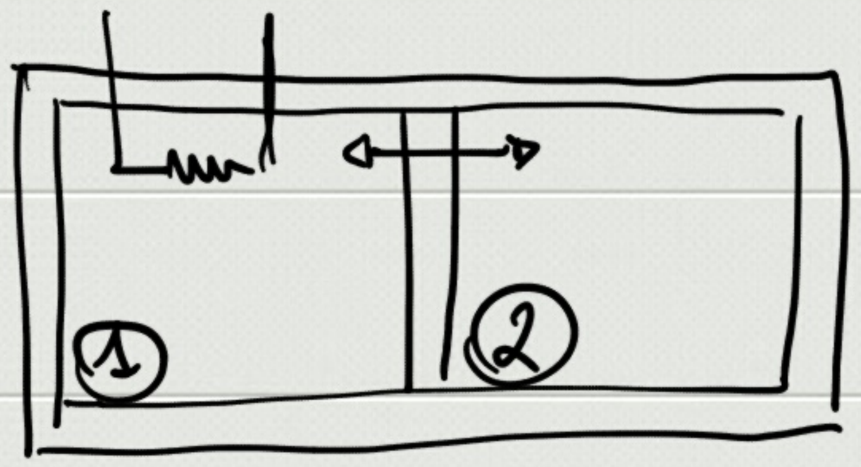


mono $\quad p_0 = 10^5 \, Pa$

$V_0 = 0.054 \, m^3$

$T_0 = 273 \, K$

T_2, W_2, T_1, Q_1 $\qquad p_2 = 7.69 \cdot 10^5 \, Pa$

② adiab. rev. $\qquad T_0 p_0^{\frac{1-\gamma}{\gamma}} = T_2 p_2^{\frac{1-\gamma}{\gamma}}$

$$T_2 = T_0 \left(\frac{p_0}{p_2}\right)^{\frac{1-\gamma}{\gamma}} = 613 \, K$$

$$Q_2 = 0 \Rightarrow W_2 = -\Delta U_2 = -mc_v (T_2 - T_0) = -10^4 \, J$$

$$m = \frac{p_0 V_0}{R T_0} = 2.38$$

$$T_1 = \frac{p_1 V_1}{mR} = 3530 \, K \qquad p_1 = p_2 \qquad V_1 = 2V_0 - V_2$$

$$V_2 = \frac{mRT_2}{p_2} = 0.016 \, m^3$$

$$Q_1 = \Delta U_1 + W_1 = mc_v (T_1 - T_0) - W_2 = 1{,}07 \cdot 10^5 \text{ J}$$

$$W_{TOT} = W_1 + W_2 = 0 \Rightarrow W_1 = -W_2$$

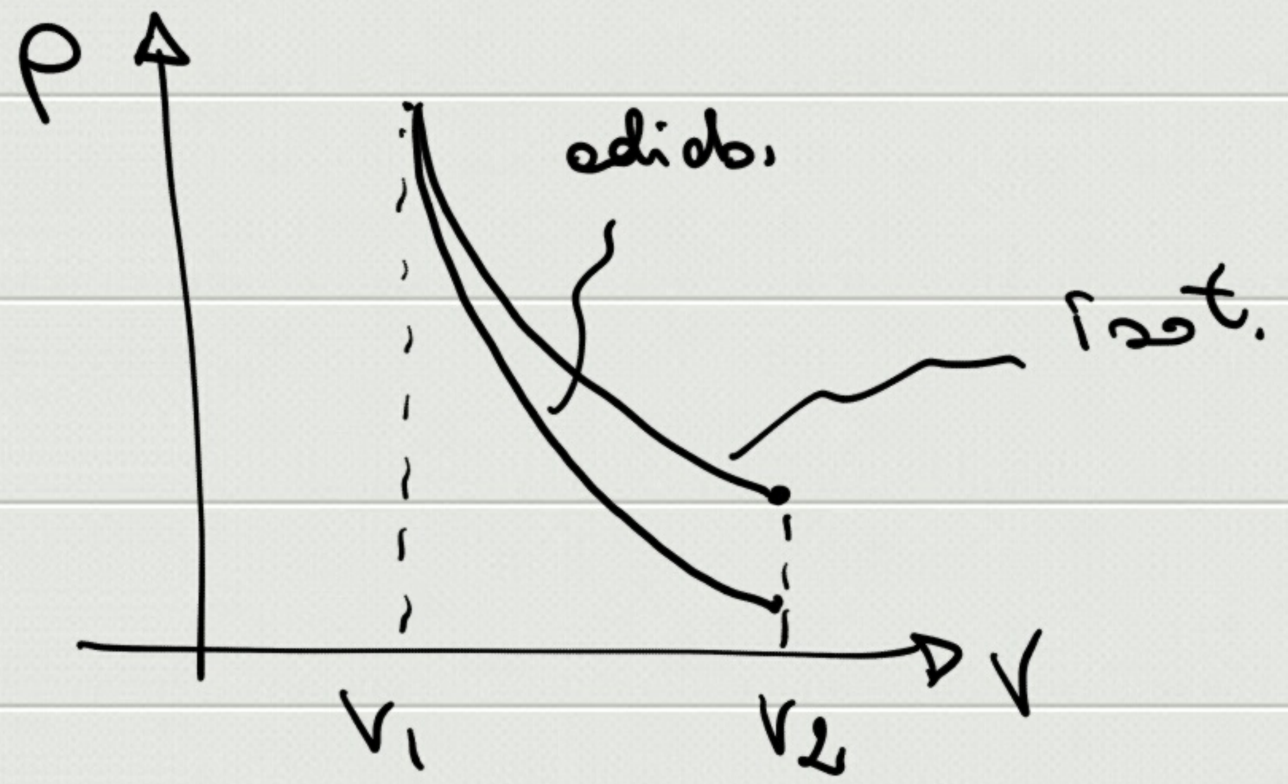
mono, espansione $V_1 \to V_2 = 2.7\, V_1$ reversibile

1) isoterma

2) adiabatica $(T_1 \to T_2)$

- $\Delta U_{isot} \gtrless \Delta U_{adiab}$?

$$\frac{W_{adiab}}{W_{isot}} = ?$$



$Q = 0$

$\Delta U_{isot} = 0$ $\qquad$ $\Delta U_{adiab} = -W_{adiab} < 0$

$$\boxed{\Delta U_{isot} > \Delta U_{adiab}}$$

$$W_{isot} = Q_{isot} = n R T_1 \ln \frac{V_2}{V_1} \simeq n R T_1$$

$$W_{adiab} = -\Delta U_{adiab} = -n c_V (T_2 - T_1) = -nR \frac{3}{2} (T_2 - T_1)$$

$$T_1 V_1^{\gamma-1} = T_2 V_2^{\gamma-1} \Rightarrow \quad T_2 = T_1 \left(\frac{V_1}{V_2} \right)^{\gamma-1}$$

$$\Rightarrow W_{adiab} = -\frac{3}{2} nR T_1 \left[\left(\frac{V_1}{V_2} \right)^{\gamma-1} - 1 \right]$$

$$\frac{W_{adiab}}{W_{isot}} = \frac{\frac{3}{2} \cancel{nRT_1} \left[1 - \left(\frac{V_1}{V_2} \right)^{\gamma-1} \right]}{\cancel{nRT_1}} = 0.73$$

$n = 1.6$, biatto

A: contatto termico $H_2O + gh$ $T_A = 273.15\ K$

$p_A = 10^5\ Pa$

AB: isot. rev. $p_B = 0,64 \cdot 10^5\ Pa$

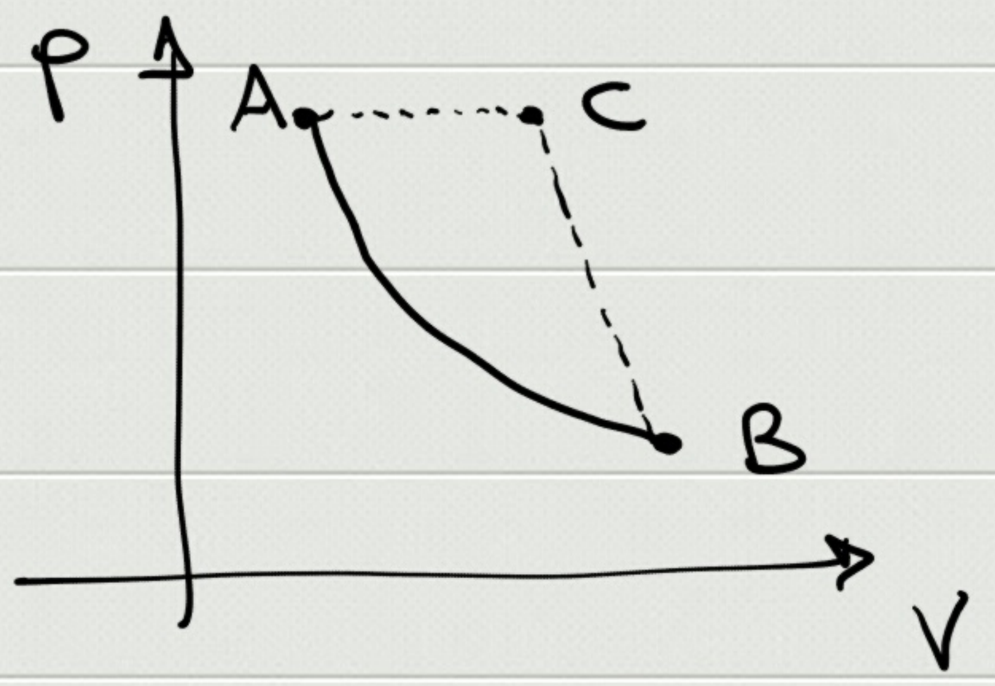
BC: generica (NO contatto termico) $p_C = p_A$

CA: isobara con contatto termico

$m_{gh} = 8 \cdot 10^{-3}\ kg$ (fonde) $\lambda_{gh} = 3,3 \cdot 10^5\ J/K$

$Q_{ciclo} = -245.6\ J$

$T_C = ?$ $W_{BC} = ?$



$Q_{ciclo} = Q_{AB} + Q_{BC} + Q_{CA}$

$-m\lambda_{gh} = Q_{AB} + Q_{CA}$ *

$Q_{ciclo} = m\lambda_{gh}$

$Q_{ciclo} = -m\lambda_{gh}$

$$-mg\Delta h = Q_{AB} + Q_{CA} = nRT_A \ln\frac{V_B}{V_A} + mc_p(T_A - T_C)$$

$$\uparrow$$

$$p_A V_A = p_B V_B \Rightarrow \frac{V_B}{V_A} = \frac{p_A}{p_B}$$

$$\Rightarrow T_C = T_A + \frac{1}{mc_p}\left[mg\Delta h + nRT_A \ln\frac{p_A}{p_B}\right] =$$

$$= 365\ K$$

* $W_{BC} = Q_{BC} - \Delta U_{BC}$, $Q_{cicle} = Q_{AB} + Q_{BC} + Q_{CA}$

$$W_{BC} = \int p\,dV$$

$$W_{BC} = \frac{1}{2}(p_C + p_B)(V_B - V_C) \qquad W_{BC}$$

$$\uparrow$$

* $Q_{cicle} = nRT_A \ln\frac{V_B}{V_A} + W_{BC} + nR(T_A - T_C)$

$\Delta U_{cicle} = 0 \Rightarrow Q_{cicle} = W_{cicle}$

$\Rightarrow W_{BC} = -650\ J$