

MATTER HAS A PATTERN

Read how elements are organized, use property evidence, and track atoms through a closed system.

FIELD QUESTIONS

1. How does the periodic table organize elements?
2. Which properties support a classification?
3. What remains constant in a closed system?

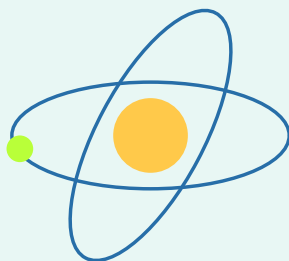
Elements and atoms

An element is a pure substance made of one type of atom. An atom is the smallest unit of an element that still keeps that element's properties. Each element has its own name and symbol on the periodic table.



Copper
Visible matter: many copper atoms

SIMPLIFIED
ATOM MODEL



Not to scale. Subatomic parts are not the focus.

ELEMENT = ONE TYPE OF ATOM

Different samples can contain different numbers of atoms.

The type of atom identifies the element.

CHECK Point to the copper sample. Point to the atom model. Say: Copper is an element.

Read the periodic table

The periodic table organizes elements so patterns are easier to see. A group is a vertical column. A period is a horizontal row. Elements in nearby or repeated positions can be compared using property evidence.

1 2		13 14 15 16 17 18					
GROUPS ↓	1	2					2
	1	H					He
	2	3	4				
		Li	Be				
	3	11	12				
		Na	Mg				
	4	19	20				
		K	Ca				
				5	6	7	8
				B	C	N	O
							F
							Ne
				13	14	15	16
				Al	Si	P	S
							Cl
							Ar

Use coordinates

PERIODS

Na: Group 1, Period 3 | Mg: Group 2, Period 3 | O: Group 16, Period 2

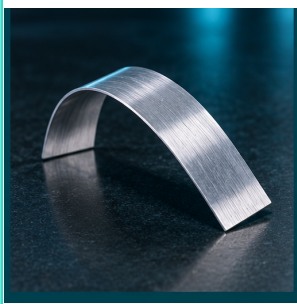
PATTERN CHECK

Trace down Group 1. Then trace across Period 3. Which highlighted elements are in Period 3?

Grade 7 focus: use observable properties. Family names are not needed.

Classify with properties

Scientists use evidence to classify elements as metals, nonmetals, or metalloids. These are common patterns, not rules based on one clue alone.



METAL

- often shiny
- often bends
- conducts well



NONMETAL

- may look dull
- solid may break
- often poor conductor



METALLOID

- some metal clues
- some nonmetal clues
- mixed evidence

USE EVIDENCE Match: bends and conducts well -> metal. Mixed evidence -> metalloid. Often conducts poorly -> nonmetal.

Illustrative samples: aluminum, sulfur, and silicon. Appearance alone is not enough.

Properties are evidence

A property is a characteristic that scientists observe or measure. Use more than one property when you compare substances.

**COLOR**

what it looks like

**SOLUBILITY**

how well it dissolves

**HARDNESS**

resistance to scratching

**DENSITY**

mass in a given volume

**CONDUCTIVITY**

transfer of heat or electricity

**MELTING POINT**

solid becomes liquid

**BOILING POINT**

liquid becomes gas

**VISCOSITY**

resistance to flowing

**MALLEABILITY**

ability to bend or flatten

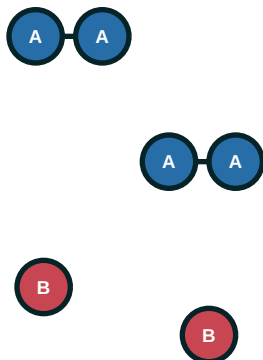
APPLY

Which property would best compare two wires? Which would best compare two liquids that flow at different speeds?

Mixture or compound?

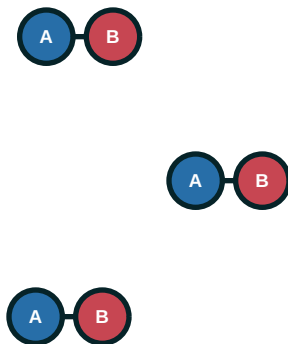
A mixture contains two or more substances that keep their separate compositions. A compound contains two or more different elements joined chemically in a fixed composition.

MIXTURE



Different substances remain separate.

COMPOUND



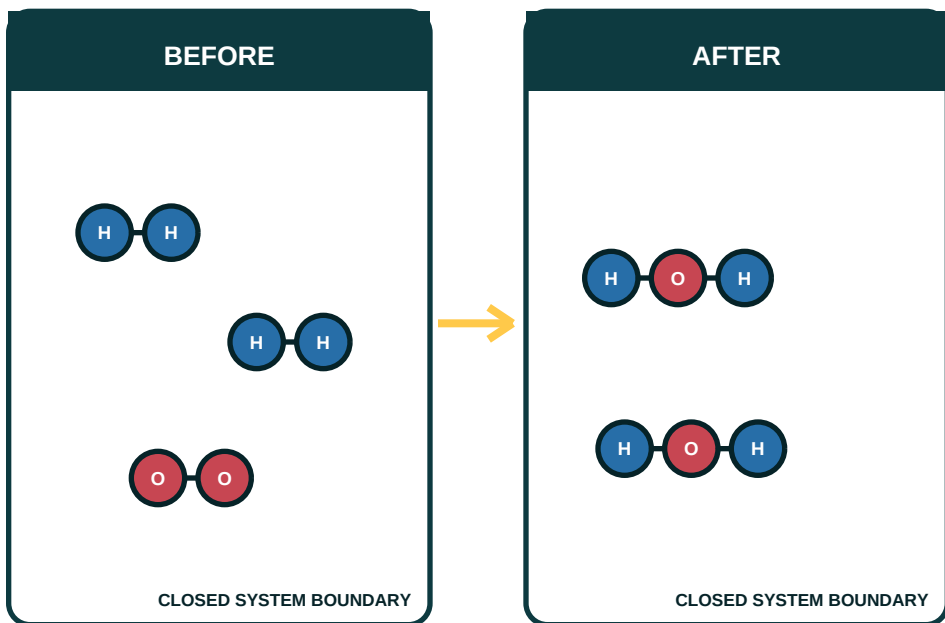
Different elements are joined together.

Particle models are simplified and not to scale. Letters identify particle types.

EXPLAIN Circle the model that can be separated by physical processes. Explain using the word separate or joined.

Atoms stay accounted for

In a closed system, matter cannot enter or leave. Atoms can rearrange into new molecules, but the number and type of atoms stay the same. Therefore, total mass stays constant.



BEFORE: H = 4, O = 2

AFTER: H = 4, O = 2

SAME TYPES + SAME NUMBERS OF ATOMS = MASS CONSERVED

Model: 2 H₂ molecules + 1 O₂ molecule rearrange into 2 H₂O molecules

COUNT + REASON Count the H atoms and O atoms before and after. What changed? What stayed the same?

Words for the mission

Use these words when you explain evidence in the game.

ELEMENT

one type of atom

ATOM

smallest unit of an element

PROPERTY

a characteristic to observe or measure

METAL

often shiny, bendable, conductive

NONMETAL

often a poor conductor

METALLOID

mixed metal and nonmetal properties

CONDUCTIVITY

ability to transfer heat or electricity

MELTING POINT

temperature when solid becomes liquid

BOILING POINT

temperature when liquid becomes gas

SENTENCE FRAMES

This element is a ____ because it is ____ and ____.

This is a mixture because the substances ____.

The atoms rearranged, but the number of ____ atoms stayed ____.

SAY OR WRITE

Choose one frame. Say or write a complete science explanation before you enter the lab.