PHYSICS

BOOKS - ICSE

FLUIDS

Topic 1 2 Marks Questions

1. Name and state the principal on which the hydraulic brakes of a car works.

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2. Write the principal of hydraulic press. Also give its application.

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3. At sea level, the atmospheric pressure is 76 cm of Hg. If air pressure falls by 10 mm of Hg per 120 m of ascent, what is the height of a hill where the barometer reads 70 cm Hg.

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4. Name the physical quantity which is expressed in the unit .atm.. State its value in pascal.

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5. At sea level, the atmospheric pressure is 1.04×10^5 Pa. Assuming $g = 10\mathrm{m\,s^{-2}}$ and density of air to be uniform and equal to $1.3\mathrm{kg\,m^{-3}}$, find the height of the atmosphere.

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6. Why is the tip of a nail made sharp?

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7. What is meant by the statement “the atmospheric pressure at a place is 76 cm of Hg"? State its value in Pa.

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8. What is Torricellian vacuum?

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9. State two advantages of use of mercury as a barometric liquid.

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10. Why is not water used as a barometric liquid? Give two reasons.

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11. Why does nose start bleeding on high mountains?

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12. What is an altimeter ? State its principle. How is its scale calibrated?

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13. Explain why a gas bubble released at the bottom of a lake grows in size as it rises to the surface of the lake.

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14. A dam has broader walls at the bottom than at the top. Explain.

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15. Name two applications of Pascal.s law.

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16. A block of iron of mass 7.5 kg and of dimensions 12 cm x 8 cm x 10 cm is kept on a table top on its base of side 12 cm x 8 cm.

Calculate : Thrust

Take 1 kgf= 10 N

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17. A block of iron of mass 7.5 kg and of dimensions 12 cm x 8 cm x 10 cm is kept on a table top on its base of side 12 cm x 8 cm.

Calculate : Pressure exerted on the table top

Take 1 kgf= 10 N

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18. The area of base of a cylindrical vessel is $300\mathrm{cm}^2$.

Water (density= $1000\mathrm{kg}/\mathrm{m}^3$) is poured into it

up to a depth of 6 cm. Calculate the pressure . $(g = 10\mathrm{m\ s^{-2}})$.

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19. The area of base of a cylindrical vessel is $300\mathrm{cm}^2$.

Water (density= $1000\mathrm{kg/m}^3$) is poured into it up to a depth of 6 cm. Calculate the thrust of water on the base. $\left(g = 10\mathrm{m\ s^{-2}}\right)$.

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20. A vessel contains water up to a height of 1.5 m. Taking the density of water $10^3 \mathrm{kg\,m^{-3}}$, acceleration due to gravity $9.8 \mathrm{m\,s^{-2}}$ and area of base of vessel $100 \mathrm{cm}^2$, calculate the pressure

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21. A vessel contains water up to a height of 1.5 m. Taking the density of water $10^3 \mathrm{kg\,m^{-3}}$, acceleration due to gravity $9.8 \mathrm{m\,s^{-2}}$ and area

of base of vessel 100cm^2, calculate the thrust at the base of vessel.

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22. In a hydraulic machine, a force of 2 N is applied on the piston of area of cross section 10cm^2 . What force is obtained on its piston of area of cross section 100cm^2 ?

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23. What should be the ratio of area of cross section of the master cylinder and wheel cylinder of a hydraulic brake so that a force of 15 N can be obtained at each of its brake shoe by exerting a force of 0.5 N on the pedal ?

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Topic 1 3 Marks Questions

1. We do not feel uneasy even under enormous pressure of the atmosphere above as well as around us. Give a reason.

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2. A balloon collapses when air is removed from it. Explain.

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3. Water does not run out of a dropper unless its rubber bulb is pressed.

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4. Two holes are made in a sealed tin can to take out oil from it. Explain.

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5. In a hydraulic machine, the two pistons are of area of cross section in the ratio 1:10. What weight force in needed on the narrow piston to overcome a force of 100 N on the wide piston?

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6. How does the pressure at a certain depth in water differ from that of the same depth in river water. Explain year answer.

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7. A human exerts a force of 1.5 N on each of the two nails A and B the area of cross secton of tip of nail A in $2\mathrm{mm}^2$ while that of B in $6\mathrm{mm}^2$ Calculate the pressure on each nail in pascal.

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8. At a given place, a mercury barometer records a pressure of 0.70 m of Hg. What

would be the height of water column if mercury in barometer is replaced by water? Take R.D. of mercury = 13.6.

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9. Assuming the density of air to be $1.295 \mathrm{kg\,m^{-3}}$, find the fall in barometric height in mm of Hg at a height of $107 \mathrm{m}$ above the sea level. Take density of mercury = $13.6 \times 10^3 \mathrm{kg\,m^{-3}}$.

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10. How is the barometric height of a simple barometer affected if Its tube is pushed down into the trough of mercury?

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11. How is the barometric height of a simple barometer affected if Its tube is slightly tilted from vertical?

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12. How is the barometric height of a simple barometer affected if A drop of liquid is inserted inside the tube?

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13. Calculate the height of a water column which will exert on its base the same pressure as the 70 cm column of mercury. Density of mercury is $13.6 \mathrm{g\ cm}^{-3}$

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14. Will the height of the water column change if the cross section of the water column is made wider ?

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15. The pressure of water on the ground floor is 40,000 Pa and on the first floor is 10,000 Pa. Find the height of the first floor. (Take : density of water = $1000\mathrm{kg\,m^{-3}}$, $g = 10\mathrm{m\,s^{-2}}$)

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16. Differentiate between thrust and pressure .

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17. A simple U tube contains mercury to the same level in both of its arms. If water is poured to a height of 13.6 cm in one arm, how much will be the rise in mercury level in the other arm ?

Given : density of mercury = $13.6 \times 10^3 \mathrm{kg\ m^{-3}}$ and density of water = $10^3 \mathrm{kg\ m^{-3}}$.

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18. A force of 50 kgf is applied to the smaller piston of a hydraulic machine. Neglecting friction, find the force exerted on the large piston, if the diameters of the pistons are 5 cm and 25 cm respectively.

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Topic 1 4 Marks Questions

1. Why does the liquid rise in a syringe when its piston is pulled up?

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2. The area of cross section of press plunger of a hydraulic press is $4m^2$. It is required to overcome a resistiveload of 400 kg on it. Calculate the force required on the pump

plunger if the area of cross section of the pump plunger is $0.01m^2$.

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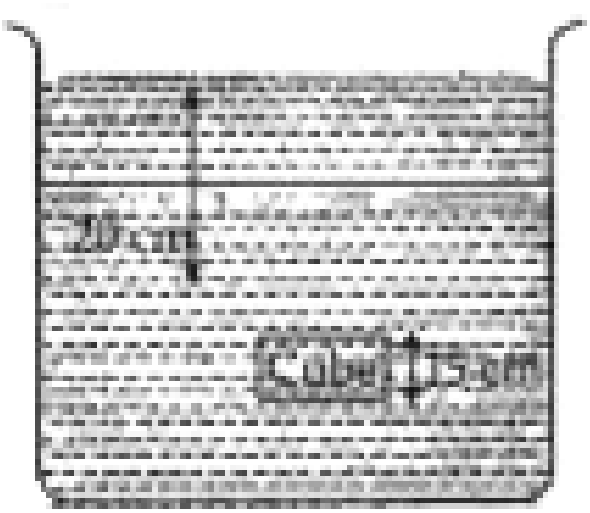
3. In the below figure shows a cube of each side 15 cm immersed in a tub containing water of density $10^3 \mathrm{kgm}^{-3}$ such that its top surface in 20 cm below the free surface of water. Calculate the pressure at the top of the cube Take atmosphere pressure = 10^5 Pa and

$g = 9.8 \text{ms}^{-2}$



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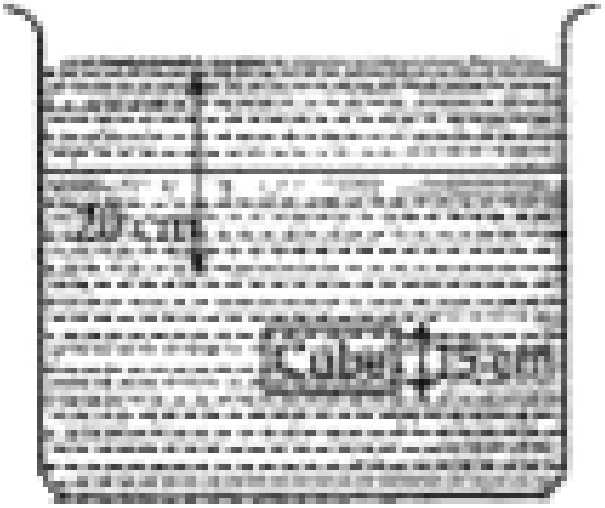
4. In the below figure shows a cube of each side 15 cm immersed in a tub containing water of density 10^3kgm^{-3} such that its top surface

in 20 cm below the free surface of water. Calculate the pressure at the bottom of cube

Take atmosphere pressure = 10^5 Pa and $g = 9.8 \text{ms}^{-2}$



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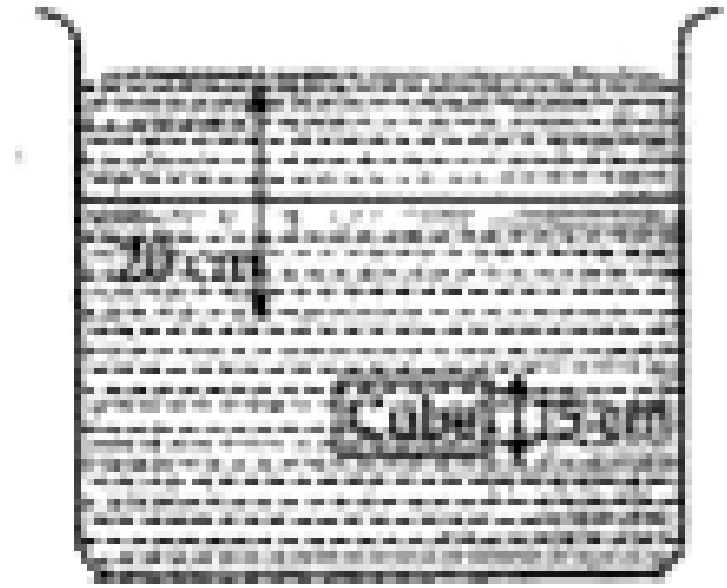
5. In the below figure shows a cube of each side 15 cm immersed in a tub containing water of density $10^3 \mathrm{kgm}^{-3}$ such that its top surface in 20 cm below the free surface of water. Calculate the resultant thrust on cube

Take atmosphere pressure = 10^5 Pa and

$g = 9.8 \mathrm{ms}^{-2}$



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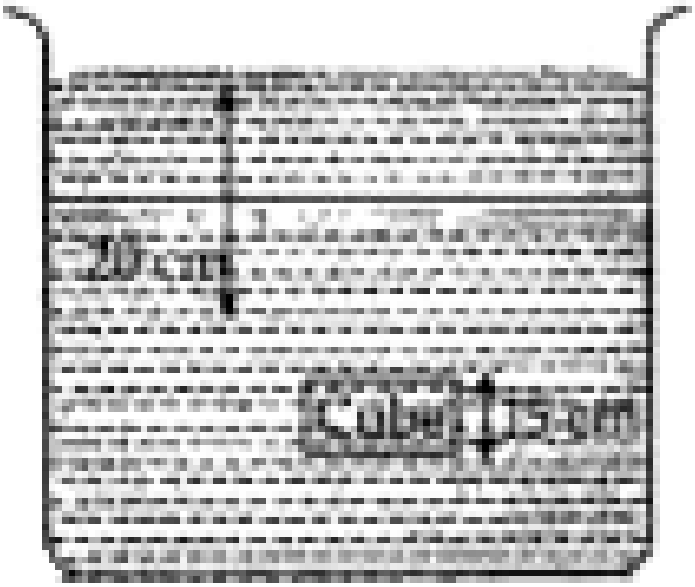
in 20 cm below the free surface of water.

Calculate the resultant thrust on cube

Take atmosphere pressure = 10^5 Pa and

$g = 9.8 \text{ms}^{-2}$



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7. A vessel of base area 100 cm x 60 cm and height 200 cm is completely filled with a liquid of density $1.1 \times 10^3 \mathrm{kgm}^{-3}$ Ignoring the atmosphere pressure find the thrust at the bottom of the vessel

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8. A vessel of base area 100 cm x 60 cm and height 200 cm is completely filled with a liquid of density $1.1 \times 10^3 \mathrm{kgm}^{-3}$ Ignoring the

atmosphere pressure find the pressure at the depth of 5 cm from the free surface

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9. Describe an experiment to demonstrate that air exerts pressure.

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10. Deduce an expression for the pressure at depth inside a liquid.

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Topic 2 2 Marks Questions

1. If a bowl in formed from the same steel piece then it can float in water. Why?

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2. Define relative density of a substance.

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3. The relative density of silver in 10.5 what in the density of silver in SI unit.

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4. What do you understand by the term upthrust of a fluid?

Describe an experiment to show its existence.

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5. A body dipped into a liquid experiences an upthrust. State two factors on which upthrust on the body depends.

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6. A body experiences an upthrust F_1 in river water and F_2 in sea water when dipped up to the same level.

Which is more F_1 or F_2?Give reason

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7. How does the density of material of a body determine whether it will float or sink in water?

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8. It is easier to lift a heavy stone under water than in air. Explain.

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9. Calculate the mass of a body whose volume is $2m^3$ and relative density is 0.52

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10. A body is volume $100cm^3$ weighs 5 kgf in air. It is completely immersed in a liquid of density $1.8 \times 10^3 kgm^{-3}$. Find (i) the upthrust due to liquid and (ii) the weight of the body in liquid.

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11. A body is volume $100cm^3$ weighs 5 kgf in air. It is completely immersed in a liquid of density $1.8 \times 10^3 kgm^{-3}$. Find (i) the upthrust due to liquid and (ii) the weight of the body in liquid.

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12. A body weighs 450 gf in air and 310 gf when completely immersed in water. Find:

(i) the volume of the body

(ii) the loss in weight of the body, and

(iii) the upthrust on the body. State the assumption made in part (i)

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Watch Video Solution

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(i) the volume of the body

(ii) the loss in weight of the body, and

(iii) the upthrust on the body. State the assumption made in part (i)

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15. What is meant by the term buoyancy?

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16. What is the cause of upthrust? At which point it can be considered to act?

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17. A man first swims in sea water and then in river water.

(i) compare the weights of sea water and river water displaced by him.

(ii) Where does he find it easier to swim and why?

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18. Will a body weigh more in air or in vacuum when weiged with a spring balance? Give a reasonfor you answer.

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19. a metal solid cylinder tied ot a thread is hanging from the hook of a spring balance. The cylinder is gradually immersed into water contaned in a jar. What changes do you expect in the readings of spring balance? Explain your answer.

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20. What is the unit of relative density?

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21. State the principle of floatation.

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22. A body held completely immersed inside a liquid experiences two forces: (i) F_1, the force due to gravity and (ii) F_2 the buoyant force. Draw a diagram showing the direction of these forces acting on the body and state the conditions when the body will float or sink.

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23. When a piece of wood is suspended from the hook of a spring balance, it reads 70 gf. The wood is now lowered into water. What reading do you expect on the scale of spring balance?

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24. What is the centre of buoyancy? State its position for a floating body with respect to

the centre of gravity of the body.

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25. A nail sinks in water whereas it floats on mercury.

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26. A piece of iron sinks in water, but a slip made of iron floats in water. Why?

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27. A piece of ice is floating in a glass vessel filled with water. How will the level of water in the vessel change when the ice melts ?

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28. Explain the following observation: "Icebergs floating in sea are dangerous for ships".

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29. Explain the following:

An egg sinks in fresh water, but floats in a strong salt solution.

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30. Explain the following:

A toy balloon filled with hydrogen rises to the ceilling, but if filled with carbon dioxide sinks to the floor.

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31. Explain the following:

As a ship in harbour is being unloaded, it slowly rises higher in water.

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32. A block of wood is so loaded that it just floats in water at room temperature. What change will occur in the state of floatation, if some salt is added to water? Give reasons.

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33. A block of wood is so loaded that it just floats in water at room temperature. What change will occur in the state of floatation, if some salt is added to water? Give reasons.

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34. A body of volume V and density P_S, floats with volume v inside a liquid of density P_L .

Show that

$$\frac{v}{V} = \frac{P_S}{P_L}$$

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35. The density of iron is $7.8 \times 10^3 \mathrm{kg\,m^{-3}}$

What is its relative density?

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36. The density of iron is $7800 \mathrm{kg\,m^{-3}}$. What do you understand by this statement?

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37. The relative density of silver is 10.8. Find its density.

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38. Calculate the mass of air in a room of dimensions 4.5 m x 3.5 m x 2.5 m if the density of air at N.T.P. is $1.3 \mathrm{kgm}^{-3}$

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39. A piece of stone of mass 113 g sinks to the bottom in water contained in a measuring cylinder and water level in cylinder rises from 30 ml to 40 ml. Calculate R.D. of stone.

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40. A solid iron ball of mass 500 g is dropped in mercury contained in a beaker.

Will the ball float or sink? Give reasons.

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41. A solid iron ball of mass 500 g is dropped in mercury contained in a beaker.

What will be the apparent weight of the ball?

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42. A piece of wax floats in brine. What fraction of its volume will be immersed?

Density of wax = $0.95\ \mathrm{g\ cm^{-3}}$,

Density of brine = $1.1\ \mathrm{g\ cm^{-3}}$.

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43. If the density of ice is $0.9gcm^{-3}$, what portion of an iceberg will remain below the surface of water in a sea? (Density of sea water $= 1.1gcm^{-3}$)

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44. Two identical pieces, one of ice (density $= 900kgm^{-3}$) and other of wood (density $= 300kgm^{-3}$)

float on water.

a. Which of the two will have more volume summerged inside water?

b. Which of the two will experience more upthrust due to water?

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45. Two identical pieces, one of ice (density $= 900 kgm^{-3}$) and other of wood (density $= 300 kgm^{-3}$) float on water.

a. Which of the two will have more volume summerged inside water?

b. Which of the two will experience more upthrust due to water?

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Topic 2 3 Marks Questions

1. A nail sinks in water whereas it floats on mercury.

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2. The density of a substance in $0.9\mathrm{g}/\mathrm{cm}^3$

Find its relative density

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3. The density of a substance in $0.9\mathrm{g}/\mathrm{cm}^3$

Find its density in SI units.

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4. An ice berg floats on fresh water with a part of it outside the water surface. Calculate the fraction of the volume of the ice berg which is below the water surface. (Density of ice = $917 \mathrm{kgm}^{-3}$, Density of water = $1000 \mathrm{kgm}^{-3}$)

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5. You are provided with a hollow iron ball A of volume $15 \mathrm{cm}^{3}$ and mass 12 g and a solid iron ball B of mass 12 g. Both are placed on the

surface of water contained in a large tub.

Find upthrust on each ball.

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6. You are provided with a hollow iron ball A of volume 15cm^3 and mass 12 g and a solid iron ball B of mass 12 g. Both are placed on the surface of water contained in a large tub.

Which ball will sink? Give a reason for your answer. (Density of iron = 8.0g cm^{-3})

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7. Two spheres A and B, each of volume 100cm^3 are placed on water (density = 1.0g cm^{-3}). The sphere A is made of wood of density 0.3g cm^{-3} and the sphere B is made of iron of density 8.9g cm^{-3}.

Find the weight of each sphere

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8. Two spheres A and B, each of volume 100cm^3 are placed on water (density =

1.0g cm^{-3}). The sphere A is made of wood of density 0.3g cm^{-3} and the sphere B is made of iron of density 8.9g cm^{-3}.

Find the upthrust on each sphere.

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9. Two spheres A and B, each of volume 100cm^3 are placed on water (density = 1.0g cm^{-3}). The sphere A is made of wood of density 0.3g cm^{-3} and the sphere B is made

of iron of density $8.9 \mathrm{g\ cm}^{-3}$.

which sphere will float? Give reason.

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10. The mass of a block made of certain material is 13.5 kg and its volume is $15 \times 10^{-3} m^3$.

Calculate upthrust on the block if it is held fully immersed in water.

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11. The mass of a block made of certain material is 13.5 kg and its volume is $15 \times 10^{-3} m^3$.

Will the block float or sink in water when released? Give a reason for your answer.

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12. The mass of a block made of certain material is 13.5 kg and its volume is $15 \times 10^{-3} m^3$.

What will be the upthrust on block while

floating?

Take density of water = $1000 \mathrm{kg\ m^{-3}}$

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13. Describe an experiment to show that a body immersed in a liquid appears lighter than it really is.

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14. A metal cube of edge 5 cm and density $9.0cm^{-3}$ is suspended by a thread so as to be completely immersed in a liquid of density $1.2gcm^{-3}$. Find the tension in thread. (Take $g = 10ms^{-2}$)

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15. A body of volume 100cm^3 weighs 1 kgf in air. Find: Its relative density.

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16. A body of volume $100\mathrm{cm}^3$ weighs 1 kgf in air. Find: Its weight in water

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17. A solid weighs 120 gf in air and 105 gf when it is completely immersed in water. Calculate the relative density of solid.

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18. A jeweller claims that he makes ornaments of pure gold that has a relative density of 19.3. He sells a bangle weighing 25.25 gf to a person. The clever customer weighs the bangle when immersed in water and finds that it weighs 23.075 gf in water. With the help of suitable calculations, find out whether the ornament is made of pure gold or not.

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19. A rubber ball floats on water with its $1/3^{rd}$ volume outside water. What is the density of rubber?

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20. A block of wood of mass 24 kg floats in water. The volume of wood is 0.032 m. Find the volume of block below the surface of water

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21. A block of wood of mass 24 kg floats in water. The volume of wood is 0.032 m^3. Find the density of wood. (Density of water = $1000 \mathrm{kg\,m^{-3}}$)

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22. A wooden cube of side 10 cm has mass 700 g. What part of it remains above the water surface while floating vertically on water surface?

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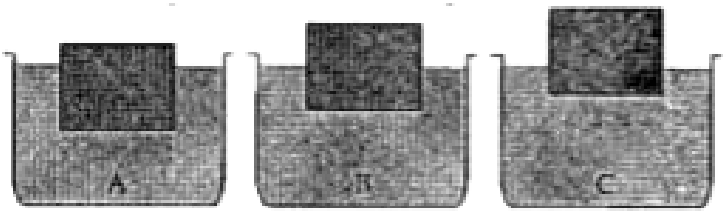
23. Fig. shows the same block of wood floating in three different liquids A, B and C of densities by e_1, e_2 and e_3 respectively. Which of the liquid has the highest density? Give a reason for your answer.



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Topic 2 4 Marks Questions

1. A metal piece weighs 200gf in air and 150 gf when completely immersed in water.

Calculate the relative density of the metal piece.

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2. A metal piece weighs 200gf in air and 150 gf when completely immersed in water.

How much will it weigh in a liquid of density $0.8 \mathrm{gcm}^{-3}$?

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3. A block of wood of volume 30cm^3 floats it water with 20cm^3 of its volume immersed. Calculate the density.

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4. A block of wood of volume 30cm^3 floats in water with 20cm^3 of its volume immersed. Calculate the weight of the block of wood .

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5. A solid weighs 32 gf in air and 28.8 gf in water.

Find the volume of solid

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6. A solid weighs 32 gf in air and 28.8 gf in water.

Find R.D. of solid

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7. A solid weighs 32 gf in air and 28.8 gf in water.

Find the weight of solid in a liquid of density $0.9 \mathrm{g\ cm}^{-3}$

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8. With the use of Archimedes' Principle, state how you will find relative density of a solid denser than water and insoluble in it. How will

you modify your experiment if the solid is soluble in water?

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9. A piece of stone of mass 15.1 g is first immersed in a liquid and it weighs 10.9 gf. Then on immersing the piece of stone in water, it weighs 9.7 gf. Calculate the weight of the piece of stone in air

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10. A piece of stone of mass 15.1 g is first immersed in a liquid and it weighs 10.9 gf. Then on immersing the piece of stone in water, it weighs 9.7 gf. Calculate the volume of the piece of stone

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11. A piece of stone of mass 15.1 g is first immersed in a liquid and it weighs 10.9 gf. Then on immersing the piece of stone in

water, it weighs 9.7 gf. Calculate the relative density of stone

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12. A piece of stone of mass 15.1 g is first immersed in a liquid and it weighs 10.9 gf. Then on immersing the piece of stone in water, it weighs 9.7 gf. Calculate the relative density of the liquid.

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13. A piece of wood of uniform cross section and height 15 cm floats vertically with its height 10 cm in water and 12 cm in spirit. Find the density of (i) wood and (ii) spirit

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14. A wooden block floats in water with two third of its volume submerged. A. Calculate the density of wood.b. When the same block is placed in oil, three - quarter of its volume in immersed in oil. Calculate the density of oil.

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15. A wooden block floats in water with two-third of its volume submerged.

When the same block is placed in oil, three quarters of its volume is immersed in oil. Calculate the density of oil.

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16. The density of ice is $0.92 \mathrm{g\,cm^{-3}}$ and that of sea water is $1.025 \mathrm{g\,cm^{-3}}$. Find the total volume of an iceberg which floats with its volume $800 \mathrm{cm^{-3}}$ above water.

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