# Dots Explain Pressure

Use a particle model to connect visible changes to invisible motion.

**PS.1.e.i** "developing and using models construct, develop, and use models and simulations to illustrate and/or explain observable and unobservable phenomena"

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline each sentence that names an observable change or evidence. Circle each model feature or particle idea that helps explain that evidence.

### A Bottle Warms Up

1. When a sealed plastic bottle is warmed in a bowl of warm water, its sides may bulge outward. The change is observable, but the moving gas particles inside are too small to see. Scientists can use a particle model to connect these ideas. In the model, dots stand for gas particles, arrows show their motion, and the bottle outline shows the container. A model is not the gas itself. It is a tool for explaining evidence from the investigation.

2. To develop the model, a class first records what it can observe: the bottle's shape changes after warming. Then students decide which unobservable ideas are needed. They draw the same number of dots before and after warming because the bottle is sealed. In the warm version, they use longer arrows to represent faster particle motion. More frequent, harder collisions with the bottle walls explain why the sides push outward. The model links a visible change to particle behavior inside the container.

3. Scientists test a model by using it to make a prediction. This model predicts that cooling the same sealed bottle should make the sides move inward because particles would move more slowly and collide with the walls less forcefully. If observations do not match, students revise the model or check their investigation. The dot-and-arrow model has limits. It does not show each particle's true size, exact path, or every collision. Useful models include important patterns without copying every detail.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. Name two parts of the particle model and tell what each part represents.

2. Why should the before-and-after models show the same number of dots?

3. Use the model to explain why the bottle sides bulge outward after warming.

4. What does the model predict will happen when the sealed bottle is cooled? Include the particle behavior that supports the prediction.

## 3 YOUR TURN

Your own words

Construct a two-panel particle model for a sealed balloon moved from a cool room to a warmer room. In both panels, draw the balloon outline and the same number of dots, then use arrows to show motion. Label both panels and write two sentences that explain the expected balloon change and what the arrow differences mean.

ANSWER KEY

# Dots Explain Pressure

GRADES 7-8 · PS.1.e.i

## PART 1 · READ AND MARK

Underline each sentence that names an observable change or evidence. Circle each model feature or particle idea that helps explain that evidence. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | Name two parts of the particle model and tell what each part represents. | **Dots represent gas particles, and arrows represent particle motion. The bottle outline represents the container.** |
| 2 | Why should the before-and-after models show the same number of dots? | **The bottle is sealed, so the model keeps the same number of gas particles before and after warming.** |
| 3 | Use the model to explain why the bottle sides bulge outward after warming. | **Warming makes particles move faster. They collide with the bottle walls more often and more forcefully, pushing the sides outward.** |
| 4 | What does the model predict will happen when the sealed bottle is cooled? Include the particle behavior that supports the prediction. | **The sides should move inward. Particles move more slowly and collide with the walls less forcefully.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Cool, 12 dots, short arrows Panel 2: Warmer, 12 dots, longer arrows The balloon will expand in the warmer room because its air particles move faster and push on the walls more strongly. The longer arrows represent faster particle motion.

Accept equivalent descriptions of model parts, particle motion, and collisions that accurately connect warming to outward pressure. For the two-panel model, accept any consistent number of dots in both panels, shorter arrows in the cool panel, longer arrows in the warmer panel, and an explanation that the balloon expands.