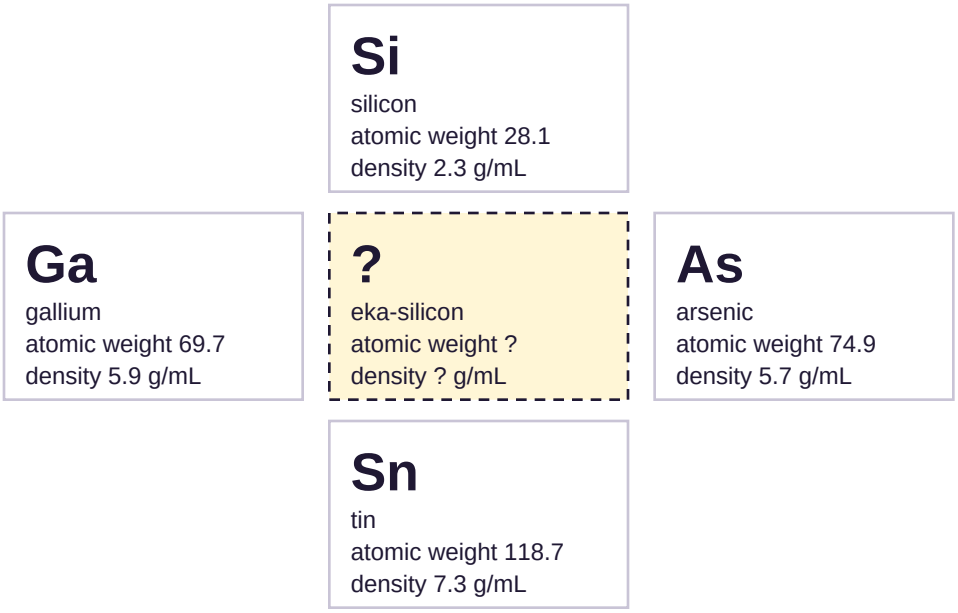
Predict the Missing Element

Name _____

Mendeleev and the periodic table · ages 11–14 · about 45 minutes

In 1871 Dmitri Mendeleev saw a gap in his table directly below silicon. No known element fitted, so he predicted one and called it eka-silicon. Use its neighbours to make your own prediction, as he did.

Part of the table (modern values)



Your predictions

Property	How I worked it out	My prediction
Atomic weight		
Density (g/mL)		
Colour (metal or not?)		
Formula of its oxide (silicon's is SiO2)		

Think about it

1. Averaging the elements above and below gives one estimate. Averaging the ones beside it gives another. Which do you trust more? Why?

2. Mendeleev's idea could have been proved wrong. Why does that make it scientific?

Sources: Royal Society of Chemistry; Lente, ChemTexts 5:17 (2019). Element data: RSC periodic table.

Teacher page: what happened

Name _____

Mendeleev's 1871 prediction and the element found in 1886

Property	Eka-silicon (Mendeleev, 1871)	Germanium (Winkler, 1886)
Atomic weight	about 72	72.6
Density (g/mL)	about 5.5	5.3
Colour	grey	grey
Oxide formula	EsO2	GeO2

Averaging silicon and tin gives about 73 for atomic weight and about 4.8 for density. Averaging gallium and arsenic gives about 72 and 5.8. Mendeleev combined both directions, which is why his numbers sit close to germanium's.

He made similar predictions for eka-aluminium (found as gallium, 1875) and eka-boron (found as scandium, 1879). Not all of his predictions came true; he did not foresee the noble gases.

Discussion point: Mendeleev trusted the pattern over some measured atomic weights. He put tellurium before iodine because of how they behave. Atomic number (Moseley, 1913) later showed why that order is right.

Extension: play Dmitri, the free Super Elements card game (dmitri-game.pages.dev). Each round the cards are put in order by a property before the winner takes them.

Sources: Royal Society of Chemistry; Lente, ChemTexts 5:17 (2019); Foundations of Chemistry (2018).