

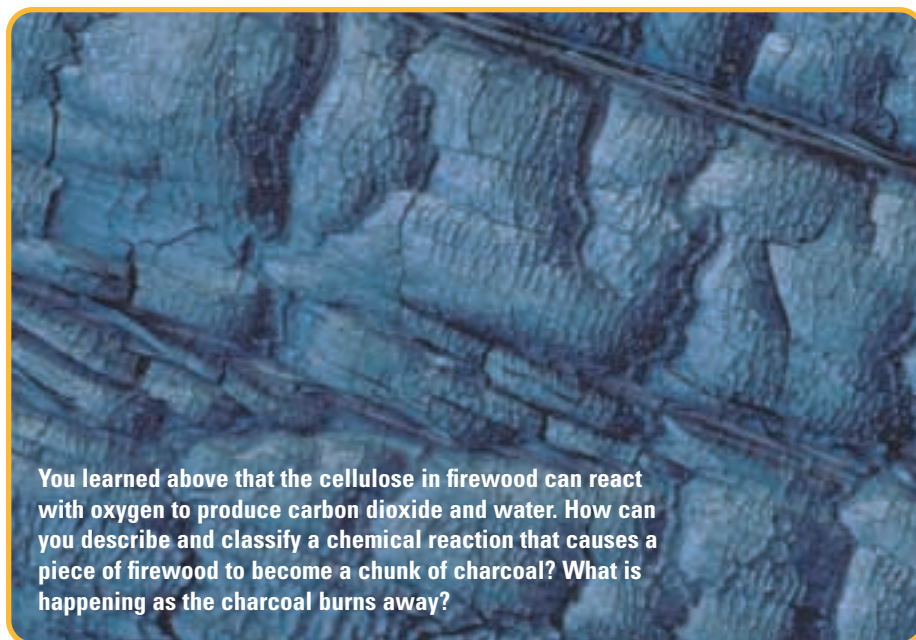


# Classifying Reactions: Chemicals in Balance

**P**icture a starry night and tired hikers sitting around a campfire. Everywhere in this peaceful setting, chemical reactions are taking place. The cellulose in the firewood reacts with the oxygen in the air, producing carbon dioxide and water. The light and heat of the campfire are evidence of the chemical reaction. If someone roasts a marshmallow its sugars react with oxygen. The soft, white marshmallow forms a brown and brittle crust. When someone eats a marshmallow, the chemicals in the stomach react with the sugar molecules to digest them. A person telling a story exhales carbon dioxide with every breath. Carbon dioxide is the product of respiration, another chemical reaction.

In each star in the night sky above, another type of reaction is taking place. This type of reaction is called a **nuclear reaction**, because it involves changes within the nucleus of the atom. Nuclear reactions are responsible for the enormous amounts of heat and light generated by all the stars, including our Sun.

Back on Earth, however, chemical reactions are everywhere in our daily lives. We rely on chemical reactions for everything from powering a car to making toast. In this chapter, you will learn how to write balanced chemical equations for these reactions. You will look for patterns and similarities between the chemical equations, and you will classify the reactions they represent. As well, you will learn how to balance and classify equations for nuclear reactions.



You learned above that the cellulose in firewood can react with oxygen to produce carbon dioxide and water. How can you describe and classify a chemical reaction that causes a piece of firewood to become a chunk of charcoal? What is happening as the charcoal burns away?

## Chapter Preview

- 4.1** Chemical Equations
- 4.2** Synthesis and Decomposition Reactions
- 4.3** Single Displacement and Double Displacement Reactions
- 4.4** Simple Nuclear Reactions

## Concepts and Skills You Will Need

Before you begin this chapter, review the following concepts and skills:

- defining and describing the relationships among atomic number, mass number, atomic mass, isotope, and radioisotope (Chapter 2, section 2.1)
- naming chemical compounds (Chapter 3, section 3.4)
- writing chemical formulas (Chapter 3, section 3.4)
- explaining how different elements combine to form covalent and ionic bonds using the octet rule (Chapter 3, sections 3.2 and 3.3)