Using electron arrangements

Student activity • class activity

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The question

How can outer electrons help explain group patterns?

Compare neutral-atom electron arrangements to identify main-group positions and explain similar chemical properties. Use the noble gases to test the difference between a full outer shell and the misleading rule “every atom needs eight electrons”. No reactions are performed.

Equipment

- Student booklet and periodic table
- Pencil, ruler and optional counters for comparing electron arrangements
- Per pair: one copy of the six supplied configuration cards

Desk activity only. Use pre-cut cards or reusable counters; keep small pieces out of mouths and off the floor. No chemicals, flames, glassware or radiation sources are required.

Course coverage: 1.22–1.24: electronic configuration, main-group position, similar properties and noble-gas reactivity.

Configuration cards • neutral atoms

A: 2,1	**B: 2,8,1**	**C: 2,7**
D: 2,8,7	**E: 2**	**F: 2,8**

Method and reasoning

Read the whole sequence before starting

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1. Read the six configuration cards. For each, add the electrons to find the atomic number of its neutral atom. Identify the element using a periodic table.

2. Count occupied shells to identify the period. Use the outer-electron count to identify the main group, remembering helium's full first shell.

3. Sort the cards into pairs with related outer-shell arrangements. Explain the pairings before checking element names.

4. Compare the lithium/sodium pair and the fluorine/chlorine pair. Describe the common outer-electron patterns without claiming identical reaction rates.

5. Compare helium and neon. Both have full outer shells, but the full-shell electron counts differ. Explain why the noble gases do not readily gain, lose or share electrons.

6. Predict the group and period of a neutral atom with arrangement 2,8,8,1. Check its identity and explain your reasoning.

7. Evaluate the statement "same group means every property is the same". Correct it using electron arrangements and the distinction between similar chemical properties and identical physical properties.

Cleanup

- Count and return cards or counters. Keep your written work and corrections; recycle unwanted paper.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Supplied neutral-atom cards: A = 2,1; B = 2,8,1; C = 2,7; D = 2,8,7; E = 2; F = 2,8. Here the course uses Groups 1–7 and 0; Group 0 corresponds to modern Group 18. Similar outer-electron arrangements support similar chemical behaviour, not identical rates or physical properties.

Card / arrangement	Atomic number	Element	Period	Group
A: 2,1				
B: 2,8,1				
C: 2,7				
D: 2,8,7				
E: 2				
F: 2,8				

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Identify the group and period of cards A and B, with reasons.

2. Explain why cards C and D belong to the same group.

3. Explain why cards E and F belong together although their outer-electron counts differ.

4. Why do noble gases not readily react? Avoid saying they “want” electrons.

5. Predict the element, group and period for 2,8,8,1.

6. Correct: “Elements in one group have identical properties and the same number of shells.”