Model Reality Check

Compare what a particle model shows with what it leaves out.

PS.1.e.ii "developing and using models evaluate limitations of models"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one statement that tells what the particle model can help explain. Circle two statements that describe a limitation, so you can compare what the model shows with what it leaves out.

A Model Is Not the Real Thing

1. Scientists often use models to study things that are too small, too large, too fast, or too dangerous to observe directly. A particle model can show a solid as closely packed particles that vibrate in place. It helps explain why a solid keeps its shape. The model also lets students predict that heating the solid makes its particles vibrate faster. This model is useful because it focuses on particle motion instead of every detail of a real substance.

2. However, the particle model has limitations. The particles are often drawn as identical circles, but real particles can have different sizes, shapes, and attractions. A drawing may show empty spaces between particles, yet it cannot show the electrical forces that act across those spaces. It also cannot show the enormous number of particles in even a tiny ice cube. If someone treats the drawing as a photograph, they may wrongly think particles are flat circles arranged in neat rows.

3. To evaluate a model, first name the question it can help answer. Next, compare the model with the real system and identify what was left out, simplified, or shown out of scale. A limitation does not make a model useless. Instead, it tells you when to use caution. For example, the particle model is strong for explaining changes in motion during heating, but it is weak for showing forces between individual particles. Scientists may use a different model when forces are the main question.

2 ANSWER WITH EVIDENCE

Use the passage

1. What feature of the particle model helps explain why a solid keeps its shape?

2. Name two limitations of the particle model described in the passage.

3. Why might a person misunderstand particles by treating the model drawing as a photograph?

4. When would scientists need a different model than this particle model? Explain why.

3 YOUR TURN

Your own words

In the two panels, sketch a particle model of air in a syringe before and after it is compressed. Below the panels, write two sentences that name one question your model can help answer and two limitations of your model.

ANSWER KEY

Model Reality Check

GRADES 7-8 · PS.1.e.ii

PART 1 · READ AND MARK

Underline one statement that tells what the particle model can help explain. Circle two statements that describe a limitation, so you can compare what the model shows with what it leaves out. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What feature of the particle model helps explain why a solid keeps its shape?	**It shows closely packed particles that vibrate in place.**
2	Name two limitations of the particle model described in the passage.	**Answers may include that it draws particles as identical circles, does not show electrical forces, cannot show the enormous number of particles, and can make particles seem flat and arranged in neat rows.**
3	Why might a person misunderstand particles by treating the model drawing as a photograph?	**The person might think particles are flat circles arranged in neat rows.**
4	When would scientists need a different model than this particle model? Explain why.	**They may need a different model when forces between individual particles are the main question, because this model is weak for showing those forces.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: 12 widely spaced dots in a syringe. Panel 2: the same 12 dots closer together in a smaller syringe space. This model can help answer the question, "What happens to air-particle spacing when a syringe is compressed?", but it does not show particle speeds. Its dots also leave out particle size and forces between particles.

Accept sketches that keep the same number of particles and show them closer together after compression. Accept reasonable limitations that identify missing or simplified features, not claims that particles disappear or become larger during compression.