

CHAPTER 18 LEARNING OBJECTIVES

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

Understand and be able to use the terms product-favored and reactant-favored.

Describe how entropy is related to randomness/disorder or dispersal of energy, and

- predict whether the sign of ΔS is positive, negative, or near zero for a chemical or physical change.
- describe how and why the entropy of a substance changes with temperature or when a phase change occurs.
- calculate ΔS° for any reaction from tabulated absolute entropy values, S°
- know the third law of thermodynamics and explain why it's needed to calculate entropies

Know the second law of thermodynamics and

- discuss how the second law leads to the definition of Gibbs free energy
- explain the relationship between the sign of the free-energy change, ΔG , and whether a process is spontaneous in the forward direction.
- predict how ΔG will change with temperature, given the signs for ΔH and ΔS .
- use the equation $\Delta G = \Delta H - T\Delta S$ to calculate the free energy change for a reaction and to determine the temperature at which a nonspontaneous reaction becomes spontaneous.

Calculate the standard free-energy change, ΔG° , from standard free energies of formation.

Understand the relationship between ΔG° and K and be able to

- calculate ΔG° from K and perform the reverse operation
- calculate the maximum possible work for a reaction
- explain how ΔG differs from ΔG° and discuss how ΔG changes during the course of a reaction
- calculate the free-energy ΔG for given reaction concentrations

Distinguish between thermodynamic stability and kinetic stability.

To learn the material in this chapter, you should:

- Review the “In Closing” and “Key Terms” sections of Chapter 18.
- Do the following:
Exercises: 18.1, 18.3, 18.4, 18.5, 18.7, 18.9
Problem Solving Practice: 18.2, 18.3, 18.4, 18.5, 18.6, 18.7, 18.8, 18.9, 18.10, 18.13
- Test your knowledge by completing the assigned OWL modules.