Chapter 12

Q1 :

$m = 70\ kg$

$\rho = \frac{m}{V} \Rightarrow V = \frac{m}{\rho}$

$= \frac{70}{10^3} = 0.07\ m^3$

Q4

$r = 0.5\ m$

$\rho_{He} = 0.164\ kg.m^{-3}$

$m_{app} = ?!$

- Solution

$V_{balloon} = \frac{4}{3} \pi r^3$

$= \frac{4}{3} \pi (0.5)^3$

$= 0.5235$

* $m = \rho V$

$= 0.164 * 0.5235$

$m' = 0.08587$

Now

$F_g = 0.8587\ N$

$F_B = \rho g V_{balloon}$

$= 1.18 * 10 * 0.5235$

$F_B = 6.1773\ N$

$\Delta F = F_B - F_g = W_{app}$

$6.1773 - 0.8587 = 5.3183\ N$

$\therefore m_{app} = 0.5318\ kg$

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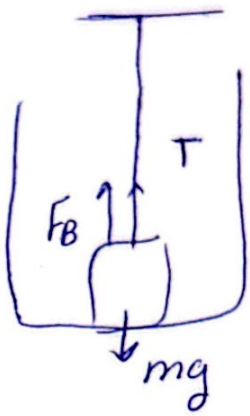
$\rho_{poly} = 25\ kg.m^{-3}$

$m = 0.2\ kg$

$\rho_{water} = 10^3\ kg.m^{-3}$



Sol

$$\Sigma F = ma$$

$$T + \rho_{Liq} g V_{obj} = mg$$

$$T = -\rho_{Liq} g \frac{m}{\rho_{obj}} + mg$$

$$= mg\left[1 - \frac{\rho_{water}}{\rho_{obj}}\right]$$

$$= 9.8 \times 0.2\left[1 - \frac{10^3}{25}\right]$$

$$\boxed{T = 78\ N}$$

Q7

ρ_{metal} = !!

$W_a = 27.5\ N$

$W_w = 17.5\ N$

Solution:

$$\rho = \frac{W_a}{W_a - W_w}$$

$$= \frac{27.5}{27.5 - 17.5} = \frac{27.5}{10} = 2.75\ g.cm^{-3}$$

$$= 2750\ kg.m^{-3}$$

Q10

Cube with $L = 3\,cm$

floating $1.5\,mm = 0.15\,cm$

$\rho_{water} = 10^3\ kg.m^{-3}$

$\rho_{wood} = ?!$

sink $\Rightarrow$

$L = 3 - 0.15$

$\boxed{L = 2.85\ cm}$

Solution :-

$$\frac{\rho_{water}}{\rho_{wood}} = \frac{V_{wood}}{V_{displaced}}$$

$$\frac{10^3}{\rho} = \frac{(3)^3}{3 * 3 * 2.85}$$

$$\rho_{wood} = 950\ kg.m^{-3}$$