Clues in Materials

Compare properties to make sense of everyday substances

P.7.5A.3 "Compare and contrast chemical and physical properties (e.g., combustion, oxidation, pH, solubility, reaction with water)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB As you read, underline observations that show physical properties and circle observations that show chemical properties. Number two places where the passage compares materials.

The Museum Storage Puzzle

1 At a museum workshop, a conservator must decide how to store objects without damaging them. A physical property can be observed without changing a material into a different substance. For example, a rubber band stretches and returns to its shape. Solubility is another physical property: it describes whether a substance dissolves in a liquid. In a small water test, a pinch of table salt dissolves, while an iron nail and a glass bead do not. The nail and bead share that physical property, even though they look and feel different.

2 Chemical properties describe how a substance can change into new substances. In damp air, an iron nail can react with oxygen and form reddish rust. A glass bead does not rust under those conditions. A drop of vinegar on a limestone chip may produce bubbles of carbon dioxide as the rock reacts, but the same drop on glass produces no such bubbles. Vinegar has a pH near 3, while pure water has a pH near 7. The lower pH tells you vinegar is more acidic, a chemical property of the liquid.

3 To compare combustion, the conservator reads a report from a controlled lab, rather than setting objects on fire. When lit in air, dry paper burns and leaves ash while releasing gases. A strip of copper foil does not catch fire easily in the same conditions, although copper can react with oxygen in other conditions. Both paper and copper foil can be folded into new shapes without becoming new substances. Folding shows a physical property; burning shows a chemical property because new substances form. Knowing both kinds of properties helps the conservator choose safe storage.

2 ANSWER WITH EVIDENCE

Use the passage

1. How are the iron nail and glass bead alike in water but different in damp air? Name the physical and chemical properties in your answer.

2. Compare the pH of vinegar and pure water. What does that difference tell you about their chemical properties?

3. How do limestone and glass differ when vinegar touches them? Explain why this comparison concerns a chemical property.

4. Compare paper and copper foil when folded and when lit in air. Which comparison shows a physical property, and which shows a chemical property?

3 YOUR TURN

Your own words

On paper, compare a wooden craft stick and an aluminum strip by predicting one physical-property difference and one chemical-property difference. Explain what evidence would show that each prediction concerns the correct kind of property, without testing the materials.

ANSWER KEY

Clues in Materials

GRADE 7 · P.7.5A.3

PART 1 · READ AND MARK

As you read, underline observations that show physical properties and circle observations that show chemical properties. Number two places where the passage compares materials. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How are the iron nail and glass bead alike in water but different in damp air? Name the physical and chemical properties in your answer.	**Neither dissolves in water, which compares their physical property of solubility. In damp air, iron can rust but glass does not, which compares a chemical property.**
2	Compare the pH of vinegar and pure water. What does that difference tell you about their chemical properties?	**Vinegar has a pH near 3, lower than pure water's pH near 7. Vinegar is more acidic.**
3	How do limestone and glass differ when vinegar touches them? Explain why this comparison concerns a chemical property.	**Limestone may react and release carbon dioxide bubbles, while glass produces no such bubbles. The comparison concerns a reaction that makes a new substance.**
4	Compare paper and copper foil when folded and when lit in air. Which comparison shows a physical property, and which shows a chemical property?	**Both can be folded without becoming new substances, showing a physical property. Paper burns and forms ash and gases, while copper foil does not catch fire easily, showing a difference in chemical properties.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

An aluminum strip bends more easily than a wooden craft stick of similar size. Bending changes shape without making a new substance, so this is a physical-property difference. In a controlled lab, the wooden stick would catch fire more easily than the aluminum strip. Burning wood makes ash and gases, so this is a chemical-property difference.

Accept other reasonable comparisons supported by the passage. For the open task, accept predictions that correctly distinguish a change without a new substance from a reaction that produces new substances.