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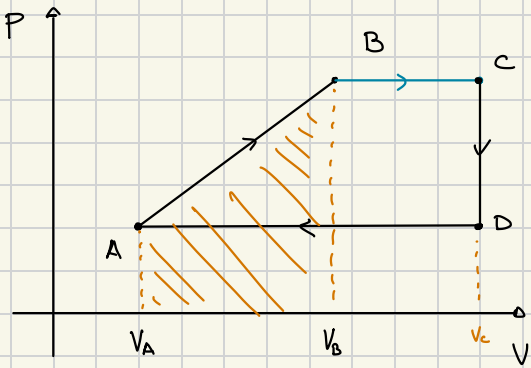

$m = 2g$ elio

$\ell = 3$

$\mathcal{M} = 4 \frac{g}{mol}$

$V_A = 2L = 2 \cdot 10^{-3} m^3$

$T_A = 0°C = 273\ K$

$V_B = 2V_A$

$A \rightarrow B$ $\frac{P}{V}$ è costante

è una retta

$B \rightarrow C$ P costante $V_C = 5L$

$C \rightarrow D$ V costante $P_D = P_A$

$D \rightarrow A$ P costante

▷ Calcolare tutto a ogni vertice $\rightsquigarrow$ $n = \frac{m}{\mathcal{M}} = \frac{2g}{4\frac{g}{mol}} = 0{,}5 mol$

$P_A V_A = nRT_A$

$T_A = 273\ K$

$V_A = 2 \cdot 10^{-3} m^3$

$P_A = \frac{nRT_A}{V_A}$

$P_B V_B = nRT_B \rightsquigarrow T_B = \frac{P_B V_B}{nR} = 4 \frac{P_A V_A}{nR} = 4T_A$

$V_B = 2V_A$

$\frac{P_A}{V_A} = \frac{P_B}{V_B} \rightsquigarrow P_B = \frac{V_B}{V_A} P_A = \frac{2V_A}{V_A} P_A = 2P_A$

$T_B = 4T_A$

$V_B = 2V_A$

$P_B = 2P_A$

$P_C V_C = nRT_C \rightsquigarrow T_C = \frac{P_C V_C}{nR} = \frac{2P_A \cdot \frac{5}{2} V_A}{nR} = 5T_A$

$V_C = \frac{5}{2} V_A$ ← ce lo dice il problema

$P_C = P_B = 2P_A$

$T_C = 5T_A$

$V_C = \frac{5}{2} V_A$

$P_C = 2P_A$

$T_D = \dots = \frac{5}{2} T_A$

$V_D = \frac{5}{2} V_A$

$P_D = P_A$ ← ce lo dice il problema

▷ Trova calore e lavoro ad ogni scambio

Tratto AB. $\Delta U_{AB} = Q_{AB} - W_{AB}$

$$\Delta U_{AB} = \frac{\ell}{2} nR(T_B - T_A) = \frac{\ell}{2} nR(4T_A - T_A) = 3\,\frac{\ell}{2} nRT_A = \frac{3}{2}\ell P_A V_A$$

$$W_{AB} = \frac{(P_B + P_A)(V_B - V_A)}{2} = \frac{(2P_A + P_A)(2V_A - V_A)}{2} = \frac{3}{2} P_A V_A$$

$$Q_{AB} = \Delta U_{AB} + W_{AB} = \frac{3}{2} P_A V_A (1 + \ell)$$

$$\Delta U_{BC} = \frac{\ell}{2} nR(T_C - T_B) = \dots$$

$$W_{BC} = (V_C - V_B) \cdot P_B = \left(\frac{5}{2} V_A - 2V_A\right) 2P_A = \frac{1}{2} V_A \cdot 2P_A = P_A V_A$$

$$Q_{BC} = \frac{\ell+2}{2} nR(T_C - T_B) = \dots$$

nota, ma si può fare per diff.

$$\Delta U_{CD} = \frac{\ell}{2} nR(T_D - T_C)$$

$$W_{CD} = 0$$

$$Q_{CD} = \frac{\ell}{2} nR(T_D - T_C)$$

$$\Delta U_{DA} = \frac{\ell}{2} nR(T_A - T_D)$$

$$W_{DA} = (V_A - V_D) P_A = \left(V_A - \frac{5}{2} V_A\right) P_A = -\frac{3}{2} P_A V_A$$

$$Q_{DA} = \frac{\ell+2}{2} nR(T_A - T_D)$$

Quante volte va fatto il ciclo per sollevare di 80m = h, una massa M = 650kg

Per alzare la massa è necessario un $W = Mgh$

Ogni ciclo produce $W_{AB} + W_{BC} + W_{CD} + W_{DA} = W_{ciclo}$ lavoro

$$N = \frac{W}{W_{ciclo}} = \frac{Mgh}{\frac{3}{2} P_A V_A + P_A V_A - \frac{3}{2} P_A V_A} = \frac{Mgh}{P_A V_A} = \frac{Mgh}{nRT_A}$$