

Copper Change Detectives

Use evidence to tell physical changes from chemical changes.

PS.3.b "pure substances can undergo physical and chemical changes that may result in a change of properties;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline every physical change, circle every chemical change, and number the sentences that give evidence about whether a new substance formed.

When Substances Change

- ① Pure copper is an element made of only copper atoms. In a workshop, a technician cuts a copper wire into shorter pieces and bends one piece into a hook. These are physical changes because the copper remains copper. Each piece can still conduct electricity, has the same reddish color, and can be recognized as copper. Cutting changes size, and bending changes shape, but neither action makes a new substance. Physical changes can alter a substance's form without changing its chemical identity.
- ② A different physical change occurs when pure copper is heated until it melts, then allowed to cool into a solid bead. Its state and shape change, yet it is still copper. However, heating a clean copper strip strongly in air can cause copper atoms to react with oxygen. The product is copper oxide, a new substance. It is black rather than reddish and does not have copper's high electrical conductivity. This chemical change results in different properties because a different substance forms.
- ③ Scientists look for evidence of a new substance, not merely a dramatic appearance. In a controlled laboratory test, pure sulfur may be crushed into yellow powder, which is a physical change. If sulfur burns in oxygen, it reacts to form sulfur dioxide gas, so a chemical change occurs. The gas has properties unlike solid sulfur. A change of state, size, or shape points to a physical change. A new substance with new properties points to a chemical change.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 In paragraph 1, what two actions are physical changes to the copper wire?

2 Why is melting and cooling the copper in paragraph 2 a physical change?

3 When copper reacts with oxygen, what new substance forms? Give two properties from the passage that are different from copper's properties.

4 Compare crushing sulfur with burning sulfur in oxygen. Classify each change and give the passage evidence for each classification.

3 YOUR TURN _____ Your own words

Choose a pure substance. Write exactly three sentences that describe one physical change and one chemical change it can undergo. Include a property or identity clue that supports each classification.

PART 1 • READ AND MARK

Underline every physical change, circle every chemical change, and number the sentences that give evidence about whether a new substance formed. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	In paragraph 1, what two actions are physical changes to the copper wire?	The technician cuts the wire into shorter pieces and bends a piece into a hook.
2	Why is melting and cooling the copper in paragraph 2 a physical change?	Its state and shape change, but it remains copper.
3	When copper reacts with oxygen, what new substance forms? Give two properties from the passage that are different from copper's properties.	Copper oxide forms. It is black rather than reddish and does not have copper's high electrical conductivity.
4	Compare crushing sulfur with burning sulfur in oxygen. Classify each change and give the passage evidence for each classification.	Crushing sulfur is a physical change because it changes solid sulfur into powder. Burning sulfur is a chemical change because sulfur dioxide gas, a new substance with different properties, forms.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Pure iron can be bent into a hook, a physical change because it remains iron. When iron reacts with oxygen, iron oxide forms, so this is a chemical change. The iron oxide has a reddish-brown color unlike gray iron, showing that a new substance has different properties.

Accept equivalent wording that identifies physical changes as changes in form, state, size, or shape without a new substance. For chemical changes, students must identify formation of a new substance and support it with a changed property or identity clue.