Clues in Columns

Ask questions that connect an element's position to its properties.

CHE.1.d "Ask questions to determine the relationship between an element's physical and chemical properties and its position on the periodic table."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline statements about where elements sit on the periodic table, circle physical properties, and number the chemical-property comparisons in the order you find them.

What Can a Position Predict?

1. Suppose a museum labels three sealed samples: lithium, sodium, and potassium. All sit in Group 1, the first column of the periodic table. Each is a soft, silvery metal and conducts electricity. In carefully controlled demonstrations, each reacts with water to make hydrogen gas and a basic solution. Potassium reacts more vigorously than sodium, which reacts more vigorously than lithium. These observations describe both physical properties, such as appearance and conductivity, and chemical properties, such as reactions. The samples offer a way to investigate how elements in one group can resemble one another but differ in reactivity.

2. A different set of sealed samples holds chlorine, bromine, and iodine. These elements are in Group 17, near the right edge of the periodic table. At room temperature, chlorine is a yellow-green gas, bromine is a reddish-brown liquid, and iodine is a dark solid. All three can react with metals to form compounds called salts. In comparable reactions, chlorine is generally more reactive than bromine, and bromine is more reactive than iodine. Their shared group points to a chemical similarity, while their different states show that members of one group need not look or feel alike.

3. Now compare positions across Period 3, a single row. Sodium is in Group 1, magnesium is in Group 2, and chlorine is in Group 17. At room temperature, sodium and magnesium are solid metals that conduct electricity, while chlorine is a gas that does not conduct electricity under ordinary conditions. Sodium reacts vigorously with cold water, but magnesium reacts much more slowly with cold water. Both metals can react with chlorine to form solid compounds. Sharing a row therefore does not mean sharing every property. Group and row locations help frame questions, but observations are needed to test any prediction.

2 ANSWER WITH EVIDENCE

Use the passage

1. What question could you ask to connect Group 1 position to a physical property? Answer your question with evidence from the passage.

2. What question could you ask about position within Group 1 and reaction with water? Answer it using the passage.

3. What question could you ask about physical state and chemical reactivity within Group 17? Answer it using the passage.

4. Sodium and chlorine share Period 3 but are in different groups. What question could you ask to test whether sharing a row means sharing physical properties? Answer it using the passage.

3 YOUR TURN

Your own words

An unfamiliar element R sits directly below potassium in Group 1. Write two testable questions, one about R's physical properties and one about its reaction with water; after each question, predict an answer using passage evidence. Add one sentence explaining why your predictions still need testing.

Clues in Columns

PART 1 · READ AND MARK

Underline statements about where elements sit on the periodic table, circle physical properties, and number the chemical-property comparisons in the order you find them. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What question could you ask to connect Group 1 position to a physical property? Answer your question with evidence from the passage.	**Do lithium, sodium, and potassium share physical properties because they are in Group 1? All three are soft, silvery metals that conduct electricity.**
2	What question could you ask about position within Group 1 and reaction with water? Answer it using the passage.	**How does reaction with water change from lithium to potassium down Group 1? It becomes more vigorous: lithium reacts least vigorously of the three, then sodium, then potassium.**
3	What question could you ask about physical state and chemical reactivity within Group 17? Answer it using the passage.	**How do state and reactivity change from chlorine to iodine in Group 17? Chlorine is a gas, bromine a liquid, and iodine a solid at room temperature; chlorine is generally most reactive of the three in comparable reactions, followed by bromine and iodine.**
4	Sodium and chlorine share Period 3 but are in different groups. What question could you ask to test whether sharing a row means sharing physical properties? Answer it using the passage.	**Do sodium and chlorine share physical properties because they are in Period 3? No. Sodium is a solid metal that conducts electricity, while chlorine is a gas that does not conduct electricity under ordinary conditions.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Would R be soft and silvery? I predict it would be, because the three Group 1 metals in the passage are soft and silvery. Would R react more vigorously with water than potassium? I predict it would, because water reactions grow more vigorous from lithium to potassium down Group 1. These predictions need testing because a pattern in three elements does not prove what R will do.

Accept other testable questions that link position to a physical or chemical property and use the passage as evidence. Predictions about R must be identified as predictions, not established observations.