

Clues in a Flask

Compare properties before and after substances interact.

MS-PS1-2 "Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. Clarification Statement: Examples of reactions could include burning sugar or steel wool..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each property recorded before mixing, circle each property recorded after mixing, and number the paired property changes that could support a claim about new substances.

Zinc and Acid Data

- ① At a lab bench, a group combines zinc granules with dilute hydrochloric acid in a flask. Before mixing, the zinc is a silvery solid with a density of 7.14 g/cm^3 and a melting point of 420°C . It does not burn easily in air. The acid solution is clear and has a sharp, irritating odor. Its density is about 1.01 g/cm^3 . The students record these observations before the substances touch. They also note that zinc is not soluble in water.
- ② Once mixed, bubbles rise from the flask, and the zinc granules slowly disappear. A gas is collected in a small tube. The gas has no odor, has a very low density, and burns with a pale blue flame when tested carefully. The liquid left in the flask is clear and has no sharp acid odor. It contains dissolved zinc chloride, which is soluble in water. The group compares these observations with its before mixing data rather than relying on bubbling alone.
- ③ When substances interact, a change such as dissolving or a temperature change is not enough by itself to identify a chemical reaction. Scientists look for evidence that substances with different properties are present after the interaction. Useful comparisons include density, melting point, boiling point, solubility, flammability, and odor. A claim should name a before property and an after property, then explain whether the evidence supports formation of new substances. Use the recorded data to make that claim for this investigation.

2 ANSWER WITH EVIDENCE Use the passage

1 What before and after observations show a difference in flammability?

2 How did solubility in water differ between the zinc before mixing and the zinc chloride after mixing?

3 What odor evidence changed after the substances interacted?

4 Does the property data support the claim that a chemical reaction occurred? Use two property comparisons as evidence.

3 YOUR TURN Your own words

A lab record shows that solid P dissolves in water, has a density of 1.8 g/cm^3 , and melts at 110°C . After heating in air, solid Q does not dissolve in water, has a density of 3.1 g/cm^3 , and melts at 690°C . Write exactly two sentences that state whether the data support a chemical reaction and use at least two properties as evidence.

PART 1 • READ AND MARK

Underline each property recorded before mixing, circle each property recorded after mixing, and number the paired property changes that could support a claim about new substances. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What before and after observations show a difference in flammability?	Before mixing, zinc did not burn easily in air. After mixing, the collected gas burned with a pale blue flame.
2	How did solubility in water differ between the zinc before mixing and the zinc chloride after mixing?	Zinc was not soluble in water, while zinc chloride was soluble in water.
3	What odor evidence changed after the substances interacted?	The hydrochloric acid solution had a sharp, irritating odor before mixing. After mixing, the gas had no odor and the liquid no longer had a sharp acid odor.
4	Does the property data support the claim that a chemical reaction occurred? Use two property comparisons as evidence.	Yes. The data show substances with different properties after mixing, such as a flammable, odorless gas instead of zinc that did not burn easily, and soluble zinc chloride instead of insoluble zinc.

PART 3 • YOUR TURN (SAMPLE ANSWER)

The data support a chemical reaction because the material after heating has different solubility, density, and melting point from the material before heating. Solid P dissolved in water and had a density of 1.8 g/cm^3 , while solid Q did not dissolve and had a density of 3.1 g/cm^3 .

Accept a supported claim that a chemical reaction occurred when the student compares at least two before and after properties. Students may use solubility, density, melting point, flammability, or odor as evidence.