



a.) Isothermal  $\Rightarrow T_2 = T_1$

$$b.) W_{1 \rightarrow 2} = - \int_{V_1}^{V_2} P dV = - \int_{V_1}^{V_2} \frac{nRT_1}{V} dV = -nRT_1 \int_{V_1}^{V_2} \frac{dV}{V}$$

$$= -nRT_1 \ln\left(\frac{V_2}{V_1}\right)$$

$$\therefore \underline{W_{1 \rightarrow 2} = -nRT_1 \ln(2)}$$

c.) First law:

$$\Delta E_{th} = Q + W \quad \& \quad \Delta E_{th} = 0$$

since  $T = \text{const.}$

$$\therefore \underline{Q_{1 \rightarrow 2} = -W_{1 \rightarrow 2} = nRT_1 \ln(2)}$$