TENDER HEART HIGH SCHOOL, CHD-Sec. 33B

CLASS-IX

Subject - PHYSICS

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Numericals Ch-5 (Upthrust, Archimedes' Principle and Floatation)

Exercise (E)

Q1. Volume of body ⇒ 100 cm^3

Weight of body ⇒ 5 kgf

d_l (density of liquid) $= 1.8 \times 10^3 \, kg\,m^{-3}$

$g = 10 m/s^2$

(i) upthrust (F_B) ⇒ $V\rho g$

V - Volume of body

ρ - density of liquid

g - acc^n due to gravity

So $F_B = 100\,cm^3 \times 1.8 \times 10^3 \, kg\,m^{-3} \times 10\,m/s^2$

$V = 100\,cm^3 = \cancel{100} \times \frac{1}{\cancel{100}} \times \frac{1}{100} \times \frac{1}{100} m^3$

$V = \frac{1}{10000} m^3$

So $F_B = \frac{1}{10000} m^3 \times 1.8 \times 10^3 \, kg\,m^{-3} \times 10\,m/s^2$

$= \frac{1}{10^4} \times 1.8 \times 10^3 \times 10$

$F_B = \frac{1.8 \times \cancel{10^4}}{\cancel{10^4}} = 1.8 \, N$ Ans

So $F_B = \frac{1.8}{10}$ kgf ← (1 kgf = 10 N or 1 N = $\frac{1}{10}$ kgf)

$= \frac{18}{100} = 0.18$ kgf Ans

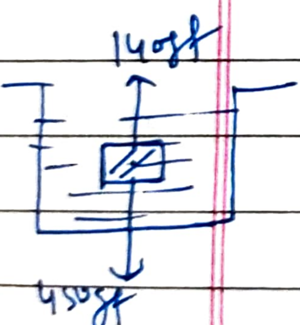
Ans. can be upthrust = 1.8 N
or 0.18 Kgf

* Both are Correct

(ii) weight of body in liquid = ?

wt. of body in liquid = wt. of body − upthrust
= 5 Kgf − 0.18 Kgf
= 4.82 Kgf Ans

(2) wt. of body in air = 450 gf (Real wt.)
" " " in liquid = 310 gf (Apparent wt.)
So (ii) Loss in weight =
= 450 gf − 310 gf
(iii) " " = 140 gf Ans
∴ upthrust = loss in weight = 140 gf Ans



(4) density of Solid = 5000 Kgm^{-3}
wt. of Solid in air = 0.5 Kgf (Real wt.)
density of water = 1000 Kgm^{-3}
Apparent wt. of solid = ?
loss in wt. or upthrust = Volume of solid × density of liquid × g
(1)

Volume of Solid = $\dfrac{\text{mass of Solid}}{\text{density of solid}}$

$= \dfrac{0.5\,\text{Kgf}}{5000\,\text{Kgm}^{-3}}$ (mass of solid = 0.5 Kgf)

$V = \dfrac{\cancel{5}}{\cancel{5}000 \times 10} = \dfrac{1}{10000} = \dfrac{1}{10^4}\,m^3$

using (1); So upthrust $F_B = \dfrac{1}{10^4} \times 1000 \times 10$ ($g = 10\,m/s^2$)

$= \dfrac{10^4}{10^4} = 1\,N$

∴ apparent weight of solid = real weight − F_B — (1)

Real wt = 0.5 Kgf = 0.5 × 10 N [∵ F_B (upthrust)]

$= \dfrac{5 \times 10}{10}\,N = 5N$ (∵ 1 Kgf = 5N)

So using (1) App. wt. = 5N − 1N

= 4N

or $\dfrac{4}{10}$ Kgf = 0.4 Kgf

[∵ 1 Kgf = 10N]

Q (9)

Dimensions of Block = 50 cm × 50 cm × 50 cm

So Volume of Block = $\dfrac{50}{100}\,m \times \dfrac{50}{100}\,m \times \dfrac{50}{100}\,m$

Volume of Block = $\frac{125}{10^3}$ m3

$g = 9.8$ N/Kg. , Buoyant force = F_B

density of water ⇒ 10^3 Kg/m3 = upthrust = ?

∴ F_B = upthrust = Volume of Block × density of liquid × g

$= \frac{125}{10^3} \times 10^3 \times g$

$F_B \Rightarrow \frac{125}{\cancel{10^3}} \times \cancel{10^3} \times 9.8$

$F_B = \frac{\overset{25}{\cancel{125}} \times \overset{49}{\cancel{98}}}{\underset{2}{\cancel{10}}} = 1225N$ Ans

(18)

Body mass = 3.5 Kg

Volume of water displaced = 1000 cm^3

acc. to Archimedes's principle ; volume of water displaced = Volume of body immersed in water

(i) ∴ Volume of body = 1000 cm^3 = $\frac{1000}{100} \times \frac{1}{100} \times \frac{1}{100} m^3 = \frac{1}{10^3} m3$

(ii) upthrust = F_B = Volume of body × density of water × g

$= \frac{1 \times 10^3 \times 10}{10^3}$

F_B = 10 N = 1 Kgf Ans

($\because$ 1 Kgf = 10 N)

Real weight = 3.5 kg = 3.5 kgf ($\because$ 1 kgf = 1 kg)

apparent wt. of body = Real wt. − F_B (upthrust)

= 3.5 kgf − 1 kgf

App. wt. = 2.5 kgf Ans

× — × — ×

n3