

60. (a) In the free expansion from state 0 to state 1 we have $Q = W = 0$, so $\Delta E_{\text{int}} = 0$, which means that the temperature of the ideal gas has to remain unchanged. Thus the final pressure is

$$p_1 = \frac{p_0 V_0}{V_1} = \frac{p_0 V_0}{3V_0} = \frac{1}{3}p_0 .$$

- (b) For the adiabatic process from state 1 to 2 we have $p_1 V_1^\gamma = p_2 V_2^\gamma$, i.e.,

$$\frac{1}{3}p_0(3V_0)^\gamma = (3.00)^{\frac{1}{3}}p_0 V_0^\gamma$$

which gives $\gamma = 4/3$. The gas is therefore polyatomic.

- (c) From $T = pV/nR$ we get

$$\frac{\bar{K}_2}{\bar{K}_1} = \frac{T_2}{T_1} = \frac{p_2}{p_1} = (3.00)^{\frac{1}{3}} = 1.44 .$$