SB - Chapter Opener

# Chapter Title

Chapter 7: Covalent Bonding  
Unit 2: Atomic Structure and Bonding

# Essential Questions

- How do covalent bonds form, and how do they differ from ionic bonds?  
- How do we name and write formulas for covalent compounds?  
- How does VSEPR theory help us predict the shapes of molecules?  
- How do differences in electronegativity lead to molecular polarity and affect intermolecular forces?  
These essential questions are designed to guide your thinking as you explore the properties of covalent compounds and the shapes of molecules.

# Big Idea

In this chapter, we explore the formation of covalent bonds, where atoms share electrons, and how these bonds lead to the creation of molecules with unique shapes and properties. By understanding covalent bonding, molecular geometry, and polarity, you will be able to predict how molecules behave in various conditions.

# Phenomenon-Based Learning

In northern countries, people spread road salt on icy streets to help melt the ice and snow. But is the water produced by melting ice still the same as solid ice? Does the shape of water molecules change? This chapter investigates how molecular shapes and bonds impact the physical properties of substances like water and salt.

# Chapter STEM Task

By the end of this chapter, you will complete a STEM task that explores how road salt melts ice and how the properties of molecules, such as shape and bonding, determine their interactions. You will apply concepts like covalent bonding, polarity, and molecular geometry to explain these real-world phenomena.

# Chapter Overview

This chapter includes the following lessons:  
1. Lesson 1: Covalent Bonding and Molecular Structure  
2. Lesson 2: Naming and Writing Formulas for Covalent Compounds  
3. Lesson 3: VSEPR Theory and Molecular Geometry  
4. Lesson 4: Electronegativity, Polarity, and Intermolecular Forces

SB - Chapter Wrap-Up

# Summary of Main Ideas

Throughout this chapter, you learned about:  
- Covalent bonds, where atoms share electrons to form molecules.  
- Naming and writing formulas for covalent compounds.  
- VSEPR theory, which helps predict the shape of molecules.  
- Electronegativity and how differences in electronegativity lead to molecular polarity and affect intermolecular forces.  
These concepts helped explain the behavior of substances like water and salt in real-world applications.

# Revisit Phenomenon

Let’s revisit the phenomenon: Why does water dissolve salt but not metals? Through this chapter, you learned that water’s polarity and hydrogen bonding allow it to dissolve ionic compounds like salt. Meanwhile, metals, which are held together by metallic bonds, do not dissolve. This difference is due to the unique properties of covalent and ionic bonds.

# Extended STEM Activity (optional)

If you are interested in further exploration, try conducting an experiment to observe how different covalent compounds dissolve in water, depending on their polarity and molecular structure. This hands-on activity can deepen your understanding of molecular geometry and polarity.

# Bring It Together

The lessons in this chapter helped you understand how covalent bonding and molecular shape affect the properties of substances. The mini STEM tasks, like predicting molecular geometry and determining bond polarity, fit into the larger task of explaining why water behaves the way it does. Together, these tasks helped you connect molecular structure to real-world phenomena.

# Chapter Reflective Journal

Reflect on the following:  
- How has your understanding of covalent bonding and molecular geometry evolved throughout the chapter?  
- How does the phenomenon of water and salt on icy roads shape your view of molecular interactions?  
Write about how your understanding of covalent bonding and molecular geometry has changed from the start of the chapter to now.

# Formative Assessment

1. Describe how covalent bonds are formed and provide an example of a simple covalent molecule.  
2. Explain how VSEPR theory helps predict the shape of molecules.  
3. Compare and contrast the properties of covalent and ionic compounds.  
4. How does electronegativity affect molecular polarity?  
5. Draw and label a diagram of the molecular geometry of water and explain how its shape affects its properties.