Pearson

9.1: Fire and Ice

Have you ever seen ice burn? Normal ice is frozen water, so it does not burn. But if ice is made of a flammable substance—such as ethanol, for example—it will burn upon ignition. The result is a flame that remains relatively cool because two processes—one that emits heat and one that absorbs heat—happen simultaneously. The first process is the combustion of the ethanol, which is an exothermic chemical reaction (a reaction that emits heat; see Section E.6). However, because the liquid ethanol is frozen, another process simultaneously occurs: the melting of the ice. The melting is endothermic and absorbs the heat emitted by the combustion of ethanol. As a result, the two processes cancel each other out and the temperature of the flaming ice is relatively cool and does not change much as the ice burns.

The flaming ethanol ice illustrates many of the principles of **thermochemistry**, the study of the relationships between chemistry and energy. In this chapter, we examine how chemical reactions *exchange* energy with their surroundings and how we quantify the magnitude of those exchanges. These kinds of calculations are important, not only for flaming ice, but also for many other important processes, such as the production of energy, which drive the world economy.