

## CHAPTER 14 LEARNING OBJECTIVES

To satisfy the minimum requirements for this course, you should be able to:

Describe the properties of chemical equilibrium and be able to

- Write the equilibrium expression ( $K_c$ , or  $K_p$  for gaseous reactions) for a balanced chemical equation.
- Classify any equilibrium as heterogeneous or homogeneous.
- Given a chemical reaction and its equilibrium constant, determine the new equilibrium constant when the reaction has been reversed or multiplied by a constant.
- Numerically evaluate  $K_c$  and  $K_p$  from knowledge of the equilibrium concentrations (or pressures) of reactants or products, or from the initial concentration and the equilibrium concentration of at least one substance.
- Interpret the magnitude of  $K_c$  and  $K_p$  and what this tells you about the composition of the equilibrium mixture.
- Use  $K_p$  and  $K_c$  to calculate equilibrium concentrations (i.e., apply *ICE* tables).

Understand the concept of reaction quotient,  $Q$ , and by comparison with the value of  $K_{eq}$

- determine whether a reaction is at equilibrium
- predict in which direction a reaction will shift to reach equilibrium.

Explain how the relative equilibrium quantities of reactants and products are shifted by changes in temperature, pressure, or the concentrations of substances in the equilibrium reaction (Le Chatelier's Principle).

Discuss the relationship between thermodynamics and equilibrium by

- Explaining how the change in equilibrium constant with the change in temperature is related to the enthalpy change in the reaction.
- qualitatively predicting whether products are favored over reactants from the changes in enthalpy and entropy

**To learn the material in this chapter, you should:**

- Review the "In Closing" and "Key Terms" sections of Chapter 14.
- Do the following:  
Exercises: 14.3, 14.4, 14.6, 14.8, 14.9, 14.10, 14.11  
Problem Solving Practice: 14.1, 14.2, 14.3, 14.5, 14.6, 14.7, 14.8
- Test your knowledge by completing the assigned OWL modules.