

## 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).

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