Clues to Change

Use controlled comparisons to investigate household materials.

PHS.4.1 "Design and conduct experiments to investigate physical and chemical changes of various household products (e.g., rusting, sour milk, crushing, grinding, tearing, boiling…"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB In each test, circle the factor the volunteer changes, underline the outcome observations, and draw a box around the control to help you judge what caused the change.

Two Tests at the Repair Cafe

1. At a community repair cafe, volunteers want to know whether a household material has merely changed form or has become a different substance. A physical change alters size, shape, or state without making a new substance. A chemical change makes one or more new substances. Clues such as bubbles, a new color, or an odor can suggest a reaction, but a clue alone is not proof. A fair test changes one factor at a time and holds other conditions steady. Record what happens before and after, repeat the test, and compare the results with a control that lacks the factor being tested.

2. At the repair cafe, two equal pieces of clean steel wool are placed in separate open jars. A volunteer moistens one piece with 10 milliliters of water and leaves the other dry. Both jars sit side by side for two days so they have similar access to air, light, and room temperature. The volunteer notes each piece's color and texture at the start and again after two days. A rough orange-brown coating appears on the damp wool, while the dry wool stays gray and smooth. Rubbing the coating with a cloth does not make the damp piece look like it did before.

3. At a nearby table, another volunteer tests a kitchen reaction. Two identical cups each receive 30 milliliters of vinegar. The volunteer adds 2 grams of baking soda to one cup but no powder to the other, then immediately fits an identical balloon over each opening. Bubbles form in the first cup, and its balloon expands. The cup without powder shows no visible bubbles, and its balloon stays flat. Both cups remain at the same temperature. A balloon can expand when gas enters it, so this observation offers stronger evidence than bubbles alone. The volunteer records both outcomes and repeats the comparison.

2 ANSWER WITH EVIDENCE

Use the passage

1. Which steel wool sample is the control, and why?

2. Is the damp wool's change more consistent with a physical or a chemical change? Use two details from the test to support your answer.

3. What factor changes between the two cups? Name two conditions the volunteer keeps the same.

4. How does the balloon observation strengthen the claim that a reaction occurred, beyond simply seeing bubbles?

3 YOUR TURN

Your own words

Plan a safe test of how lemon juice affects browning on apple slices. Name your comparison, the factor you change, two conditions you keep the same, what you record, and how you would interpret the result without treating color alone as proof.

Clues to Change

PART 1 · READ AND MARK

In each test, circle the factor the volunteer changes, underline the outcome observations, and draw a box around the control to help you judge what caused the change. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Which steel wool sample is the control, and why?	**The dry steel wool is the control because it does not receive the water being tested.**
2	Is the damp wool's change more consistent with a physical or a chemical change? Use two details from the test to support your answer.	**It is more consistent with a chemical change. A rough orange-brown coating appears only on the damp wool, and rubbing it does not restore the wool's original appearance.**
3	What factor changes between the two cups? Name two conditions the volunteer keeps the same.	**One cup receives baking soda and the other does not. Both have 30 milliliters of vinegar and are kept at the same temperature. Identical cups or balloons are also acceptable.**
4	How does the balloon observation strengthen the claim that a reaction occurred, beyond simply seeing bubbles?	**The balloon expands only over the cup with baking soda, providing evidence that gas entered it during that test.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would cut two slices of equal thickness from the same apple. I would brush one with lemon juice and the other with an equal amount of water. I would leave them side by side for one hour and record their colors at the start and every 15 minutes. The liquid applied is the factor I change; slice thickness and time exposed to air stay the same. If the water-coated slice browns more, that suggests lemon juice affects a chemical change, but color alone cannot prove a new substance formed.

Accept other valid controlled conditions named in the passage. In the apple plan, look for a comparison that changes the treatment while keeping other conditions steady, and for a cautious interpretation of browning.