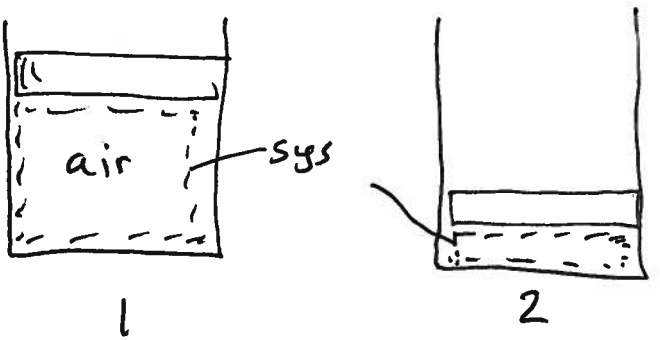
Mech 222 Quiz 1 Thermo Solution

a)



b) $E_2 - E_1 = Q - W$ no ΔKE, ΔPE so

$U_2 - U_1 = Q - W$

process is reversible so $W = \int P dV$

$$U_2 - U_1 = Q - \int_{V_1}^{V_2} P dV$$

c) Model: ideal gas

d) Process is isothermal, so $U_2 = U_1$ because we have an ideal gas $\Rightarrow \Delta U = 0$

From First Law, $\boxed{{}_1Q_2 = {}_1W_2 = \int P dV}$

$$ {}_1W_2 = \int_{V_1}^{V_2} \frac{mRT}{V} dV = mRT \ln \frac{V_2}{V_1} = P_1 V_1 \ln \frac{V_2}{V_1} = (100)(2) \ln \frac{0.5}{2} \quad \text{kPa-L} = \text{J}$$

$$ {}_1W_2 = -277\ \text{J} $$

e)