The Powder Test

Use investigation results to compare two white solids.

PS.5.a "Carry out investigations and use results to compare and contrast the physical and chemical properties of matter."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline observations from each test, circle any evidence of a new substance, and number the conditions kept the same. Use your marks to compare the powders' physical and chemical properties.

Two Powders, Two Tests

1 At a school science fair, two jars of white solids have lost their labels. One holds sugar, and the other holds baking soda, but their similar color cannot settle which is which. A student plans two tests using fresh portions from each jar. A physical-property test checks what matter does without making a new substance. For example, bending a copper wire changes its shape but leaves it copper. A chemical-property test checks whether a substance can form new substances under certain conditions. Burning a piece of wood makes ash and gases. The student wears goggles and never tastes either powder.

2 For the first test, the student puts 5 grams of each powder into separate cups holding 20 milliliters of room-temperature water. Each cup gets the same stirring time, 30 seconds. The sugar portion disappears into the water and leaves a clear solution. Some baking soda remains as solid grains at the bottom of its cup. Both powders can dissolve in water, but the observations show that different amounts dissolve under these conditions. No gas bubbles or other evidence of a new substance appear in either cup. The student records these results before cleaning the equipment and preparing fresh portions.

3 For the second test, the student puts 1 gram of each dry powder into separate clean cups and adds 10 milliliters of vinegar to each. The baking soda cup fizzes quickly as carbon dioxide gas forms. The sugar cup shows no fizz; the sugar begins to dissolve. The vinegar amount, powder mass, and cup size stay the same, so the kind of powder is the key difference between trials. Fizzing is evidence of a chemical change here because a new gas forms. Dissolving sugar alone does not show that a new substance formed. A single observation of no fizz cannot rule out every possible chemical reaction.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare how much sugar and baking soda dissolved in the water test. What physical-property difference do the results show?

2. Why is the difference observed in the water test evidence about physical properties, not chemical properties?

3. Compare the powders' behavior in vinegar. Which result gives evidence of a chemical property, and why?

4. Why did the student use the same amount of vinegar for both powders?

3 YOUR TURN

Your own words

Design a safe investigation to compare limestone and quartz. In four or five sentences, describe one physical-property test and one chemical-property test, predict what you would observe for each material, name one condition you would keep the same, and explain what your results would show.

ANSWER KEY

The Powder Test

PART 1 · READ AND MARK

Underline observations from each test, circle any evidence of a new substance, and number the conditions kept the same. Use your marks to compare the powders' physical and chemical properties. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare how much sugar and baking soda dissolved in the water test. What physical-property difference do the results show?	**All 5 grams of sugar dissolved, but some of the 5 grams of baking soda remained. More sugar dissolved than baking soda in 20 milliliters of water under these conditions.**
2	Why is the difference observed in the water test evidence about physical properties, not chemical properties?	**The test compared how much of each powder dissolved. Neither cup showed evidence that a new substance formed.**
3	Compare the powders' behavior in vinegar. Which result gives evidence of a chemical property, and why?	**Baking soda fizzed as carbon dioxide gas formed, showing that it reacted with vinegar. Sugar did not fizz; its dissolving alone is not evidence of a chemical change.**
4	Why did the student use the same amount of vinegar for both powders?	**Keeping the vinegar amount the same makes the kind of powder the key difference between trials, so the student can compare their behavior in vinegar.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would wear goggles and use equal-sized pieces of limestone and quartz. I would try to scratch each piece with the same steel nail; I predict the nail would scratch limestone but not quartz, showing a difference in hardness. Then I would add the same amount of vinegar to fresh pieces and predict bubbles on limestone but not quartz. Bubbles would be evidence that limestone reacts with vinegar to form a gas, revealing a chemical property.

Accept comparisons that use the stated observations and distinguish dissolving from evidence that a new substance formed. For the open task, accept other safe, plausible tests if the response predicts results for both materials and identifies a controlled condition.