# FSI Patterns in the Periodic Table and Atomic Structure Reading for Meaning

All matter is made of atoms, and the structure of atoms helps explain why elements behave the way they do. Atoms are composed of three main subatomic particles: **protons**, **neutrons**, and **electrons**. Protons have a positive charge and are found in the nucleus, neutrons have no charge and are also found in the nucleus, and electrons have a negative charge and move in energy levels surrounding the nucleus.

The **atomic number** of an element is equal to the number of protons in its nucleus. This number determines the identity of the element and its position on the periodic table. Elements are arranged in order of increasing atomic number, which results in repeating patterns in physical and chemical properties known as **periodic trends**.

Elements in the same **group (column)** of the periodic table have the same number of **valence electrons**, which are the electrons in the outermost energy level. Valence electrons play a key role in how elements react with one another. Because elements in the same group have the same number of valence electrons, they tend to have similar chemical properties.

Across a **period (row)** on the periodic table, the number of energy levels remains the same, but the number of valence electrons increases from left to right. This causes predictable changes in properties such as reactivity and bonding behavior. Metals, nonmetals, and metalloids are arranged in distinct regions of the table, reflecting differences in atomic structure and electron arrangement.

By analyzing patterns in atomic structure and the organization of the periodic table, scientists can predict how elements will interact, form compounds, and behave under different conditions—even without directly observing every reaction.

**1. Which claim is best supported by the information in the passage? (DOK 3)**

A. Elements with the same atomic mass have identical chemical properties
B. Elements are organized randomly on the periodic table
C. Elements in the same group have similar chemical behavior
D. All atoms have the same number of energy levels

**2. An unknown element reacts in a similar way to sodium. Based on periodic table patterns, which evidence best supports identifying this element? (DOK 3)**

A. It has the same atomic mass as sodium
B. It is located in the same group as sodium
C. It has more neutrons than sodium
D. It has fewer energy levels than sodium

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**3. Which reasoning best explains why elements in the same group share similar properties? (DOK 3)**

A. They have the same number of protons and neutrons
B. They have the same atomic number
C. They have the same number of valence electrons
D. They are all metals

**4. What conclusion can be drawn about elements as you move left to right across a period? (DOK 3)**

A. The number of energy levels increases
B. The number of valence electrons increases
C. Atomic number decreases
D. All elements become more metallic

**5.Which observation best supports the idea that atomic structure determines element behavior? (DOK 3)**

A. Elements are found naturally on Earth
B. Atoms contain charged particles
C. Elements with similar valence electrons react similarly
D. All atoms contain neutrons

**6. A student claims that two elements will form similar compounds because they are in the same column on the periodic table. Which evidence most strongly supports this claim? (DOK 4)**

A. They have similar atomic masses
B. They have the same number of energy levels
C. They have the same number of valence electrons
D. They are both nonmetals

**7. How does the arrangement of elements on the periodic table help scientists predict chemical reactions? (DOK 4)**

A. It shows which elements are radioactive
B. It groups elements by similar atomic structures
C. It ranks elements by temperature resistance
D. It separates natural and synthetic elements

**8. Which reasoning explains why atomic number is more important than atomic mass for organizing the periodic table? (DOK 4)**

A. Atomic mass never changes
B. Atomic number determines the element's identity
C. Atomic mass controls electron charge
D. Atomic number determines neutron count

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**9. If two elements have different numbers of protons but the same number of energy levels, what conclusion is most accurate? (DOK 4)**

A. They are in the same group
B. They are the same element
C. They are in the same period
D. They have identical chemical properties

**10. Which statement best summarizes the relationship between atomic structure and the periodic table? (DOK 4)**

A. Atomic structure explains why elements are randomly arranged
B. Atomic structure determines patterns seen on the periodic table
C. The periodic table changes atomic structure
D. Atomic structure has little effect on element behavior

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