

Matter Detectives

Use observations and particle behavior to classify matter.

6.6 "Matter and energy. The student knows that matter is made of atoms, can be classified according to its properties, and can undergo changes. The student is expected to: compare solids, liquids, and gases in terms of their structure, shape..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline every phrase that gives an observation or particle detail, then circle the matter category or change that the detail supports.

Elena's Materials Test

- ① During a makerspace test, Elena sorted samples for a water filter. A copper wire was an element, a metal that bends and carries electricity. Sulfur was an element too, but it was a nonmetal. Silicon is a metalloid, so it has some metal-like and nonmetal-like properties. Rare Earth elements, such as neodymium, are metals used in strong magnets for headphones and wind turbines. Elements are pure substances because each contains only one kind of atom.
- ② Elena then compared matter in three states. In a solid, particles are packed closely and vibrate in place. The solid keeps its own shape and volume. In a liquid, particles stay close but slide past one another. A liquid changes shape to fit its container, yet keeps its volume. Gas particles are far apart and move fastest. A gas spreads to fill both the shape and volume of its container. Faster particle motion means greater kinetic energy.
- ③ Two jars helped Elena identify other samples. Salt water looked the same throughout, so it was a homogeneous mixture, or solution. Trail mix had visible different parts, so it was a heterogeneous mixture. A plastic bead floated in water because it was less dense than water. The same bead sank in oil, which was less dense than the bead. Finally, mixing two clear liquids made a yellow solid settle. The precipitate and color change were evidence that a new substance may have formed. Gas bubbles or a thermal-energy change can also be evidence.

2 ANSWER WITH EVIDENCE _____ Use the passage

- 1** Compare a solid and a liquid. Describe how their particles move and how their shape and volume are alike or different.

- 2** How are salt water and trail mix classified? Give the observation that supports each classification.

- 3** Classify copper, sulfur, silicon, and neodymium. What modern item uses neodymium?

- 4** What does the bead's behavior show about its density compared with water and oil? Name two observations that suggested a new substance may have formed when the liquids mixed.

3 YOUR TURN _____ Your own words

Complete the table to classify each sample or event. Use an observation or particle clue as evidence for every classification.

SAMPLE OR EVENT	CLASSIFICATION	EVIDENCE

PART 1 • READ AND MARK

Underline every phrase that gives an observation or particle detail, then circle the matter category or change that the detail supports. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Compare a solid and a liquid. Describe how their particles move and how their shape and volume are alike or different.	Solid particles vibrate in place, while liquid particles slide past one another. A solid keeps its shape and volume. A liquid changes shape to fit its container but keeps its volume.
2	How are salt water and trail mix classified? Give the observation that supports each classification.	Salt water is a homogeneous mixture, or solution, because it looks the same throughout. Trail mix is a heterogeneous mixture because different parts are visible.
3	Classify copper, sulfur, silicon, and neodymium. What modern item uses neodymium?	Copper is a metal, sulfur is a nonmetal, silicon is a metalloid, and neodymium is a Rare Earth metal. Neodymium is used in strong magnets for headphones or wind turbines.
4	What does the bead's behavior show about its density compared with water and oil? Name two observations that suggested a new substance may have formed when the liquids mixed.	The bead was less dense than water but more dense than oil. A yellow precipitate formed and there was a color change.

PART 3 • YOUR TURN (SAMPLE ANSWER)

SAMPLE OR EVENT	CLASSIFICATION	EVIDENCE
Distilled water	Pure substance	It contains only water molecules, H ₂ O.
Sports drink	Homogeneous mixture, or solution	It looks the same throughout.
Cereal in milk	Heterogeneous mixture	Different parts are visible.
Effervescent antacid in water	Possible chemical change	Gas bubbles form.

Accept equivalent descriptions of particle motion, density, and mixture evidence. For the final table, accept a possible chemical change when the student gives gas production, thermal-energy change, precipitate formation, or color change as evidence.