

91. Since no heat is transferred in an adiabatic process, then

$$Q_{\text{total}} = Q_{\text{isotherm}} = W_{\text{isotherm}} = nRT \ln\left(\frac{3}{12}\right)$$

where the First Law of Thermodynamics (with  $\Delta E_{\text{int}} = 0$  during the isothermal process) and Eq. 20-14 have been used. With  $n = 2.0$  mol and  $T = 300$  K, we obtain  $Q = -6912 \text{ J} \approx -6.9 \text{ kJ}$ .