SIMULAZIONE 17/09/21

1) $\frac{E_{CIN}}{Q} = J = \boxed{\frac{kg\,m^2}{s^2}}$ $\quad c_p = \frac{J}{kg\,K} = \frac{kg\,m^2}{s^2} \cdot \frac{1}{kg\,K} = \boxed{\frac{m^2}{s^2 K}}$

2) $m = 0,5\ kg$
$v = 3\ m/s$
$F_1\ (-1,-1)\ N$
$F_2\ (1,1)\ N$
- $F_{TOT} = F_1 + F_2 = ?$
- $a = ?$

- $F_{TOT} = \begin{pmatrix}-1\\-1\end{pmatrix} + \begin{pmatrix}1\\1\end{pmatrix} = \boxed{\begin{pmatrix}0\\0\end{pmatrix} N}$ $\quad F = ma$
- $a_x = \frac{F}{m} = \frac{0\ N}{0,5\ kg} = \boxed{0\ m/s^2}$
- $a_y = \frac{0\ N}{0,5\ kg} = \boxed{0\ m/s^2}$

3) $m = 0,52\ kg$ NO ATTRITO
$v_A = 2\ m/s$
$h_A = 18\ m$
$v_B = 16\ m/s$
- $h_B = ?$
- E_{POT} in A,B = ?
- E_{MECC} in A,B,C = ?

- $E_{CIN\,A} = \frac{1}{2} m v_A^2 = \frac{1}{2} \cdot 0,52 \cdot (2)^2 = \boxed{1,04\ J}$
- $E_{POT\,A} = mgh_A = 0,52 \cdot 9,81 \cdot 18 = \boxed{91,82\ J}$
- $E_{MECC\,A,B,C} = E_{CIN} + E_{POT} = \boxed{92,86\ J}$

SI CONSERVA

- $E_{CIN\,B} = \frac{1}{2} m v_B^2 = \frac{1}{2} \cdot 0,52 \cdot (16)^2 = \boxed{66,56\ J}$
- $E_{POT\,B} = E_{MECC} - E_{CIN} = \boxed{26,3\ J}$

4) $m = 0,35\ kg$
$h = 0,3\ m$
SI ATTRITO
$\theta = 30°$
$\mu_s = \mu_d = 0,5$
- E_{MECC} in h_0 = ?
- E_{MECC} in h_{MAX} = ?

- E_{MECC} SI CONSERVA = ?
→ NO PERCHÈ CI SONO FORZE NON CONSERVATIVE (ATTRITO)

- E_{MECC} in $h=0$ = $E_{CIN} + \cancel{E_{POT}}^{0} = \frac{1}{2} m v^2 = \frac{1}{2} \cdot 0,35 \cdot 0,89^2 = \boxed{0,14\ J}$

- d lungo piano inclinato $\Rightarrow \ell = \frac{h}{\sin\theta} = \frac{0,3}{\sin 30} = 0,6\ m$
- $a = g(\sin\theta - \mu\cos\theta) = 9,81 \cdot (\sin 30° - 0,5 \cdot \cos 30) = 0,66\ m/s^2$
- $v = \sqrt{2ad} = 0,89\ m/s$
- E_{MECC} in $h_{MAX} = \cancel{E_{CIN}}^{0} + E_{POT} = mgh = 0,35 \cdot 9,81 \cdot 0,3 = \boxed{1,03\ J}$

5) $\rho = 700\ kg/m^3$

$r = 5,5\ cm \rightarrow 0,055\ m$

$h = 0,6\ m$

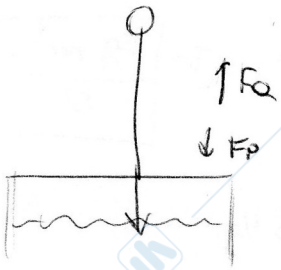
$v_0 = 0\ m/s$

- MAX PROFONDITÀ = ?

$d = \frac{m}{V}$

$V = \frac{4}{3} r^3 \pi = 6,97 \cdot 10^{-4}\ m^3$

$m = d \cdot V = 0,4878\ kg$



$F_p = mg = 0,4878 \cdot 9,81 = 4,786\ N$

$F_A = \rho g V = 1000 \cdot 9,81 \cdot 6,97 \cdot 10^{-4} = 6,837\ N$

$F_{TOT} = F_A - F_p = 2,05\ N$

$F = ma \rightarrow a = \frac{F}{m} = \frac{2,05\ N}{0,4878\ kg} = 4,2\ m/s^2$

$v_{entrata\ in\ H_2O} = \sqrt{2gh} = \sqrt{2 \cdot 9,81 \cdot 0,6} = 3,43\ m/s$

$x(t) = x_0 + \cancel{v_0 t}^{\,0} + \frac{1}{2} a t^2 \rightarrow x = 0,6 + \frac{1}{2} \cdot 4,2 \cdot (0,82)^2 = \boxed{2\ m}$ MAX PROFONDITÀ

$v = \cancel{v_0}^{\,0} + at \rightarrow t = \frac{v}{a} = \frac{3,43}{4,2} = 0,82\ s$

6) PIANO A TUTTI GLI EFFETTI DI DIMENSIONI INFINITE

$F = ?$

$m = 0,03\ g \rightarrow 3 \cdot 10^{-5}\ kg$

$Q = 1,2 \cdot 10^{-6}\ C$

$\sigma = ?$

$\varepsilon_0 = 8,9 \cdot 10^{-12}\ \frac{C^2}{N m^2}$

$E = \frac{\sigma}{2\varepsilon_0} \rightarrow \sigma = E \cdot 2\varepsilon_0 = 245,25 \cdot 2 \cdot 8,9 \cdot 10^{-12} = \boxed{4,4 \cdot 10^{-9}\ C/m^2}$

$E = \frac{F}{q} = \frac{2,943 \cdot 10^{-3}\ N}{1,2 \cdot 10^{-6}\ C} = 245,25\ N/C$

$F = ma = mg = 3 \cdot 10^{-5} \cdot 9,81 = 2,943 \cdot 10^{-4}\ N$