

Element Clues

Use periodic table patterns to predict properties and chemical behavior.

PS.2.b “the periodic table can be used to predict the chemical and physical properties of matter; and”

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline every clue about an element's location on the periodic table, and circle each property or behavior that the location can help you predict.

Reading the Table

- ① Chemists can learn much about an element before holding a sample. The periodic table lists elements by increasing atomic number, but its layout also shows repeating patterns. A horizontal row is a period, and a vertical column is a group. Elements in the same group have similar outer electrons, so they often react in similar ways. An element's location can therefore help predict whether it is a metal, nonmetal, or metalloid and suggest how it may behave in a chemical change.
- ② Most metals are on the left and center of the table. They usually conduct heat and electricity well, and many can be shaped without breaking. Metals commonly lose electrons when they form ions. Most nonmetals are on the right side. Many are poor conductors, and several are gases at room temperature. Nonmetals commonly gain or share electrons. The zigzag boundary between these regions contains metalloids, which can show a mixture of metal and nonmetal properties. These broad patterns are clues, not guarantees for every property.
- ③ Groups provide another useful clue about chemical properties. For example, Group 1 metals have one outer electron and tend to lose it, forming ions with a 1^+ charge. Group 17 nonmetals have seven outer electrons and tend to gain one, forming 1^- ions. Group 18 elements have full outer electron levels and are usually very unreactive. By combining an element's group with its metal or nonmetal region, scientists make a reasonable prediction, then test the actual substance.

2 ANSWER WITH EVIDENCE Use the passage

- 1 An unknown element is located in the left-center region of the periodic table. Predict one physical property and one likely electron behavior for this element.

- 2 Element Q is a Group 17 nonmetal with seven outer electrons. Predict the charge of the ion it tends to form, and explain why.

- 3 Two elements are in the same vertical group but are in different periods. What can you predict about their chemical behavior? Use information about outer electrons in your answer.

- 4 Element R is in Group 18. Predict its reactivity and identify the table clue that supports your prediction.

3 YOUR TURN Your own words

YOUR TURN: Choose one metal and one nonmetal from the periodic table. Complete the table with each element's location, one predicted physical property, and one predicted chemical behavior.

ELEMENT AND LOCATION	PREDICTED PHYSICAL PROPERTY	PREDICTED CHEMICAL BEHAVIOR

PART 1 • READ AND MARK

Underline every clue about an element's location on the periodic table, and circle each property or behavior that the location can help you predict. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	An unknown element is located in the left-center region of the periodic table. Predict one physical property and one likely electron behavior for this element.	It will likely conduct heat and electricity well, and it will commonly lose electrons when forming ions.
2	Element Q is a Group 17 nonmetal with seven outer electrons. Predict the charge of the ion it tends to form, and explain why.	It tends to form a 1⁻ ion because it gains one electron.
3	Two elements are in the same vertical group but are in different periods. What can you predict about their chemical behavior? Use information about outer electrons in your answer.	They will often react in similar ways because elements in the same group have similar outer electrons.
4	Element R is in Group 18. Predict its reactivity and identify the table clue that supports your prediction.	It is usually very unreactive. Group 18 elements have full outer electron levels.

PART 3 • YOUR TURN (SAMPLE ANSWER)

ELEMENT AND LOCATION	PREDICTED PHYSICAL PROPERTY	PREDICTED CHEMICAL BEHAVIOR
Magnesium, left-side metal	Conducts heat and electricity well.	Commonly loses electrons when forming ions.
Sulfur, right-side nonmetal	Poor conductor of heat and electricity.	Commonly gains or shares electrons.

Accept accurate metal and nonmetal choices with locations that support the stated predictions. For the open task, accept equivalent physical properties and electron behaviors supported by the element's periodic table region or group.