PHYSICS

BOOKS - PRADEEP PHYSICS (HINGLISH)

FLOTATION

Problems

1. The force on a phonogram needle is 1-2N.

The point has a circular cross-section of radius

0-1 mm. What pressure does it exert on the record in (i) Pa (ii) atm?

2. A force of 15 N is uniformly distributed over an area of 150 m^2. Find the pressure is pascals.

3. how much force should be applied on an area of 1 cm^2 to get a pressure of 15 Pa?

4. A block weighing 1.0 kg is in the shape of a cube of length 10 cm. It is kept on a horizontal table. Find the pressure on the portion of the table where the block is kept.

5. The pressure due to atmoshere 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 1-0m wide.

6. Find the thrust acting on the human body due to atmospheric pressure. Take the surface area of a man of middle size to be $1.5m^2$ and atmospheric pressure (1 atm) $= 1.013 \times 10^5$ Pa.

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

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2. What do you mean by buoyancy?

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

4. You find your mass to be 42 kg on a weighing machine. If your mass more or less than 42 Kg?

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?

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

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

8. The volume of 50 g of a substance is 20 cm^3. If the density of water is $1\dfrac{g}{cm^3}$, will the substance float or sink?

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

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Questions Answer

1. Define thrust, what is its unit?

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2. Define pressure. What is its unit?

3. Calculate the pressure when a force of 200 N acts on an area of (a) $10m^2$ (b) $5m^2$.

4. What force acting on an area of $0.5m^2$ will produce a pressure of 500 Pa ?

5. Define density .What is the SI unit of density ?

(b) Define relative density .What is the SI unit of relative density ?

The density of turpentine is $840 kg/m^3$.What will be its relative density ? (Density of water $= 1000 kg/m^3$)

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

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7. Define buoyant force. What is its unit?

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8. State one important effect produced by the buoyant force exerted by water.

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9. Where does a solid weigh more: in air or in a liquid?

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10. Name two factors on which the buoyant force acting on an object depends.

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11. What is the relationship between the buoyant force on an object and the liquid displaced by it?

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12. An object weighs 9.8 N in air and 9.0 N when fully immersed in water. How much is the buoyant force on the object?

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13. The relative density of mercury is 13.6 what does this statement mean?

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14. The density of turpentine oil is $840\dfrac{kg}{m^3}$. What will be its relative density?

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15. What is the density of water at $4°C$?

Short Answer Question

1. Explain whi big boulders can be moved easily by floods.

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2. Why is a slight blow on a cork of bottle fully filled with a liquid suffiecient to break the bottle?

3. Why is it easier to walk on soft sand with a flat shoe than with a pencil-heeled shoe?

4. Lead has greater density than iron and both are denser than water. Is the buoyant force on a lead object greater than, less than or equal

to the buoyant force on an iron object of the same volume?

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5. Why do you feel lighter when you swim?

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6. Why a bucket of water weighs lighter inside the well than when it is outside the water?

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

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8. Two different object are completely immersed in water and undergo same loss in weight. Is it necessary that the weights of these objects in air be also the same?

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9. If two equal weights of unequal volumes are balanced in air, what will happen when these are completely dipped in water?

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10. Why does a person feel pain when he stands on a pile of gravel than when he stands on a bed of sand?

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11. An iron sphere is suspended with a spring. The length of the spring increases. When the sphere is completely in water, the extension in the length of the spring decreases. Why does it happen so?

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12. Why are sleepers used below the rails?

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13. Human corpse always floats on the surface of water, but the head always stays within water, why?

14. When a plastic block is released under water, it never stays under water but instead comes to the suface of water. Explaing Why?

15. A ship made of iron and steel does not sink in sea, but the same amount of iron and steel in form of a sheet would sink Why?

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Value Based Questions

1. Breathing is the process that moves air in (inhaling) and out (exhaling) of the lungs. Breath is life as breathing provides 99% of energy to our bodies.

(a) What happen when we inhale?

(b) Why a person with pulmonary disease has difficulty in breathing? What message does it convey?

(c) What is done to make a newborn have his first breath?

2. Pascal's law states that a fluid in a confined space expands into every possible space if it is put under pressure. This law plays a very

important role in our lives. Give three applications with brief description.

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3. Air is a fluid and our bodies displace air. As a result of this, a buoyant force is acting on each one of us.

What is the approximate density of your body?

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4. Which human virtue was at stake when Archimedes came out with his principle while bathing in a tub?

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Solved Problems

1. A wooden block of dimensions $10cm \times 20cm \times 50cm$ weighs 6-5 kg Calculate the density of the block.

2. Calculate the mass of a body whose volume is $2m^3$ and density $0.52\dfrac{g}{cm^3}$.

3. A dining hall has dimensions $50m \times 10m \times 3.5m$. Calculate the mass of air in the hall. Given, density of air $= 1.30\dfrac{kg}{m^3}$.

4. A thread of mercury of 10.2 g is in a tube of uniform cross-section $0.1 cm^2$. Calculate the length of the thread. The density of mercury is $13.6 \dfrac{g}{cm^3}$.

5. 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.

6. A piece of copper of mass 106 g is dipped in a measuring cylinder containing water at 22 ml mark. The water rises to 34 ml mark. Find (a) volume of the copper piece (b) the density of copper.

7. 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 $4°C = 1000\dfrac{kg}{m^3}$.

8. A cubical block of water is dipped completely in water. Each edge of the block is 1 cm is length. Find the bouyant force acting on the block.

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

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

11. A solid body of mass 150 g and volume 250 cm^3 is put in water. Will the body float or sink?

Problems For Practice

1. A cube of edge length 10 cm is placed inside a liquid. The pressure at the centre of the face

is 15 Pa. find the force exerted by the liquid on this face.

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2. A force of 16 N is distributed uniformly on one surface of a cube of edge 8 cm. find the pressure on this surface.

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3. a force of 100 N is applied on an object of area $2m^2$. Calculate the pressure

4. A boy weighing 60 kg f is wearing shoes with heel area of cross-section $20cm^2$ while a girl weighing $45kg$ f is wearing shoes with heel of area of cross-section $1.5cm^2$. Compare the pressures exerted on the ground by their

heels when they stands on the heel of one foot.

5. A nail is driven into a wooden board by using a hammer. The impact of the hammer on the head of the nail produce a thrust of 25 N. If the area of the head is $0.5mm^2$ and of the tip $0.1mm^2$. Find the pressure on the head and the top of the tail.

6. a car weight 1200 kg. This weight is evenly distributed on 4 wheels. If the pressure in each tyre is $15kg\left(\dfrac{wf}{cm^2}\right)$. What is the area of each tyre in contact.

7. Calculate the greatest and the least pressure exerted by a metal block of size $20cm \times 8 \times cm \times 5cm$ and having a mass of $5kg$.

8. A hydraulic automobile lift is designed to lift cars with a maximum mass of $3000Kg$. The area of cross section of the piston carrying the load is $425cm^2$. What maximum pressures would the smaller piston have to bear?

9. A block of wood is kept on a table top The mass of the wooden block is 5 kg and its dimensions are $40cm \times 20cm \times 10cm$. 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 dimension (a)$20cm \times 10cm$ (b) $40cm \times 20cm$. Given $g = 9.8\dfrac{m}{s^2}$.

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10. An iron cylinder of radius 1.4cm and length 8 cm is found to weigh 369.6g. Calculate the density of iron.

11. Calculate the mass of air enclosed in a room of length, breadth and height equal to 5m, 3m and 4m respectively. Density of air $= 1.3\dfrac{kg}{m^3}$.

12. The mass of a solid rectangular block of iron is 23.6g and its dimensions are $2.1cm \times 1.2 \times 1.1cm.$ Calculate the density of iron.

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13. The mass of an empty 40 litre petrol tank of a vehicle is 8.0 kg What will be its mass when filled completely with a fuel of density $700\dfrac{kg}{m^3}.$

14. A weather forecasting plastic balloon of volume $15m^3$ contains hydrogen of density $0.09\dfrac{kg}{m^3}$. The mass of the empty balloon is 7.15kg Calculate (a) the mass of hydrogen in the balloon (b) the mass of the balloon filled with hydrogen.

15. The mass of a density bottle is 25 g when empty, 50 g when filled completely with water and 365 g when filled completely with mercury. Find the density of mercury.

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

17. A bottle can hold 100 g of water at $4°C$. What mass of sea water (density $= 1030\dfrac{kg}{m^3}$) can it hold?

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18. Relative density of silver is 10.8. The density of water is $10^3\dfrac{kg}{m^3}$. What is the density of silver in SI.

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1. For a liquid in an open cantainer, the total pressure at any depth depends on:

    A. Atmospheric pressure

    B. liwuid density

    C. acceleration due to gravity

    D. all of the precending

Answer: D

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2. When measuring automobile tyre pressure, what type of presure is this:

A. gauge

B. absolute

C. relative

D. all of the precending

Answer: A

3. A suction pump at ground level can draw water from a well whose depth of water level is:

    A. more than 40 m

    B. less than 34 m

    C. less than 10.3 m

    D. about 10^5 m

Answer: C

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4. A mercury barometer set up inside a sealed cabin on the moon containing air at our usual atmospheric pressure and temperature would stant about:

A. 760 mm

B. $\left(\dfrac{760}{6} \right)$ mm

C. (760×6) mm

D. zero

Answer: C

5. A tank with length 10 m, breadth 8 m and depth 6 m is filled with water upto top . If $G = 10m/s^2$. And density of water $= 1000kg/m^3$, then the thrust on the bottom is:

A. $(6 \times 1000 \times 10 \times 80)$N

B. $(3 \times 1000 \times 10 \times 48)$ N

C. $(3 \times 1000 \times 10 \times 60)$ N

D. $(3 \times 100 \times 10 \times 80)$ N

Answer: A

6. A beaker is filled with a liquid of density ρ upto a height h If the beaker is at rest, the mean pressure at the walls is:

A. 0

B. $h\rho g$

C. $h\rho\dfrac{g}{3}$

D. $2h\rho g$

Answer: C

7. Explain how do we breath (inhalation and exhalation).

8. the gauge pressure is both tyres of a bicycle is 690 k Pa. If the bicycle and the rider have a combined mass of 90 kg. what is the area of

contact of each tyre with the ground? (assume that each tyre supports half the total weight of the bicycle.)

9. Explain why a wide steel belt is provided over the wheels of an army tank.

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

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

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12. Find the pressuer exerted on the skin of a balloon with a force of 2.1 N usint (a) your finger of (b) a needle. Assume the area of your finger tip is $1.0 \times 10^{-4} m^2$, and the area of the needle tip is $2.5 \times 10^{-7} m^2$. (c) Find the maximum force necessary to burst the balloon with the needle given that the balloon bursts with pressure of $3.0 \times 10^5 \dfrac{N}{m^2}$. What insight you gain from the results obtained?

13. A cubical box 20 cm on a side is completely immersed in a fluid. At the top of the box the pressure is 105 k Pa and at the bottom the pressure is 106.8 Pa. What is the density of the fluid ? Guess the fluid.

14. The titanic was found in 1985 lying on the bottom of the north atlantic at a depth of 2.5 miles. What is the pressure at this depth? (Given 1 mile`=1609m1)

15. (a) Gallinule (an aquatic bird with exceptionally long toes that are spread out over a large area) can actually walk across lily pads without sinking. Explain.

(b) One day while ewimming below the surface of the ocean, you let out a small bubble of air from your mouth. What happens to the bubble as it rises towards the surface?

16. A body floats in a liquid if the buoyant force is

    A. zero

    B. greater than its weight

    C. less than its weight

    D. equal to its weight

Answer: D

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17. Loss of wuight of a body immersed in a liquid is:

A. equal to the weight of the liquid displaced

B. more than the weight of the liquid displaced

C. less than the weight of the liquid displaced

D. zero

Answer: A

18. Which of the following gases is the densest of all?

    A. Air

    B. Chlorine

    C. Ozone

    D. Argon

Answer: B

▶

19. Buoyant force acting on a body immersed in a fluid depends on:

    A. the shape of the body

    B. the mass of the body

    C. the mass of the fluid displaced

    D. depth to which body is immersed

Answer: C

20. A boat having a length of 3 m and breadth

of 2 m is floating on a lake. The boat sinks by 1

cm when a man gets on it. The mass of the

mas is:

A. 60 Kg

B. 72 kg

C. 12 kg

D. 128 kg

Answer: A

21. The reading of a spring balance when a block is suspended from it in air is 60 N. This reading is changed to 40 N when the block is submerged in water. The relative density of the block is:

A. 3

B. 2

C. 6

D. $\dfrac{3}{2}$

Answer: A

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22. What fraction of an iceberg lies beneath the surface of the sea? Density of sea water $(\rho) = 1.028 \times 10^3 \, kg/m^3$, density of ice $(d) = 0.917 \times 10^3 \, kg/m^3$

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23. Air is a fluid and our bodies displace air. And so a buoyant force is acting on each of us. Estimate the magnitude of the buoyant force on a 75 kg person due to air displaces. Is the actual weght of the person more or less than the scale reading?

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24. Two blocks of equal bolume, one of iron and one of aluminium, are dropped into a

body of water. Which block will experience the greater buoyant force? Why?

25. What is cause of buoyant force?

26. An object is immersed in different liquids. Does same buoyant force acts on the object due to all the liquids?

27. An ice cube floats in a glass of water. As the ice melts, how does the level of water in the glass change? Would it make any difference if the ice cubbe were hollow? Explain.

28. If the density of an object is exactly equal to the density of a fluid, The object will: (a)

float, (b) sink, (c) stay at any place in the fluid so long as it is totally immersed.

29. A cube 8.5 cm on each side has a mass of 0.65 kg. Will the cube float or sink in water? Prove your answer.

30. State Archimedes's Principle. Describe an experiment for its verification.

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Oral Testing

1. What is meant by a fluid?

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2. Define thrust, what is its unit?

3. How is pressure related to thrust?

4. what is 1 pascal?

5. In which unit is thrust measured?

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6. What is the relation between bar and atm?

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7. What is an aneroid borometer?

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8. What is an altimeter?

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9. What is weather glass?

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10. What is borograph?

▶ Watch Video Solution

11. (a) What is 1 atm?

(b) What is the relation between 1 atm and pascal?

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12. What is relation between mass and density?

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13. In which units is density measured?

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14. Name the instrument used for determining the purity of a sample of milk.

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15. What is the density of water at $20°C$ in SI units?

16. What do you mean by a heavy substance?

17. Name one quantity which determines the purity of a substance?

18. What do you mean by buoyancy?

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19. Name one practical application of Archimedes' principle.

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20. How does the density of sea water change with depth?

21. When a ship sinks, does it reach the bottom of the sea?

Quiz Testing Between Two Groups

1. (a) What is a pascal?

(b) How big is pascal?

2. (a)How could you use a borometer to measure the height of a mountain pass?

(b) Why can water not be sucked to a height greater than 10 m even with a good suction pump?

3. (a) Whi are wide wooden sleepers kept below railway lines?

(b) Whi does a balloon not collapse under atmospheric pressure?

4. (a) What is hydrostatic paradox?

(b) What determines the pressure due to a liquid : its depth or the total quiantity of liquid?

5. (a) what is density of air at NTP?

(b) what is the unit of relative density?

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6. (a) When does a body sink in a fluid?

(b) Why does a balloon filled with hydrogen gas rise up against gravity?

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7. (a) Which has greater denstiy: 1kg or iron or 2 kg of iron?

(b) If a hollow sphere and a solid sphere are both made of the same amount of iron, which sphere has greater average density?

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

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

9. (a) A body weighs 10 N in air and 8 N when fully immersed in water. How much is the buoyant force acting on the body?

(b) Why are the buoys making the channel in a river are hollow spheres?

1. An airplane window has an area of $825cm^2$. Cabin pressure is 1 atm, and the outside pressure in 0.3 atm. Find the force produced by air pressure on the window.

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2. Automobile tyres are inflated to about 30 $\frac{\text{pound}}{\text{inch}^2}\left(\frac{lb}{\text{in}^2}\right)$ whereas bicycle tyres are

inflated to 90 to `115(lb)/(I n^2), at leastthree times as much pressure ! Why?

3. Two dams form artificial lakes of equal depth. However, one lake backs up 15 km behind the dam, and the other backs up 50 km behind. What effect does the difference in lengths have on the pressure on the dams?

4. What is the pressure on a scuba diver at a depth of 30 m?

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1. When you are on a hill station, there is atmosphere above you. And yet the typical atmospheric pressure given on the daily weather report is the same as on the coast. How can this Be?

2. Why does a load freighter sit lower in water than an empty one?

3. Salt water is slightly dense than fresh water. Will a boat float higher in salt water on in fresh water?

4. Dams are usually thicker at the bottom. Why?

Worksheet Testing

1. Find the mass of air in an empty room with dimensions 5 m by 4 m and ceiling 3 m high. What is the weight of this mass of air?

2. Calculate the buoyant force on a helium filled balloon having a volume of $14000 cm^3$.

3. In his original barometer, Pascal used water instead of mercury. Water is lwss dense than mercury, so the water barometer would have:

(a) higher height than, (b) a lower height than,

or (c) the same height as the mercury barometer. Why?

4. How high would the water column have been in Q. 3?

Multiple Choice Questions

1. An object is put turn in three liquids having different densities. The object floats with $\frac{1}{9}$, $\frac{2}{11}$ and $\frac{3}{7}$ parts of its volume outside the liquid surfacei n liquids of densities d_1, d_2 and d_3 respectively. Which of the following statements is correct?

A. $d_1 > d_2 > d_3$

B. $d_1 > d_2 < d_3$

C. $d_1 < d_2 > d_3$

D. $d_1 < d_2 < d_3$

Answer: D

2. An object weighs 10 N in air. When immessed fully in liquid, it weighs only 8 N. The weight of the liquid displaced by the object will be:

A. 2N

B. 8N

C. 10N

D. 12N

Answer: A

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3. A brick stands on a box having 60 cm length, 40 cm breadth and 20 cm width. Pressure exerted by the brick will be:

A. maximum when length and breadth form the base

B. maximum when breadth and width form

 the base

C. maximum when width and length form

 the base

D. the same in all the above three cases

Answer: B

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4. The density of a substance is defined as:

A. density $=$ volume/mass

B. density $=$ volume/$(mass)^2$

C. density $=$ mass/volume

D. density $=$ $(volume)^2$/mass.

Answer: C

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5. The SI unit of density is:

A. $\dfrac{kg}{m}$

B. $\dfrac{kg}{m^2}$

C. $\dfrac{kg}{m^3}$

D. kg

Answer: C

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6. The density of water is maximum at:

A. $0°\,C$

B. $10°\,C$

C. $4°C$

D. $100°C$

Answer: C

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7. The density of water at $4°C$ is:

A. $1\dfrac{kg}{m^3}$

B. $10\dfrac{kg}{m^3}$

C. $1000\dfrac{kg}{m^3}$

D. $100\dfrac{kg}{m^3}$

Answer: C

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8. The SI unit of relative density is:

A. $\dfrac{kg}{m^3}$

B. $\dfrac{kg}{m}$

C. $\dfrac{kg}{m^2}$

D. no unit

Answer: D

9. The SI unit of volume is:

A. litre (L)

B. L^3

C. mL^3

D. m^3

Answer: D

10. $1m^3$ is equal to :

    A. 1 litre (L)

    B. 10 L

    C. 1000 L

    D. 100 L.

Answer: C

11. $1m^3$ is equal to :

A. $10^3 cm^3$

B. $10^4 cm^3$

C. $10^6 cm^3$

D. $10^\circ cm^3$

Answer: C

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12. When each side of a regular body is doubled, its volume bacomes:

A. two times

B. four times

C. eight times

D. sixteen times

Answer: C

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13. In case of a hollow body, if ρ_B and ρ_S represent the densities of the body and the substance (of which it is made) respectively, then:

A. $\rho_B = \rho_S$

B. $\rho_B < \rho_S$

C. $\rho_B > \rho_S$

D. none of these

Answer: B

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14. If two liquids of same mass but densities ρ_1 and ρ_2 respectively are mixed, then the density of the mixture is:

A. $\rho = \dfrac{\rho_1 + \rho_2}{2}$

B. $\rho = \dfrac{\rho_1 + \rho_2}{2\rho_1\rho_2}$

C. $\rho = \dfrac{2\rho_1\rho_2}{\rho_1 + \rho_2}$

D. $\rho = \dfrac{\rho_1\rho_2}{\rho_1 + \rho_2}$

Answer: C

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15. If two liquids of same volume but different densities ρ_1 and ρ_2 are mixed, then the density of the mixture is:

A. $\rho = \dfrac{\rho_1 + \rho_2}{2}$

B. $\rho = \dfrac{\rho_1 + \rho_2}{2\rho_1\rho_2}$

C. $\rho = \dfrac{2\rho_1\rho_2}{\rho_1 + \rho_2}$

D. $\rho = \dfrac{\rho_1\rho_2}{\rho_1 + \rho_2}$

Answer: A

16. Equal masses of water and a liquid of density 2 are mixed together. The density of mixture is:

A. $\left(\dfrac{2}{3}\right) \dfrac{g}{cm^3}$

B. $\left(\dfrac{4}{3}\right) \dfrac{g}{cm^3}$

C. $\left(\dfrac{3}{2}\right) \dfrac{g}{cm^3}$

D. $3 \dfrac{g}{cm^3}$

Answer: B

17. If the radius of a sphere is increased to three times its previous value, the volume of the sphere increases to :

A. 3 times

B. 6 times

C. 27 times

D. 12 times

Answer: C

18. By doubling the mass of a solid body, its density becomes:

A. 2 times

B. $\dfrac{1}{2}$

C. 4 times

D. remains the same.

Answer: A

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

    A. remains the same

    B. becomeas four times

    C. becomes half

    D. become double

Answer: D

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20. Relative density of a substance depends upon:

A. mass of the substance

B. shape of the substance

C. volume of the substance

D. material of the substance

Answer: D

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21. Which one of the following liquids has the highest density?

A. water

B. alcohol

C. mercury

D. kerosene oil

Answer: C

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22. If each side of a cube becomes n times, its volume becomes:

A. 3 N times n^2 times

B. n^3 times

C. $3n^3$ times.

D. NONE

Answer: C

23. The density of salty solution of water as compared to density of pure water is:

A. more

B. less

C. same

D. dependent on the concentration of the

salty solution.

Answer: A

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24. The relative density of mercury is 13.66. Its density in SI unit is:

A. $13.6\dfrac{kg}{m^3}$

B. $136\dfrac{kg}{m^3}$

C. $1360\dfrac{kg}{m^3}$

D. $13.6 \times 10^3\dfrac{kg}{m^3}$.

Answer: D

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25. When an object is fully immersed in a liquid, the apparent loss in weight:

A. equal to the weight of the liquid displaced

B. more than the weight of the liquid desplaced

C. less than the weight of the liquid displaced

D. depends upon the manner in which the body is immersed in the liquid.

Answer: A

26. When a body is imjmersed (fully or partly) in a liquid, the apparent loss in its weight is due to:

   A. decrease in its mass

   B. decrease in its volume

   C. an upward thrust exerted on the body by the liquid

D. decrease in the density on the body.

Answer: C

27. On immersing a body fully in a liquid, the apparent loss in weight is:

A. more in a denser liquid

B. independent of the density of the liquid

C. less in a denser liquid

D. more in a lighter liquid.

Answer: A

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28. If a body floats in a liquid, the quight of the

liquid displaced is:

A. more than the weght of the body

B. less than the weight of the body

C. equal to the weght of the body

D. none of the above statements is correct.

Answer: C

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29. compared to pore water, a body in salty

water sinks:

A. more

B. to the same extent

C. depends upon the manner the body is

sunk in salty water.

D. less

Answer: B

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30. Which one of the following would a

hydrogen balloon find easiest to lift?

A. one kg of steel

B. one kg of lightly packed feathers

C. one kg of water

D. all the same.

Answer: B

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31. A ship can easily sail on sea water (salty water) due to the reason that:

A. salty water is denser than ordinary water

B. salty water is lighter than ordinary water

C. salty water contains salt

D. salty water is calm as compared to ordinary water.

Answer: A

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32. Pressure at a point inside a liquid does not depend on:

A. 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 containing vessel.

Answer: D

33. A dam for water reservoir is built whicker at the bottom than at the top because:

A. pressure of water is very large at the bottom due to its large depth

B. water is likely to have more density at the bottom due to its large depth

C. quantity of water at the bottom is large

D. none of these

Answer: A

34. With increase in temperature of water above $4°C$, density of water:

    A. increases

    B. decreases

    C. first increases

    D. then decreases

Answer: B

35. A device used to check the purity of milk is called:

A. lactometer

B. Hydrometer

C. speedometer

D. barometer

Answer: A

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36. When a body is weighed in a liquid, the loss in its weight depends upon:

A. volume of the body

B. mass of the body

C. shape of the body

D. ventre of gravity of the body

Answer: A

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37. A body weight 40 g in air. If its volume is 10 cm^3, in water it will weigh:

A. 30 g

B. 40 g

C. 50 g

D. insufficient data.

Answer: A

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38. A hydrogen balloon released on the moon would

A. climb up with an acceleration of $9.8\dfrac{m}{s^2}$

B. climb up with an acceleration of $9.8 \times 6\dfrac{m}{s^2}$

C. neither climb nor fall

D. fall with an acceleration of $\left(\dfrac{9.8}{6}\right)\dfrac{m}{s^2}$

Answer: D

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39. A wooden sylinder floats vertically in water with half of its length immersed. The density of wood is:

    A. equal to that of water

    B. half the density of water

    C. double the density of water

    D. the quiestion is incomplete.

Answer: B

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40. Two bodies are in equilibrium when suspended in water from the arms of balance. The mass of one body is 36 g and its density is $9g/cm^3$ If the mass of the other is 46 g, its density in g/cm^3 is

A. $\dfrac{4}{3}$

B. $\dfrac{3}{2}$

C. 3

D. 5

Answer: C

41. The construction of a submarine is based on:

A. archimedes principle

B. bernoulli's principle

C. pascal's law

D. newton's law

Answer: A

42. A raft of wood (density $= 600 kg/m^3$) of mass $120 kg$ floats in water. How much weight can be put on the raft to make it just sink?

A. 120 kg

B. 200 kg

C. 40 kg

D. 80 kg

Answer: D

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

    A. sea is wider than river

    B. sea is deeper than river

    C. density of sea water is greater than that of river water

    D. sea is having high wabes all the time.

Answer: C

44. A raft of wood (density $= 600 kg/m^3$) of mass $120 kg$ floats in water. How much weight can be put on the raft to make it just sink?

A. 20 kg

B. 80 kg

C. 100 kg

D. 120 kg

Answer: B

45. A body is just floating on the surface of a liquid. The density of the body is the same as that of the liquid. The body is slightly pushed down. What will happen to the body?

    A. it will come back slowly to its earlier position

    B. it will remain submerged where it is left

    C. it will sink

D. it will come out violently

Answer: C

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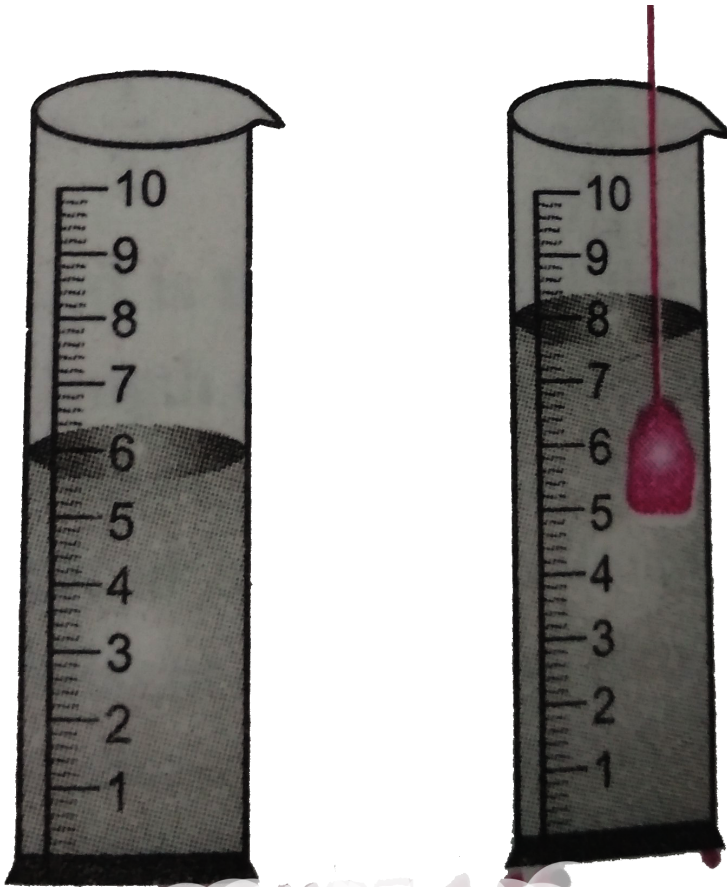
46.

A measuring cylinder (caliberated in cm^3) shown in Fig. is used to measure the level of water before and after immersing a solid in it. The volume of the given solid is:

A. $2.0cm^3$

B. $1.8cm^3$

C. $1.5cm^3$

D. $2.2cm^3$

Answer: A

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47. The phenomenon due to which a body when partly or wholly immersed in a liquid, experiences an upward thrust is called:

A. archimede's priciple

B. buoyancy

C. normal reaction

D. antigravity

Answer: B

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48. When a loaded boat enters into sea fromo

a river, it rises because:

A. there is more water in swa than in river

B. sea water is denser than river

C. there is difference of temperature between the sea water and the river water

D. sea is deeper than river water.

Answer: B

49. A body floats with one-third of its volume outside water and $3/4$ of its volume outside another liquid. The density of another liquid is :

A. $\left(\dfrac{9}{4}\right) \times 10^3 \dfrac{kg}{m^3}$

B. $\left(\dfrac{4}{9}\right) \times 10^3 \dfrac{kg}{m^3}$

C. $\left(\dfrac{8}{3}\right) \times 10^3 \dfrac{kg}{m^3}$

D. $\left(\dfrac{3}{9}\right) \times 10^3 \dfrac{kg}{m^3}$

Answer: C

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50. Two solids A and B floats in water. It is observed that A floats with half of its volume immersed and B Floats with $2/3$ of its volume immersed. The ratio of densities of A and B is

A. $\dfrac{4}{3}$

B. $\dfrac{2}{3}$

C. $\dfrac{3}{4}$

D. $\dfrac{1}{3}$

Answer: C

51. A body of weight W_1 displaces an amount of water W_2. If the body floats:

A. $W_1 > W_2$

B. $W < W_2$

C. $W_1 = W_2$

D. any of (a), (b) and (c).

Answer: C

52. For a body floating on water, apparent weight is equal to :

A. actual weight of the body

B. zero

C. weight of the body minus the weight of the liquid

D. none of the above

Answer: B

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53. An empty tin container with its mouth closed has an average density equal to that of liquid A. The container is taken 2 m below the suface of the liquid A and id then left there. Then:

A. container will bounce back to the surface

B. container remains where it is left

C. container sinks further

D. nothing can be said.

Answer: B

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54. A hydrometer floats with half of its stem outside water surface. It is now placed in alcohol $(RD = 0.8)$. The hydrometer floats:

A. with stem at the same position

B. with more stem inside the alcohol

C. with more stem outside alcohol

D. in tilted position.

Answer: B

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55. A student uses a spring balance of least count 10 g wt and range 500 g wt. He records the weight of a small iron cube in air, in tap water and in a cancentrated solution of common salt in water, If his three reading taken in this order are $W_1(= 50gwt)$, W_2 and W_3 he is likely to observe that:

A. $W_1 > W_2 > W_3$

B. $W_1 > W_2 = W_3$

C. $W_1 > W_3 > W_2$

D. $W_1 = W_2 < W_3$

Answer: A

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56. The magnitude of zero error of the spring

balance and least count of the measuring

cylinder

Grams

10 ml

0	0
25	25
50	50
75	75
100	100
125	125
150	150
175	175
200	200
225	225
250	250

9
8
7
6
5
4
3
2
1
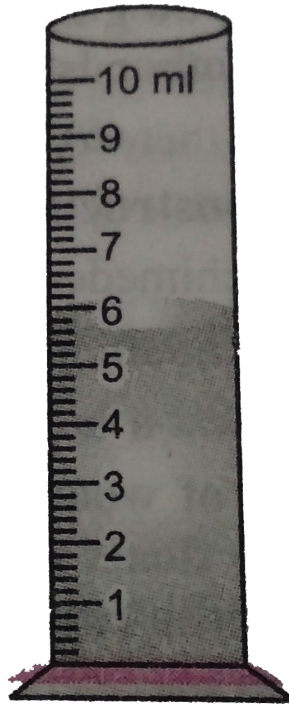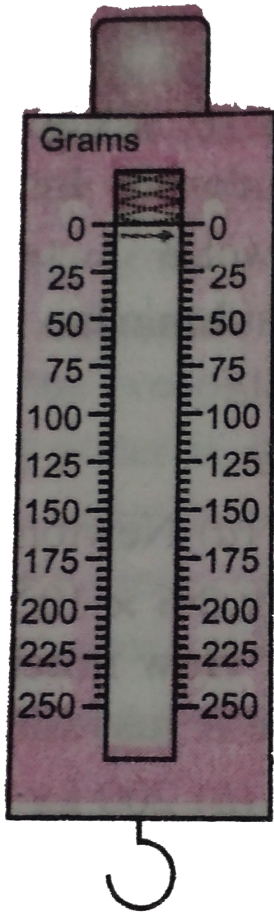
A. 2.5g and 0.1 mL

B. 5.0g and 0.1mL

C. 2.5g and 0.2 mL

D. 5.0g and 0.2mL

Answer: D

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Mock Test

1. Distinguish between force and pressure.

⏵ **Watch Video Solution**

2. How does a submarine immerse itself in sea?

3. A glass of water has an ice cube floating in water. The water level just touches the rim of the glass. Will the water overflow when the ice melts?

4. Why are you more easily able to sink to the bottom of the swimming pool when you expel as much air as possible from your lungs?

5. In an open-Utube, the pressure of a water column on one side is balanced by the pressure of a column of petrol on the other side. Compared to the height of the water column, the petrol column will have: (a) a higher

(b) a lower, or

(c) the same height. Why ? If the height of water column is 15 cm, what is the height of the petrol column? density of petrol $= 0.68 \dfrac{g}{cm^3}$.

6. A piece of iron with a mass of 790 g displaces 100 g of water when it sinks. What does the iron weigh in air and under water?

7. The heated air inside a hot air balloon weighs 5000 N. If the balloon supports a weight of 2000 N, what is the wieght of air displaced by the balloon?

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8. State Pascal's law. How can it be demonstrated?

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9. A solid body of mass 150 g and volume 250 cm^3 is put in water. Will the body float or sink?

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10. 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.

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11. The mass of a density bottle is 25 g when empty, 50 g when filled completely with water and 365 g when filled completely with mercury. Find the density of mercury.

12. A rectangular block of wood is floating on the surface of a container filled with water. You observe that 80% of the block is under wate

whereas rest is above the surface. Find the density of wood.

13. The marianas Trench, a region at the bottom of the Pacific Ocean is believed to be the deepest spot on the ocean floor. In 1960. a U.S Navy submersible vehicle werit to a spot in this Trench that is 10.700 m below sea level. Suppose the submarine had a tiny window of area $1 cm^2$ so that sailors could enjoy the view.

Find the force on this window due to the water pressure. Comment on the result.

14. Find the thrust acting on the human body due to atmospheric pressure. Take the surface area of a man of middle size to be $1.5m^2$ and atmospheric pressure (1 atm) $= 1.013 \times 10^5$ Pa.

15. (a) How do quadruples swin naturally with head on water?

(b) Distinguish between density and specific gravity.

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16. A person in a boat floating in a small pond throws an anchor overboard. Does the level of the pond rise, fall or remain the same?

▶ **Watch Video Solution**

17. The dead bod of a human being floats with head leaning downwards. Explain.

> ▶ **Watch Video Solution**

18. NASA is experimenting with balloons for use on ultralong duration (100 days) flight around the Earth. Consider a balloon that has the shape of a cylindrical chamber which is 35 m tall with 30 m radius, and is made of extremely light plastic. If our model cylindrical

balloon is filled with helium gas, what is the mass of the maximum payload it could lift from the Earth's surface? (Given $\rho_{air} = 1.29\frac{kg}{m^3} \cdot \rho_{He}\Big) = 0.18\frac{kg}{m^3}$. Why would NASA design the balloon so large?

19. A nurse administers medication in a saline solution to a patient by infusion into a vien in patient's arm. The density of the solution is $1.0 \times 10^3 \frac{kg}{m^3}$ and the gauge pressure in the

vien is $2.4 \times 10^3 Pa$. How high above the insertion point must the container be hung so that there is sufficient pressure to force the fluid into the patient?

20. Sturdy bones are essential to good health and active life. With advancing age and defective lifestyle, bones become weak.

(a). What is osteoporosis and bone mineral density (BMD)? How are they related to each

other?

(b). What is the risk of osteoporosis and how is it prevented?

(c). What habit should we inculcate to save ourselves from osteoporosis?

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21. (a). A body may sink in one liquid but float on another. Given examples.

(b). It is easier to swi in sea water than in a river water. Why ?

(c). A hollow ball has an internal diameter of 10 cm and external diameter of 12 cm. it is found that it floats on water. Find the density of the material of the ball (The volume of a sphere varies as the cube of the diameter).

22. (a). Discuss two situations in daily life where we apply the concept of pressure.

(b). A body of density ρ is dropped gently on the surface of a liquid of density ρ' (ρ' being

less than ρ). Show That it will reach the bottom of the liquid after a time $\sqrt{\dfrac{2d\rho}{g(\rho - \rho')}}$, where g is acceleration due to gravity and d is the depth of the liquid.

23. (a). A cube of side 5 cm is immersed in water and then in saturated salt solution. In which case will it experience a greater buoyant force. If each side of the cube is reduced to 4 cm and then immersed in water, what will be

the effect on the buoyant force experienced by the cube as compared to the first case for water. Given reason for each case.

(b). A ball weghing 4 kg of density 4000 kg/m^3 is completely immersed in water of density $10^3 kg/m^3$ find the force of buoyancy on it. (given $g = 10m/s^2$)

Fine Thread

Fine Thread

A

B

Thick Rope

Thick Rope

C

D
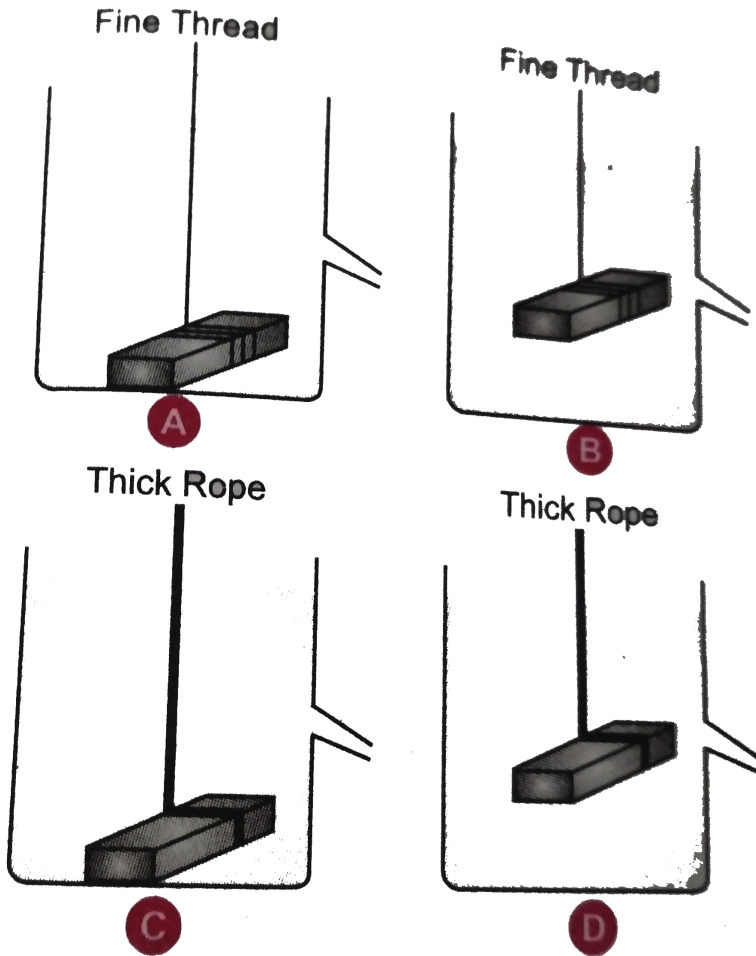
24.

In an experiment of establish relationship

between loss in weight of an immersed soild

with the weight of water displaced by it, the correct set-up shown in Fig.

A. A

B. B

C. C

D. D

Answer: b

25. The densit of a block of wood which flots on water with 0.1 of its volume above water is:

A. $10^3 kg/m^3$

B. $1.1 \times 10^3 kg/m^3$

C. $0.9 \times 10^3 kg/m^3$

D. $0.8 \times 10^3 kg/m^3$

Answer: C

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26. A vessel contains oil (density $= 0.8gm/cm^3$) over mercury (density $= 13.6gmcm^3$). A homogeneous sphere floats with half its volume immersed in mercury and the other half in oil. The density of the material of the sphere in gm/cm^3 is

A. 3.3

B. 6.4

C. 7.2

D. 2

Answer: C

27. Two stretched membranes of areas $2cm^2$ and $3cm^2$ are placed in a liquid at the same depth. The ratio of the pressures on them is:

A. $1:1$

B. $2:3$

C. $3:2$

D. $2^2:3^2$

Answer: A

Water   Water
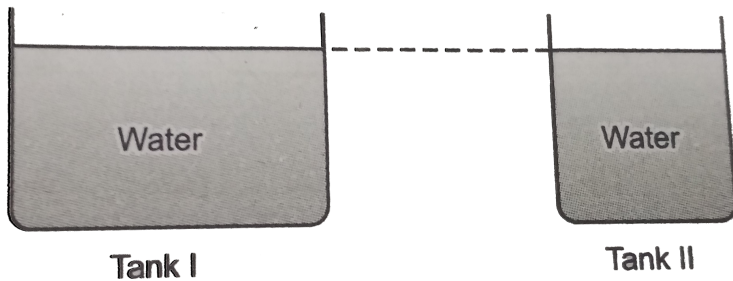
28.   Tank I   Tank II

the correct observation is:

A. The pressure on the bottom of tank I is

greater than that at the bottom of tank

II

B. the pressure on the bottom of tank I is

smaller than that at the bottom of tank

II

C. the pressure depends on the shape of

the container

D. the pressure on the bottoms of tank-I

and tank-II is the same.

Answer: D
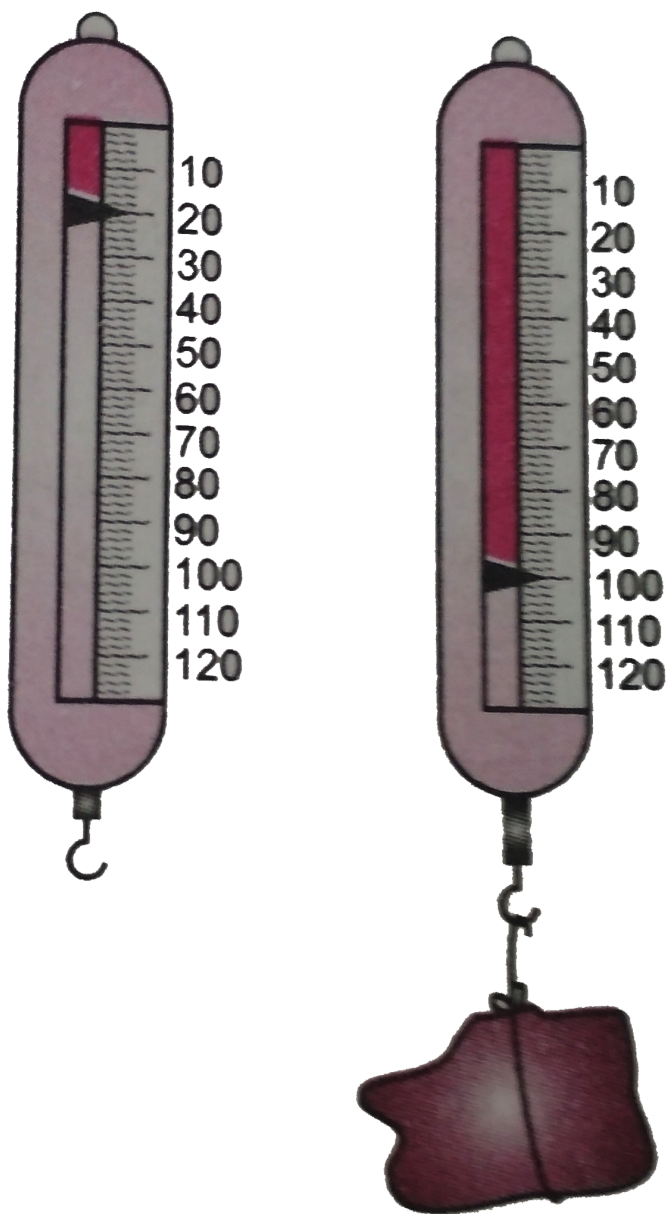
29.

The spring balance (calibrated in grams)

shown in Fig. is used to measure the mass of a given solid. The mass of the solid is:

A. 20 g

B. 40 g

C. 80 g

D. 100 g

Answer: C

30. Using a spring balance, a given solid is weghed in the air. It is then weghed by immersing fully in water in each of the three vessels containing water as shown in fig. The apparent weight of the solid will be:
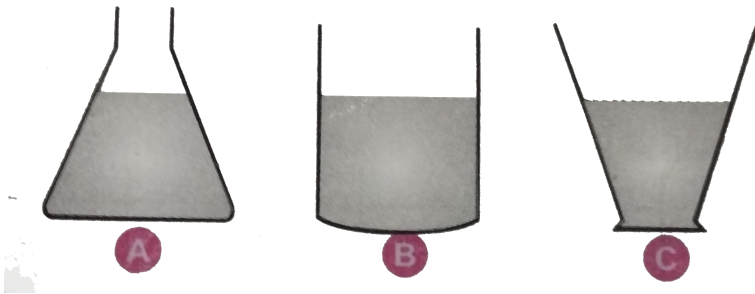
A. least in A

B. least in B

C. least in C

D. equal in all

Answer: D

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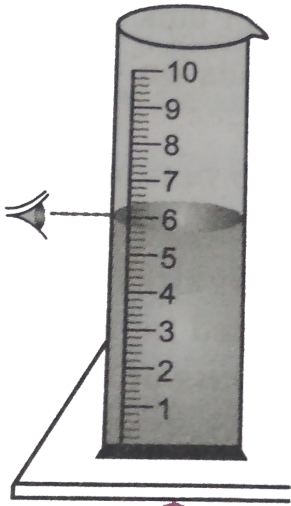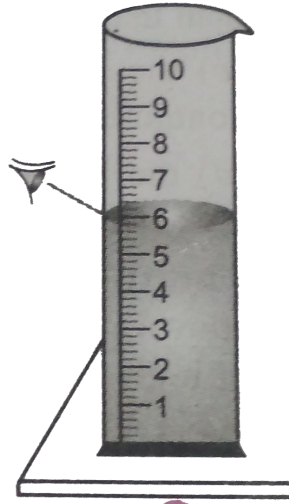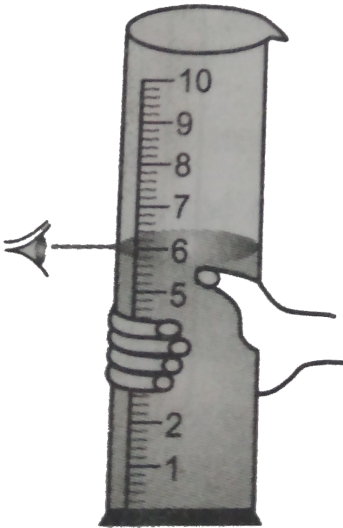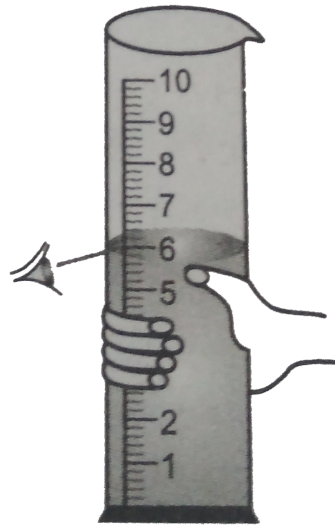
31.

Which is the correct way of reading the liquid
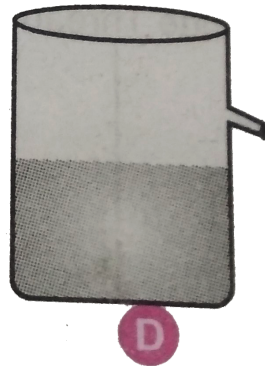
level in a measuring cylinder
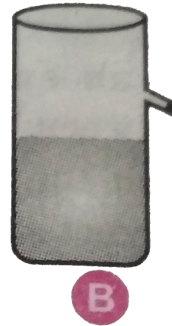
A. A

B. B

C. C

D. D

Answer: A

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32.

Four students A, B, C and D while performing

an experiment on establishing the relation

between the loss of weight of a small solid

when fully immersed In tap water and the

weight of water displaced by it, used four

different shapes of overflow-cans containing water

The arrangement, the would give correct results, is that of student:

A. A

B. B

C. C

D. D

Answer: C

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33. A boat floats on water with three fourth of its volume inside water. Density of water is $10^3 kg/m^3$ find the density of the material of the boat.
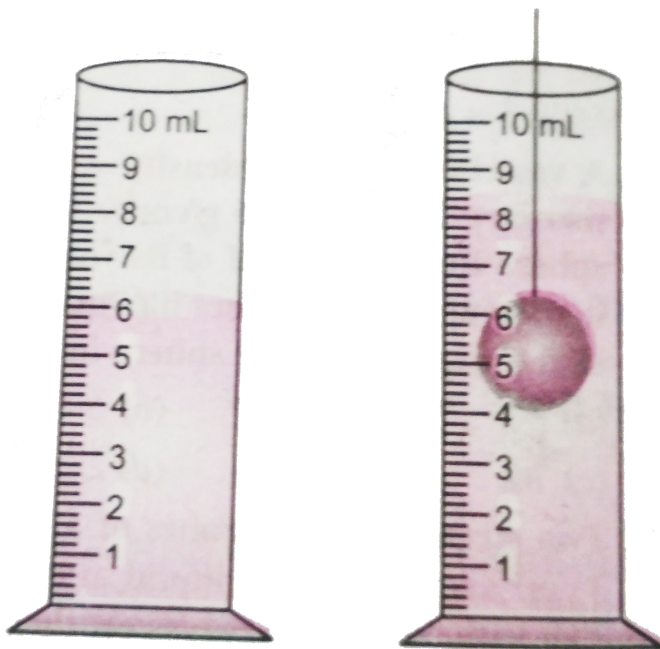
34. The reading of a spring balance when a block is suspended from it iin air is 60 N the reading is changed to 40 N when the block is

submerged in water. Find the relative density of the block.

35.

Find the least count of the measuring cylinder

used and the volume of the sphere in the set-up shown in fig.

Problem For Practice

1. A body of $50 cm^3$ is completely immersed in water. Find the force of buoyancy on it.

2. A metallic sphere of radius 2.0 cm is completely dipped in water. Find the force of buoyancy on it.

3. A body of 2.0 kg floats in a liquid. What is the buoyant force on the body?

4. A solid of density $5000\dfrac{kg}{m^3}$ weghs 0.5 kg f in air. It is completely immersed in water of density $1000\dfrac{kg}{m^3}$.

(a) Calculate the apparent weight of the solid in water.

(b) what will be its apparent weight if water is replaced by a liquid of density $8000\ \dfrac{kg}{m^3}$?

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5. 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 sink or float in water ? Give a reason for your answer.

6. Find the least count of the measuring cylinder used and the volume of the sphere in the set-up shown Fig.