9th Floating bodies (Gravitation) Solved Numerical Term-2

Q. A cube of mass 1kg with each side of 1cm is lying on the table. Find the pressure exerted by the block on the table. Take g=10 m/s^2

Ans: Pressure is given as force/area

so, Force, F = mg = 1000 gm X 10x100 m/s^2

and area, A = 1 x 1 cm^2 = 1 cm^2

Thus, the pressure exerted would be

P = (1000X 1000) / 1 or P = 10^6 pa

Q. The mass of a solid iron cube of side 3cm is to be determined usig a spring balance. If the of iron is approximately 8.5 g/cm^3, the best suited spring balance for determining weight of the solid would be of

1. range 0-250gwt ; least count 1gwt
2. range 0-250gwt ; least count 5gwt
3. range 0-1000gwt ; least count 5gwt
4. range 0-1000gwt ; least count 10gwt

Ans: Edge = 3 cm , Density=8.5 g/cm^3

Mass= density x volume = 8.5 x(3x3)=229.5gwt

Therefore second spring balance of range 0-250 gwt with least count 5gwt will be suitable.

Q. The density of turpentine oil is 840 Kg/ m3. What will be its relative density. (Density of water at 4 degree C is 10 cube kg minus cube)

Ans: Relative Density = Density of Substance/ Density of water at 4 0c

Density of turpentine oil = 840 kg/ m3 (given).

Density of water at 4 0c = 1000 kg/ m3

Relative density of turpentine oil = Density of turpentine oil / Density of water at 4^0c

= (840 /1000) kg m-3/kg m-3 = 0.84

since, the relative density of the turpentine oil is less than 1, therefore it will float in water.

Q. A solid body of mass 150 g and volume 250cm3 is put in water . will following substance float or sink if the density of water is 1 gm-3?

Ans: The substance will float if its density is less than water and will sink if its greater.

So, density of solid body is d = mass/volume or d = 150/250 = 0.6 gm/cm3 So, the solid body will float on water.

Q. A body weighs 50 N in air and when immersed in water it weighs only 40 N. Find its relative density.

Ans: The relative density Would be ratio of the density of the body with respect to air and the density of the body with respect to water.

So, $F_1 = 50$ N $F_2 = 40$ N

so, $F_1/F_2 = 50/40 = 5/4$

or relative masses $m_1/m_2 = 5/4$ and

Density = mass/volume

Volume remains constant, Relative density = d1/d2 = 5/4

Q. A ball of relative density 0.8 falls into water from a height of 2m. find the depth to which the ball will sink ?

Ans: Speed of the ball

$V = \sqrt{2gh} = \sqrt{2x10x2} = 6.32$ m/s

Buoyancy force by water try to stop the ball.

Buoyancy force = weight of displaced water = dx Vxg

where d = density of water V = volume of the ball , g = 10 m/s^2deceleration of the body by

buoyancy force, a = (dVg)/ m

where m= d'V d' = density of block

a = dVg/(d' V) = dg/d' =(d/d')*g =g/(0.8)= 10/0.8

(Given, d'/d = 0.8)= 12.5 m/s^2

Net deceleration of ball,a' = a-g = 2.5 m/s^2Final speed of ball v' = 0

Use $v'^2 = v^2 + 2a's$ s = depth of ball in the water

=> 40 = 0 + 2x2.5xs => s = 8m

Q. Equal masses of water and a liquid of relative density 2 are mixed together. Then, the mixture has a relative density of (in g/cm^3)

a)2/3 b)4/3 c)3/2 d)3

Ans: The masses of two liquids are equal, let it be m.

Let the relative densities of water and liquid be ρ1 and ρ2 respectively.

The volume of the two be V1 and V2, of water and liquid respectively.

The volume of the mixture would be, V = V1 + V2 (1)

also, volume = mass/density

thus, $2m/\rho (V) = m/\rho 1 (V 1) + m/\rho 2 (V 2)$

here ρ1 = 1,ρ2 = 2 and ρ is the relative density of the mixture.

now,

$2/\rho = 1/\rho 1 + 1/\rho 2$

by substituting the values, we $\rho/2 = 2/3$

or, the relative density of the combined liquid will be, ρ=4/3