SB - Chapter Opener

# Chapter Title

Chapter 6: Ionic and Metallic Bonding  
Unit 2: Atomic Structure and Bonding

# Essential Questions

- How do ionic bonds form, and what properties do ionic compounds exhibit?  
- What unique properties do metallic bonds give metals, and how do these properties relate to their structure?  
These essential questions are designed to guide your thinking throughout the chapter. As you learn about ions, compounds, and metals, keep these questions in mind to connect concepts from the lessons to real-world applications.

# Big Idea

In this chapter, we explore the formation and properties of ionic and metallic bonds. Ionic bonding explains how atoms transfer electrons to form charged particles that attract each other, while metallic bonding helps us understand why metals have unique properties like conductivity and malleability. Both bonding types help explain how the structure of matter affects its properties.

# Phenomenon-Based Learning

Why does water treat salt and metal differently? In the winter, road salt is spread on ice-covered streets to melt the ice, while nearby metal street signs and poles remain unaffected. Why does salt dissolve in water and melt the ice, while metals remain intact? This chapter will investigate how the structure of ions and metals helps explain their different interactions with water.

# Chapter STEM Task

By the end of this chapter, you will complete a STEM task that investigates the differences in how water interacts with salt and metals. You will apply your understanding of ionic and metallic bonding to explain why these substances behave differently when exposed to water and ice. This task will connect lessons to practical, real-world challenges.

# Chapter Overview

This chapter includes the following lessons:  
1. Lesson 1: Formation and Properties of Ions  
2. Lesson 2: Ionic Bonding and Compound Formation  
3. Lesson 3: Naming and Formulas of Ionic Compounds  
4. Lesson 4: Metallic Bonding and Metal Characteristics

SB - Chapter Wrap-Up

# Summary of Main Ideas

Throughout this chapter, we learned how:  
- Ions form by gaining or losing electrons.  
- Ionic bonds create compounds with unique properties, such as high melting points and electrical conductivity when dissolved in water.  
- Metals form bonds through the sea of electrons model, which explains their malleability, ductility, and ability to conduct electricity.  
These ideas allowed us to understand the nature of different types of bonds and their role in chemical properties.

# Revisit Phenomenon

Let’s revisit the phenomenon: Why does water treat salt and metal differently? Through this chapter, you have learned that salt, being an ionic compound, dissolves in water because the ions separate and interact with water molecules. On the other hand, metals, held together by metallic bonds, do not dissolve but remain intact. This difference stems from the nature of ionic and metallic bonding.

# Extended STEM Activity (optional)

If you are interested in further exploration, try conducting an experiment to compare the behavior of different metals and salts in various water conditions, such as saltwater, freshwater, and extreme temperatures. This hands-on activity can deepen your understanding of ionic and metallic bonds in real-world settings.

# Bring It Together

The lessons in this chapter have progressively built your understanding of how bonding types affect the properties of matter. The mini STEM tasks, like writing ionic formulas and predicting the behavior of metals, fit into the larger task of explaining why salt and metal interact differently with water. Together, these tasks helped you connect bonding concepts to observable real-world phenomena.

# Chapter Reflective Journal

Reflect on the following:  
- How has your understanding of bonding evolved throughout the chapter?  
- How does the phenomenon of salt vs. metal in water shape your view of ionic and metallic bonds?  
Write about how your understanding of ions, compounds, and metals changed from the start of the chapter to now.

# Formative Assessment

1. Describe how ionic bonds are formed and provide an example of a compound formed through ionic bonding.  
2. Explain why metals can conduct electricity based on the concept of metallic bonding.  
3. Compare and contrast the properties of ionic compounds and metals.  
4. Why do salts dissolve in water while metals do not?  
5. Draw and label a diagram of how electrons behave in both ionic and metallic bonding.