
Hot water



Slow



Medium speed



Fast

**What's next?**

You have seen that adding heat energy makes molecules move faster and that removing heat energy (cooling) makes molecules slow down. Heating and cooling affect all states of matter—solids, liquids, and gases. Sometimes when matter is heated or cooled enough, we can see pretty dramatic-looking changes. When heated, a solid can become a liquid and then a gas. Or when cooled, a gas can become a liquid and then a solid. You will explore the way water changes state as it's heated and cooled in the following activities.