1.5

Groups, periods, metals

Name _____ Class _____ Mark _____ / 18

What you are practising

I can use an atom's electron arrangement to find its group and period, and use them to decide whether the element is a metal or a non-metal.

Worked example: sulphur, 2, 8, 6
Three occupied shells, so **period 3**. Six electrons in the outer shell, so **group 6**. Group 6 is bigger than period 3, so sulphur is a **non-metal**.

Period = number of occupied electron shells.
Group = number of electrons in the outer shell. A full outer shell is group 8 (0) (group 18 on some tables).
Group number $\leq$ period number? Metal.
Group number $>$ period number? Non-metal.
Exceptions: hydrogen and some semi-metals.

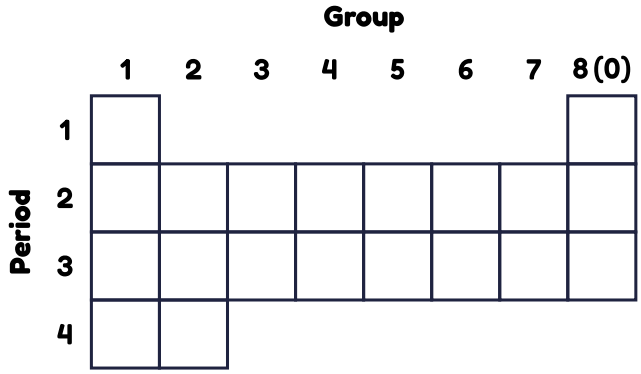
Group and period from the electrons

Fill in each row. Use the rules in the box above. **[12]**

Electron arrangement	Period	Group	Metal or non-metal?
1 2, 8, 1			
2 2, 6			
3 2, 8, 8, 2			
4 2, 8, 3			
5 2, 8, 7			
6 2, 8			

Page done? Tick it off ◌

Metals on the grid



The grid shows where the first 20 elements sit.

7 Use the rule to shade every box where group $\leq$ period. **[1]**

8 One box you shaded is not a metal. Put a cross in it. **[1]**

Explain

A Neon is 2, 8 and argon is 2, 8, 8. Why are they in the same group, and why are they very unreactive? **[2]**

Who is right?

B **Maya:** "Sodium and chlorine are in the same period, so their atoms have the same number of electrons." **Leo:** "No, the same number of occupied shells." Who is right, and why? **[2]**

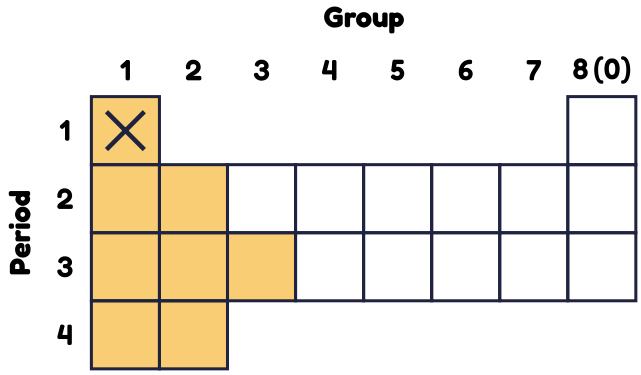
Answers

Group and period from the electrons [12]

Electron arrangement	Period	Group	Metal or non-metal?
1 2, 8, 1 (sodium)	3	1	metal ($1 \leq 3$)
2 2, 6 (oxygen)	2	6	non-metal ($6 > 2$)
3 2, 8, 8, 2 (calcium)	4	2	metal ($2 \leq 4$)
4 2, 8, 3 (aluminium)	3	3	metal ($3 \leq 3$)
5 2, 8, 7 (chlorine)	3	7	non-metal ($7 > 3$)
6 2, 8 (neon)	2	8 (0)	non-metal ($8 > 2$)

Two marks per row: period and group both right (1), metal or non-metal right (1). Aluminium is a metal: "equal to" counts. Neon's outer shell is full, so it is in group 8, also called group 0. Use 8 in the rule: $8 > 2$.

Metals on the grid [2]



7 Shaded: group 1 in every period, group 2 in periods 2–4, group 3 in period 3 (1). These are Li, Be, Na, Mg, Al, K, Ca, plus the hydrogen box.

8 Cross in group 1, period 1: hydrogen is a non-metal, the exception to the rule (1).

Explain [2]

Both have a full outer shell, so both are in group 8 (0) (1). A full outer shell makes the atoms very stable: they are unlikely to lose or gain electrons, so they are very unreactive (1).

Who is right? [2]

Leo (1). A period is a row: its atoms have the same number of occupied shells (three for sodium, 2, 8, 1, and chlorine, 2, 8, 7). The number of electrons goes up by one each step along the row: sodium has 11, chlorine has 17 (1).

How to revise this

Look at the rule box on page 1: period, group, metal or non-metal. Cover it. Write the rules out from memory and use them on sulphur, 2, 8, 6. Check against page 1. Repeat only the rows you got wrong.