

Name \_\_\_\_\_

Period \_\_\_\_\_ Date \_\_\_\_\_

## HEATING AND COOLING AIR A

### Part 1. Question

What happens to a volume of air when it is heated? When it is cooled?

### Part 2. Procedure

- Work with materials to figure out a good demonstration to show fourth graders.
- Draw and label your setup.
- Write a description of what happens to air when it gets hot and when it gets cold. Make sure it can be understood by fourth graders.

### Part 3. Draw and label your setup here.

### Part 4. Explain what happens to air when it is heated and cooled.

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Name \_\_\_\_\_

Period \_\_\_\_\_ Date \_\_\_\_\_

## HEATING AND COOLING AIR B

**Part 5. Explain what happens at the particle level when air is heated and cooled.**

- Imagine that you could see the air particles in the bottle.
- Explain what happens to the particles when the air is heated and cooled.
- Use drawings and labels if they will help.

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Name \_\_\_\_\_

Period \_\_\_\_\_ Date \_\_\_\_\_

# HEATING AND COOLING WATER A

## Materials for each pair

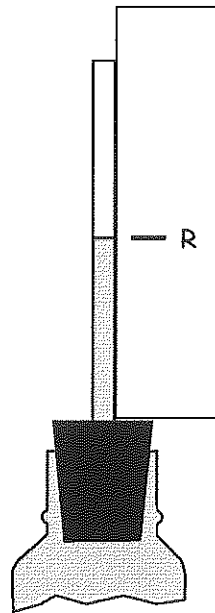
- 1 Glass bottle
- 1 Rubber stopper with clear pipe
- 1 Syringe, 35-mL
- 1 Squeeze pipette
- 1 Card, 1" X 3"
- Tape
- Blue water
- 1 Large cup (500 mL) with cold water
- 1 Large cup (500 mL) with hot water
- 1 Glass thermometer

## Procedure

- a. Push the clear plastic pipe a short distance into the rubber stopper.
- b. Use a syringe to put 35 mL of blue water into the glass bottle.
- c. Push the stopper into the bottle as far as it will go. Use the pipette to fine-tune the water level so it is halfway up the pipe.
- d. Tape a 1" X 3" card to the clear tube. Label the water level "R."
- e. Record the starting temperatures of the cold and hot water.

Cold water \_\_\_\_\_ Hot water \_\_\_\_\_

- f. Place the bottle in cold water. After 3 minutes, label the water level "C."
- g. Move the bottle to hot water. In 5 minutes, label the water level "H."



## Think about the bottle system.

1. What happened when you placed your bottle system in cold water? Draw and explain.

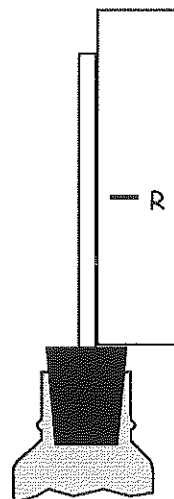
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Name \_\_\_\_\_

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## HEATING AND COOLING WATER B

2. What happened when you placed your bottle system in hot water? Draw and explain.

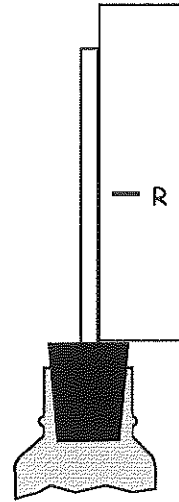
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3. What caused the water to go up in the pipe when you put the bottle in hot water?

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4. What caused the water to go down in the pipe when you put the bottle in cold water?

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5. Describe what you think happened to the water particles in the bottle system when it was placed in hot water. Discuss kinetic energy and expansion.

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