



# PHYSICS

## BOOKS - MTG IIT JEE FOUNDATION

### THRUST AND PRESSURE

#### Illustrations

1. A rectangular wooden slab of mass  $5\text{kg}$  is kept on a table top of edge  $2\text{m}$  each and the slab covers the table completely. Calculate.

(a) the thrust of the block on the table top.

(b) the pressure of the block on the table top.



[Watch Video Solution](#)

2. A force of 15 N is uniformly distributed over an area of  $150 \text{ cm}^2$ . Find the pressure in pascals.



[Watch Video Solution](#)

3. The pressure due to atmosphere is  $1.013 \times 10^5$  Pa. Find the force exerted by the atmosphere on the top surface of a table 2.0 m long and 1.0 m wide.



[Watch Video Solution](#)

4. A 50 kg girl wearing high heel shoes balance on a single heel. The heel is circular with a diameter 1 cm. what is the pressure exerted by the heel on the horizontal floor?





[Watch Video Solution](#)

5. A body weighs 500 gf in air and 300 g f when completely immersed in water. Find

(a) the apparent loss in the weight of the body,

(b) the upthrust on the body (c ) the volume of the body.



[Watch Video Solution](#)

6. A solid of density  $D$  is floating in a liquid of density  $d$ . If  $V$  is the volume of solid submerged in the liquid and  $V$  is the total volume of the solid, then  $V / V$  is equal to



[Watch Video Solution](#)

7. The mass of an empty bucket of capacity 10 litres is 1 kg. Find its mass when completely filled with a liquid of relative density 0.8.



[Watch Video Solution](#)

8. A bottle weighs 30 g when empty, 53.4 g when filled with a liquid and 48 g when filled with water, Calculate the density of the liquid,

Given density of water at  $4^{\circ}C = 1000 \frac{kg}{m^3}$ .



[Watch Video Solution](#)

9. How does a fish manage to rise up and go down in water ?



[Watch Video Solution](#)

10. A solid body of mass 150g and volume  $25\text{cm}^3$  is put in water. Will the body float or sink?



[Watch Video Solution](#)

11. The apparent weight of a floating body is equal to \_\_\_\_\_.



[Watch Video Solution](#)

1. An object of mass 60g has a volume of  $10\text{cm}^3$ . Calculate the density of the object. If the density of water be  $g/\text{cm}^3$ , state whether the object will float or sink in water.



[Watch Video Solution](#)

2. The pressure exerted by weight of a cubical block of side 3cm on the surface is 5 Pa. Calculate the weight (or force) of the block.



[Watch Video Solution](#)



3. The relative density of silver is 10.8. If the density of water be  $1.0 \times 10^3 \text{ kg m}^{-3}$  calculate the density of silver in SI units.



[Watch Video Solution](#)

4. A plastic toy is released under water. This toy comes to the surface of water and never stays under water. Explain, why?



[Watch Video Solution](#)

5. The density of copper is  $8.9g/cm^3$ .

Calculate the relative density of copper.

(Given, density of water =  $1.0g/cm^3$ ).



[Watch Video Solution](#)

6. A drawing pin is pierced in a wooden table with a force of 5N. Calculate the pressure exerted by the pin on the table if the area of the pin is  $0.02mm^2$  ?



 [Watch Video Solution](#)

7. A metal cube is found to float in a liquid of density  $2gcm^{-3}$  with  $\frac{1}{2}cm$  of its vertical side above of liquid. On placing a weight of  $144g$  over its top, it just submerges in the liquid. Find the specific gravity of the metal cube ?

 [View Text Solution](#)

8. The ratio of height of a mercury column in a barometer at a place to the height of the

liquid column at the same place are 1 : 4. Find the density of the liquid.



[Watch Video Solution](#)

9. A hollow metal of mass 180.6g contains cavity of volume  $2.5\text{cm}^3$ . This metal when placed in water displaces 24cc of water. Find the specific gravity of metal.



[Watch Video Solution](#)

## 10. Pascal's Law and its applications



[Watch Video Solution](#)

### Ncert Section

1. Why is it difficult to hold a school bag having strap made of thin and strong string?



[Watch Video Solution](#)

2. What do you mean by buoyancy?



[Watch Video Solution](#)

3. Why does an object float or sink when placed on the surface of water?



[Watch Video Solution](#)

4. You find your mass to be 42 kg on a weighing machine. Is your mass more or less

than 42 Kg?



**Watch Video Solution**

5. You have a bag of cotton and an iron bar, each indicating a mass of 100 kg when measured of a weighing machine. In reality, one is heavier than the other. Can you say which one is heavier and why?



**Watch Video Solution**

6. Why will a sheet of paper fall slower than one that is crumpled into a ball?



[Watch Video Solution](#)

7. In what direction does the buoyant force on an object immersed in a liquid act?



[Watch Video Solution](#)



8. Why does a block of plastic released under water come up to the surface of water?



[Watch Video Solution](#)

9. The volume of 50 g of a substance is  $20 \text{ cm}^3$ .

If the density of water is  $1 \frac{\text{g}}{\text{cm}^3}$ , will the

substance float or sink?



[Watch Video Solution](#)

10. The volume of 500 g sealed packet is  $350 \text{ cm}^3$ . Will the packet float or sink if the density of water is  $1 \frac{\text{g}}{\text{cm}^3}$ ? What will be the mass of the water displaced by this packed?



[Watch Video Solution](#)

## Exercise Multiple Choice Questions

1. The SI unit of thrust is

A. newton

B.  $\text{Nm}^{-1}$

C. Nm

D. pascal

**Answer: A**



**Watch Video Solution**

2. The equation for pressure is

A.  $\text{hg/d}$

B.  $\text{hdg}$

C. hd/g

D. h/dg

**Answer: B**



**Watch Video Solution**

**3. Fluids are**

A. solids and liquids

B. liquids and gases

C. solids and gases

D. only liquids

**Answer: B**



**Watch Video Solution**

4. In verifying Archimedes' principle, which of the following readings is not taken ?

A. weight of the body in air

B. apparent weight of body in water

C. weight of water displaced

D. all the above readings have to be taken

**Answer: D**



**Watch Video Solution**

5. Buoyant force acting on an object is equal to the

A. mass of the solid immersed

B. weight of the solid immersed

C. mass of the liquid displaced by the  
object

D. weight of the liquid displaced by the  
object

**Answer: D**



**Watch Video Solution**

**6.** An air bubble rises up in water because  
pressure acting on air bubble,

A. decreases

B. increases

C. remains same

D. may increase or decrease

**Answer: B**



**Watch Video Solution**

7. When a body of density  $d_1$  and volume  $V$  is floating in a liquid of density  $d_2$



- A. its true weight is  $Vd_2g$
- B. loss in its weight is  $Vd_2g$
- C. its apparent weight is zero
- D. its density  $d_1$  is greater than that of liquid  $d_2$  .

**Answer: C**



**Watch Video Solution**

8. If the density of a liquid increases, the buoyant force will

A. Increase

B. remain the same

C. decrease

D. none of the above

**Answer: A**



**Watch Video Solution**

9. Pressure exerted by a liquid on a container (in which it is enclosed) acts on

- A. the base of the container .
- B. the walls of the container .
- C. both base and walls of the container .
- D. none of the above

**Answer: C**



**Watch Video Solution**

10. A body weight 40 g in air. If its volume is  $10 \text{ cm}^3$ , in water it will weigh:

A. 30 g

B. 40 g

C. 50 g

D. data insufficient

**Answer: A**



**Watch Video Solution**

11. If the density of aluminium is  $2700\text{kg m}^{-3}$ , then its value in the CGS system is

A.  $2700\text{g cm}^{-3}$

B.  $270\text{g cm}^{-3}$

C.  $27\text{g cm}^{-3}$

D.  $2.7\text{g cm}^{-3}$

**Answer: D**



**Watch Video Solution**

12. The SI unit of relative density is:

A.  $\text{g cm}^{-3}$

B.  $\text{kg m}^{-3}$

C.  $\text{g cm}^{-2}$

D. none of these

**Answer: D**



**Watch Video Solution**

13. A sample of metal weighs 210 g in air , 180 in water , and 120 in liquid . Then , relative density of

A. RD of metal is 3

B. RD of metal is 7

C. RD of liquid is 7

D. RD of liquid is  $(1/3)$

**Answer: B**



**Watch Video Solution**

14. A piston of cross-sectional area  $100\text{cm}^2$  is used in a hydraulic pressure to exert a force of  $10^7$  dyne on the water. The cross-sectional area of the other piston which support a truck of mass 2000 kg is

A.  $100\text{cm}^2$

B.  $10^9\text{cm}^2$

C.  $1.96 \times 10^4\text{cm}^2$

D.  $2 \times 10^{10}\text{cm}^2$

**Answer: C**





Watch Video Solution

15. Buoyant force exerted by different fluids on a given body is

A. same

B. different

C. zero

D. negligible

**Answer: B**



**16.** Which of the following statements is wrong

?

A. Buoyancy is an upward force and acts in the vertically upward direction.

B. Upthrust depends on the volume of liquid displaced but not on the weight of the floating body .

C. Upthrust balances only a partial weight of the floating body .

D. None of these .

**Answer: C**



**Watch Video Solution**

17. Voyager balloons are filled with hydrogen to move up . As it goes up

- A. the pressure decreases and volume of the filled hydrogen increases
- B. its apparent weight decreases
- C. the volume, pressure and apparent weight of hydrogen remain the same
- D. all of these .

**Answer: A**



**View Text Solution**

**18.** The apparent weight of wood floating on water if it weights 100 g in air is

A. 400 g

B. 300 g

C. 100 g

D. zero

**Answer: D**



**Watch Video Solution**

19. If the density of wood is  $1500 \text{kgm}^{-3}$ , then its relative density is

A. 1500

B. 1.5

C. 15

D. 150

**Answer: B**



**Watch Video Solution**

20. If the density of iron is  $7900 \text{ kg m}^{-3}$ , then its relative density is

A. 790

B. 79

C. 7.9

D. 0.79

**Answer: C**



**Watch Video Solution**

21. Pressure at a point inside a liquid does not depend on

A. the depth of the point below the surface of the liquid

B. the nature of the liquid .

C. the acceleration due to gravity at that point .

D. the shape of the vessel containing liquid

.

**Answer: D**





Watch Video Solution

22. You have a bag of cotton and an iron bar, indicating mass of 100 kg, when measured on a weighing machine . In reality

A. cotton is heavier than iron

B. cotton and iron are equally heavy

C. iron is heavier than cotton

D. none of the above

**Answer: A**



Watch Video Solution

**23.** If a body is compressed to half its previous volume, its density:

- A. remains the same
- B. becomes four times
- C. becomes half
- D. becomes double

**Answer: D**



24. A element X with atomic mass 60 g/mol has a density of  $6.23\text{g cm}^{-3}$ . If the edge length of the unit cell is 400 pm, identify the type of the cubic unit cell. Calculate the radius of the atoms of the element.

A. 250 g f

B. 280 g f

C. 350 g f

D. 300 g f

**Answer: B**



**Watch Video Solution**

**25.** An aeroplane of mass  $3 \times 10^4 \text{ kg}$  and total wing area of  $120 \text{ m}^2$  is in a level flight at some height the difference in pressure between the upper and lower surfaces of its wings in kilo pascal is ( $g = 10 \text{ m} / \text{s}^2$ )

A. 2.5

B. 5.0

C. 10.0

D. 12.5

**Answer: A**



**Watch Video Solution**

**26.** Every liquid exerts an upward force on the objects immersed in it . Upward force is called

A. gravitational force

B. buoyant force

C. mechanical force

D. magnetic force

**Answer: B**



**Watch Video Solution**

**27.** The truck with a heavy load will move most swiftly if it is fitted with

A. four wheels

B. six wheels

C. eight wheels

D. none of the above

**Answer: C**



**View Text Solution**

**28.** When a body is wholly or partially immersed in a liquid it experiences a buoyant force which is equal to the

A. volume of liquid displaced by it

B. weight of liquid displaced by it

C. both (a) and (b)

D. neither (a) nor (b) .

**Answer: B**



**Watch Video Solution**

**29.** Pressure applied on liquids is transmitted

A. in downward direction only

B. upward direction only



C. sides of containing vessels only

D. in all directions

**Answer: D**



**Watch Video Solution**

**30.** Tank trailers are provided with 16 wheels

so as to

A. increase pressure on the road

B. decrease pressure on the road

C. support the weight of the tank

D. none of the above

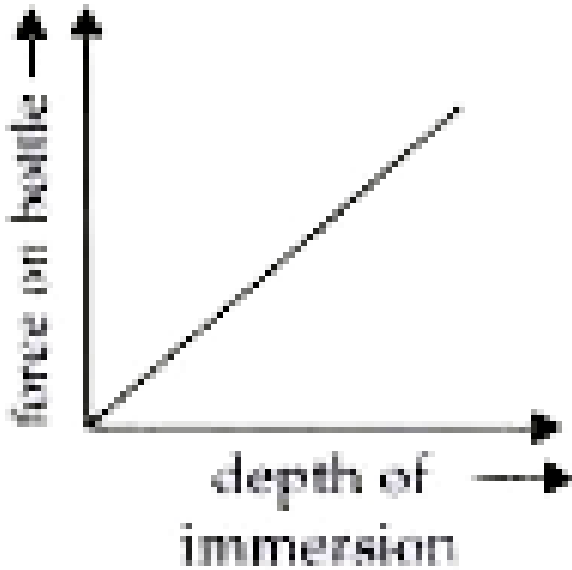
**Answer: B**



**View Text Solution**

**31.** An empty plastic bottle closed with an airtight stopper is pushed down into a bucket filled with water. As the bottle is pushed down, there is an increasing force on the bottom as

shown in graph . This is because



- A. more volume of liquid is displaced
- B. more weight of liquid is displaced
- C. pressure increases with depth
- D. all of the above .

**Answer: C**



**View Text Solution**

**32.** A ship going from sea water to river water has to displace more water to

- A. change the buoyant force
- B. decrease the buoyant force
- C. maintain the same buoyant force
- D. none of these

**Answer: C**



**View Text Solution**

**33.** Two pieces of metal when immersed in a liquid have equal upthrust on them, then

- A. both pieces must have equal weights
- B. both pieces must have equal densities
- C. both pieces must have equal volumes
- D. both are floating to the same depth

**Answer: C**



**Watch Video Solution**

**34.** One  $\text{kgf} / \text{m}^2$  is related to pascal .

A.  $1\text{kgf} / \text{m}^2 = 100 \text{ Pa}$

B.  $1\text{kgf} / \text{m}^2 = 10 \text{ Pa}$

C.  $1\text{kgf} / \text{m}^2 = 1 \text{ Pa}$

D.  $1\text{kgf} / \text{m}^2 = 0.1 \text{ Pa}$

**Answer: B**



[View Text Solution](#)

35. Which of the following is not matched correctly

A. Force -  $\text{kg m s}^{-1}$

B. Pressure -  $\text{N m}^{-2}$

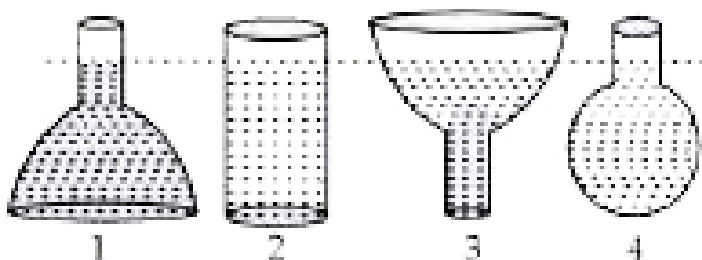
C. Buoyancy - N

D. Density -  $\text{kg m}^{-3}$

**Answer: A**



**36.** A liquid is taken in different shaped vessels as shown in the figure .



The vessels are filled with the liquid upto same level . We know that

- (i) Pressure is inversely proportional the area on which force acts
- (ii) Pressure depends on the depth of liquid



column.

Which vessel will have the highest pressure at the bottom ?

A. 1

B. 2

C. 3

D. all have same pressure

**Answer: D**



**View Text Solution**

37. A ball is floating on water. It is in

- A. stable equilibrium
- B. unstable equilibrium
- C. neutral equilibrium
- D. both (b) and (c)

**Answer: A**



**View Text Solution**

**38.** A fresh egg sinks in pure water, whereas it floats in saturated salty water. This is due to

- A. higher density of pure water
- B. higher density of the salty water
- C. the fluid matter inside the egg-shell
- D. low density of salty water

**Answer: B**



**View Text Solution**

**39.** In a pressure cooker, the food cooks faster because

A. increased pressure lowers the boiling point of water

B. increased pressure raises the boiling point of water

C. decreased pressure raises the boiling point of water

D. increased pressure decrease the melting point of water

**Answer: B**



**View Text Solution**

**40.** A truck is of mass 50, 000 kg. Its tyres exert a pressure of 2, 500, 000 Pa. The surface area of tyres in contact with ground is ( Take  $g = 10\text{m s}^{-2}$  )

A.  $2\text{m}^2$

B.  $0.2\text{m}^2$

C.  $2.5\text{m}^2$

D.  $2.75\text{m}^2$

**Answer: B**



**View Text Solution**

**41.** A girl is carrying a bucket of water in one hand and a wooden block in the other hand. After transferring the wooden block to the bucket, the girl will carry

A. more load than before

B. less load than before

C. same load as before

D. none of these

**Answer: C**



**View Text Solution**

**42.** A solid piece of lead experiences certain upthrust. The lead piece is then shaped into a hollow cube and placed in the same liquid . The upthrust acting on it

A. increases

B. decreases

C. remains same

D. none of the above

**Answer: A**

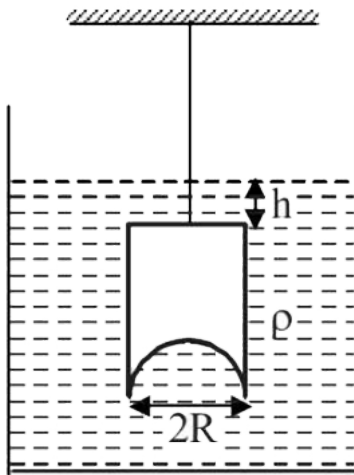


**View Text Solution**

**43.** A hemispherical portion of radius  $R$  is removed from the bottom of a cylinder of radius  $R$ . The volume of the remaining cylinder



is  $V$  and its mass  $M$ . It is suspended by a string in a liquid of density  $\rho$  where it stays vertical. The upper surface of the cylinder is at a depth  $h$  below the liquid surface. The force on the bottom of the cylinder by the liquid is



A.  $Mg$

B.  $Mg - Vdg$

C.  $Mg + \pi R^2 h dg$

D.  $dg(V + \pi R^2 h)$

**Answer: D**



**Watch Video Solution**

**44.** A body weights  $x$  g in air,  $y$  g in liquid and  $z$  g in the water . The ratio of relative density of liquid and the body is

A.  $x - y : x$

B.  $x - y : z$

C.  $y - z : x$

D.  $z - y : y$

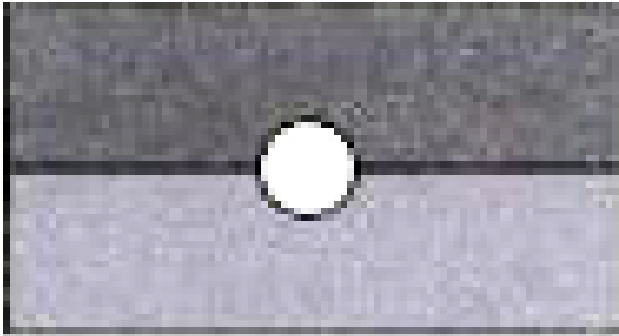
**Answer: A**



**View Text Solution**

**45.** A solid uniform ball having volume  $V$  and density  $\rho$  floats at the interface of two unmixable liquids as shown in the figure. The densities of the upper and the lower liquids

are  $\rho_1$  and  $\rho_2$  respectively, such that  $\rho_1 < \rho < \rho_2$ . What fraction of the volume of the ball will be in the lower liquid ?



A.  $\frac{\rho - \rho_2}{\rho_1 - \rho_2}$

B.  $\frac{\rho}{\rho_1 - \rho_2}$

C.  $\frac{\rho_1 - \rho}{\rho_1 - \rho_2}$

D.  $\frac{\rho_1 - \rho_2}{\rho_2}$

**Answer: C**



**View Text Solution**

**46.** A piece of steel floats in mercury. The specific gravity of mercury and steel are 13.6 and 7.8 respectively. For covering the whole piece some water is filled above the mercury. What part of the piece is inside the mercury ?

A. 0.54

B. 0.50

C. 0.47

D. 0.62

**Answer: A**



**View Text Solution**

**47.** Two stretched membranes of area  $2\text{cm}^2$  and  $3\text{cm}^2$  are placed in a liquid at the same depth. The ratio of the pressure on them is

A. 1 : 1

B. 2:3

C. 3:2

D. 22:33

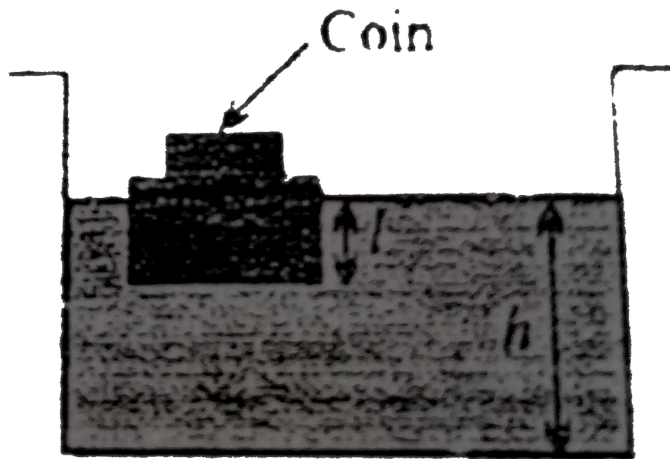
**Answer: A**



**View Text Solution**

**48.** A wooden block, with a coin placed on its top, floats in water as shown in figure. The distance  $l$  and  $h$  are shown there. After some

time the coin falls into the water. Then



- A.  $l$  decreases and  $h$  increases
- B.  $l$  increases and  $h$  decreases
- C. both  $l$  and  $h$  increase
- D. both  $l$  and  $h$  decrease

**Answer: D**





Watch Video Solution

49. A glass stopper suspended to the hook of a spring balance and immersed in water reads 100 g f. When a cork of volume  $20\text{cm}^3$  is tied to the glass stopper and then the combination is immersed in water, the reading of spring balance will be

A. more than 100 g f

B. equal to 100 g f

C. less than 100 g f

D. none of the above

**Answer: C**

 [View Text Solution](#)

50. A solid of density  $D$  is floating in a liquid of density  $d$ . If  $v$  is the volume of solid submerged in the liquid and  $V$  is the total volume of the solid, then  $\frac{v}{V}$  is equal to

A.  $\frac{d}{D}$

B.  $\frac{D}{d}$

C.  $\frac{D}{(D + d)}$

D.  $\frac{D + d}{D}$

**Answer: B**



**View Text Solution**

**Exercise Match The Following**

## 1. Matching

### List-I

- (P) 1 g wt
- (Q) 1 torr
- (R) 1 pascal
- (S)  $1 \text{ kg f m}^{-2}$

### List-II

- 1.  $10^{-5}$  bar
- 2. 10 Pa
- 3. 0.1 cm Hg
- 4. 980 dyne

A.  $P - 4, Q - 3, R - 1, S - 2$

B.  $P - 3, Q - 2, R - 4, S - 1$

C.  $P - 1, Q - 4, R - 3, S - 2$

D.  $P - 2, Q - 1, R - 3, S - 4$

**Answer: A**



**View Text Solution**

## 2. Matching

List-I	List-II
(P) Pressure exerted by a fluid	1. Pa
(Q) Force	2. $hdg$
(R) Buoyant force	3. $Vdg$
(S) Pressure	4. N

A.  $P - 1, Q - 4, R - 2, S - 3$

B.  $P - 2, Q - 4, R - 3, S - 1$

C.  $P - 3, Q - 4, R - 1, S - 2$

D.  $P - 4, Q - 1, R - 2, S - 3$

**Answer: B**



**Watch Video Solution**

### 3. Matching

**List-I**

(P) Relative density

(Q)  $1 \text{ g cm}^{-3}$

(R) Pressure

(S) Density

**List-II**

1. Thrust/area

2. Mass/volume

3. Density of  
substance/ density  
of water at  $4^\circ\text{C}$

4.  $1000 \text{ kg m}^{-3}$

A.  $P - 1, Q - 4, R - 2, S - 3$

B.  $P - 2, Q - 3, R - 4, S - 1$

C.  $P - 3, Q - 4, R - 1, S - 2$

D.  $P - 4, Q - 1, R - 2, S - 3$

**Answer: C**



**Watch Video Solution**

## 4. Matching

### List-I

- (P) Fluids
- (Q) Pascal's law
- (R) Lactometer
- (S) Hydrometer

### List-II

- 1. Pressure
- 2. Liquids and gases
- 3. Liquids
- 4. Milk

A.  $P - 1, Q - 4, R - 2, S - 3$

B.  $P - 2, Q - 1, R - 4, S - 3$

C.  $P - 3, Q - 4, R - 1, S - 2$

D.  $P - 4, Q - 2, R - 1, S - 3$

**Answer: B**



**Watch Video Solution**



## 5. Matching

List-I	List-II
(P) Density of solid > Density of liquid	1. Float partially immersed into the liquid
(Q) Density of solid < Density of liquid	2. Float wholly immersed into the liquid
(R) Density of solid = Density of liquid	3. Mass by volume
(S) Density of liquid	4. Sink into the liquid

A.  $P - 4, Q - 1, R - 2, S - 3$

B.  $P - 2, Q - 3, R - 4, S - 1$

C.  $P - 3, Q - 4, R - 1, S - 2$

D.  $P - 1, Q - 3, R - 2, S - 4$

**Answer: A**



**Watch Video Solution**

## Exercise Assertion Reason Type

**1. Assertion :** A piece of ice floats in water, the level of water remains unchanged when the ice melts completely.

**Reason :** According to Archimede's principle, the loss in weight of the body in the liquid is

equal to the weight of the liquid displaced by the immersed part of the body.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: A**



**Watch Video Solution**

2. Assertion : A wooden cube when placed in layer of two liquids of different densities, the thickness of the cube in the liquid are different.

Reason : Volume immersed depends on the density of liquid .

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: A**



**View Text Solution**

**3. Assertion :** Body will sink when density of body is equal to the density of fluid .

**Reason :** Body immerses partially and float when density of body is less than density of fluid .

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: D**



**View Text Solution**

4. Assertion: Pascal law is the working principle of hydraulic lift.

Reason: Pressure =  $\frac{\textit{thrust}}{\textit{area}}$

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.



D. If both assertion and reason are false .

**Answer: B**



**Watch Video Solution**

**5. Assertion :** Fluid is a substance which has the ability to flow.

**Reason :** Archimedes' principle is applicable for both liquids and gases.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: B**



**View Text Solution**

**6. Assertion :** A balloon filled with hydrogen stops rising after it has attained a certain height in the sky .

**Reason :** As height increases, density of air decreases resulting in increase of buoyant force.

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: C**



**View Text Solution**

7. Assertion : The pressure at the bottom of two tanks of different area of cross sections are equal if they contain same liquid to same height .

Reason : Pressure of a liquid is  $hdg$  and is independent of shape and width of the container .

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: A**



**View Text Solution**

**8. Assertion :** The apparent weight of a body in a liquid is equal to the difference of true weight of the body and weight of the liquid displaced by the body .

**Reason :** Weight of liquid displaced in this case is equal to the loss of weight .

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: A**



**View Text Solution**



9. Assertion : The blood pressure in humans is greater at the feet than at the brain .

Reason : Pressure of a liquid is  $h\rho g$  .

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: A**



**View Text Solution**

**10.** Assertion : A hydrogen filled balloon stops rising after it has attained certain height in the sky .

Reason : The atmospheric pressure decreases with height and becomes zero when balloon attained the maximum height .

A. If both assertion and reason are true and reason is the correct explanation of assertion .

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false .

**Answer: C**



**View Text Solution**

## Exercise Comprehension Type

1. A certain block weights 22 N in air . It weights 17 N when immersed in water. When immersed in another liquid it weights 18 N . Density of other liquid is  $800\text{kg m}^{-3}$  .

Calculate the relative density of the block .

A. 5

B. 4.4

C. 5.5

D. 3

**Answer: B**



**Watch Video Solution**

2. A certain block weights 22 N in air . It weights 17 N when immersed in water. When immersed in another liquid it weights 18 N . Density of other liquid is  $800\text{kg m}^{-3}$  .

Calculate the relative density of the other liquid .

A. 0.8

B. 0.67

C. 0.2

D. 1

**Answer: A**



**Watch Video Solution**

3. A certain block weights 22 N in air . It weights 17 N when immersed in water. When immersed in another liquid it weights 18 N . Density of other liquid is  $800\text{kg m}^{-3}$  .

What is the volume of the block ?

A. 500cc

B. 400cc

C. 300cc

D. 200cc

**Answer: A**



[View Text Solution](#)

4. A plastic bottle of 500 g has a volume of  $450\text{cm}^3$ . Density of water is  $1\text{g cm}^{-3}$  ?

Density of bottle is

A.  $1.11\text{g cm}^{-3}$

B.  $2.11\text{g cm}^{-3}$

C.  $3.11\text{g cm}^{-3}$

D.  $4.11\text{g cm}^{-3}$

**Answer: A**





[View Text Solution](#)

5. A plastic bottle of 500 g has a volume of  $450\text{cm}^3$ . Density of water is  $1\text{g cm}^{-3}$  ?

Mass of the water displaced by the bottle ?

A. 250 g

B. 450 g

C. 150 g

D. 350 g

**Answer: B**



[View Text Solution](#)

6. A plastic bottle of 500 g has a volume of  $450\text{cm}^3$ . Density of water is  $1\text{g cm}^{-3}$  ?

Which of the following statement is true ?

- A. Bottle will sink
- B. Bottle will float
- C. Bottle will partially float
- D. Can't say

**Answer: A**



[View Text Solution](#)

7. A balloon displaces in air, resulting in buoyant force. This buoyant force is more than the weight of the balloon and hence the balloon moves up.

Buoyant force is directly proportional to the density of

A. balloon

B. air

C. water vapour

D. none of these

**Answer: B**



**View Text Solution**

8. A balloon displaces in air, resulting in buoyant force. This buoyant force is more than the weight of the balloon and hence the balloon moves up.

As the balloon moves up, the density of air

A. Increases

B. Decreases

C. remains same

D. none of these

**Answer: B**



**View Text Solution**

9. A balloon displaces in air, resulting in buoyant force. This buoyant force is more than the weight of the balloon and hence the balloon moves up.

Which of the following is the condition for floating of balloon ?

A. weight of the balloon is more than buoyant

B. weight of the balloon is less than buoyant force

C. weight of the balloon is same as that of upthrust by air .

D. both (a) and (c ) may be right .

**Answer: C**



[View Text Solution](#)

**10.** A girl of mass 50 kg is wearing high heel sandals . The heels have a cross section of  $1\text{cm}^2$  . Also consider an elephant of mass 4000 kg with foot area of each foot  $250\text{cm}^2$  .

The pressure exerted by girl is

A.  $230 \times 10^4$  pascals

B.  $240 \times 10^4$  pascals

C.  $250 \times 10^4$  pascals

D.  $260 \times 10^4$  pascals

**Answer: C**



**View Text Solution**

**11.** A girl of mass 50 kg is wearing high heel sandals . The heels have a cross section of  $1\text{cm}^2$  . Also consider an elephant of mass 4000 kg with foot area of each foot  $250\text{cm}^2$  .

The pressure exerted by elephant is

A.  $20 \times 10^4$  pascals



B.  $30 \times 10^4$  pascals

C.  $40 \times 10^4$  pascals

D.  $50 \times 10^4$  pascals

**Answer: C**



**View Text Solution**

**12.** A girl of mass 50 kg is wearing high heel sandals . The heels have a cross section of  $1\text{cm}^2$  . Also consider an elephant of mass 4000 kg with foot area of each foot  $250\text{cm}^2$  .

By how much is the pressure exerted by girl is more than that of elephant ?

A.  $200 \times 10^4$  pascals

B.  $210 \times 10^4$  pascals

C.  $220 \times 10^4$  pascals

D.  $230 \times 10^4$  pascals

**Answer: B**



**Watch Video Solution**

13. A block of mass 5 kg and volume  $0.05\text{m}^3$  floats in a liquid of density  $140\text{kg m}^{-3}$ .

The fraction of block inside liquid is

A.  $\frac{7}{5}$

B.  $\frac{2}{7}$

C.  $\frac{5}{7}$

D.  $\frac{7}{2}$

**Answer: C**



**Watch Video Solution**

14. A block of mass 5 kg and volume  $0.05\text{m}^3$  floats in a liquid of density  $140\text{kg m}^{-3}$ .

Fraction of block outside liquid is

A.  $\frac{2}{7}$

B.  $\frac{7}{2}$

C.  $\frac{3}{7}$

D.  $\frac{7}{3}$

**Answer: A**



**Watch Video Solution**

15. A block of mass 5 kg and volume  $0.05\text{m}^3$  floats in a liquid of density  $140\text{kg m}^{-3}$ .

Volume of block above the surface of liquid is

A.  $0.024\text{m}^3$

B.  $0.014\text{m}^3$

C.  $0.015\text{m}^3$

D.  $0.041\text{m}^3$

**Answer: B**



**Watch Video Solution**

# Exercise Subjective Problem Very Short Answer Type

1. Why do you feel lighter when you swim?



[Watch Video Solution](#)

2. What is relative density? What is its unit?



[Watch Video Solution](#)

3. Why a truck or a motor but has much wider tyres?



[Watch Video Solution](#)

4. Why is it easier to swim in sea water than in river water?



[Watch Video Solution](#)

5. State Archimedes' principle.



[Watch Video Solution](#)

6. Give three types of fluid pressure .



[View Text Solution](#)

7. The volume of floating ice above the brine solution is higher as compared to that in the fresh water. Why ?



[View Text Solution](#)



8. Give the expression for the pressure at a point inside a liquid.



[Watch Video Solution](#)

9. The buoyant force depends upon



[Watch Video Solution](#)

10. The density of a solid is  $7.9\text{g cm}^{-3}$  in air.

What is the density of the solid in SI unit ?





[Watch Video Solution](#)

11. What is the significance of relative density ?



[View Text Solution](#)

12. (a) The density of a liquid is  $860 \frac{kg}{m^3}$ . What will be its relative density?

(b) The density of silver is  $10500 \frac{kg}{m^3}$ . Wxplain this statement.



[Watch Video Solution](#)

**13.** In which direction does the buoyant force on an object due to a liquid act ?



**Watch Video Solution**

**14.** A balloon filled with hydrogen gas floats in air . Explain why ?



**View Text Solution**

15. Why does a block of thermocole released under water come upto the surface of water ?



[View Text Solution](#)

## Exercise Subjective Problem Short Answer Type

1. A camel walks easily on sandy surface than a man in spite of the fact that a camel is much heavier than a man. Explain.



[Watch Video Solution](#)

2. An object of volume  $V$  is immersed in a liquid of density  $d$ . Calculate the magnitude of buoyant force acting on the object due to liquid .



[Watch Video Solution](#)

3. Why a woodpecker has long sharp beak ?



[View Text Solution](#)

4. Why are sleepers used below the rails?



[Watch Video Solution](#)

5. Two cork pieces of same size and mass are dipped in two beakers containing water and oil . The cork floats on water but sink in oil . Why ?



[Watch Video Solution](#)

6. A brick of mass 3 kg, having dimensions  $15\text{cm} \times 10\text{cm} \times 5\text{cm}$  is kept on the ground . Calculate the pressure exerted by the brick when it is placed along breadth and height on the ground . Acceleration due to gravity is  $10\text{m s}^{-2}$  .



**Watch Video Solution**

7. The relative density of gold is 19.3 . The density of water is  $10^3\text{kg m}^{-3}$  ? What is the

density of gold in S.I. unit ?



[Watch Video Solution](#)

8. The pressure inside a cycle tyre is  $3.2 \times 10^5 \text{ dyne cm}^{-2}$ . Area of contact of tyre with the ground is  $2\text{cm}^2$  when the rider is on the seat. Find the weight of the rider, assuming the weight to be evenly distributed on both tyres of the cycle .



[View Text Solution](#)



9. A cylinder of certain mass is held in vertical position. If the height of the cylinder is 10 cm and radius of cross - section is 4 cm such that the pressure acting on its bottom surface is  $21560\text{N m}^{-2}$  , find the mass of the cylinder ?



[Watch Video Solution](#)

10. Why is the pressure on the ground more when a man is walking than when he is standing?



[Watch Video Solution](#)

**11.** Use your ideas about pressure to explain why it is easier to walk on soft sand if you have flat shoes rather than shoes with sharp heels.



**Watch Video Solution**

**12.** The mass of  $2m^3$  of steel is 15600 kg. Calculate the density of steel in SI units .



**Watch Video Solution**

**13.** Give some applications of Archimedes principle.



**View Text Solution**

**14.** What are the laws of floatation ?



**View Text Solution**

**15.** A block of wood is kept on a table top. The mass of the wooden block is 5 kg and its

dimensions are  $50\text{cm} \times 30\text{cm} \times 30\text{cm}$  . Find the pressure exerted by the wooden block on the table top if it is made to lie on the table with its sides of dimensions

(a)  $30\text{cm} \times 30\text{cm}$

(b)  $50\text{cm} \times 30\text{cm}$  Given  $g = 9.8\text{m s}^{-2}$  .



**Watch Video Solution**

**Exercise Subjective Problem Long Answer Type**

1. Calculate the greatest and the least pressure exerted by a metal block of size  $10\text{cm} \times 8\text{cm} \times 5\text{cm}$  and having a mass of 5 kg .



**Watch Video Solution**

2. The volume of a 600 g sealed packet is  $450\text{cm}^3$  . What is the density of the packet ?  
Will it float or sink in water if it has the density

$1\text{g cm}^{-3}$  ? What will be the mass of the water displaced by this packet ?



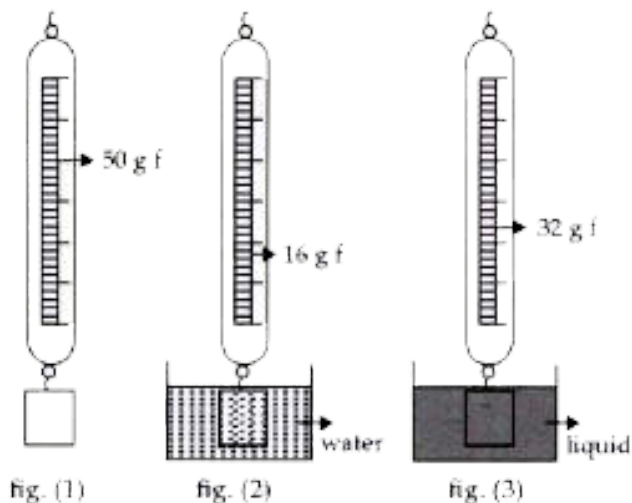
[View Text Solution](#)

**3.** A piece of iron of density  $7.8 \times 10^3\text{kg m}^{-3}$  and volume  $100\text{cm}^3$  is totally immersed in water . Calculate (a) the weight of the iron piece in air (b) the upthrust and (c ) apparent weight in water .



[Watch Video Solution](#)

4. Find the relative density (R.D.) of a liquid by using the following experimental set up . Also find the density of liquid in S.I. system .



[View Text Solution](#)

5. With the help of an example (Numerical), show that the force acting on a smaller area exerts a larger pressure ?



[View Text Solution](#)

## Exercise Integer Numerical Value Type

1. The pressure due to a man weighing 80 kg standing on his feet is  $x \times 10^4 \text{ N m}^{-2}$ . Area



of his feet is  $160\text{cm}^2$  . Find the value of  $x$  . ( $g = 10\text{ms}^{-2}$ ) .



[Watch Video Solution](#)

2. A piece of rock salt weighs 108.2 g in air and 48.2 g in saturated brine of relative density 1.2 . What is the specific gravity of the rock salt ?



[View Text Solution](#)

3. A body of mass 2.0 kg and density  $8000 \frac{kg}{m^3}$  is completely dipped in a liquid of density  $800 \frac{kg}{m^3}$ . Find the force of buoyancy on it.



[Watch Video Solution](#)

4. A solid body of mass 82 g and volume  $91.1 \text{cm}^3$  is put into water . Its density is  $x / 10 \text{g cm}^{-3}$  , then find  $x$  .



[Watch Video Solution](#)

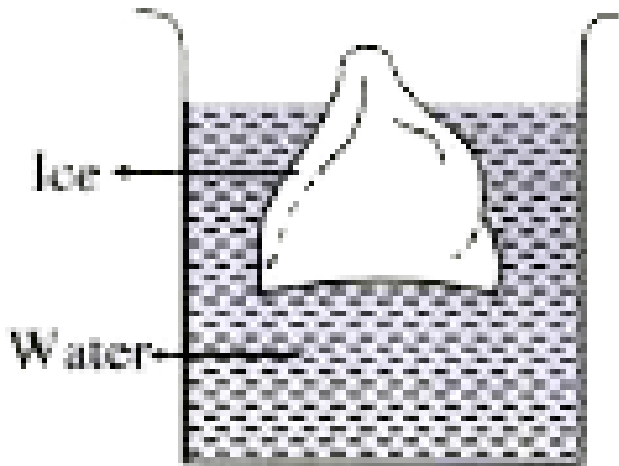
5. During blood transfusion the needle is inserted in a vein where the gauge pressure is  $2000Pa$  . At what height must the blood container be placed so that blood may just enter the vein? Density of whole blood =  $1.06 \times 10^3 Kg/m^3$  .



[Watch Video Solution](#)

Olympiad Hots Corner

1. A lump of ice floats in water as shown in the figure .



Which of the following statements is correct ?

A. The lump of ice floats because the area of its lower surface is larger than the area of its upper surface .

B. The pressure difference between the lower and the upper surfaces of the lump of ice gives rise to an upthrust equal to its weight .

C. The ice has a greater density than water .

D. The mass of water displaced by ice is equal to the upthrust .

**Answer: B**



**Watch Video Solution**

2. An object is put in turn, in three liquids having different densities . The object floats with  $\frac{3}{5}$ ,  $\frac{2}{9}$  and  $\frac{8}{11}$  parts of its volume inside the liquid surface in liquids of densities  $\rho_1$ ,  $\rho_2$  and  $\rho_3$  respectively . Which of the following is correct ?

A.  $\rho_1 > \rho_2 > \rho_3$

B.  $\rho_3 < \rho_1 < \rho_2$

C.  $\rho_3 > \rho_1 > \rho_2$

$$D. \rho_1 < \rho_3 < \rho_2$$

**Answer: B**



**Watch Video Solution**

**3.** Fill in the blanks by choosing an appropriate option .

A body sinks when its weight is \_\_\_(i)\_\_\_ than the buoyant force acting on it . A body floats when its weight is \_\_\_(ii)\_\_\_ than the buoyant force acting on it . A body sinks if the density

of the body is (iii) than the density of liquid

. A body floats if the density of the body is

(iv) than the density of liquid .

- A.      *(i)*      *(ii)*      *(iii)*      *(iv)*  
More    Less    Less    More
- B.      *(i)*      *(ii)*      *(iii)*      *(iv)*  
More    Less    More    Less
- C.      *(i)*      *(ii)*      *(iii)*      *(iv)*  
Less    More    Less    More
- D.      *(i)*      *(ii)*      *(iii)*      *(iv)*  
Less    More    More    Less

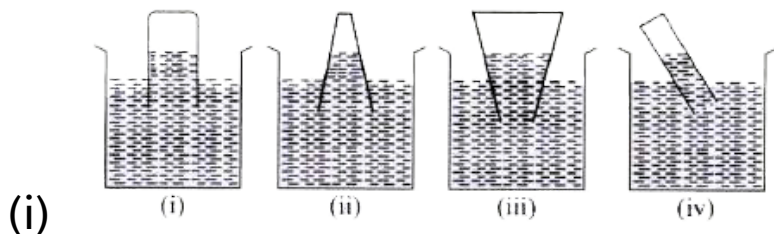
**Answer: B**



**Watch Video Solution**



4. The given diagrams show four mercury barometers .



If the

value of external pressure in cases (i), (ii), (iii) and (iv) is represented by  $P_I$ ,  $P_{II}$ ,  $P_{III}$  and  $P_{IV}$  respectively, then

A.  $P_I > P_{II} = P_{III} > P_{IV}$

B.  $P_{IV} > P_{II} = P_{III} > P_I$

C.  $P_{III} > P_{II} = P_{IV} > P_I$

D.  $P_I = P_{II} = P_{III} = P_{IV}$

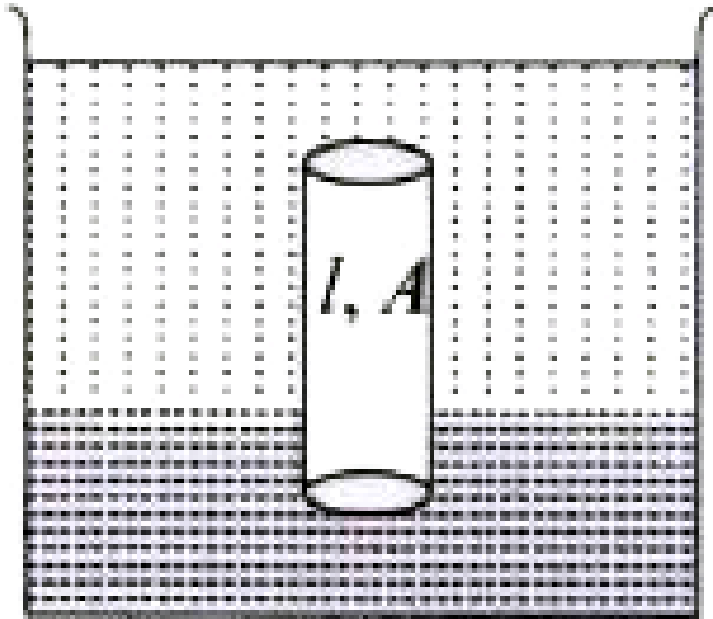
**Answer: D**



**View Text Solution**

5. A solid cylinder of length  $l$ , cross sectional area  $A$  and density  $\frac{5}{4} \times 10^3 \text{kgm}^{-3}$  is immersed such that it floats with its axis vertical at the liquid - liquid interface with length  $l/4$  in the denser liquid as shown in the figure . The lesser dense liquid is open to atmospheric pressure  $P_0$ . If the density of lesser dense liquid is  $1.0 \times 10^3 \text{kg m}^{-3}$  then

the density of denser liquid will be



A.  $1.5 \times 10^3 \text{ kg m}^{-3}$

B.  $2.0 \times 10^3 \text{ kg m}^{-3}$

C.  $2.5 \times 10^3 \text{ kg m}^{-3}$

D.  $3.0 \times 10^3 \text{ kg m}^{-3}$

**Answer: B**



**View Text Solution**

6. 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 ?

A. Increases

B. Decreases

C. Remains the same

D. First increases then decreases

**Answer: C**



**Watch Video Solution**

7. A body of volume  $V$  and density  $d$  is completely immersed in a liquid of density  $p$ . Then the apparent weight of the body will be:

A.  $Vdg$

B.  $V\rho g$

C.  $V(\rho - d)g$

D.  $V(d - \rho)g$

**Answer: D**



**Watch Video Solution**

8. A piece of wood floats in water kept in a beaker. IF the beaker moves with a vertical acceleration  $a$ , the wood will

A. remain in the same position relative to the water surface

B. Sink deeper in the liquid, if  $a$  is downward with  $a < g$

C. sink deeper the liquid, if  $a$  is upward

D. come out, more from the liquid, if  $a$  is downward with  $a < g$ .

**Answer: A**



**Watch Video Solution**

9. The volume of a substance is  $20\text{cm}^3$ . The mass of the substance if its relative density is 2.5 will be

A. 5 g

B. 50 g

C. 500 g

D. 5 kg

**Answer: B**



**Watch Video Solution**

**10.** An aluminium sphere is dipped into water .

If  $B_I$  and  $B_{II}$  are the buoyancies in water at

$0^\circ C$  and  $40^\circ C$  respectively, then



A.  $B_I < B_{II}$

B.  $B_I > B_{II}$

C.  $B_I = B_{II}$

D.  $B_I >$  or  $< B_{II}$  depending upon the  
radius of the sphere .

**Answer: B**



**View Text Solution**

11. The pressure exerted on the ground by a man is greatest when

A. he stands with both feet flat on ground

B. he stands flat on one foot

C. he stands on the toes of one foot

D. all the above yield the same pressure .

**Answer: C**



**View Text Solution**

12. The magnitude of buoyant force depends on which one of the following properties of fluid ?

- A. Mass of object
- B. Size of object
- C. Density of liquid
- D. Size of container

**Answer: C**



**View Text Solution**

**13.** The weight of an empty balloon on a spring balance is  $w_1$  . The weight becomes  $w_2$  when the balloon is filled with air . Let the weight of air itself be  $w$ . Neglect the thickness of balloon when it is filled with air. Also neglect the difference between the density of air inside and outside the balloon

A.  $w_2 < w_1 + w$

B.  $w_2 = w_1 + w$

C.  $w_2 > w_1 + w$

D.  $w_2 < w_1$

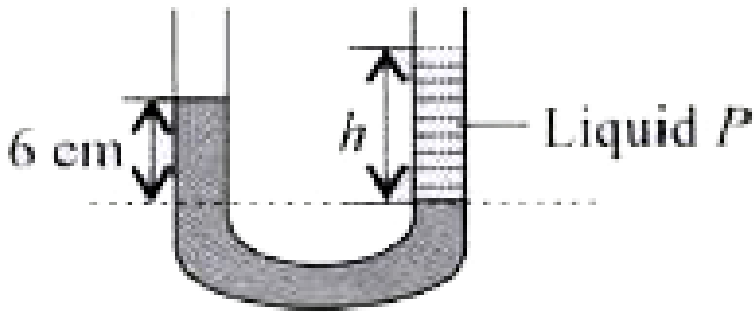
**Answer: A**



**Watch Video Solution**

**14.** The diagram shows a U-tube used to determine the density of liquid P. When liquid P is poured into one arm, the water level in the other arm rises. If the densities of water and liquid P are  $1000\text{kg m}^{-3}$  and  $750\text{kg m}^{-3}$

respectively, then what is the value of  $h$  ?



- A. 7 cm
- B. 8 cm
- C. 10 cm
- D. 12 cm

**Answer: B**



**Watch Video Solution**

15. A body floats with one-third of its volume outside water and  $\frac{3}{4}$  of its volume outside another liquid. The density of another liquid is :

A.  $\frac{9}{4}g/cc$

B.  $\frac{8}{3}g/cc$

C.  $4g/cc$

D.  $\frac{3}{8}g/cc$

**Answer: B**



**Watch Video Solution**