**Ex 9.8(a)** The equilibrium constant for the reaction \(2 \text{C}_3\text{H}_6(\text{g}) \rightarrow \text{C}_2\text{H}_4(\text{g}) + \text{C}_4\text{H}_8(\text{g})\) is found to fit the expression

\[
\ln K = -1.04 - 1088 \left(\frac{\text{K}}{\text{T}}\right) + 1.51 \times 10^5 \left(\frac{\text{K}}{\text{T}}\right)^2
\]

between 300 K and 600 K. Calculate the standard reaction enthalpy and standard reaction entropy at 400 K.

**Prob 9.3** The equilibrium pressure of \(\text{H}_2\) over \(\text{U}(\text{s})\) and \(\text{UH}_3(\text{s})\) between 450 K and 715 K fits the expression

\[
\ln \left(\frac{p}{\text{Pa}}\right) = 69.32 - 1.464 \times 10^4 \left(\frac{\text{K}}{\text{T}}\right) - 5.65 \ln \left(\frac{\text{T}}{\text{K}}\right)
\]

Find an expression for the standard enthalpy of formation of \(\text{UH}_3(\text{s})\) and from it calculate \(\Delta_r C_p^o\).

**Prob 9.11** Express the equilibrium constant of a gas-phase reaction \(\text{A} + 3 \text{B} \rightarrow 2 \text{C}\) in terms of the equilibrium value of the extent of reaction \(\xi\), given that initially \(\text{A}\) and \(\text{B}\) were present in stoichiometric proportions. Find an expression for \(\xi\) as a function of the total pressure \(p\) of the reaction mixture and sketch a graph of the expression obtained.

**Ex 10.4(a/b)** (a) Relate the ionic strengths of (a) \(\text{KCl}\), (b) \(\text{FeCl}_3\), and (c) \(\text{CuSO}_4\) solutions to their molalities \(m\). (b) Relate the ionic strengths of (a) \(\text{MgCl}_2\), (b) \(\text{Al}_2(\text{SO}_4)_3\), and (c) \(\text{Fe}_2(\text{SO}_4)_3\) solutions to their molalities \(m\).

**Ex 10.9(a)** Estimate the mean ionic activity coefficient for \(\text{CaCl}_2\) in a solution that is 0.020 mol kg\(^{-1}\) \(\text{CaCl}_2(\text{aq})\) and 0.030 mol kg\(^{-1}\) \(\text{NaF}(\text{aq})\).