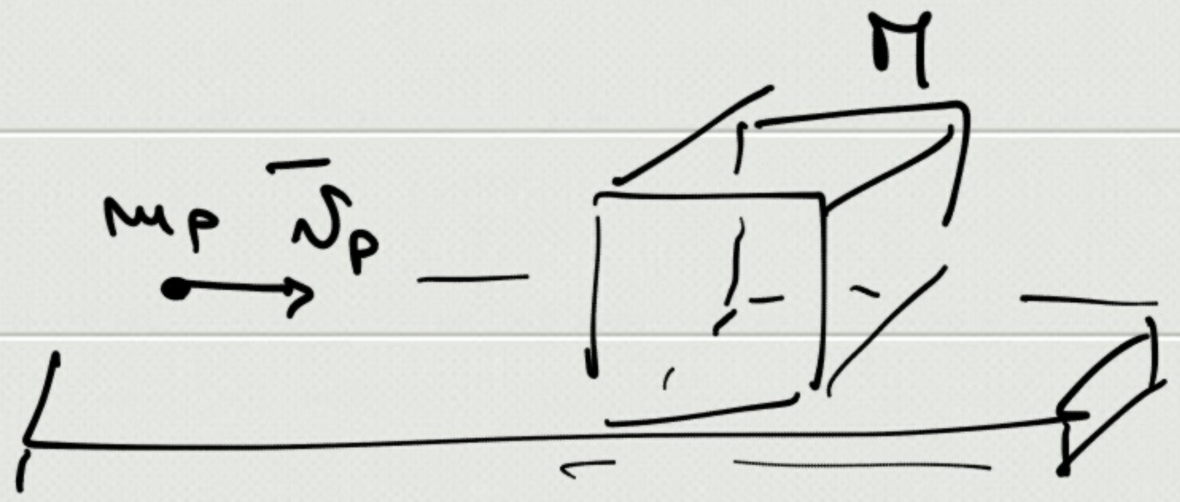
$m_p = 0.05\ kg$

$T_p = 293\ K$




$v_p = 100\ m/s$ $\quad M = 0.5\ kg$ $\quad T_g = 273.15\ K$

$c_p = 130\ J/kg\,K$ $\quad \lambda_g = 3.3 \cdot 10^5\ J/kg$ $\quad m_g = ?$ (fonde)

$\vec{p} = cost \Rightarrow m_p v_p = (m_p + M) V \Rightarrow V = \dfrac{m_p}{m_p + M} v_p$

$E_{diss} = E_{k,i} - E_{kf} = \frac{1}{2} m_p v_p^2 - \frac{1}{2}(m_p + M) V^2 = 227\ J$

$\rightarrow Q$

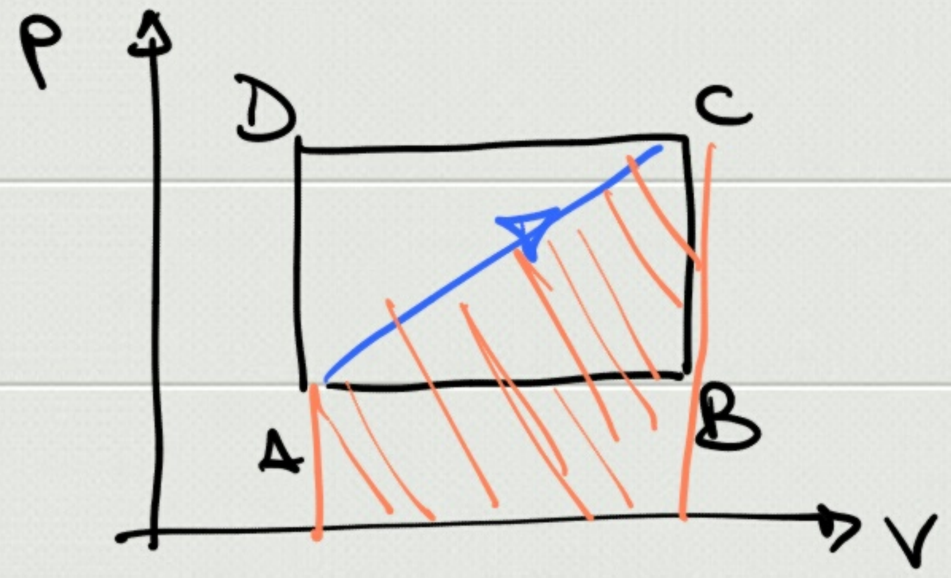
$E_{diss} = m_g \lambda_g$

$= m_g c_g (T_g - T_p)$

$= m_g \lambda_g + m_p c_p (T_g - T_p)$ *

$= m_g c_g (T_g - T_p) + m_p c_p (T_g - T_p)$

$\Rightarrow m_g = 1.1 \cdot 10^{-3}\ kg$




$W_{ABC} = 50\ J$

$Q_{ABC} = 83,5\ J$

$W_{ciclo} = -40\ J$

$\Delta U_{AC}$, $Q_{CDA}$, $W_{AC}$, $Q_{AC}$

$\Delta U_{ABC} (= \Delta U_{AC}) = Q_{ABC} - W_{ABC} = 33.5\ J$

1° P.

$\Delta U_{ciclo} = 0 \quad \Rightarrow \quad Q_{ciclo} = W_{ciclo}$

$Q_{ciclo} = Q_{ABC} + Q_{CDA} \Rightarrow Q_{CDA} = W_{ciclo} - Q_{ABC} =$

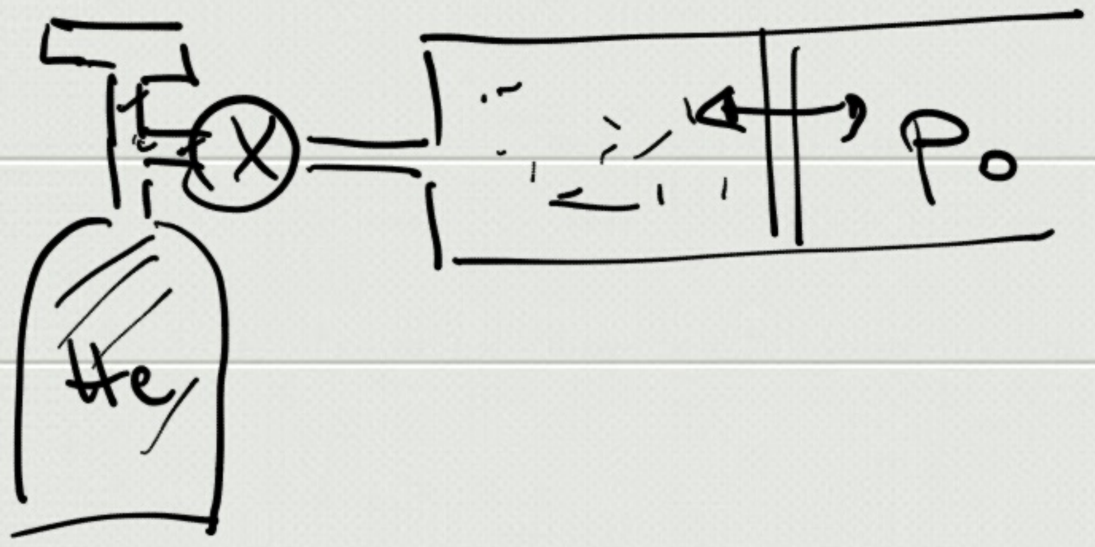
$= -123.5\ J$

$W_{AC} = W_{ciclo} - W_{ABC}$

$\overset{!}{=} W_{ABC} + \frac{1}{2} W_{ciclo}$

$\overset{!}{=} -\Delta U_{AC}$

$\overset{!}{=} W_{ABC} + \frac{1}{2} |W_{ciclo}| \quad * \quad = 103.5\ J$




$m = 4$ $\quad T = 300\ K$ $\quad p = 5 \cdot 10^6\ Pa$

$p_0 = 1.013 \cdot 10^5\ Pa = cost$

$V_{g,0} = 0$ $\qquad T = cost$ (isoterma)

$W_{gas,\,0 \to eq.}$ $\qquad Q_{ced,amb}$

$$W = \int p\,dV = p_0 \Delta V = p_0 (V_f - V_i)$$

$$p V_i = nRT \Rightarrow V_i = \frac{nRT}{p} = 0.0042\ m^3$$

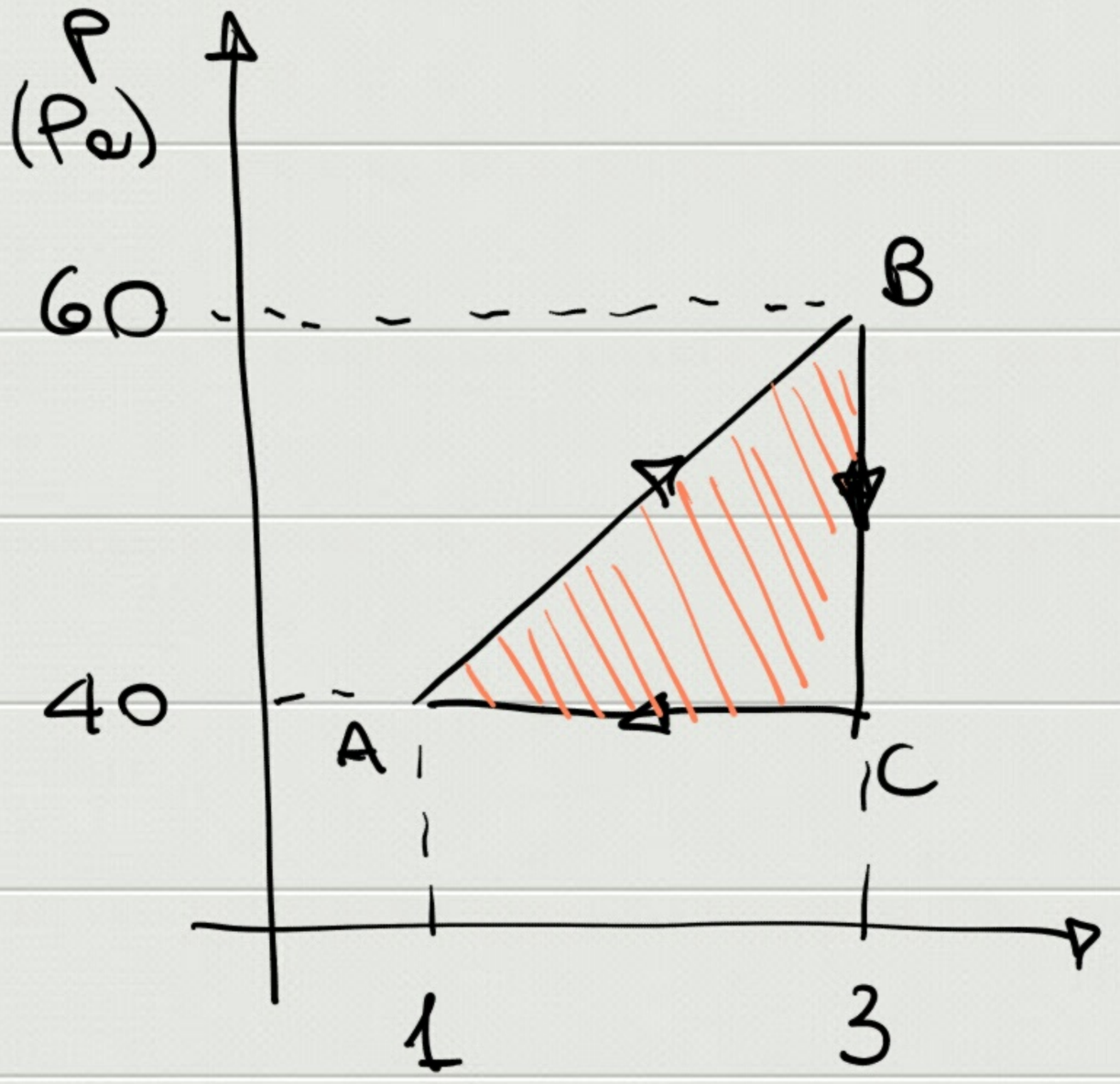
$$p_0 V_f = nRT \Rightarrow V_f = \frac{nRT}{p_0} = 0.0985\ m^3$$

$$\Rightarrow W = 9.775 \cdot 10^3\ J$$

gas : $\Delta U = 0 \Rightarrow Q_{gas} = W_{gas} =$

$= 9.775 \cdot 10^3$ J

$Q_{amb} = -Q_{gas} = -9.775 \cdot 10^3$ J




$Q_{ciclo} = ?$

$\Delta U_{ciclo} = 0$

$$\Rightarrow Q_{ciclo} = W_{gas}$$

$$Q_{ciclo} = \frac{1}{2}(P_B - P_A)(V_C - V_A) \quad *$$

$$= \frac{1}{2}\frac{1}{2}(P_A + P_B)(V_C - V_A)$$

$$= \frac{1}{2}\frac{1}{2}(P_B - P_A)(V_A + V_C)$$

$$= \frac{1}{2}(P_A + P_B)(V_C - V_A) + mC_V(T_B - T_A) +$$

$$+ \underbrace{mC_V(T_C - T_B) + mC_P(T_A - T_C)}$$

$$\left(W_{AB} + \Delta U_{AB}\right) + Q_{BC} + Q_{CA}$$

$$\| \; Q_{AB}$$