

55. (a) Let p_i , V_i , and T_i represent the pressure, volume, and temperature of the initial state of the gas. Let p_f , V_f , and T_f represent the pressure, volume, and temperature of the final state. Since the process is adiabatic $p_i V_i^\gamma = p_f V_f^\gamma$, so

$$p_f = \left(\frac{V_i}{V_f} \right)^\gamma p_i = \left(\frac{4.3 \text{ L}}{0.76 \text{ L}} \right)^{1.4} (1.2 \text{ atm}) = 13.6 \text{ atm} .$$

We note that since V_i and V_f have the same units, their units cancel and p_f has the same units as p_i .

- (b) The gas obeys the ideal gas law $pV = nRT$, so $p_i V_i / p_f V_f = T_i / T_f$ and

$$T_f = \frac{p_f V_f}{p_i V_i} T_i = \left[\frac{(13.6 \text{ atm})(0.76 \text{ L})}{(1.2 \text{ atm})(4.3 \text{ L})} \right] (310 \text{ K}) = 620 \text{ K} .$$