

Matter Test Detectives

Compare physical properties and chemical behavior using fair tests.

S8P1.c "Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline evidence of physical properties. Circle evidence of chemical properties, then number the conditions the teams kept the same so you can see how their comparison was fair.

Wax and Salt Investigation

- ① A class investigated paraffin wax and table salt to compare physical properties and chemical behavior. Their question was, "How do the samples differ in density, melting behavior, and combustibility?" For density, each team measured the mass of a 10-cubic-centimeter piece or portion, then divided mass by volume. Using equal volumes made the comparison fair. Students recorded units in grams per cubic centimeter. They predicted that a lower-density sample would have less mass when both samples had the same volume.
- ② Next, teams placed small, equal masses of the samples in separate heat-safe containers. A teacher heated each container in the same hot-water bath and recorded whether a sample changed from solid to liquid. Wax melted in the bath, while salt stayed solid at that temperature. Melting is a physical change because the material remains the same substance. A teacher then held a small wax sample in a flame. It burned, forming new substances, so combustibility is a chemical property. Salt did not burn under these test conditions.
- ③ To make conclusions stronger, teams repeated every measurement three times and looked for results that agreed. They kept the sample volume, water-bath temperature, container type, and heating time the same whenever those conditions applied. Their data showed that wax had less mass than salt for the same volume, and wax melted in the bath. The class concluded that density and melting behavior are physical properties, but burning is chemical evidence because it produces new substances. A good investigation separates observations from claims and states the test conditions.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 How did the teams make their density comparison fair?

2 What physical-property difference did the hot-water-bath test show?

3 Why is burning wax evidence of a chemical property rather than a physical property?

4 Name two practices that made the teams' conclusions stronger.

3 YOUR TURN _____ Your own words

Plan an investigation to compare limestone chips and sand. In each row, include a physical-property test, a teacher-approved dilute-vinegar reactivity test, and conditions you would keep the same.

MATERIAL	PHYSICAL-PROPERTY TEST	CHEMICAL REACTIVITY TEST	CONDITIONS KEPT THE SAME

PART 1 • READ AND MARK

Underline evidence of physical properties. Circle evidence of chemical properties, then number the conditions the teams kept the same so you can see how their comparison was fair. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How did the teams make their density comparison fair?	They compared equal volumes of wax and salt.
2	What physical-property difference did the hot-water-bath test show?	Wax melted in the hot-water bath, while salt stayed solid at that temperature. This showed different melting behavior.
3	Why is burning wax evidence of a chemical property rather than a physical property?	Burning wax formed new substances. A chemical change produces new substances.
4	Name two practices that made the teams' conclusions stronger.	They repeated each measurement three times and kept test conditions, such as sample volume, temperature, container type, and heating time, the same.

PART 3 • YOUR TURN (SAMPLE ANSWER)

MATERIAL	PHYSICAL-PROPERTY TEST	CHEMICAL REACTIVITY TEST	CONDITIONS KEPT THE SAME
Limestone chips	Measure mass and water-displacement volume, then calculate density.	Add 10 mL dilute vinegar to 5 g and observe bubbles for 3 minutes.	Use 5 g samples, 10 mL vinegar, the same container, and 3 minutes.
Sand	Measure mass and water-displacement volume, then calculate density.	Add 10 mL dilute vinegar to 5 g and observe bubbles for 3 minutes.	Use 5 g samples, 10 mL vinegar, the same container, and 3 minutes.

Accept equivalent descriptions of fair testing, including controlling variables and repeating trials. In the open task, accept any safe, measurable physical test and teacher-approved chemical reactivity test with clearly stated controls.