

Checking Dani's Study Guide: Eight Claims About Molecules and Crystals

Learning target: I can find the errors in a classmate's statements about molecules and extended structures, explain the mistaken idea behind each one, and rewrite each statement correctly.

Error analysis

About 35 min

Individual

MS-PS1-1 · practice

writing

independent practice

Name _____

Date _____

Period _____

Directions

Dani wrote eight statements in a study guide for this chapter. Some are correct and some contain a mistake. In Part A, mark each statement correct or incorrect and name, in a few words, the idea Dani got wrong. In Part B, for each incorrect statement, explain what went wrong and then rewrite the statement so that it is accurate. In Part C, step back and look for the pattern in the mistakes. Write in complete sentences in Parts B and C.

You will need: This worksheet, Pencil

Dani's study guide — **1.** Table salt is made of NaCl molecules, and each molecule has one sodium atom and one chlorine atom. **2.** Butane and isobutane have the same formula, C_4H_{10} , so they are the same substance with two names. **3.** In a ball-and-stick model the oxygen is red because real oxygen atoms are red. **4.** Hydrogen peroxide, H_2O_2 , is just water with a little extra oxygen, so it behaves almost the same as water. **5.** A big quartz crystal has a higher ratio of oxygen to silicon than a small one, because it contains more oxygen atoms. **6.** Oxygen gas, O_2 , cannot be a molecule, because a molecule has to contain more than one kind of atom. **7.** A polymer is an extended structure made of small molecule-based units joined one after another in a long chain. **8.** When water freezes, the H_2O molecules settle into a regular repeating pattern, so ice is a crystal built from molecules.

Part A: Diagnose

1. Complete the table. For a correct statement, write 'correct' and leave the second column blank.

Correct or incorrect?	The idea Dani got wrong (a few words)
Statement 1	
Statement 2	
Statement 3	
Statement 4	
Statement 5	
Statement 6	
Statement 7	
Statement 8	

Part B: Explain and rewrite

For each incorrect statement, write two things. (a) **What went wrong:** the mistaken idea behind the statement, and why someone might believe it. (b) **Rewrite:** the statement, corrected, in one or two sentences that Dani could paste back into the study guide.

2. Statement 1 (salt molecules). (a) What went wrong? (b) Rewrite it. Your rewrite must say what the formula NaCl actually describes.

3. Statement 2 (butane and isobutane). (a) What went wrong? (b) Rewrite it using the words **composition** and **structure**.

4. Statement 3 (red oxygen). (a) What went wrong? (b) Rewrite it so that it says what the colors in a model are for.

5. Statement 4 (hydrogen peroxide). (a) What went wrong? (b) Rewrite it. Include the atom counts of both molecules and one way their behavior differs.

6. Statement 5 (big crystal, bigger ratio). (a) What went wrong? (b) Rewrite it, and include a worked example with numbers that shows the ratio stays the same.

7. Statement 6 (oxygen gas). (a) What went wrong? (b) Rewrite it so that it gives the correct definition of a molecule and names one other molecule made of a single element.

Part C: Step back

8. Statements 1 and 5 are both about the same deeper idea. Statements 2 and 4 are both about another. Name the two ideas, and write one sentence Dani could keep on a card to avoid each kind of mistake.

9. Statements 7 and 8 are correct. Pick one and explain why it is correct, as if Dani had asked you to double-check it. Use at least one example from the chapter.

Three test questions for every statement

Ask each statement: (1) Is it talking about a particle with an exact count, or a repeating pattern with a ratio? (2) Does it confuse what the atoms are (composition) with how they are connected (structure)? (3) Does it treat a feature of the model, like a color or a stick, as if it were a feature of the real atoms? Almost every mistake in Dani's guide fails one of these three tests. Write the number of the failed test beside each incorrect statement before you begin Part B.

Write two traps of your own

Write two new statements for Dani's guide that sound reasonable but contain a mistake about this chapter's ideas, and one statement that sounds surprising but is correct. For each, write the correct version and the test question from the scaffold that catches the error. Trade with a partner and see whether they can find the correct statement among your three. Good traps often involve diamond and graphite, ice and liquid water, or the meaning of a chemical formula.