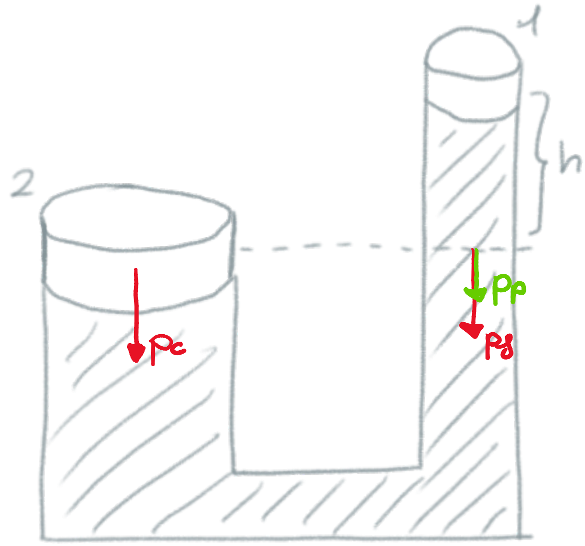
01/12/2020

martedì 1 dicembre 2020 14:35

① $m = 1000\,kg$
$S_2 = 3\,dm^2$
$d = 800\,kg/m^3$
$S_1 = 25\,cm^2$
$h = 3\,m$
$m_p = ?$



$$p_c = \frac{m_c g}{S_2}$$

$$p_g = dgh$$

$$p_p = \frac{m_p g}{S_1}$$

Considero il sistema in equilibrio

$$p_c = p_p + p_g$$

$$\frac{m_c g}{S_2} = \frac{m_p g}{S_1} + dgh$$

$$m_p = \frac{\left(\frac{m_c g}{S_2} - dgh\right) S_1}{g} = 77{,}3\,kg$$

② $C, t_1, m, t, c,$

$T = ?$

$$C = \frac{Q}{\Delta T} \longrightarrow \Delta T = \frac{Q}{C}$$

IL SISTEMA TENDE a raggiungere l'equilibrio

$$Q_{termometro} + Q_{liquido} = 0$$

$$C \cdot (T - t_1) + cm(T - t) = 0$$

$$T = \frac{C t_1 + cmt}{C + cm} \qquad T \approx t \longrightarrow \left|\frac{T - t}{t}\right| \ll 1$$

$$\left|\frac{\frac{Ct_1 + cmt}{C + cm} - t}{t}\right| \ll 1$$

lasciando stare per ora il valore assoluto

$$t(C+cm) \cdot \frac{Ct_1 + cmt - Ct - cmt}{t(C + cm)} \ll 1 \cdot t(C+cm)$$

$$\frac{t_1}{t} - 1 \ll 1 + \frac{cm}{C}$$

$$\frac{t_1}{t} - 1 \ll 1 + \frac{cm}{C}$$

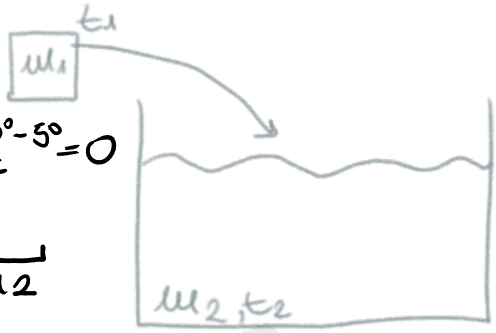
$$\frac{t_1 - t}{t} \ll 1 + \frac{cm}{C}$$

la condizione è che $C \ll cm$

$C \rightarrow$ termometro

$cm \rightarrow$ oggetto

3)
$m_1 = 2\,Kg$
$t_1 = -10\,°C$
$t_2 = 20°C$
$t = 5°C$
$m_2 = ?$



$$\underbrace{Q_{GH}^{-10°C-0°} + \underbrace{Q_{GH}^{fus}}_{\lambda_{GH} m_1} + Q_{AC}^{0-5°C}}_{m_1} + \underbrace{Q_{AC}^{20°-5°}}_{m_2} = 0$$

$$c_{GH} m_1 (0° + 10°) + \lambda_{GH} m_1 + c_{AC} m_1 (5° - 0°) +$$
$$+ c_{AC} m_2 (5° - 20°)$$

$$m_2 = \frac{c_{GH} m_1 (10°) + \lambda_{GH} m_1 + c_{AC} m_1 (5°)}{c_{AC} (15°)} = 11,83\ Kg$$

4)
$m = 0,05\,Kg$
$t_{pb} = 20°C$
$V_0 = 100\,m/s$
$M = 0,5\,Kg$
$c_{pb} = 130\ \frac{J}{Kg\ °C}$
$\lambda_{GH} = 3,3 \cdot 10^5\ J/Kg$
$m_{fusa} = ?$

URTO ANELASTICO

- si conserva p

$$(m + M) V = m V_0$$

$$V = \frac{m V_0}{m + M}$$

- NON si conserva E_k

$$E = \frac{1}{2} m v_0 - \frac{1}{2} (m + M) V =$$

$$= \frac{1}{2} \frac{mM}{m+M} V_0^2 = 227\ J$$

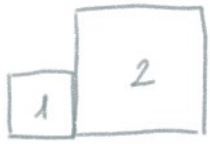
$\hookrightarrow$ energia dissipata sotto forma di calore

$$\lambda_{GH} \Delta M + Q_{pb}^{20°-0°} = E$$

$$\Delta M = \frac{E + m c_{pb} (20° - 0°)}{\lambda_{GH}} = 1,1\ g$$

$$\Delta \dot{M} = \frac{E + \dot{m} c_{Pb}(20° - 0°)}{\lambda_{GH}} = 1{,}1\,g$$

(5) $m_1 = 1\,Kg$
$m_2 = 2\,Kg$
$T_1 = 10\,°C \longrightarrow 283\,K$
$T_2 = 50\,°C \longrightarrow 323\,K$
$c = aT^2$



$T_f = ?$

$Q = c m \Delta T$ valida solo se c non dipende da T

se c dipende da T

$$\int dQ = \int c m\, dT$$

$$Q = m \int a T^2 dT$$

$$Q = m a \int_0^T T^2 dT = m a \left[\frac{T^3}{3}\right]_0^T$$

$$Q = m a \frac{T^3}{3}$$

$$Q_1 + Q_2 = 0$$

$$\int_{T_1}^{T_f} m_1 a T^2 dT + \int_{T_2}^{T_f} m_2 a T^2 dT = 0$$

$$m_1 a \left(\frac{T_f^3 - T_1^3}{3}\right) + \underbrace{m_2}_{2m_1} a \left(\frac{T_f^3 - T_2^3}{3}\right) = 0 \quad \text{IN } °K$$

$$T_f = \sqrt[3]{\frac{2 \cdot 323^3 + 283^3}{3}} = 311\,K = 37{,}8\,°C$$

GAS IDEALI:

(6) $T = 300\,K$
$N = 10^{25}\ mol/m^3$
$p = ?$

$$pV = nRT$$

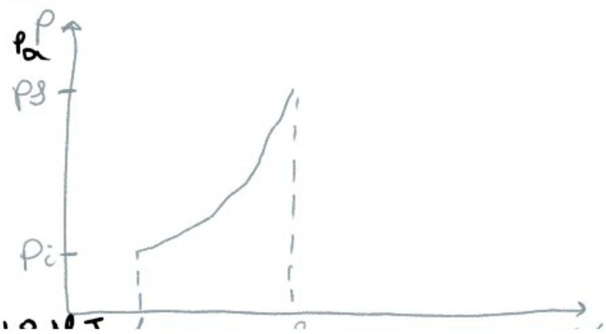
$$N = \frac{molecole}{V} \qquad n = \frac{molecole}{N_A}$$

$$p = \frac{nRT}{V} = \frac{molecole}{N_A} \cdot \frac{RT}{V} = \frac{N}{N_A} RT = 41400\,Pa$$

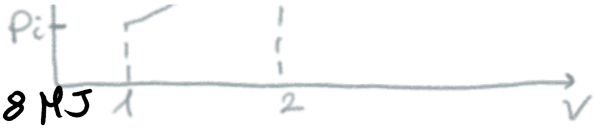
(7) $V_i = 1\,m^3$ $\qquad V_f = 2V_i$
$p = \alpha V^2$
$\alpha = 5\ atm/m^6 \rightarrow \dots\ Pa$
$L = ?$

$$L = \int_{V_i}^{V_f} p\,dV =$$

$$= \int_{V_i}^{V_f} \alpha V^2 dV =$$



$= \int_{V_i} \alpha V^2 \, dV =$



$= \alpha \left(\frac{V_f^3 - V_i^3}{3} \right) = 1{,}18 \text{ MJ}$