

CHAPTER OVERVIEW

11: Reactions and Other Chemical Processes

This chapter discusses the thermodynamics of mixing processes and processes described by reaction equations (chemical equations). It introduces the important concepts of molar mixing and reaction quantities, advancement, and the thermodynamic equilibrium constant. The focus is on chemical processes that take place in closed systems at constant pressure, with no work other than expansion work. Under these conditions, the enthalpy change is equal to the heat (Eq. 5.3.7). The processes either take place at constant temperature, or have initial and final states of the same temperature.

Most of the processes to be described involve mixtures and have intermediate states that are nonequilibrium states. At constant temperature and pressure, these processes proceed spontaneously with decreasing Gibbs energy (Sec. 5.8). (Processes in which G decreases are sometimes called *exergonic*.) When the rates of change are slow enough for thermal and mechanical equilibrium to be maintained, the spontaneity is due to lack of transfer equilibrium or reaction equilibrium. An equilibrium phase transition of a pure substance, however, is a special case: it is a reversible process of constant Gibbs energy (Sec. 8.3).

[11.1: Mixing Processes](#)

[11.2: The Advancement and Molar Reaction Quantities](#)

[11.3: Molar Reaction Enthalpy](#)

[11.4: Enthalpies of Solution and Dilution](#)

[11.5: Reaction Calorimetry](#)

[11.6: Adiabatic Flame Temperature](#)

[11.7: Gibbs Energy and Reaction Equilibrium](#)

[11.8: The Thermodynamic Equilibrium Constant](#)

[11.9: Effects of Temperature and Pressure on Equilibrium Position](#)

[11.10: Chapter 11 Problems](#)

Contributors

- Howard DeVoe, Associate Professor Emeritus, [University of Maryland](#) from [Thermodynamics and Chemistry](#)

This page titled [11: Reactions and Other Chemical Processes](#) is shared under a [CC BY 4.0](#) license and was authored, remixed, and/or curated by [Howard DeVoe](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.