6th WS-5

Foundation Task

(1)

side $a = 1m$, $m = 3 kg$

volume of cube $= a^3 = 1^3 = 1$

density $= \frac{mass}{volume} = \frac{3}{1} = 3 \ kg/m^3$

(2)

volume $= 25 \ m^3$; density $= 5 \ kg/m^3$.

mass = density × volume

$= 5 \times 25 = 125 \ kg$

(3)

mass $= 50 \ gm = 50 \times 10^{-3} \ kg$; R.D = 10

Relative density = $\frac{\text{density of a body}}{\text{density of water}}$

$\Rightarrow 10 = \frac{d_b}{10^3} \Rightarrow d_b = 10 \times 10^3$

$\Rightarrow d_b = 10^4$

volume $= \frac{m}{d_b} = \frac{50 \times 10^{-3}}{10^4} = 50 \times 10^{-7} \ m^3$

$= 5 \times 10^{-6} \ m^3 = 5 \ cm^3$

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(4)

mass = 500 kg ; volume = 0.5 m3.

$d_w = 10^3$ $\quad d_{body} = \frac{m}{V} = \frac{500}{0.5} = 10^3\ kg/m^3$

Relative density $= \frac{d.body}{d\,water} = \frac{10^3}{10^3} = 1$

(5)

$m_1 = 30\ kg$; $vol_1 = 3m^3$.

$m_2 = 15\ kg$; $vol_2 = 2\,vol_1 = 2 \times 3 = 6\ m^3$.

$\therefore$ change in density $= d_2 \sim d_1$

$$= \frac{m_2}{vol_2} \sim \frac{m_1}{vol_1}$$

$$= \frac{15}{6} \sim \frac{30}{3} \Rightarrow \frac{15 \sim 60}{6}$$

$$= \frac{45}{6} = \frac{15}{2} = 7.5\ kg/m^3$$

(6)

$m_1 = 5\ kg$; $m_2 = 3\ kg$. $\quad$ density = same.

$$\frac{V_1}{V_2} = \frac{m_1}{m_2} = \frac{5}{3}$$

(7)

$V_1 = 2\,m^3$; $V_2 = 4\,m^3$ $\quad$ mass = same.

Density $\propto \frac{1}{\text{volume}}$

$$\Rightarrow \frac{d_1}{d_2} = \frac{V_2}{V_1} = \frac{4}{2} = \frac{2}{1}$$

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(8)

mass = 100 gm = 10^{-1} kg ; V_b

volume of water displaced = 40 ~ 40 = 20 cm³
= 20×10^{-6} m³

loss of weight of the body = weight of water displaced

$\Rightarrow d_b V_b \cancel{g} = d_w \times V_{\text{liquid displaced}} \cancel{g}$

$\Rightarrow m_b \cancel{d_b} = d_w \times 20 \times 10^{-6}$

$\Rightarrow \frac{10^{-1}}{20} \times 10^{6} = d_w \Rightarrow \therefore d_w = 5 \times 10^{3}$ gm/cc
$= 5$ kg/m3

(9)

$m_1 = 1$ kg ; $m_2 = 2$ kg

$R.D = \frac{d_{body}}{d_{water}} = \frac{m_b}{V_b\, d_{water}}$

$\frac{R.D_1}{R.D_2} = \frac{m_{b_1}}{m_{b_2}} = \frac{1}{2}$

(10)

mass = 20 kg . V = 10 m³.

In order to float on water

$d_b = d_w$ R.D. $\frac{d_b}{d_w}$

$\Rightarrow \cancel{\frac{m_b + m_b}{V} = 10^3}$

$\Rightarrow$

$\Rightarrow \cancel{\frac{20 + m}{10} = 20}$

(14)

$m_{b_1} = 2\ kg$ $\quad d_b = 10\ kg/m^3$

$m_{b_2} = 2m_{b_1}$, $d_b = ?$ $\quad d \propto m$

$$\Rightarrow \frac{d_{b_1}}{d_{b_2}} = \frac{m_{b_1}}{m_{b_2}}$$

$$\Rightarrow \frac{10}{d_{b_2}} = \frac{\cancel{m_{b_1}}}{2\cancel{m_{b_1}}} = \frac{1}{2}$$

$$\Rightarrow d_{b_2} = 2 \times 10 = 20\ kg/m^3$$

(15)

$vol_1 = 2\ m^3$ $\quad d_1 = 5\ kg/m^3$

$V_2 = 1\ m^3$ $\quad d_2 = ?$

$$d \propto \frac{1}{V} \Rightarrow \frac{d_1}{d_2} = \frac{V_2}{V_1} \Rightarrow \frac{5}{d_2} = \frac{1}{2}$$

$$\Rightarrow d_2 = 10\ kg/m^3.$$

(16)

$m_1 = 5\ kg$; $V = 2\ m^3$

$$d_{sphere} = \frac{m}{V} = \frac{5}{2} = 2.5\ kg/m^3$$

(17)

$m = 20\ gm$; $vol = 4\ cm^3$; $d_w = 1\ gm/cc$

$$R.d = \frac{d_b}{d_w} = \frac{\frac{m}{V}}{d_w} = \frac{\frac{20}{4}}{1} = 5 \qquad \frac{m}{V\, d_w}$$

$R.d < 1$ $\quad \Rightarrow d_b < d_w$

volume of body $= \cancel{R.d} \cdot \frac{m}{d_w} \cancel{\Rightarrow} \frac{m_b}{R.d}$

Here $R.d < 1$ if we take V value as 25 $\quad R.d = \frac{20}{25 \times 1} = \frac{4}{5} < 1$

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(18)

Side = 0.5 m $\quad$ m = 2 kg

$$\text{density} = \frac{m}{vol} = \frac{2m}{(side)^3}$$

$$= \frac{2}{(0.5)^3} = \frac{2}{125\times10^{-3}} = \frac{2\times10^{3}}{125}$$

$$= 2\times\frac{1000}{125}^{8} = 16 \text{ kg/m}^3$$

(19)

density = 20 kg/ m^3

volume = 4 m^3

$\Rightarrow$ mass = density $\times$ volume = $20\times4 = 80$ kg

L Task

SAQ's

(1)

vol = 3 m^3 ; mass = 30 kg

$$\text{density} = \frac{m}{V} = \frac{30}{3} = 10 \text{ kg/m}^3$$

(2)

m = 400 kg; $\quad$ volu = 2 m^3 ; d_w = 1000 kg/m^3

$$d_b = \frac{m}{V} = \frac{400}{2} = 200$$

$$R.d = \frac{d_{body}}{d_w} = \frac{200}{1000}$$

R.d = 0.2

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(3)

vol $= 10\ cm^3$; $d = 2\ gm/cm^3$

mass $= d \times vol = 2 \times 10 = 20\ gm$

(4)

$m_{cube} = 2\ kg$; $m_{cuboid} = 5\ kg$

$\because$ we know density $\propto$ mass

$\Rightarrow \frac{d_{cube}}{d_{cuboid}} = \frac{m_{cube}}{m_{cuboid}} = \frac{2}{5}$

(5)

$V_1 = 6\ cm^3$; $V_2 = 9\ cm^3$

Relative density $= \frac{d_{body}}{d_{water}} = \frac{\frac{m_{body}}{Vol_{body}}}{d_{water}}$

$\frac{R.D_1}{R.D_2} = \frac{V_2}{V_1} = \frac{9}{6} = \frac{3}{2}$

(6)

mass $= 300\ kg$; $R.d = 0.03$; $d_w = 10^3\ kg/m^3$

Relative density $= \frac{m_{body}}{V_{body} \times d_{water}}$

$V_{body} = \frac{m_{body}}{R.D \times d_w} = \frac{300}{0.03 \times 10^3} = 10\ kg$

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(7)

$l = 5m$; $r = 1m$, density = ? mass = 20 kg.

volume of cylinder = $\pi r^2 h$

$= \frac{22}{7} \times 1^2 \times 5$

$= \frac{110}{7}$

density = $\frac{mass}{volume} = \frac{20}{\frac{110}{7}} = \frac{2\times 7}{11} = \frac{14}{11}$

$= 1.27$ kg/m3

(8)

$l = 5m$; r-

$vol_{liquid} = 125\ cm^3$ $m_l = 250$ gm

$m_{empty\ beaker} = 100$ gm. ∴ $m_{liquid} + m_{empty\ beaker} = 250$ gm

∴ $m_{liquid} = 250 - m_{empty\ beaker}$

$= 250 - 100 = 150$ gm

density of liquid = $\frac{m_{liquid}}{vol} = \frac{150}{125} = \frac{30}{25} = \frac{6}{5} = 1.2\ cm^3$

(9)

$m = 0.2$ gm ; vol = $2\ cm^3$; $d_w = 1$ gm/cc

if the brick sink in water $d_b > d_w$

$d_b = \frac{m}{vol} = \frac{0.2}{2} = 0.1$ gm/cc $< d_w$ so if the volume of body < it's original volume then $d_b > d_w$

For V = 0.02 we will get $d_b = \frac{0.2}{0.02} = 10 > d_w$

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(10)

$d_{cube} = 0.8\ kg/m^3$; $m = 10\ kg$

If the cube wants to sink in water

$d_b > d_w$.

we know $d_w = 1\ gm/cc = 10^3\ kg/m^3$

$\therefore$ $d_b = 2000\ kg/m^3$ then only it can sink in water,

(13)

$l \times b \times h = 4cm \times 1cm \times 5cm$; $m = 50\ gm$.

$= 20 \times cm^3$ $\quad d_w = 1\ gm/cc$

Relative density $= \dfrac{m_b}{vol_b \times d_w} = \dfrac{50}{20 \times 1} = 2.5\ gm/cc.$

(14)

$m = 10gm$; $vol = 20\ cm^3$, $d_w = 1gm/cc$

Relative density $= \dfrac{m_b}{vol_b \times d_w} = \dfrac{10}{20 \times 1} = \dfrac{1}{2} = 0.5$

(15)

$d = 50\ kg/m^3$; volume $= 5m^3$

mass $= d \times vol = 50 \times 5 = 250\ kg$

(16)

$m = 20\ kg$; $dv = 10m^3$ $\quad$ density $= \dfrac{m}{v} = \dfrac{20}{10} = 2\ kg/m^3$

(17)

$m = 1kg$; $d = 2\ kg/m^3$ $\quad$ volume $= \dfrac{m}{dens} = \dfrac{1}{2} = 0.5$

$= 5 \times 10^{-1}\ m^3$

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