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

= 0.000125× 9× 10³

= 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 ×

= 0.000125× 1.2× 10³

= 0.15 kg

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

= 0.15kg

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

= 1.5N = upthrustk

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

= 11.25 – 1.5

= 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 cm^3

Less weight in water is due to upthrust

Q8- weight of a metallic block is 13.5 kgf and volume is 15000cm^3.Calculate upthrust onnthe block , when immersed fully in water.

Solution- Mass of block = 13.5kg

Weight of block = 13.5kgf

Volume = 0.015m^3

Density of water = 1000kg/m^3

Upthrust = volume of block × density of water × g

= 0.015× 1000× g

= 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/cm^3

Solution – While floating upthrust =. Weight of block

= 13.5 kgf

Q10- A body of weight 3.5 kgf displaces 1000 cm^3 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 = 1000cm^3

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

= 1000 cm^3 × 1g/cm^3× g

= 1000gf= 1 kgf

Apparent weight = weight in air – upthrust

= (3.5- 1) kgf

= 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 10^3

$13.6\ g/cm^3 = 13.6 \times 10^3 kg/m^3$

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

Solution – in C.G.S system –

Density = R.D × 1 g/ cm³

= 13.6 ×1 g/cm³

= 13.6 g/cm³

In. S.I system

Density = R.D× 10^3kg/m³

= 13.6× 10^3 kg/m³

Q3- Density of silver is 10.8 × 10^3 kg/ m³.find its relative density.

Solution- Density of silver = 10.8×10^3kg/m³

R.D = density/10^3kg/m³

R.D.= 10.8× 10^3/10^3

= 10.8

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

Solution- Volume =?

Mass = 1040kg

R.D = 0.52

Density = R.D× 10^3kg/m³

= 0.52 ×10^3 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- A metallic Bob of mass 113g is immersed in a jar filled with water and water level rises by 10ml .Find the relative density of metal.

Solution- Mass of stone = 113g

Volume of water = 10cm³

Density of stone = m/V

= 113/10

= 11.3g/cm³

Relative density = density of object/ density of water at

= 11.3/1

R.D= 11.3

Q7- A body of volume 200cm³ weighs 1kgf in air .Find it's weight in water.

Solution- Volume of body = 100cm³

Weight in air W1= 1 kgf= 1000gf

Mass of body =1kg=1000g

R.D of solid =R.D of water= 1

R.D of body =m/V =1000/200=5

Let W2 be the weight of the body in water

R.D of body = W1 /(W1-W2)

5= 1000/(1000 - W2)×1

5 (1000-W2)= 1000

W2= 800gf

Q8- A body of mass 100kg is immersed in water and displaces 2×10^4 cm^3 of water.Find the weight of body in water .

Solution – Volume of water displaced =volume of body

Here body displaces = $2\times 10^4 cm^3$ of water

I) Volume of body = 2×10^4 cm^3= $0.02cm^3$

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

= 0.02×1000×10

= 200N

Now mass of body in air= 100kg= 100×10=1000N

We know,

Upthrust = weight of body in air- weight of body in water

200N=1000N – weight of body in water

Weight of body in water= 1000N-200N

= 800N or 80kgf

Q9- weight in air= 99gf

Weight in water= 88gf

R.D=?

R.D= weight of body in air/(weight of body in air-weight of body in water)

R.D= 99/(99-88)

R.D= 99/11=9

Q10- A body of relative density 10weighs 20gf in air .Find it's weigh in water

Solution- we know,

R.D = weight in air/(weight in air- weight in water)

10= 20/(20-x)

X= 18gf

Q11- A solid of relative density 3 weighs 1.5 kgf in air and 0.9 kgf in a liquid. Find the density of liquid.

Solution- we know,

R.D= W1/(W1-W2) × density of liquid/1*10³

3= 1.5/0.6. × density of liquid/1*10³

Density of liquid= 3×0.6×10³/1.5

=1.2 g/cm³

Q12- A piece of stone of mass 20g is first immersed in a liquid and weighs 12 gf and then immersed in water weighs 10gf.Calculate I) volume ofg stone piece

Ii) weight of piece in air

Solution- I) volume of stone = weight in air- weight in water

= 20gf- 10gf= 10gf or 10cm³

Ii) weight of piece of stone in air= 20gf

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Q1- A wooden piece floats on water with 1/4 th part outside.What is the density of wood?

Solution- outside part =1/4 th

Submerged part = 1- 1/4 = 3/4 th

Let volume be V

Then 3/4V is submerged

Now, let density of wood= p

Density of water = d

So, Vpg=3/4V dg

P= 3/4d

P= 0.75g/cm³

Q2- A cubical block of wood of side 10cm has 600 g.What part of wood remain outside while floating non the water?

Solution- Let us consider p^o and p be the density of water and wooden block respectively.

Density of wooden block = p= m/V p= m/(side)³

P= 600/(10)³

P= 0.6g/cm³

Fraction of cube submerged in water

V'/V= p^o/p

V'/V = 0.6/1

V'/V =60%

Now 60% part is submerged so part outside= 40% or 40cm

Q3- A piece of wax floats ,on brine .What fraction of its volume remain outside ? Density of wax is 0.95g/cm³ and density of brine 1.1g/cm³

Solution- volume of wax immersed = density of wax/density of brine

= 0.95/1.1= 0.86

= 1-0.86= 0.14

Q4- An I every floats in fresh water with a part of it outside the water.Calculate the fraction of volume outside the water . density of ice= 900kg/m³, density of water= 10^3kg/m³

Solution- fraction immersed in water= density of ice / density of water

= 900/1000= 0.9

Now fraction outside water= 1.0.9= 0.1

Q5- A body of iron floats on mercury.find the fraction of volume,which remains immersed in mercury

Solution- fraction immersed in mercury= density of iron /density of mercury

= 7.8× 10^3/13.6×10^3

So, fraction immersed= 0.574

Q6- The relative density of pure gold is 19.3 .A customer buys a bangle , weighing 41.495 g from a jeweller .To check the purity of gold the customer weigh in water and it's weight is 39.345g.Prove that bangle is made of pure gold.

Solution- we know relative density of pure gold is known to be 19.3

So. Here also finding R.D of given gold bangle

Weight of bangle in air= 41.495g

Weight of bangle in water = 39.345g

R.D = weight in air/(weight in air-weight in water) ×density of water

R.D= 41.496/(41.495-39.345)× 1g/cm³

R.D = 19.

So, the bangles were of pure gold

Q7- The density of ice is 0.92 g/cm³ and sea water is 1.025g/cm³ .Find the total volume of an iceberg which floats with its 800cm³ above water.

Solution- Let V is the volume of iceberg below water.So, mass of ice below the water= V×0.92g

Then, amount of water displaced by ice = mass of ice below water / density of water

= V×0.92/1.025= 0.897560

Therefore 0.897560 part of iceberg is sinking in the sea water and then ,.

1-0.897560=0.102439 above sea water

Also a given volume of iceberg above the sea water is 800cm³

So, fractional part of iceberg above the sea water= volume of iceberg above sea water/ volume of iceberg

= 0.102439= 800/0.102439= 7809.5cm³

Q8- If density of ice is 0.9g/m³. What part of ice remain inside and outside the sea water.density of sea water is 1.1g/cm

Solution – part that remain inside = density of ice/ density of sea water

= 0.9/1.1

= 9/11th

Part outside = 1-9/11= 2/11 th part