# Answers to Periodic Table Lesson Questions : U2Ch5L2

## Essential Question

1. How do you use the periodic table to predict the properties of elements?  
 - The periodic table organizes elements by increasing atomic number and groups them based on similar properties. This arrangement allows us to predict properties such as reactivity, state of matter, electronegativity, and bonding patterns. For instance, elements in Group 1 (alkali metals) are highly reactive and form ionic compounds.

## Curiosity Corner

2. Why do sodium, magnesium, and calcium share similarities, and how do these similarities make them effective as deicing agents?  
 - Sodium, magnesium, and calcium belong to Groups 1 and 2 of the periodic table and have similar chemical properties like forming salts. Their exothermic reactions with ice lower the freezing point of water, making them effective deicing agents.

## Progress Check 1

3. How does the periodic table help us predict similar properties of elements?  
 - Elements in the same group have similar valence electron configurations, leading to analogous chemical and physical properties. For example, alkali metals in Group 1 are all highly reactive.

4. Why might elements in the same group show similar chemical properties? Do they show similar physical properties?  
 - Elements in the same group have the same number of valence electrons, which determines their chemical reactivity. However, their physical properties, like melting point or density, may vary due to differences in atomic size and mass.

## Progress Check 2

5. How would you expect the properties of an element in Group 1 to differ from those of an element in Group 17? Explain your reasoning.  
 - Group 1 elements (alkali metals) are reactive metals that lose one electron to form cations. In contrast, Group 17 elements (halogens) are nonmetals that gain one electron to form anions. Group 1 elements are more metallic and reactive with water, while Group 17 elements are more reactive with metals.

## Progress Check 3

6. Identify whether the following elements are metals, metalloids, or nonmetals: Silicon, Oxygen, and Magnesium.  
 - **Silicon**: Metalloid  
 - **Oxygen**: Nonmetal  
 - **Magnesium**: Metal

7. Compare the properties of metals and metalloids. How do these properties influence their use in different industries? Provide examples.  
 - Metals are conductive, malleable, and ductile, making them ideal for construction (e.g., steel) and electronics (e.g., copper wires). Metalloids have intermediate properties, such as semiconductivity, and are used in the tech industry (e.g., silicon in computer chips).

## Progress Check 4

8. Draw the Lewis dot structure for chlorine:  
 - Chlorine (Cl) has 7 valence electrons, represented as:  
 Cl:  
 \*\* . \*\*  
 \* Cl \* \*\*   
 \*\* \*\*

## Power Up

9. Reflect on the following prompts:  
 - The periodic table classifies elements based on properties like malleability, reactivity, and conductivity, aiding their application in industries.  
 - Similarities among lanthanides and actinides group them separately to highlight unique properties like magnetism or radioactivity.  
 - With new element discoveries, the periodic table might expand to include unknown properties and classifications.

## Lesson Check

10. If you were asked to find an element that could replace sodium in road salt to melt ice, where on the periodic table would you look and why?  
 - Look in Group 1 (alkali metals) for elements like potassium or lithium. These elements share similar properties with sodium, such as high reactivity and salt-forming ability.

11. Explain how the position of an element in a group affects its valence electrons and chemical behavior. Provide an example.  
 - Elements in the same group have the same number of valence electrons, determining their chemical reactivity. For example, all Group 17 halogens have 7 valence electrons, making them highly reactive nonmetals.

12. Compare the properties of metals and nonmetals based on their location on the periodic table. How do these locations help determine whether an element is a metal or a nonmetal?  
 - Metals are on the left and center of the periodic table, characterized by malleability and conductivity. Nonmetals are on the right, known for being brittle and poor conductors. This separation reflects their distinct physical and chemical behaviors.

13. Magnesium and aluminum are located in adjacent groups on the periodic table. Predict how their properties might be similar or different based on their position and explain your reasoning.  
 - Both are metals with high conductivity and reactivity, but aluminum is less reactive than magnesium due to its higher ionization energy and smaller atomic radius.

14. Why do elements in the same period show a gradual change in properties as you move from left to right? Describe what happens to atomic size and other properties across a period.  
 - Across a period, atomic size decreases due to increasing nuclear charge, pulling electrons closer. Ionization energy and electronegativity increase, while metallic character decreases.

15. Draw the Lewis dot structure for oxygen. Explain how it indicates the number of bonds that oxygen can form with other elements.  
 - Oxygen (O) has 6 valence electrons, represented as:  
 \*\* .O..\*\*  
 Oxygen can form 2 bonds by sharing electrons to complete its octet.

## Beyond the Lesson

16. How does understanding the periodic table enable manufacturers to predict which metals will mix well to form alloys with specific properties like strength, lightweight, or corrosion resistance?  
 - The periodic table helps identify complementary properties, such as combining aluminum (lightweight) with copper (strength) to form durable alloys for aviation.

17. How do the properties of elements influence their applications in medicine and environmental science?  
 - Elements like iodine are essential for health, used in antiseptics and thyroid treatments. In environmental science, elements like carbon are studied for their role in climate change.