Class -9th

PHYSICS

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Q1- A body of volume1000cm³ weighs 5kgf in air and it is completely immmersed in a liquid of density 1.8 g/cm³.Find upthrust and weight of body in liquid.

Solution- weight of body in air(W) = 5kgf

Volume of body (V) = 1000cm³= 0.001m³

Density of liquid=d= 1.8× 10³ kg/m³

    I)   The upthrust due to liquid = buoyant force= Vdg
             = 0.001×1.8×10³×10
             = 1.8kgf

Ii) The weight of the body in liquid= W-B

                               =(5-1.8)kgf.

                               = 3.2kgf

Q2- Weight of body in air and water is 450gf and 310gf . calculate volume,upthrust,and loss in the weight of the body.

Solution- weight of body in air= 450gf

Weight of body in water= 310gf

    I)   Let d be the density of the body

    V be it's volume, let q be the density of water then W= V×d×g

             450=Vdg

    Buoyant force B= vqg

                B = Vg(q= 1g/cm³)

      Now 310= 450-B

         Vg= (450-310)g

          V= 140cm³

    ii) weight in water= weight in air- upthrust

                310= 450- upthrust

Upthrust= 450-310= 140gf

Iii) loss in weight= upthrust= 140gf

Q3- A body of density 5 g/cm³ weighs 0.5kgf in air.It is immersed in water of density 1g/cm³.Calculate the apparent weight of solid in water.

Solution-Density = 5g/cm³= 5000kg/m³

Weight in air= 0.5kgf

Volume V = m/V = 0.5/5000=0.0001m³

Mass of water displaced = V ×density of water

Mass of water displaced= 0.0001×1000

=0.1kg

Apparent weight = weight in air -weight of water displaced

= 0.5kgf- 0.1kgf

= 0.4kgf

Q4- A body of weight 3.5 kgf displaces 1litre of water when fully immersed.Calculate the volume of body and upthrust acting on the body.

Solution- weight of body = 3.5 kgf

Water displaced= 1 litre

I)   Volume of body = volume of water displaced by it = 1 litre or 1000cm³
II)   Upthrust = volume of water displaced × density of water × g
        Upthrust= 1000×1×g
        = 1000gf or 1 kgf

Q5- A wooden block is floating on the surface of water with its dimension 50cm×50cm× 50cm inside water .find buoyant force acting on the block .(g = 9.8m/s²)

Solution-

Solution- Volume of body = 50×50×50= 125000cm³=0.125m³

Density of water = 1000kg/m³

Buoyant force acting on the body=V×d×g

= 0.125×1000×9.8

=1225N

Q6- A cuboid of volume 125cm³ and density 9×10³kg/m³ is suspended in a liquid by means of a thread .Find tension in the thread I density of liquid is 1.2 × 10³ kg/m³

Solution - Volume of metal cube = 125 cm³= 0.000125m³

Density of metal = 9× 10³ kg/m³

Mass of metal cube = v×d

$\qquad$ = 0.000125× 9× 10³

$\qquad$ = 1.125 kg

Weight of the metal cube in the air = m× g = 1.125×10= 11.25N

Volume of liquid displaced = volume of metal cube= 0.000125m³

Mass of liquid displaced= volume × density of liquid ×

$\qquad$ = 0.000125× 1.2× 10³

$\qquad$ = 0.15 kg

Weight of liquid displaced = 0.15 kg× 10m/s²

$\qquad$ = 0.15kg

Weight of liquid displaced = 0.15kg × 10m/s²

$\qquad$ = 1.5N = upthrustk

Weight of metal cube in liquid = weight of metal cube in air- upthrust

$\qquad$ = 11.25 – 1.5

$\qquad$ = 9.75N

Therefore tension in thread = 9.75N

Q7- A piece of iron weighs 200gf in air and 175 gf in water when immersed completely in water .The density of water is 1g/cm³, find the volume of iron piece .Also, explain why does iron piece weigh less in water.

Solution – weight of iron piece in air = 200gf

Weight of iron piece in water= 175gf

Density of water = 1 g/cm³

Let V be the volume of iron piece

Then, weight in air = weight in water – upthrumst

200gf = 175gf - V× density of water× g

200-175= V×g

25g= V

V= 25 cm³

Less weight in water is due to upthrust

Q8- weight of a metallic block is 13.5 kgf and volume is 15000cm³.Calculate upthrust onnthe block , when immersed fully in water.

Solution- Mass of block = 13.5kg

Weight of block = 13.5kgf

Volume = 0.015m³

Density of water = 1000kg/m ³

Upthrust = volume of block × density of water × g

$\qquad$ = 0.015× 1000× g

$\qquad$ = 15 kgf

Q9- What will be the upthrust on Metallic block in the above problem when it floats on the surface of water ? Density of water is 1g/cm³

Solution – While floating upthrust =. Weight of block

$\qquad\qquad\qquad$ = 13.5 kgf

Q10- A body of weight 3.5 kgf displaces 1000 cm³ of water when immersed completely in water.Calculate apparent weight of body in water.

Solution- Volume of water displaced = volume of the body

Therefore, volume of the body = 1000cm³

Upthrust = volume of water displaced × density of water × g

$\qquad$ = 1000 cm³ × 1g/cm³× g

$\qquad$ = 1000gf= 1 kgf

Apparent weight = weight in air – upthrust

$\qquad\qquad$ = (3.5- 1) kgf

$\qquad\qquad$ = 2.5 kgf

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Q1-Density of mercury is 13.6 g/cm³.Express it is kg/m³.

Solution- To change g/cm³ to kg/m³ we multiply by 10³

$\quad$ 13.6 g/cm³= 13.6 × 10³kg/m³

Q2- Relative density of mercury is 13.6 .Write it in C.G.S and S.I unit.

Solution – in C.G.S system –

$\qquad$ Density = R.D × 1 g/ cm³

$\qquad$ = 13.6 ×1 g/cm³

$\qquad$ = 13.6 g/cm³

In. S.I system

$\qquad$ Density = R.D× 10³kg/m³

$\qquad$ = 13.6× 10³ kg/m³

Q3- Density of silver is 10.8 × 10³ kg/ m³.find its relative density.

Solution- Density of silver = 10.8×10³kg/m³

$\qquad$ R.D = density/10³kg/m³

$\qquad$ R.D.= 10.8× 10³/10³

$\qquad$ = 10.8

Q4- Calculate the volume of the body whose mass is 1040 kg and relative density is 0.52.

Solution- Volume =?

$\qquad$ Mass = 1040kg

$\qquad$ R.D = 0.52

$\quad$ Density = R.D× 10³kg/m³

$\qquad$ = 0.52 ×10³ kg/m³

Volume = mass/density

= 1040kg/(0.52×10³) kg/ m³

= 2m³

Q5- Calculate the mass of air in a cubical container of side 5 m.Density of air is 1.3kg/m³

Solution- Density = 1.3 kg/m³

Side of container = 5m

Volume = (5m)³

=125 m³

Mass = D × V

Mass= 1.3× 125

= 162.5kg

Q6-