Models Beyond Sight

Read how particle models show composition and repeating patterns.

MS-PS1-1 "Develop models to describe the atomic composition of simple molecules and extended structures. Clarification Statement: Emphasis is on developing models of molecules that vary in complexity..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each phrase that tells the kind or number of atoms in a model. Circle each phrase that explains how a model can show a repeating structure.

Seeing Matter with Models

1 Scientists use models to show what matter is made of when the pieces are too small to see. In a molecular model, each colored sphere stands for one atom. A key, or legend, tells which color represents each element. Sticks or touching spheres can show which atoms belong together, but the key evidence is the kind and number of atoms. A model is useful only when its colors, symbols, and labels make its meaning clear to another person.

2 For example, ammonia is a simple molecule made of one nitrogen atom and three hydrogen atoms. A drawing can show one blue sphere labeled N with three white spheres labeled H near it. The model does not need to show an actual magnified picture. Instead, it is a representation that helps you count the atoms and identify their elements. If a student draws four identical circles without a legend, a viewer cannot tell that the molecule contains two types of atoms.

3 Some substances form extended structures instead of separate, small molecules. In a sodium chloride model, sodium and chlorine atoms repeat in a regular arrangement. The pattern continues beyond the edge of a drawing, so the drawing may show only a small section and use arrows or dots to indicate continuation. Diamond is another extended structure. It contains only carbon atoms, yet its repeating arrangement differs from sodium chloride because the kinds and positions of atoms shown in the model are different.

2 ANSWER WITH EVIDENCE

Use the passage

1. Describe the atomic composition of ammonia. What model feature helps a viewer tell the two elements apart?

2. Why would four identical circles without a legend be an unclear model of ammonia?

3. What evidence in a drawing would show that sodium chloride is an extended structure rather than one small molecule?

4. Compare a diamond model with a sodium chloride model by naming the kinds of atoms each model shows.

3 YOUR TURN

Your own words

Create a particle model of carbon dioxide, CO_2. Use three connected circles, label or color them with a legend, and write one sentence telling the kind and number of atoms in your model.

ANSWER KEY

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GRADES 6-8 · MS-PS1-1

PART 1 · READ AND MARK

Underline each phrase that tells the kind or number of atoms in a model. Circle each phrase that explains how a model can show a repeating structure. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Describe the atomic composition of ammonia. What model feature helps a viewer tell the two elements apart?	**Ammonia has 1 nitrogen atom and 3 hydrogen atoms. Different colors or labels, explained by a legend, distinguish the elements.**
2	Why would four identical circles without a legend be an unclear model of ammonia?	**A viewer could not tell that the circles represent two different types of atoms, nitrogen and hydrogen.**
3	What evidence in a drawing would show that sodium chloride is an extended structure rather than one small molecule?	**The drawing would show a regular repeating pattern of sodium and chlorine atoms and indicate that the pattern continues beyond the drawing's edge.**
4	Compare a diamond model with a sodium chloride model by naming the kinds of atoms each model shows.	**A diamond model shows only carbon atoms. A sodium chloride model shows sodium atoms and chlorine atoms.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

○O-●C-○O Legend: ● = carbon atom; ○ = oxygen atom. My model shows 1 carbon atom and 2 oxygen atoms.

Accept any clear three-atom model with one carbon atom, two oxygen atoms, and a legend or labels that distinguish the elements. The circles may be arranged in a line or another connected arrangement if the atom counts and labels are accurate.