PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

FLUID MECHANICS

Pressure And Density

1. In a hydraulic lift at a service station, the radii of the large and small piston are in the ratio of 20 : 1. What weight placed on the small piston will be sufficient to lift a car of mass 1200 kg ?

A. 3 kgf

B. 30 kgf

C. 300kgf

D. 300 kgf

Answer: A

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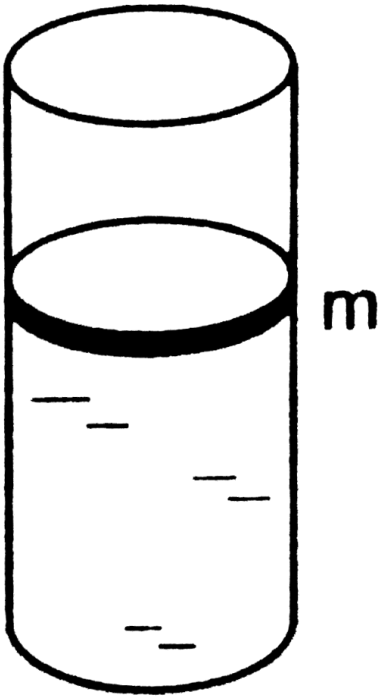
2. A cylindrical vessel containing a liquid is closed by a smooth piston of mass m as shown in the figure. The area of cross section of the piston is A. If the atmospheric pressure is P_0, find the pressure of the liquid just

below the piston.



,

A. P_0

B. $P_0 + \frac{mg}{A}$

C. $\frac{mg}{A}$

D. Data is not sufficient.

Answer: B

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3. A uniformly tapering vessel of height h whose lower and upper radii are r and R is completely filled with a liquid of density ρ The force that acts on the base of the vessel due of the liquid is

A. $\pi R^2 h\rho g$

B. $\pi r^2 h\rho g$

C. $\pi\left(\frac{R+\pi}{2}\right)^2 h\rho g$

D. $\frac{1}{3}\pi\left(R^2 - r^2\right)h\rho g$

Answer: B

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4. The diameter of the piston of a hydraulic automobile is D metre. What pressure, in atmosphere is required to lift a car of mass m kg ?

A. $\frac{4mg}{\pi D^2 \times 10^5}$

B. $\frac{2mg}{\pi D^2}$

C. $\frac{mg}{\pi D^2}$

D. $10^5 \times \frac{4mg}{\pi D^2}$

Answer: A

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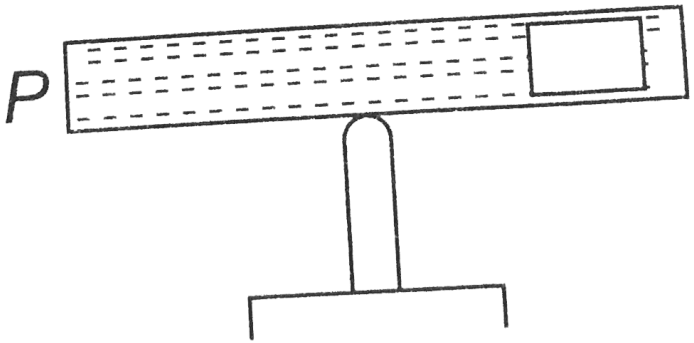
5. An open pan P filled with water (density ρ_m) is placed on one side of the pan as shown. If water depth is more then height of the block, then choose the correct statement.



A. Equilibrium will be maintained only if $\rho < \rho_w$.

B. Equilibrium will be maintained only $\rho \leq \rho_w$.

C. Equilibrium will be maintained for all relation between $\rho \text{ and } \rho_w$.

D. Equilibrium will not be maintained in all cases.

Answer: B

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6. A 50 kg girl wearing heel shoes balances on a single heel. The heel is circular with a diameter 1 cm. The pressure exerted by the heel on the horizontal floor is $\left(Takeg = 10ms^{-2}\right)$

A. $6.4 \times 10^4 Pa$

B. $6.4 \times 10^5 Pa$

C. $6.4 \times 10^6 Pa$

D. $6.4 \times 10^7 Pa$

Answer: C

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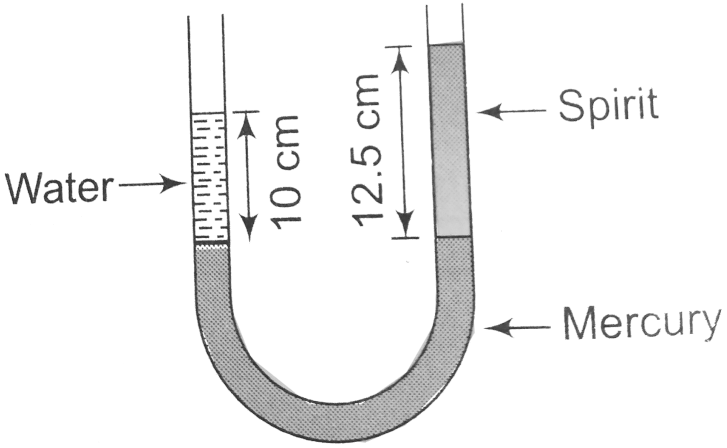
7. A U tube contains water and methylated spirit separated by mercury. The mercury columns in the two arms are at the same level with 10 cm of water in one arm and 12.5 cm of spirit in the other as shown in figure. The relative density of the spirit is



A. 0.6

B. 0.8

C. 1

D. 1.25

Answer: B

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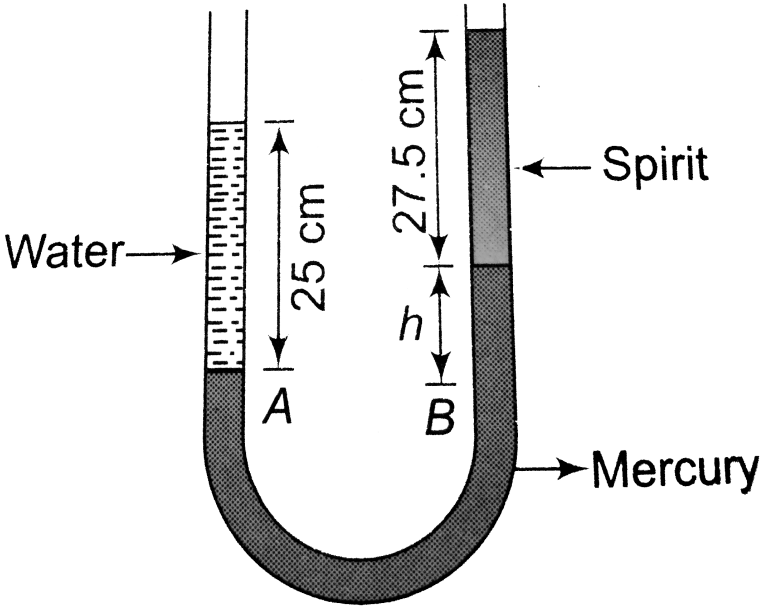
8. in previous question, if 15 cm of water and spirit each are further poured into the respective arms of the tube. Difference in the level of mercury in the two arms is (Take, relvative density of mercury = 13.6)



A. 0.20 cm

B. 0.22 cm

C. 0.27c m

D. 0.26cm

Answer: B

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9. A tank with a square base of area $2m^2$ is divided into two compartments by a vertical partition in the middle. There is a small hinged door of face area $20cm^2$ at the bottom of the partition. Water is filled in one compartment and an acid of relative density 1.5 in the other, both to a height of 4m. The force necessary to keep the door closed is $(Takeg = 10ms^{-2})$

A. 10 N

B. 20 N

C. 40 N

D. 80 N

Answer: C

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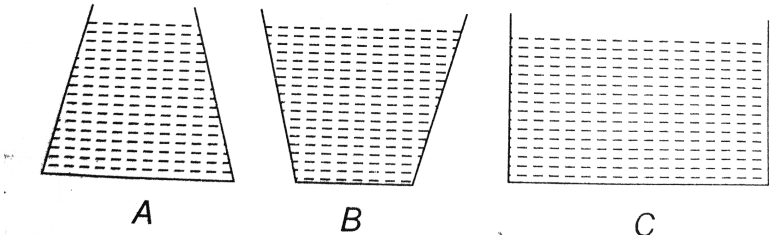
10. Three vessels A, B and C of different shapes contain water upto the same height in the figure. P_A, P_B and P_C be the pressure exerted by the water at the bottom of the vessels A, B and C respectively. Then



A. $P_A > P_B > P_C$

B. $P_B > P_C > P_A$

C. $P_C > P_B > P_A$

D. $P_A = P_B = P_C$

Answer: D

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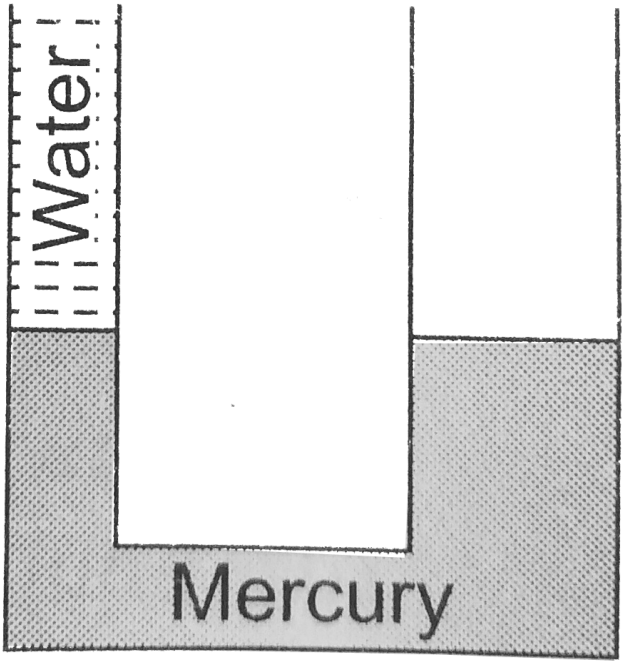
11. A U -tube in which the cross - sectional area of the limb on the left is one quarter, the limb on the right contains mercury $\left(density 13.6 g / cm^3\right)$. The level of mercury in the narrow limb is at a distance of 36 cm from the upper end of the tube. What will be the rise in the level of mercury in the right limb if the left limb is filled to the top

with water ?



A. 1.2 cm

B. 2.35 cm

C. 0.56 cm

D. 0.8 cm

Answer: C

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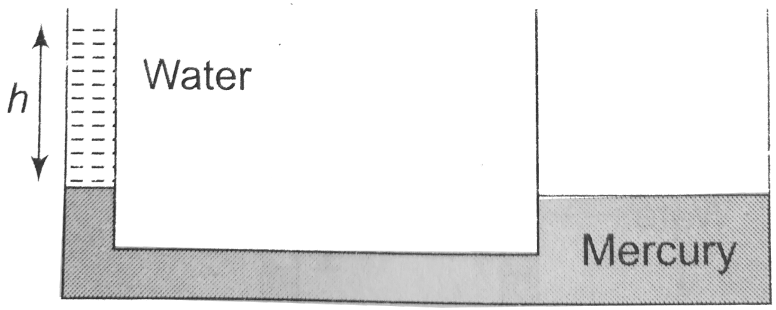
12. Two communicating vessels contain mercury. The diameter of one vessel in n times larger then the diameter of the other. A column of water of height h is poured into the left vessel. The mercury level will rise in the right hand vessel (s = relative density of mercury and ρ = density of water) by



A. $\frac{n^2 h}{(n+1)^2 s}$

B. $\frac{h}{(n^2+1)s}$

C. $\frac{h}{(n+1)^2 s}$

D. $\frac{h}{n^2 s}$

Answer: B

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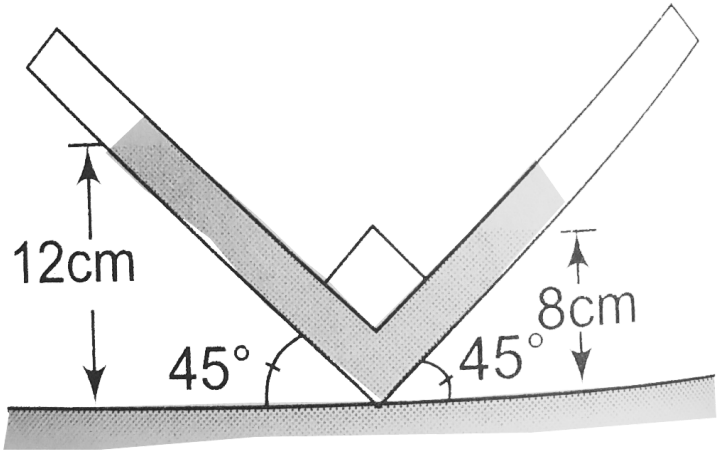
13. An L shaped glass tube is kept inside a bus that is moving with constant acceleration. During the motion, the level of the liquid in the left arm is at $12cm$ whereas of the tube is as shown. Assuming that the diameter of the tube is much smaller then levels of the liquid and neglecting effect of surface tension, acceleration of the bus will be $(g = 10m/s^2)$



A. $1m/s^2$

B. $2m/s^2$

C. $4m/s^2$

D. $5m/s^2$

Answer: B

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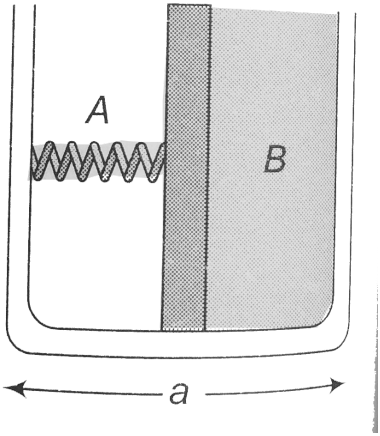
14. A broad vessel, with a square base of edge $s = 10cm$ is separated into two halves A and B, by a smooth vertical piston. A spring of spring constant $k = 1500\frac{N}{m}$ is filled across the compartment A and the compartment B is filled with water to a height $20cm$. Find the compression in the spring.



A. 1.3 cm

B. 2.1 cm

C. 3.9 cm

D. 0.07 cm

Answer: A

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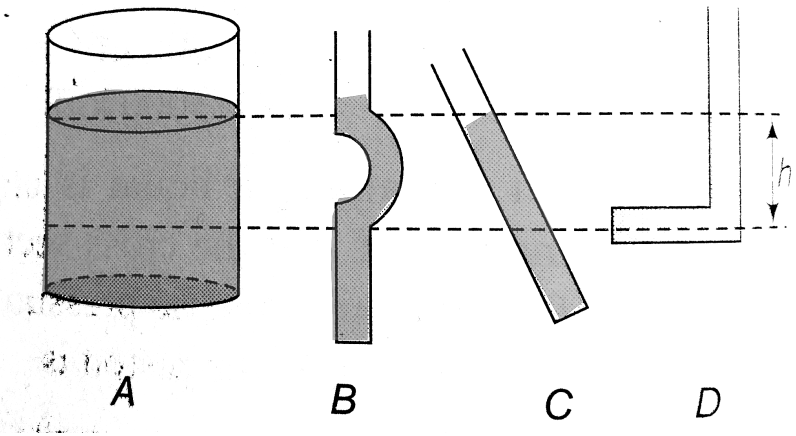
15. Figure shows for containers of olive oil. The pressure at depth h is



A. least in B and C both

B. greatest in A

C. greatest in D

D. equal in all the containers

Answer: D

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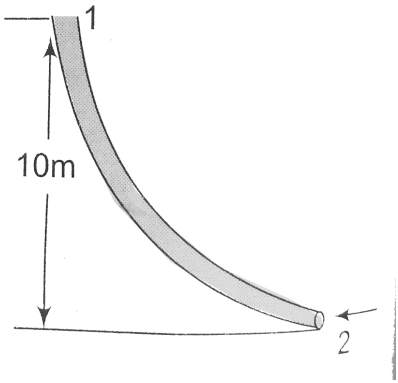
16. Find the force acting on the pistion of $3cm^2$ at point 2 due to the water coluum of height $10m$.



A. 10 N

B. 20 N

C. 30 N

D. 40 N

Answer: C

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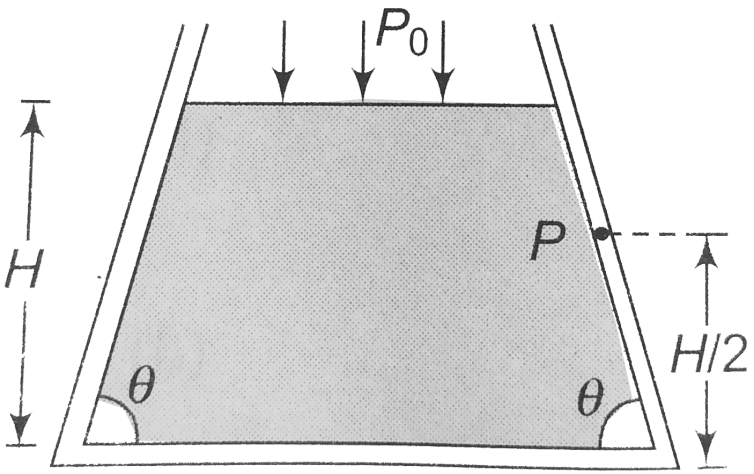
17. A container shown in figure contains a liquid to depth H, and of density ρ The gauge pressure at point P is :



A. $\frac{\rho g H}{2 + P_0}$

B. $\frac{\rho g H}{2}$

C. $\frac{\rho g H}{2\cos\theta}$

D. $\frac{\rho g H \cos\theta}{2}$

Answer: B

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18. If pressure at half the depth of a lake is equal to 2/3 pressure at the bottom of the lake then what is the depth of the lake ?

A. 10 m

B. 20 m

C. 60 m

D. 30 m

Answer: B

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19. An isosceles triangular plates of base 3 m and altitude 3 m is immersed in oil vertically with its base coinciding with its base coinciding with the free surface of the oil of relative density 0.8. Determine the total thrust.

A. 24 N

B. 48 N

C. 36 N

D. None of these

Answer: C

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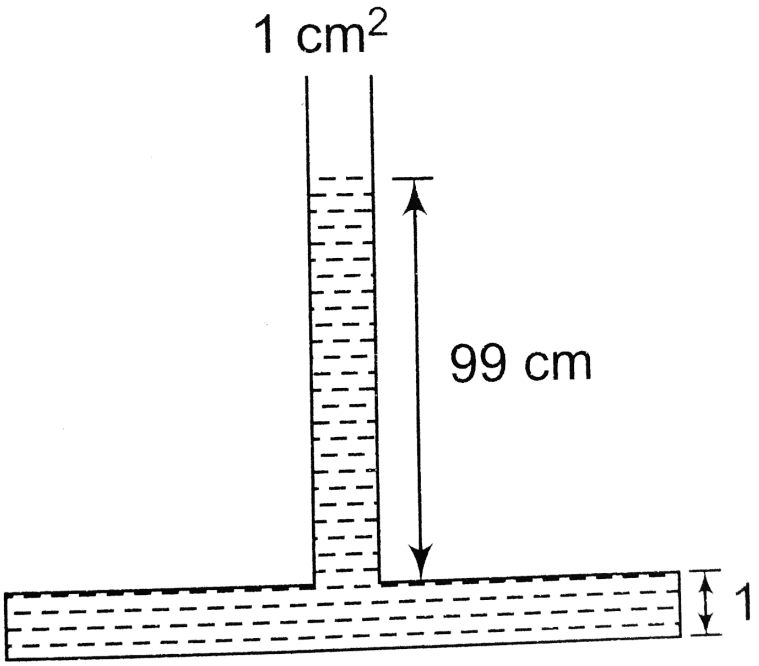
20. A tube $1cm^2$ in cross = section is attached to the top of a vessel 1 cm high and of cross - section 100 cm^2 Water is poured into the system filling it to a depth of 100 cm above the bottom of the vessel as shown in

fig. Take $g = ms^I(-2)$ Now.



A. The force exerted by the water against the bottom of the vessel is

100 N

B. The weight of water in the system is 1.99 N

C. Both (a) and (b) are correct

D. Neither (a) nor (b) is correct

Answer: C

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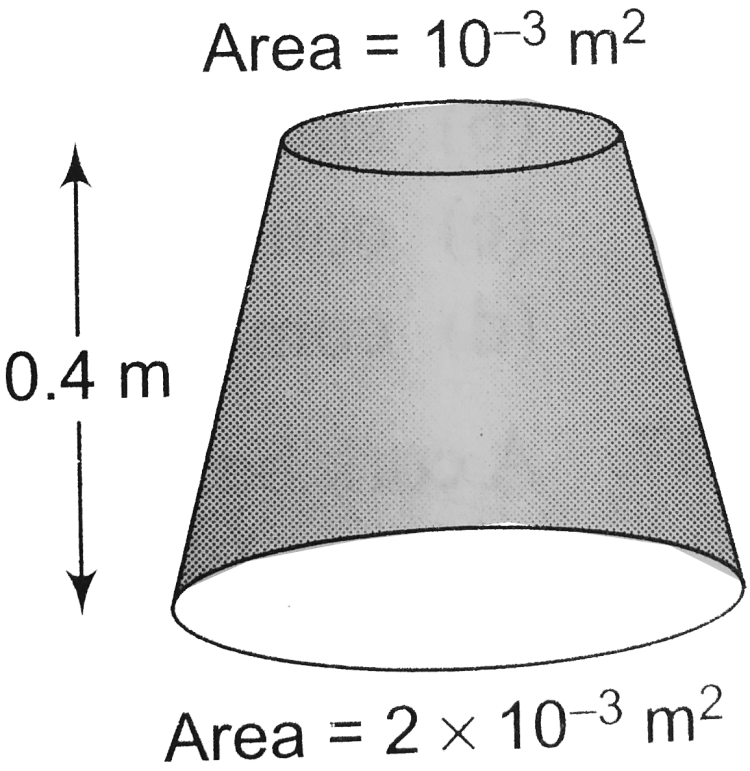
21. A uniformly tapering vessel is filled with a liquid of density $900kg/m^3$. The force that acts on the base of the vessel due to the liquid is $(g = 10ms^{-2})$



A. 3.6 N

B. 7.2 N

C. 9.0 N

D. 14.4 N

Answer: B

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22. A tank 5 m high is half filled with water and then is filled to top with oil of density $0.85g/cm^3$ The pressure at the bottom of the tank, due to these liquids is

A. $1.85g/cm^2$

B. $89.25g/cm^2$

C. $462.5g/cm^2$

D. $500g/cm^2$

Answer: C

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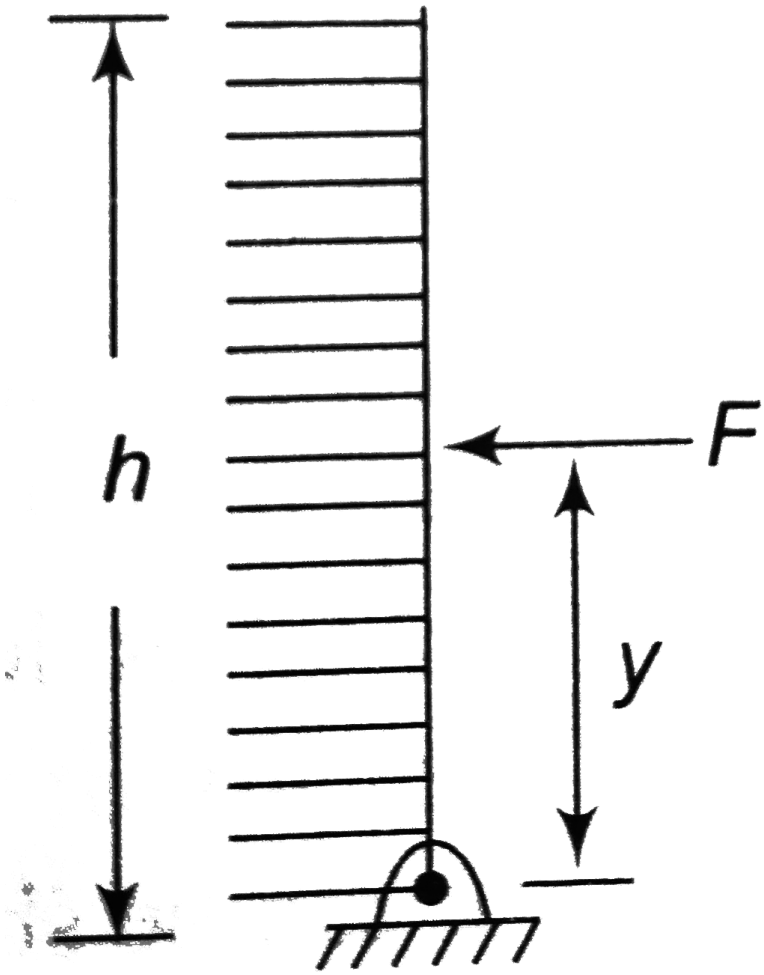
23. A smooth gate is kept in equilibrium by applying a horizontal force. What is the value of y so that no horizontal reaction force acts at the

pivot ?



A. $\frac{h}{3}$

B. $\frac{h}{6}$

C. $\frac{2h}{3}$

D. zero

Answer: A

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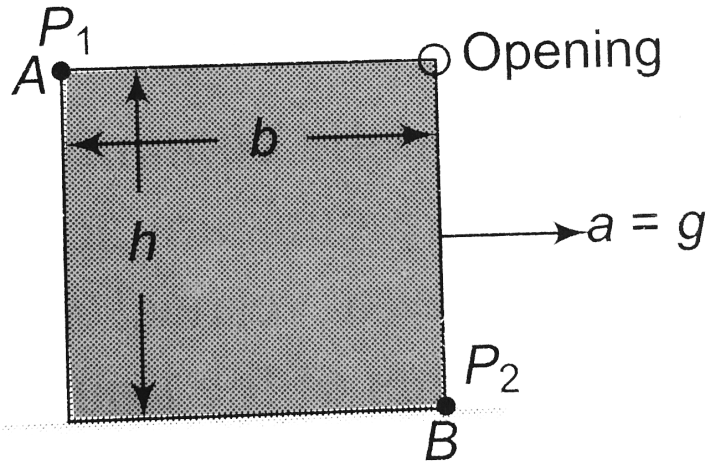
24. A closed rectangular vessel completely filled with a liquid of density $\rho moveswithanae \leq rationa = g. Thevalueofthepressrured \Leftrightarrow erenceat$ (P_1 -P_2)` is :



A. $\rho g(b-h)$

B. $\rho gh/2$

C. ρgh

D. $\frac{\rho g(b+h)}{2}$

Answer: A

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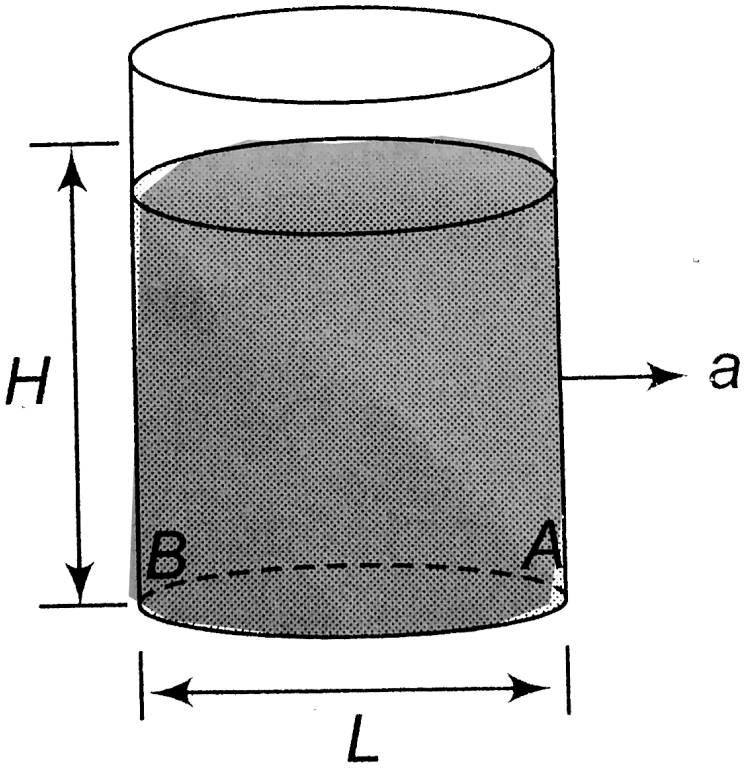
25. A tank with base area L^2 is filled with a liquid to height H. The tank is acceleration horizontally with acceleration a as shown in figure. If a small hole is made at the point A. then it is observed that the liquid does not

come out of the tank. The magnitude of acceleration should be



A. $\frac{H}{L}g$

B. $\frac{L}{H}g$

C. g

D. None of these

Answer: D

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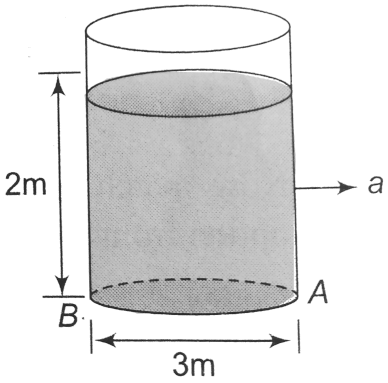
26. The minimum horizontal acceleration of the container IS a so that pressure at the point A of the container becomes atmospheric is (The tank is of sufficient height)



A. $\frac{3}{2}g$

B. $\frac{4}{3}g$

C. $\frac{4}{2}g$

D. $\frac{3}{4}g$

Answer: B

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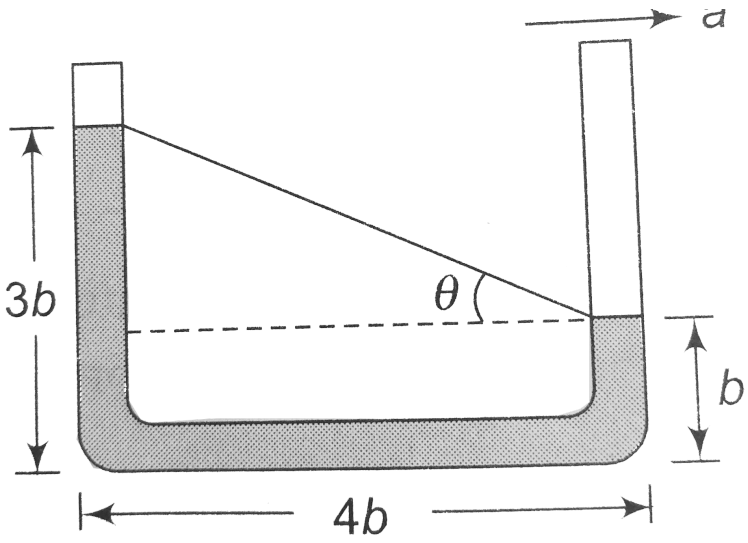
27. The acceleration a of the vertical U-tube is



A. g

B. g/2

C. 2g

D. zero

Answer: B

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28. A cart supports a cubic tank filed with a liquid up to the top. The cart moves with a constant acceleration a in the horizontal direction. The tank is tightly closed. Assume that the liquid when in motion with uniform acceleration. The pressure at a point at a depth h and distance I from the front wall is :

A. dgh

B. dla

C. dgh+ dla

D. dgh - dla

Answer: C

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29. A U-tube containing a liquid is accelerated horizontally with a constant acceleration a_0. If the separation between the vertical limbs is l find the difference in the heights of the liquid in the two arms.

A. Zero

B. l

C. $\frac{la_0}{g}$

D. $\frac{lg}{a_0}$

Answer: C

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Buoyancy And Floatation

1. A wooden block is floating in a water tank. The block is pressed to its bottom. During the process, work done is equal to :

A. work done against upthrust exerted by the water

B. work done against upthrust plus loss of gravitational potential energy of the block

C. work done against upthrust minus loss of gravitational potential energy of the block

D. None of these

Answer: C

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2. A piece of ice is floating in a beaker containing water when ice melts, the temperature falls from $20^\circ C \rightarrow 4^C$ When ice melts, the temperature falls from $20^\circ C \rightarrow 4^\circ C$ and the level of water :

A. remains uchanged

B. falls

C. rises

D. changes erratically

Answer: B

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3. A boy is carrying a bucket of water in one hand and a piece of plastic in the other. After transferring the plastic piece to the bucket (in which it floats) the boy will carry :

A. same load as before

B. more loas as before

C. less load as before

D. either less or more load, depending on the density of plastic

Answer: A

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4. A bird resting on the floor of an airtight box which is being carried by a boy star flying. The boy will fell that the box is now :

A. heavier

B. lighter

C. same in weight

D. Lighter in the beginnig and heavier later

Answer: C

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5. A steel ball is floating in a trough of mercuty. If we fill the empty part of the trough with water, what will happen to the steel ball ?

A. it will continue in its position

B. it will move up

C. it will move down

D. it will execute vertical oscillation

Answer: B

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6. A body is just floating in a liquid (their densities andd equal). If the body is slightly pressed down and relased it wll :

A. start oscillating

B. sink to the bottom

C. come back to the same position immediately

D. come back to the same postiton slowly

Answer: B

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7. A cork ball is floating on the surface of water in a beaker. The beaker is covered with a bell jar and the air is evacuted. What wil happen to the ball ?

A. Sink a little

B. Rise a little

C. Remain ucchanged

D. Sink completely

Answer: A

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8. An ice cube containing a piece of lead floats in water What would be the effect on the level of water if the ice cube melts ?

A. It would fall

B. it would rise

C. it would remain the same

D. it would rise very high.

Answer: A

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9. A metal ball immersed in alcohol weighs W_1 at $0^\circ C$ and W_2 at $50^\circ C$. The coefficient of cubical expansion of the metal is less than that of the alcohol. Assuming that the density of the metal is large compared to that of alcohol, it can be shown that

A. $W_1 = W_2$

B. $W_1 > W_2$

C. $W_1 < W_2$

D. `none of these

Answer: C

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10. A rectangular block is 5 cm xx 5 cm xx 10 cm in size. The block floating in water change will occur in the level of water ?

A. no change

B. it will rise

C. it will fall

D. it may rise of fall depending on the density of block

Answer: A

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11. If a block of iron (density $5gcm^{-3}$) is size 5 cm xx 5 cm xx 5 cm was weight while completely submerged in water, what would be the apperent weight ?

A. 5xx5xx5xx5 gf

B. 4xx4xx4xx5 gf

C. 3xx5xx5xx5 gf

D. 4xx5xx5xx5 gf

Answer: D

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12. A piece of solid weight 120 g in air, 80 g in water and 60 g in a liquid, then the relative density of the solid, and that of liquid are

A. $3, 2$

B. $2, \frac{4}{3}$

C. $3, \frac{3}{2}$

D. $4, 3$

Answer: C

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13. A glass beaker of mass 400 kg floats in water with the open end just touching the surface of water and half of the beaker filled with water. The

inner volume of the beaker is $500cm^3$ What is the density of the meterial of the beaker ?

A. $1.52gcm^{-3}$

B. $2.67gcm^{-3}$

C. $3.01gcm^{-3}$

D. $3.87gcm^{-3}$

Answer: B

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14. Tow 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. $\frac{4}{3}$

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

C. 3

D. 5

Answer: C

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15. A metal block having an internal cavity weight 110 g in air and 80 g in water. If the density of metal is 5.5 g//cc, then the volume of cavity is :

A. 30cc

B. 20 cc

C. 10 cc

D. 5 cc

Answer: C

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16. A body of density d is conuterpoised by Mg of weights of density d_1 in air of density d. Then the true mass of the body is

A. M

B. $M\left(1-\frac{d}{2}\right)$

C. $M\left(1-\frac{d}{d_1}\right)$

D. $\frac{M(1-d/d_2)}{(1-d/d_1)}$

Answer: D

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17. A hollow sphere of volume V is floating on water surface with half immersed in it. What should be the minimum volume of water poured inside the sphere so that the sphere now sinks into the water?

A. $V/2$

B. $V/3$

C. $V/4$

D. V

Answer: A

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18. A ball whose density is $0.4 \times 10^3 kg/m^3$ falls into water from a height of 9 cm. To what depth does the ball sink ?

A. 9 cm

B. 6 cm

C. 4.5 cm

D. 2.25 cm

Answer: B

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19. The thickness of the ice layer on the surface of lake is 20 m. A hole is made in the ice layer. What is the minimum length of the rope required to take a bucket full of water out ? (Take density of ice $= 0.9 \times 10^3 kg/m^3$)

A. 2 m

B. 5 m

C. 9 m

D. 18 m

Answer: A

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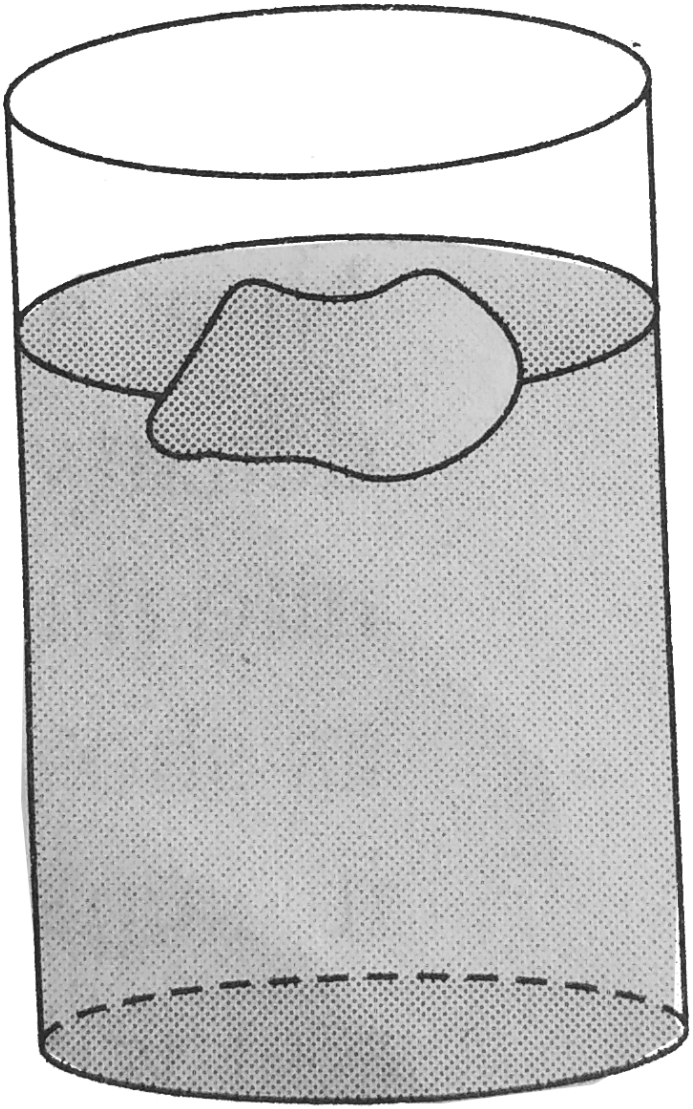
20. A body floats in a liquid contained in a beaker. The whole system as shown falls freely under gravity. The upthrust on the body due to the

liquid is



A. zero

B. Equal to the weight of the liquid displaced

C. Equal to the weight of the body in air

D. Equal to the weight of the immersed position of the body

Answer: A

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21. A boy carries a fish in one hand and a bucket (not full) of water in the other hand. If he places the fish in the bucket, the weight now carried by him (assume that water does not spill) :

A. is less than before

B. is more than before

C. is the same as before

D. depends upon his speed

Answer: C

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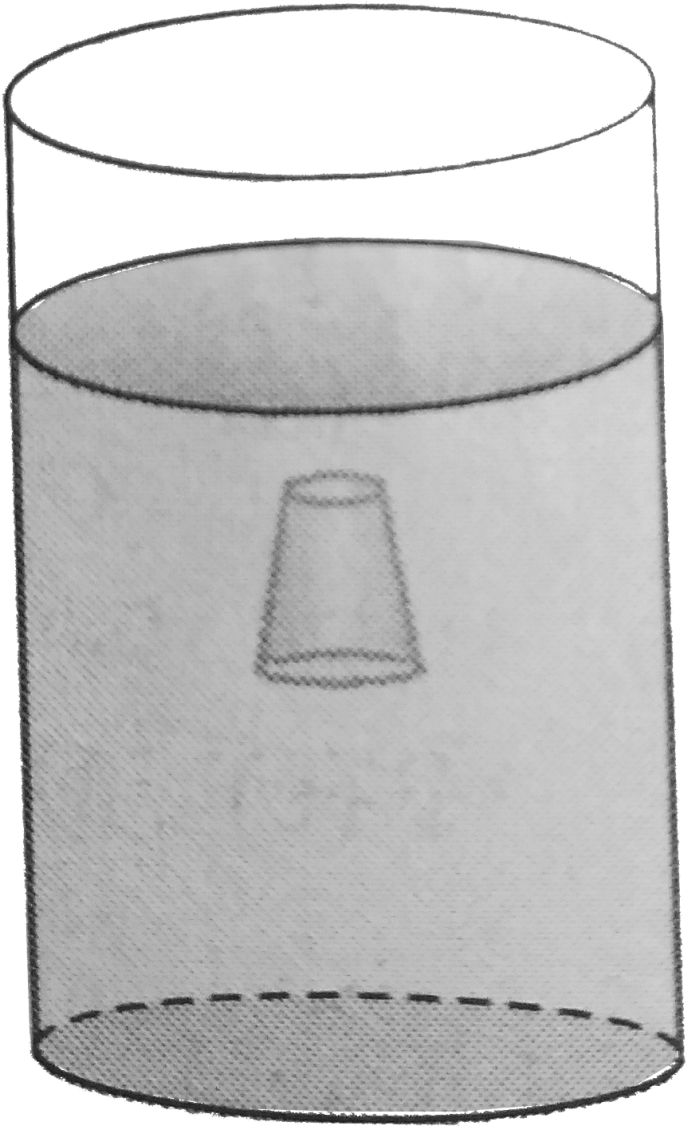
22. An empty glass jar is submerged in tank of water with open mouth of the jar downwards, so that air inside the jar is trapped and cannot get out. As the jar is pushed down slowly, the magnitude of net buoyant force

on the system of volume of gas trapped in the jar and the jar.



A. increases

B. decreases

C. remain same

D. Information is insufficient to draw inference.

Answer: B

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23. A piece of gold weighs 10g in air and 9g in water. What is the volume of cavity? (Density of gold =$19.3gcm^{-3}$)

A. 0.282 cc

B. 0.482 cc

C. 0.682cc

D. None of these

Answer: B

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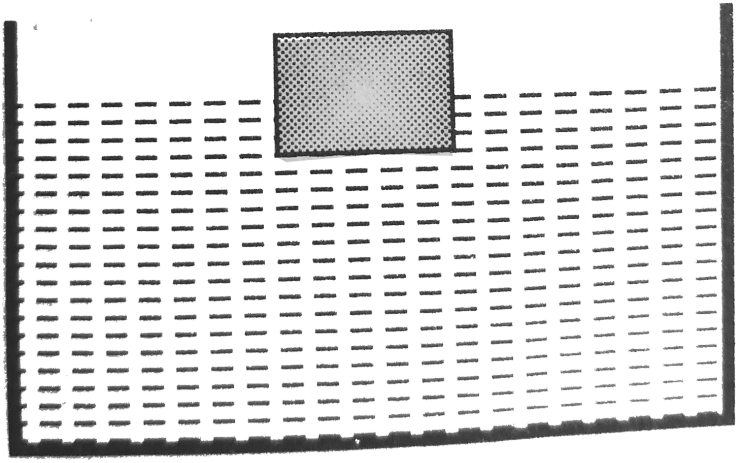
24. A cubical block is floating in a liquid with half of its volume immersed in the liquid. When the whole system accelerates upwards with acceleration of $g/3$, the fraction of volume immersed in the liquid will be



A. $\frac{1}{2}$

B. $\frac{3}{8}$

C. $\frac{2}{3}$

D. $\frac{3}{4}$

Answer: A

Watch Video Solution

25. 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 ration of densities of A and B is

A. $4:3$

B. $2:3$

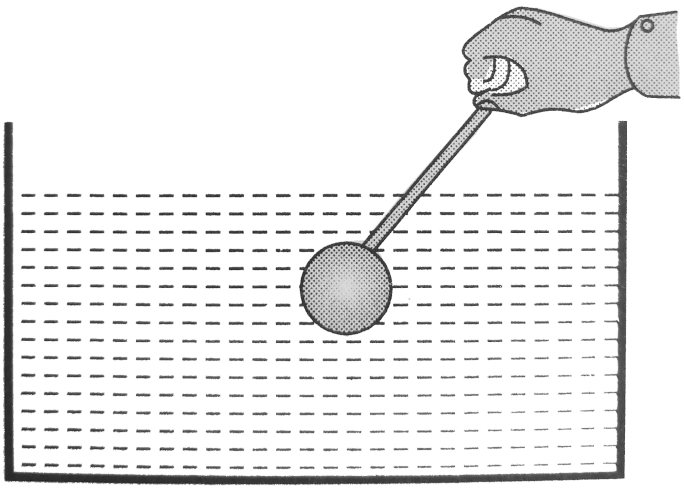
C. $3:4$

D. $1:3$

Answer: C

Watch Video Solution

26. A vessel with water is placed on a weighing pan and reads $600g$. Now a ball of 40g and density $0.80g/cc$ is sunk into the water with a pin as shown in fig. keeping it sunk. The weighing pan will show a reading



A. $600g$

B. $550g$

C. $650g$

D. $632g$

Answer: C

Watch Video Solution

27. The fraction of a floating object of volume V_0 and density d_0 above the surface of a liquid of density d will be

A. $\frac{d_0}{d}$

B. $\frac{dd_0}{d+d_0}$

C. $\frac{d-d_0}{d}$

D. $\frac{dd_0}{d-d_0}$

Answer: C

Watch Video Solution

28. Density of ice is ρ and that of water is σ. What will be the decrease in volume whebn a mass M of ice melts?

A. $\frac{M}{\sigma-\rho}$

B. (sigma-rho)/(M)`

C. $M\left[\frac{1}{\rho}-\frac{1}{\sigma}\right]$

D. $\frac{1}{M}\left[\frac{1}{\rho}-\frac{1}{\sigma}\right]$

Answer: C

Watch Video Solution

29. A matallic block weighs $15N$ in air. It weights $12N$ when immersed in water and $13N$ when immersed in another liquid. What is the specific gravity of the liquid?

A. $1/3$

B. $2/3$

C. $12/13$

D. $13/15$

Answer: B

Watch Video Solution

30. 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. $\frac{4}{3}$

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

C. 3

D. 5

Answer: C

Watch Video Solution

31. 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. $4:3$

B. $3:4$

C. $3:2$

D. $2:3$

Answer: B

Watch Video Solution

32. A body of density d and volume V floats with volumes V of its total volume V immersed in a liquid of density d and the rest of the volume V_2 immersed in another liquid of density $d_2(<d_1)$. The volume V_1 immersed in liquid of density d_1 is

A. $\frac{d_1}{d_2}V$

B. $\left(\frac{d_1-d_2}{d_1}\right)V$

C. $\left(\frac{d+d_2}{d_1+d_2}\right)V$

D. $\left(\frac{d-d_2}{d_1-d_2}\right)V$

Answer: D

Watch Video Solution

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

A. 120 kg

B. 200kg

C. 40kg

D. 80kg

Answer: D

Watch Video Solution

34. Two solid pieces, one of gold and the other of silver when immersed completely in water have equal weights. When weighted in air:

A. the gold piece $\left(\rho_{gold} < \rho_{silver}\right)$ will weigh more than silver

B. the silver piece will weigh more than gold

C. they will have the same weight

D. both of them weigh less than they weighed in water

Answer: B

Watch Video Solution

35. The volume of the hollow portion of a sphere is $\frac{3}{4}$ of the external volume of the sphere. If it floats in a liquid of relative density $\frac{3}{2}$, half of its external volume immersed, the relative density of the material of the solid is :

A. 2

B. 3

C. 2.4

D. 1.8

Answer: B

Watch Video Solution

36. A $0.5kg$ block of brass (density $8 \times 103Kgm^{-3}$) is suspended from a string. What is the tension in the string if the block is completely immersed in water? $(g = 10ms^{-2})$

A. $5N$

B. $\frac{0.5}{8 \times 10^3}N$

C. $\frac{5}{8}N$

D. $\left[5 - \frac{5}{8}\right]N$

Answer: D

Watch Video Solution

37. A piece of brass (Cu and Zn) weighs $12.9g$ in air. When completely immersed in water, it weighs $11.3g$. Then relative densities of Cu and Zn are $8.9 \text{ and } 7.1$ respectively. The mass of copper in the alloy is

A. $4.6g$

B. 5.6g

C. 7.6 g

D. 8.6g

Answer: C

Watch Video Solution

38. A steel block having an internal cavity weighs 234g in air and 197g in water. If the density of steel is $7.8gcm^{-3}$ then the volume of the cavity is

A. $5cm^3$

B. $7cm^3$

C. $9cm^3$

D. $11cm^3$

Answer: B

Watch Video Solution

39. A piece of solid weighs 120 g in air ,80 g in water and 60 kg in a liquid .

The relative density of the solid and that of the liquid are respectively

A. $\frac{2}{3}$

B. $\frac{4}{5}$

C. $\frac{13}{15}$

D. $\frac{15}{13}$

Answer: A

Watch Video Solution

40. Iceberg floats in sea water with a part of it submerged. The percentage fraction of the ice berg submerged is (density of ice = $0.9gcm^{-3}$, density of sea water = $1.1gcm^{-3}$)

A. 18%

B. 12%

C. 10%

D. 8%

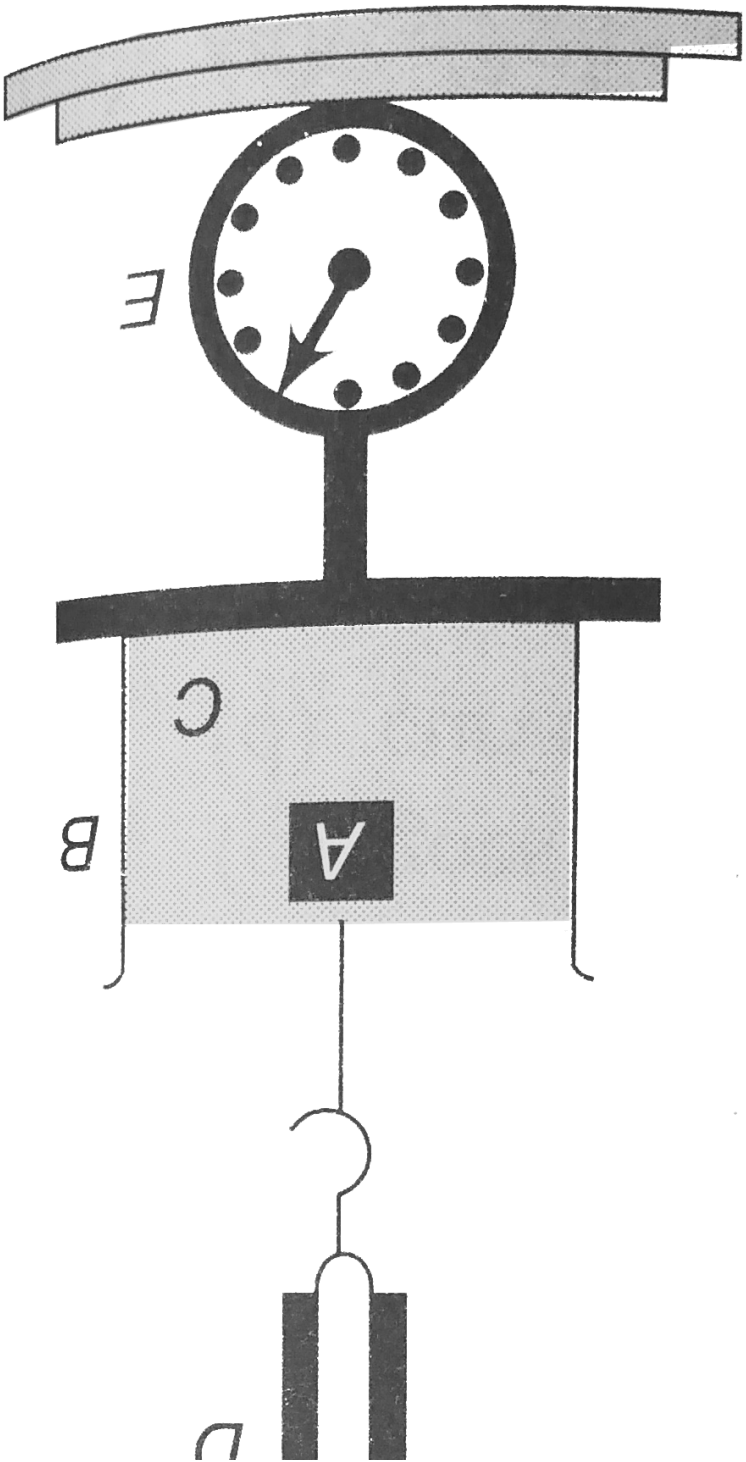
Answer: A

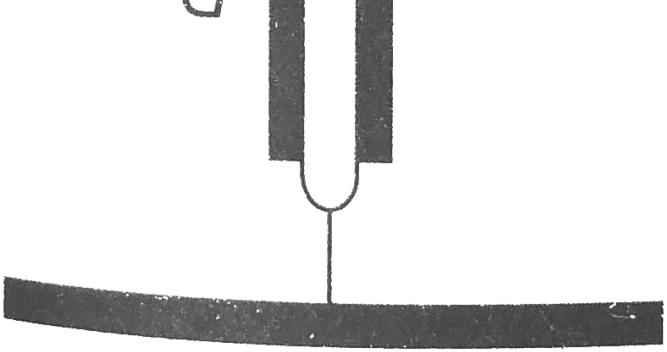
Watch Video Solution

Problems Based On Mixed Concepts

1. In figure, block A hangs by a cord form spring balance D and it submerged in a liquid C contained in a beaker B. The mass of the beaker is $1kg$. The mass of the liquid is $1.5kg$. Balance D reads $7.5kg$. The volume

of block A is $0.003m^3$. The mass per unit volume of the liquid is





A. $2500 kgm^{-3}$

B. $5000 kgm^{-3}$

C. $1 kgm^{-3}$

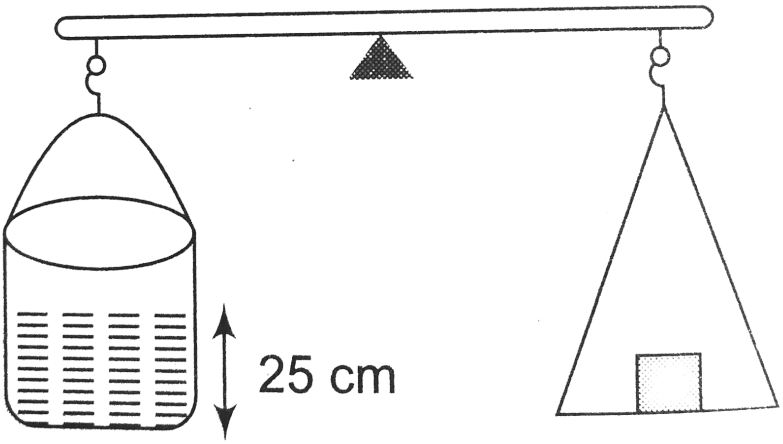
D. $\frac{5000}{3} kgm^{-3}$

Answer: D

Watch Video Solution

2. A cylinder containing water up to a height of $25 cm$ has a hole of cross-section $\frac{1}{4} cm^2$ in its bottom. It is counterpoised in a balance. What is the

intial change in the balancing weight when water begin to flow up?



A. increases of $12.5gwt$

B. increase of $6.25gwt$

C. Decrease of $12.5gwt$

D. Decrease of $6.25gwt$

Answer: C

Watch Video Solution

3. A small solid ball is dropped from a height above the free surface of a liquid. It strikes the surface of the liqiud at $t = 0$. The density of the material of the ball is $500 kg/m^3$ and that of liquid is $1000 kg/m^3$. If the ball comes momentarily at rest at $t = 2 \sec$ then initial height of ball form surface of liquid was (neglect viscosity):

A. 20m

B. 10m

C. 15m

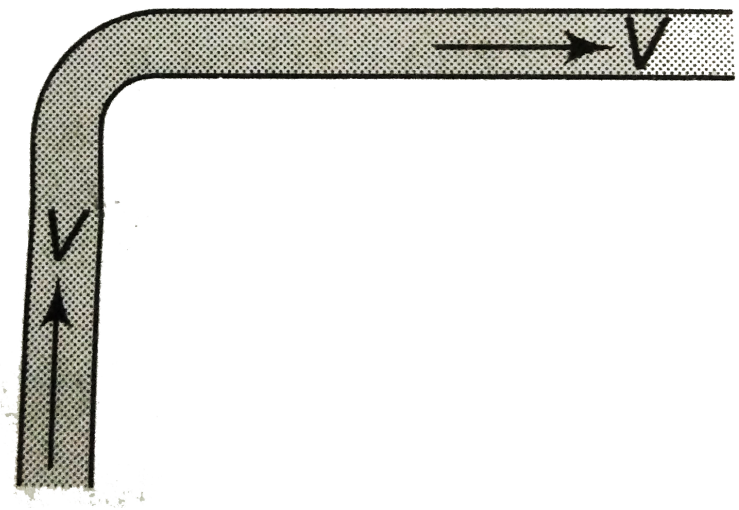
D. 25m

Answer: A

Watch Video Solution

4. A fire hydrant delivers water of density ρ at a volume are L. The water travels vertically upward through the hydrant and then does 90° turn to emerge horizontally at speed V. The pipe and nozzel have uniform corss-

section throught out. The force exerted by the water on the corner of the hydrant is



A. ρVL

B. zero

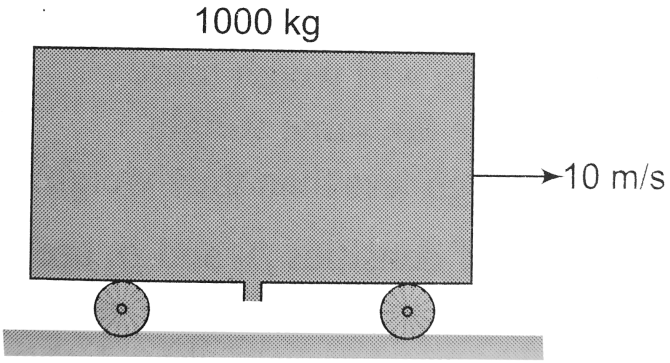
C. $2\rho VL$

D. $\sqrt{2}\rho VL$

Answer: D

Watch Video Solution

5. A trolley containing water has total mass $1000kg$. Now water starts coming out of the trolley at the rate of $10kg/s$ from below it. Find the velocity of the trolley after 50 sec, If the initial speed is $10m/s$ on the horizontal frictionless road.



A. $10m/s$

B. $20m/s$

C. $15m/s$

D. none of these

Answer: A

Watch Video Solution

6. A hemispherical bowl just floats without sinking in a liquid of density $1.2 \times 10^3 kg/m^3$. If outer diameter and the density of the bowl are $1m$ and $2 \times 10^4 kg/m^3$ respectively, then the inner diameter of bowl will be

A. 0.94m

B. 0.97m

C. 0.98m

D. 0.99m

Answer: C

Watch Video Solution

7. A concrete sphere of radius R has cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are respectively $2.4 \text{ and } 0.3$ for this sphere to float with its entire volume submerged under water. Ratio of mass of concrete to mass of swadust will be

A. 8

B. 4

C. 3

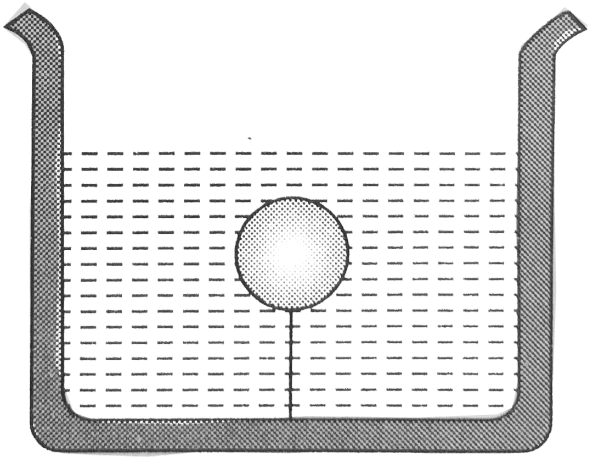
D. Zero

Answer: B

Watch Video Solution

8. A solid sphere of density $\eta(>1)$ times lighter than water is suspended in a water tank by a string tied to its base as shown in fig. If the mass of

the sphere is m, then the tension in the string is given by



A. $\left(\frac{\eta-1}{\eta}\right)mg$

B. ηmg

C. $\frac{mg}{\eta-1}$

D. $(\eta-1)mg$

Answer: D

Watch Video Solution

9. The verticla water tank, shown has uniform cross section, closed at the top and initial level of water in it is $4.5m$ from bottom. The empty space of length L contains air at atmospheric pressure $\left(10^5 Pa\right)$, that can be considered as an ideal gas. When the value at the bottom is opened, the level of water decreases by $0.5m$ when the flow of water ceases though value remains opened. Neglecting any variation in temperature during the process find intial length of empty space L in cm. ($g = 10m/s^2$, density of water = 1000 kg//m^(3)`)

A. 75cm

B. 65cm

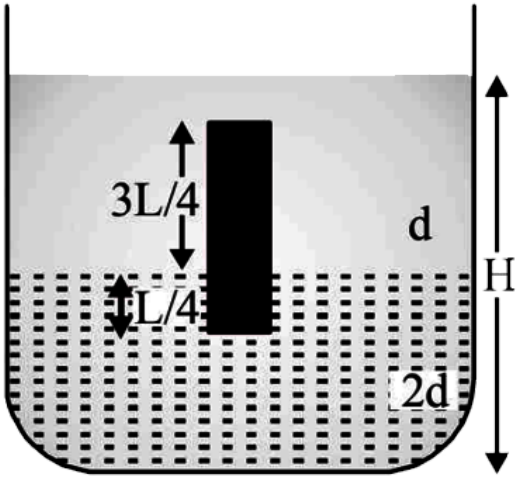
C. 80cm

D. 85cm

Answer: A

Watch Video Solution

10. A homogeneous solid cylinder of length L(LltH/2), cross-sectional area A/5 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 lower density liquid is open to atmosphere having pressure P_0. Then density D of solid is given by



A. $\frac{5}{4}d$

B. $\frac{4}{5}d$

C. $4d$

D. $\frac{d}{5}$

Answer: A

Watch Video Solution

11. A cube made of material having a density of $900kgm^{-3}$ floats between water of density $1000kgm^{-3}$ and a liquid of density $700kgm^{-3}$, which is immiscible with water. What part of the cube is inside the water?

A. $1/3$

B. $2/3$

C. $3/4$

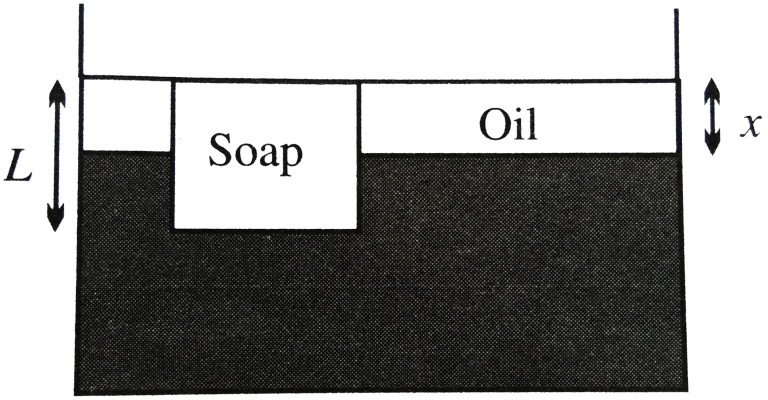
D. $3/7$

Answer: B

Watch Video Solution

12. A rectangular bar of soap having density $800kg/m^3$ floats in water of density $1000kg/m^3$. Oil of density $300kg/m^3$ is slowly added, forming a layer that does not mix with water. When the top surface of the oil is at

the same level as the top surface of the soap. What is the ratio of the oil layer thickness to the soap's thickness x / L?



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

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

C. $\frac{3}{10}$

D. $\frac{3}{8}$

Answer: B

Watch Video Solution

13. We have a vessel in shape of a cuboid partially filled with water. Its base is square with an area of $4.5dm^2(1dm = 10cm)$ and a vessel contains water up to $2cm$ height. Then we place wooden cube inside water. The wood has mass $4kg$ and specific gravity 0.5. The base of the wooden cube is horizontal. Find the height of water level above the base of the wooden block.

A. 10cm

B. 5cm

C. 15cm

D. 7cm

Answer: A

Watch Video Solution

14. A concrete sphere of radius R has cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are

respectively $2.4 \text{ and } 0.3$ for this sphere to float with its entire volume submerged under water. Ratio of mass of concrete to mass of swadust will be

A. 8

B. 4

C. 3

D. Zero

Answer: B

Watch Video Solution

15. In a wind tunnel experiment the pressure on the upper and lower surfaces of the wings are $0.90 \times 10^5 Pa$ and $0.91 \times 10^5 Pa$ respectively. If the area of the wing is $40 m^2$ the net lifting force on the wing is

A. $2 \times 10^4 N$

B. $4 \times 10^4 N$

C. $6 \times 10^4 N$

D. $8 \times 10^4 N$

Answer: B

Watch Video Solution

16. The force acting on a window of area $50cm \times 50cm$ of a submarine at a depth of $2000m$ in an ocean, the interior of which is maintained at sea level atmospheric pressure is (Density of sea water = $10^3 kgm^{-3}$, $g = 10ms^{-2}$)

A. $5 \times 10^5 N$

B. $25 \times 10^5 N$

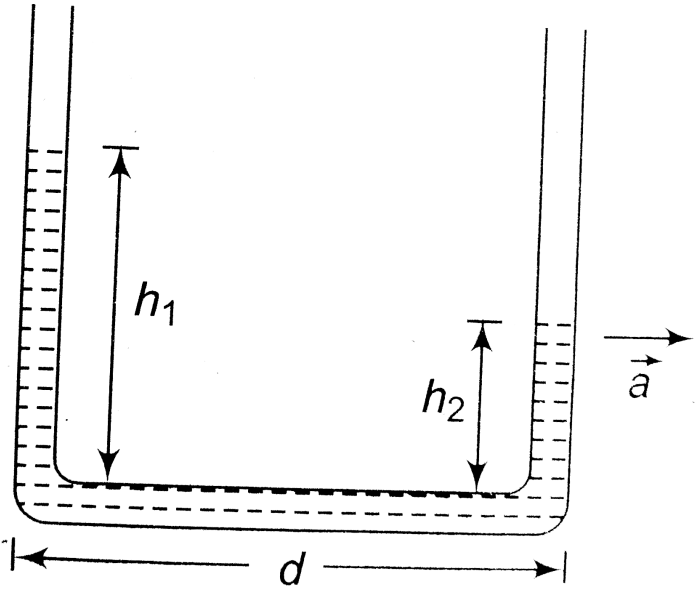
C. $5 \times 10^6 N$

D. $25 \times 10^6 N$

Answer: C

Watch Video Solution

17. Fig, shows a U-tube of uniform cross-sectional area A accelerated with acceleration a as shown. If d is the seperation between the limbs. Then the difference in the levels of the liquid in the $U-tube$ is



A. $\frac{ad}{g}$

B. $\frac{g}{ad}$

C. adg

D. $ad+g$

Answer: A

Watch Video Solution

18. A hollow cylinder of mass m made heavy at its bottom is floating vertically in water. It is tilted from its vertical position through an angle θ and is left. The restoring force acting on it is

A. $mg\cos\theta$

B. $\frac{mg}{\cos\theta}$

C. $mg\left[\frac{1}{\cos\theta}-1\right]$

D. $mg\left[\frac{1}{\cos\theta}+1\right]$

Answer: C

Watch Video Solution

19. Assume the density of brass weights to be $8gcm^{-3}$ and that of air to be $0.0012gcm^{-3}$. What fractional error arises from neglecting buoyancy of air in weighing an object of density $3.4gcm^{-1}$ on a beam balance?

A. 2×10^{-1}

B. 2×10^{-2}

C. 2×10^{-3}

D. 2×10^{-4}

Answer: D

Watch Video Solution

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

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

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

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

Answer: C

Watch Video Solution

21. Two solid pieces, one of gold and the other of silver when immersed completely in water have equal weights. When weighted in air:

A. the gold piece will weigh more

B. the silver piece will weigh more

C. both will have the same weight

D. both will weigh less than they weigh in water

Answer: B

Watch Video Solution

22. Two substances of densities ρ_1 and ρ_2 are mixed in equal volume and the relative density of mixture is 4. When they are mixed in equal masses, the relative density of the mixture is 3. the values of ρ_1 and ρ_2 are:

A. $\rho_1 = 6 \text{ and } \rho_2 = 2$

B. $\rho_1 = 3 \text{ and } \rho_2 = 5$

C. $\rho_1 = 12$ and $\rho_2 = 4$

D. none of these

Answer: A

Watch Video Solution

23. A metallic sphere with an internal cavity weighs $40gwt$ in air and $20gwt$ in water. If the density of the material with cavity be $8gpercm^3$ then the volume of cavity is :

A. Zero

B. $15cm^3$

C. $5cm^3$

D. $20cm^3$

Answer: B

Watch Video Solution

24. A stream-lined body falls through air from a height h on the surface of a liquid . Let d and D denote the densities of the materials of the body and the liquid respectively, if $D > d$, then the time after which the body will be intantaneously at rest, is:

A. $\sqrt{\frac{2h}{g}}$

B. $\sqrt{\frac{2h}{g}\frac{D}{d}}$

C. $\sqrt{\frac{2h}{g}\frac{d}{D}}$

D. $\sqrt{\frac{2h}{g}}\left(\frac{d}{D-d}\right)$

Answer: D

Watch Video Solution

25. A plane is in level flight at constant speed and each of the two wings has an area of $25m^2$. If the speed of the air on the upper and lower surfaces of the wing are $270kmh^{-1}$ and $234kmh^{-1}$ respectively, then the mass of the plane is (take the density of the air = $1kgm^{-3}$)

A. $1550kg$

B. $1750kg$

C. $3500kg$

D. $3200kg$

Answer: C

Watch Video Solution

26. An aircraft of mass $4 \times 10^5 kg$ with total wing area $500 m^2$ in level flight at a speed of 720 km h^(-1). $The density of a at its height is$ 1.2 kgm^(-3)

. $The \frac{t}{i} onal \in creases \in the speed of the air on the upper surface of its w \in g$ g = 10 ms^(-2)`)

A. 0.04

B. 0.08

C. 0.17

D. 0.34

Answer: C

Watch Video Solution

27. The two femurs each of cross-sectional area $10 cm^2$ support the upper part of a human body of mass $40 kg.$ $the avera \geq pressure susta \in ed by the fe \mu rsis (take$g=10 ms^(-2))`

A. $2 \times 10^3 Nm^{-2}$

B. $2 \times 10^4 Nm^{-2}$

C. $2 \times 10^5 Nm^{-2}$

D. $2 \times 10^6 Nm^{-2}$

Answer: C

Watch Video Solution

28. Two syringes of different cross-section (without needle filled with water are connected with a tightly fitted rubber tube filled with water. Diameters of the smaller piston an larger piston are $1cm$ and $3cm$ respectively. If a force of 10N is applied to the smaller piston then the force exerted on the larger piston is

A. 30N

B. 60N

C. 90N

D. 100N

Answer: C

Watch Video Solution

29. If the smaller piston is pushed in through $6cm$, how much does the longer piston move out?

A. $\frac{2}{3}cm$

B. $\frac{3}{2}cm$

C. $\frac{1}{3}cm$

D. $\frac{1}{2}cm$

Answer: A

Watch Video Solution

Assertion Reasoning

1. Assertion: Aeroplanes are made to run on the runway before take off, so that they acquire the necessary lift.

Reason: This is as per Bernoulli's theroem.

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: Pascal law is the working principle of hydraulic lift.

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

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

3. Assertion: To floats, a body must displace liquid whose weight is greater than actual weight of the body.

Reason: The body will experience no net downward force in that case.

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

4. Assertion: In taking into account the fact that any object which floats must have an average density less than that of water, during World War I, a number of cargo vessels were made of concrete.

Reason: Concrete cargo vessels were filled with air.

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: Sudden fall of pressure of at a place indicates storm.

Reason: air flows from higher pressure to lower pressure.

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

6. Assertion: A dam for water reservoir is built thicker at bottom than at the loop.

Reason : Pressure of water is very large at the bottom.

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

7. Assertion: The flow of fluid is said to be steady if at any given point, the velocity of each passing fluid particle remains constant.

Reason: The path taken by a fluid particle under a steady flow is a streamline.

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

8. Assertion: A spinning cricket ball deviates from is trajectory as it moves through air.

Reason: The ball is moving forward and relative to it the air is moving backward.

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

9. Assertion: The flow is turbulent for Reynolds number greater than 2000.

Reason: Turbulence dissipates kinetic energy in the form of heat.

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

10. Assertion: Bernoulli's equation hold for non-steady or turbulent flows.

Reason: In these situations, velocity and pressure are constant with time.

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

Watch Video Solution

11. Assertion: To floats, a body must displace liquid whose weight is greater than actual weight of the body.

Reason: The body will experience no net downward force in that case.

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

Watch Video Solution

12. Assertion: The velocity of flow of a liquid is smaller when pressure is larger and viceversa.

Reason: According to Bernoulli's theorem, for the stream line flow of an ideal liquid, the totla energy per unit mass remains constant.

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

13. Assertion: A fluid flowing out of a small hole in a vessel apply a backward thrust on the vessel.

Reason: According to equation of continuity, the product of area and velocity remain constant.

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

14. Assertion: The shape of an automobile is so designed that its front resembles the stream line pattern of the fluid through which it moves.

Reason: The resistance offered by the fluid is maximum.

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

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15. Assertion: The velocity increases, when water flowing in broader pipe enter a narrow pipe.

Reason: According to equation of continuity, product of area and velocity is constant.

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

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Neet Questions

1. There is a small hole at the bottom of tank filled with water. If total pressure at the bottom is $3atm\left(1atm = 10^5 Nm^{-2}\right)$, then find the velocity of water flowing from hole.

A. $\sqrt{400}m/s$

B. $\sqrt{600}m/s$

C. $\sqrt{60}m/s$

D. None of these

Answer: A

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2. An iceberg of density $900kg/m^3$ is floating in water of density $1000kg/m^3$. The percentage of volume of ice cube outside the water is

A. $20\ \%$

B. $35\ \%$

C. $10\ \%$

D. $25\ \%$

Answer: C

Watch Video Solution

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

A. 80kg

B. 50kg

C. 60kg

D. 30kg

Answer: A

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4. A wind with speed $40m/s$ blows parallel to the roof of a house. The area of the roof is $250m^2$. Assuming that the pressure inside the house is atmospheric pressure, the force exerted by the wind on the roof and the direction of the force will be $\left(P_{air} = 1.2kg/m^3\right)$

A. $4.8 \times 10^5 N$, downward

B. $4.8 \times 10^5 N$, upward

C. $2.4 \times 10^5 N$, upwards

D. $2.4 \times 10^5 N$, downwards

Answer: C

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5. The cylinderical tube of a spray pump has radius R, one end of which has n fine holes, each of radius r. If the speed of the liquid in the tube is V, the speed of the ejection of the liquid through the holes is:

A. $\frac{V^2 R}{nr}$

B. $\frac{VR^2}{n^2r^2}$

C. $\frac{VR^2}{nr^2}$

D. $\frac{VR^2}{n^3r^2}$

Answer: C

Watch Video Solution

6. Two non-mixing liquids of densities ρ and $(n > 1)$ are put in a container. The height of each liquid is h. A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length $pL(p < 1)$ in the denser liquid. The density d is equal to :

A. $\{1 + (n + 1)p\}\rho$

B. $\{2 + (n + 1)p\}\rho$

C. $\{2 + (n - 1)p\}\rho$

D. $\{1 + (n - 1)p\}\rho$

Answer: D

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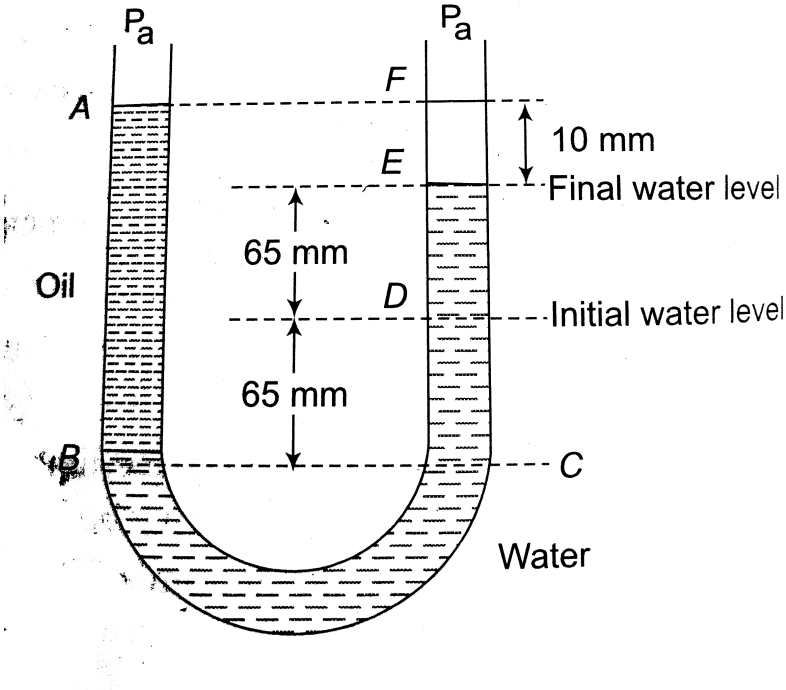
7. A U-tube with both ends open to the atmosphere is partially filled with water. Oil, which is immiscible with water. Is poured into one side until it stands at a distance of $10mm$ above the water level on the other side. Meanwhile the water rises by $65mm$ from its original level (see diagram). The density of the oil is:



A. $425kgm^{-3}$

B. $800kgm^{-3}$

C. $928kgm^{-3}$

D. $650kgm^{-3}$

Answer: C

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Aiims Questions

1. Beronoulli's principle is based on the law of conservation of

A. energy

B. mass

C. angular momentum

D. linear momentum

Answer: A

Watch Video Solution

2. Scent sprayer is based on

A. Bernoulli's theorem

B. Charles's law

C. Boyal's law

D. Archimedes principle

Answer: A

Watch Video Solution

3. In old age arteries carrying blood in the human body become narrow resulting in an increase in the blood pressure, this follows from

A. Pascal's law

B. Stokes'law

C. Archimedes 'principle

D. Bernoulli's principle

Answer: D

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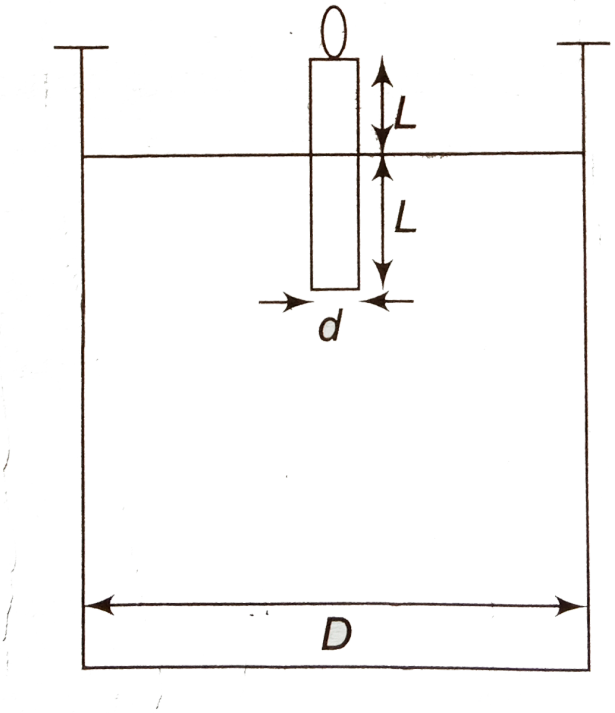
4. A candle of diameter d is floating on a liquid in a cylindrical container of diameter $D(D << d)$ as shown in figure. If it is burning at the rate

of $2cm/h$ then the top of the candle will :



A. remains uchanged

B. fall at the rate of $1cm/hour$

C. fall at the rate of $2cm/hour$

D. go up the rate of $1cm/hour$

Answer: B

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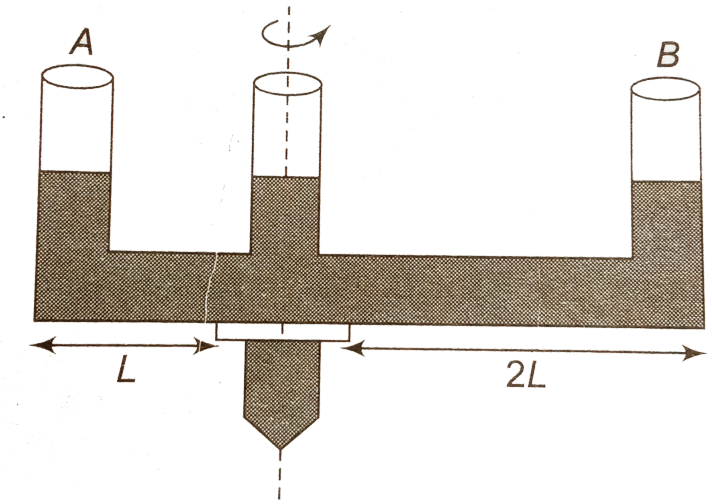
5. A given shaped glass tube having uniform cross-section is filled with water and is mounted on a rotatable shaft as shown in figure. If the tube is rotated with a constant angular velocity ω then :



A. water levels in both sections A and B go up

B. water level in section A goes up and that in B comes down

C. water level in section A comes down and that in B goes up

D. water levels remain same in both sections.

Answer: B

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6. By sucking a straw a student can reduce the pressure in his lungs to $750mm$ of $Hg(\text{density}) = 13.6kg/cm^3)$ Using the straw, he can drink water from a glass up to a maximum depth of :

A. 10cm

B. 75cm

C. 1.36cm

D. 13.6cm

Answer: D

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7. The fraction of a floating object of volume V_0 and density d_0 above the surface of a liquid of density d will be

A. $\frac{d_0}{d}$

B. $\frac{dd_0}{d+d_0}$

C. $\frac{d-d_0}{d}$

D. $\frac{dd_0}{d-d_0}$

Answer: C

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8. A solid sphere having volume V and density ρ floats at the interface of two immiscible liquids of densityes ρ_1 and ρ_2 respectively. If $\rho_1 < \rho < \rho_2$, then the ratio of volume of the parts of the sphere in upper and lower liquid is

A. (rho-rho_(1))/(rho_(2)-rho)`

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

C. (rho+rho_(1))/(rho+rho_(2))`

D. (rho+rho_(2))/(rho+rho_(1))`

Answer: B

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9. Assertion: Bernoulli's equation hold for non-steady or turbulent flows.

Reason: In these situations, velocity and pressure are constant with time.

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Chapter Test

1. A mercury barometer reads $75cm$ in vertical position . If the tube is inclined by 60° to the vertical, the length of the mercury in the tube will be

A. 37.5 cm

B. 75cm

C. 112.5cm

D. 150cm

Answer: D

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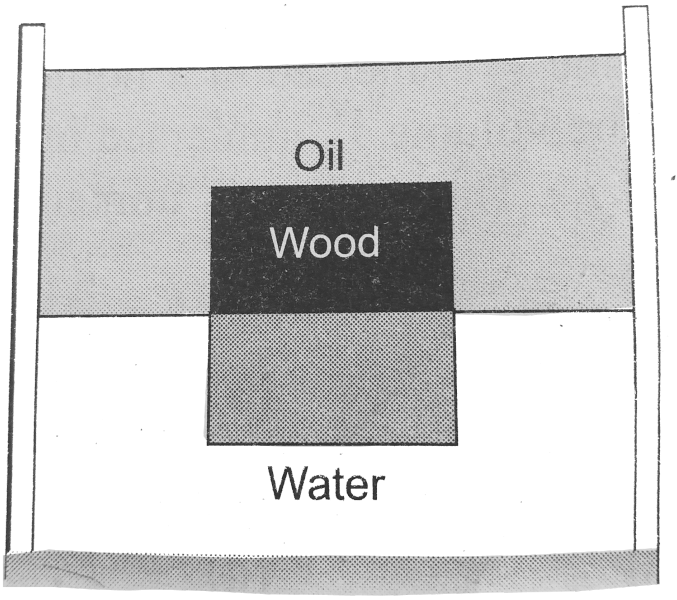
2. A cubical block of wood $10cm$ on a side floats at the interface between oil and water, as in fig. with its lower face $2cm$ below the interface. The intensity of the oli is $0.6gcm^{-3}$. The mass of the block is $1kg$



A. 340g

B. 680g

C. 80g

D. 10g

Answer: B

Watch Video Solution

3. the gauge pressure at the lower face of the block is

A. $84Pa$

B. $384Pa$

C. $484Pa$

D. $784Pa$

Answer: D

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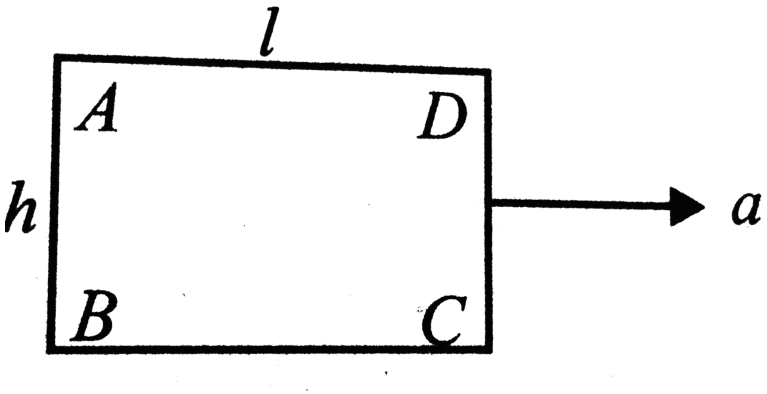
4. A closed rectangular tank is completely filled with water and is accelerated horizontally with an acceleration towards the right. Pressure is i. maximum and ii. minimum at



A. (i) B (ii) D

B. (i) C (ii) D

C. (i) B (ii) C

D. (i) B (ii) A

Answer: A

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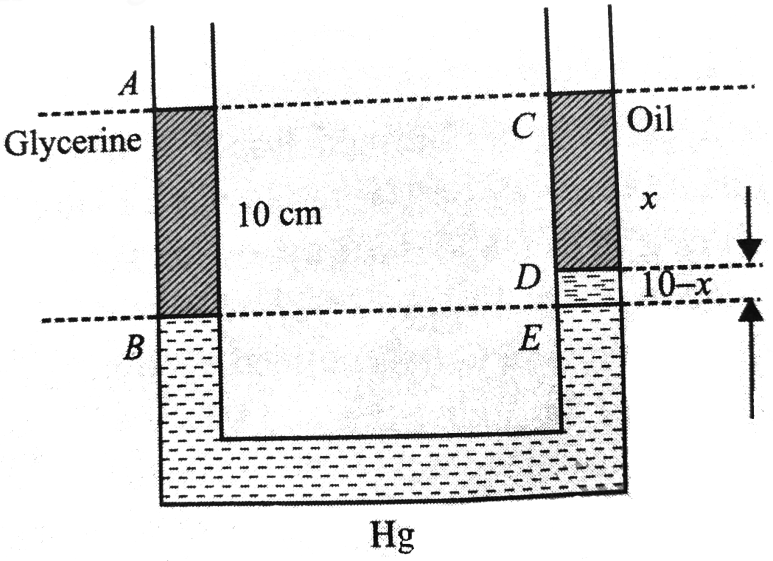
5. A vertical U tube of uniform cross section contains mercury in both of its arms. A glycerine $\left(d = 1.3g/cm^3\right)$ column of length $10cm$ is introduced into one of the arms. Oil of density $0.8g/cm^3$ is poured in the other arm until the upper surfaces of the oil and glycerine are in the same horizontal level. Find the length of oil column. Densit of mercury is $13.6g/cm^3$.



A. $10.4cm$

B. $8.2cm$

C. $7.2cm$

D. $9.6cm$

Answer: D

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6. A man is sitting in a boat which is floating in a pond. If the man drinks some water from the pond, the level of water in the pond decreases.

A. increases

B. decreases

C. remains unchanged

D. increases are decreases depends upon the weight of man

Answer: C

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7. A body of density d and volume V floats with volumes V of its total volume V immersed in a liquid of density d and the rest of the volume V_2 immersed in another liquid of density $d_2(< d_1)$. The volume V_1 immersed in liquid of density d_1 is

A. $\left(\frac{d-d_2}{d_1-d_2}\right)V$

B. $\left(\frac{d+d_2}{d_1+d_2}\right)V$

C. $\left(\frac{d_1-d_2}{d_1}\right)V$

D. $\frac{d_1}{d_2}V$

Answer: A

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8. When a loaded test tube floats vertically with $\frac{1}{3}$ and $\frac{1}{4}$ of the lengths inside two liquids, then the ratio of the densities of the two liquids is

A. $3:4$

B. $4:3$

C. $9:16$

D. $16:2$

Answer: A

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9. The density of ice xcm^{-3} and that of water is $ygcm^{-3}$. What is the change in volume when mg of ice melts?

A. $m(y-x)cm^3$

B. $\frac{y-x}{m}cm^3$

C. $mxy(x-y)cm^3$

D. $m\left(\left(\frac{1}{y}-\frac{1}{x}\right)cm^3.\right.$

Answer: D

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10. We have two different liquids A and B whose relative densities are 0.75 and 1.0, respectively. If we dip solid objects P and Q having relative densities 0.6 and 0.9 in these liquids, then

A. P floats in A and Q sinks in B

B. P sinks in A and Q floats in B

C. P floats in B and Q sinks in A

D. P sinks in B and Q floats in A

Answer: C

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11. The fraction of a floating object of volume V_0 and density d_0 above the surface of a liquid of density d will be

A. $\frac{d_0}{d}$

B. $\frac{dd_0}{d+d_0}$

C. $\frac{d-d_0}{d}$

D. $\frac{dd_0}{d-d_0}$

Answer: C

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12. A block of ice of area A and thickness $0.5m$ is floating in the fresh water. In order to just support a man of $100kg$. Find the area A. (the specific gravity of ice is 0.917 and density of water = 1000 kg//m^(3)`)

A. $2.41m^2$

B. $1.40m^2$

C. $0.75m^2$

D. None

Answer: A

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13. A cubical block of copper of side $10cm$ is floating in a vessel containing mercury. Water is poured into the vessel so that the copper block just gets submerged. The height of water column is

$(\rho_{Hg} = 13.6g/cc, \rho_{Cu} = 7.3g/cc, \rho_{water} = 1gm/cc)$

A. 1.25 cm

B. 2.5cm

C. 5cm

D. 7.5cm

Answer: C

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14. A beaker containing water with a total mass of $10kg$ is placed on the pan of a balance A . A solid body of mass $5kg$ and density $50g/cc$

suspended from a spring balance B is gently lowered in the water contained in the beaker. So that it gets fully immersed with out any contact with the beaker. Find the ratio of readings shown by the balance A and B.

A. $\frac{11}{4}$

B. $\frac{7}{4}$

C. $\frac{9}{4}$

D. None of these

Answer: A

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15. A necklace weighs $50g$ in air, but it weighs $46g$ in water. Assume that copper is mixed with gold to prepare the necklace. Find how much copper is present in it. (Specific gravity of gold is 20 and that of copper is 10.)

A. 10g

B. 20g

C. 30g

D. None

Answer: C

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16. A small ball of density r is immersed in a liquid of density $\sigma(> \rho)$ to a depth h and released. The height above the surface of water upto which the gall wall jump is

A. $\left(\frac{simga}{\rho} - 1\right)h$

B. $\left(\frac{\rho}{simga} - 1\right)h$

C. $\left(\frac{\rho}{simga} + 1\right)h$

D. $\left(\frac{simga}{\rho} + 1\right)h$

Answer: A

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17. For a fluid which is flowing steadily, the level in the vertical tubes is best represented by

A. (##A2Z_XI_C10_E01_197_O01##)

B. (##A2Z_XI_C10_E01_197_O02##)

C. (##A2Z_XI_C10_E01_197_O03##)

D. (##A2Z_XI_C10_E01_197_O04##)

Answer: A

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18. 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. $\frac{9}{4}$

B. $\frac{4}{9}$

C. $\frac{8}{9}$

D. $\frac{8}{3}$

Answer: C

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19. 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. 60kg

B. 62kg

C. 12kg

D. 128kg

Answer: A

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20. The flow of blood in a large artery of a anesthetized dog is diverted through a venturimeter. The wider part of the meter has a cross-sectional area equal to that of the artery A = $10mm^2$. The narrower part has an area a = $5mm^2$. The pressure drop in the artery is $22Pa$. Density of the blood is $1.06 \times 10^3 kgm^{-3}$. What is the speed of blood in the artery?

A. $0.12ms^{-1}$

B. $0.62ms^{-1}$

C. $0.24ms^{-1}$

D. $0.42ms^{-1}$

Answer: A

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21. There are two holes, each of cross-sectional area a, on the oppisite side of a wide rectangular tank containing a liquid of density ρ. When the

liquid flows out of the holes the net force on the tank is [h is the vertical distance between the two holes].

A. $2\alpha\rho gh$

B. $4\alpha\rho gh$

C. $0.5\alpha\rho gh$

D. $\alpha\rho gh$

Answer: A

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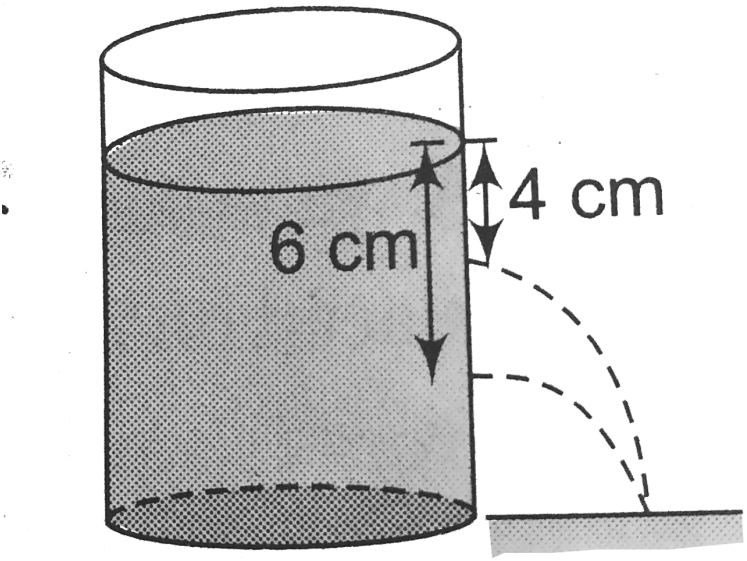
22. figure shows two holes in a wide tank containing a liquid common. The water streams coming out of these holes strike the ground at the

same point. The heigth of liquid column in the tank is



A. $10cm$

B. $8cm$

C. $9.8cm$

D. $980cm$

Answer: A

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23. A wide cylindrical tank with a small opening in the bottom has a water column of height h_1 and above the water column, there is a layer of kerosene oil of thickness h_2. The velocity of efflux through the opening is

A. $\sqrt{2gh_1}$

B. $\sqrt{2gh_2}$

C. $\sqrt{2g(h_1+h_2)}$

D. Data is not sufficient.

Answer: C

Watch Video Solution

24. A tank has a hole at its bottom. The time needed to empty the tank from level h_1 to h_2 will be proportional to

A. $h_1 - h_2$

B. $h_1 + h_2$

C. $\sqrt{h_1} - \sqrt{h_2}$

D. $\sqrt{h_1} + \sqrt{h_2}$

Answer: C

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25. A large open tank has two holes in the wall. One is a square hole of side L at a depth y from the top and the other is a circular hole of radius R at a depth 4y from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then, R is equal to

A. $2\pi L$

B. $\frac{L}{\sqrt{2\pi}}$

C. L

D. $\frac{L}{2\pi}$

Answer: B

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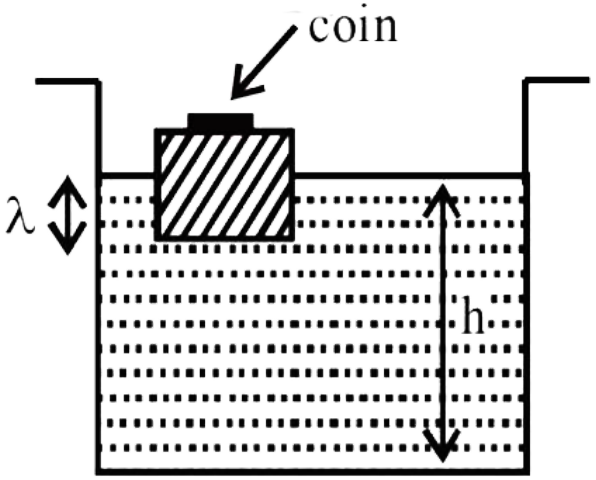
26. A wooden block, with a coin placed on its top, floats in water as shown in figure. The distance l and h are shown here. After some time the coin falls into water. Then



A. l decreases and h increases.

B. l increases and h decreases .

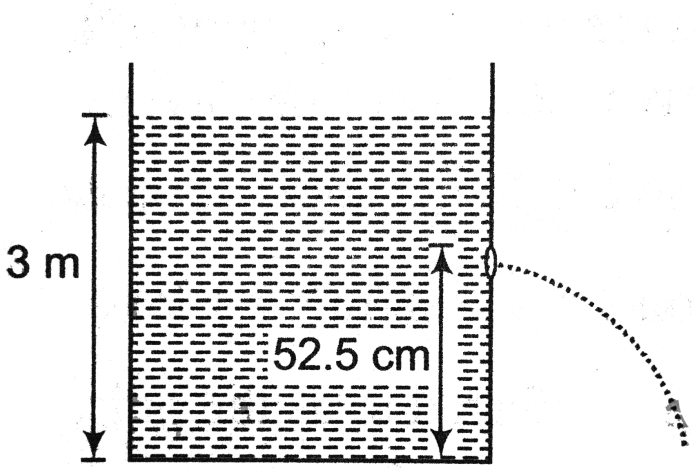
C. Both l and h increase.

D. Both l and h increase.

Answer: D

Watch Video Solution

27. Water is filled in a cylindrical container to a height of $3m$. The ratio of the cross-sectional area of the orifice and the beaker is 0.1. The square of the speed of the liquid coming out from the orifice is $\left(g = 10m/s^2\right)$.



A. $50m^2/s^2$

B. $50.5m^2/s^2$

C. $51m^2/s^2$

D. $52m^2/s^2$

Answer: A

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28. Assertion: If an object is submerged in fluid at rest, the fluid exerts a force on its surface.

Reason: The force exerted by the fluid at rest has to be parallel to the surface in contact with it.

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

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29. Assertion: Liquids and gases are largely incompressible and densities are therefore, nearly constant at all pressure.

Reason: Liquids exhibit a large variation in densities with pressure by gases do not.

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

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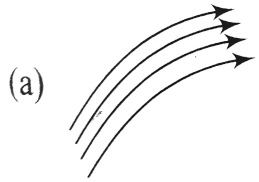
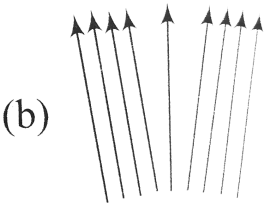
Others

1. Which of the following diagrams does not represent a streamline flow?

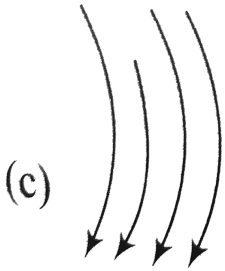
A.



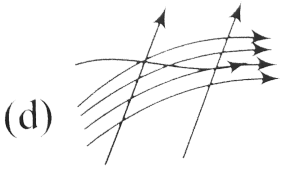
B.



C.



D.



Answer: D

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2. Along a streamline,

A. the velocity of a fluid particle remains constant

B. the velocity of all fluid particle crossing a given position is constant

C. the velocity of all fluid particles at a given instant is constant

D. the speed of a fluid particles remains constant

Answer: B

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3. Streamline flow is more likely for liquid with

A. high density and high viscosity

B. low density and low viscosity

C. high density and low viscosity

D. low density and high viscosity

Answer: D

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4. An ideal fluid through a pipe of circular cross-section made of two sections with diameters $2.5cm$ and $3.75cm$. The ratio of the velocities in the two pipes is

A. $9:4$

B. $3:2$

C. $\sqrt{3}:\sqrt{2}$

D. $\sqrt{2}:\sqrt{3}$

Answer: A

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5. The cylindrical tube of a spary pump has a cross-section of $6cm^2$ one of which has 50 holes each of diameter $1mm$. If the liquid flow inside the tube is $1.2m$ per minutes, then the speed of ejection of the liquid through the holes is

A. $2.1ms^{-1}$

B. $0.31ms^{-1}$

C. $0.96ms^{-1}$

D. $3.4ms^{-1}$

Answer: B

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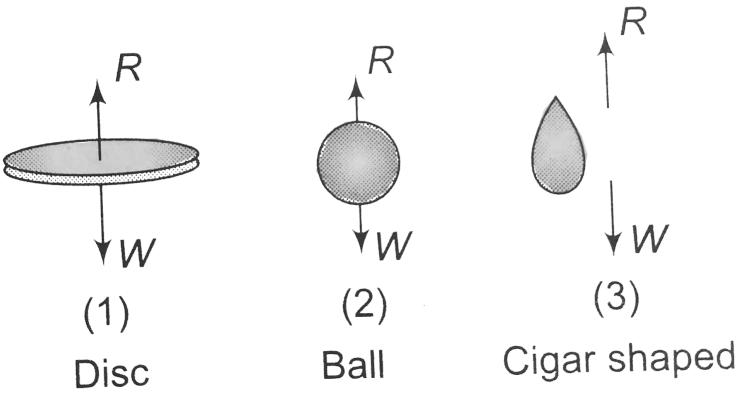
6. When a body falls in air, the resistance of air depends to a great extent on the shape of the body, 3 different shapes are gives. Identify the

combination of air resistances which truly represents the physical situation. (the cross sectional areas are the same).



A. 1<2< 3

B. 2<3<1

C. 3<2<1

D. 3<1<2

Answer: C

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7. The pressure energy per unit volume of a liquid is

A. $\frac{P}{\rho}$

B. P

C. $P \times \rho$

D. $\frac{\rho}{P}$

Answer: B

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8. If air is blown under one of the pans of a phusical balance in equilbrium, then the pan will

A. not be disturbed

B. go up

C. go down

D. becomes vertical

Answer: C

Watch Video Solution

9. What is the pressure energy of a liquid of mass m and density ρ?

A. $\frac{Pm}{\rho}$

B. $\frac{P}{\rho}$

C. $\frac{m}{\rho}$

D. $Pm\rho$

Answer: A

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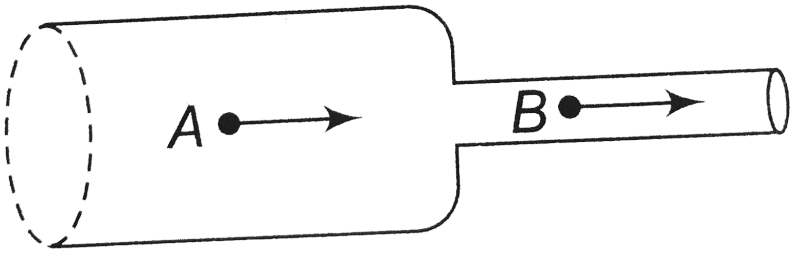
10. Water is flowing in streamline motion in the tube shown in fig. pressure is



A. more at A then that at B

B. equal to A and at B

C. lesser at A then that at B

D. normal at A and B

Answer: A

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11. In old age, arteries carrying blood in the human body become narrow resulting in an increase in the blood pressure, this follows from

A. Pascal's law

B. Stokes' law

C. Bernoulli's principle

D. Archimedes' principle

Answer: C

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12. If two ping-pong balls are suspended near each other and a fast stream of air is produced in the space between the balls, then the ball

A. come closer

B. move farther

C. remain in original position

D. fall down.

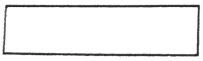
Answer: A

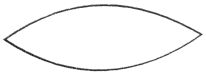
Watch Video Solution

13. The vertical sections of the wing of a fan are shown. Maximum upthrust is in

A. 

B. 

C. 

D. 

Answer: A

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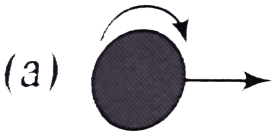
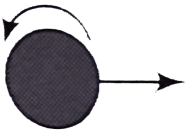
14. To get the maximum flight a ball must be thrown as :

A. 

B. 

C. 

D.

Answer: B

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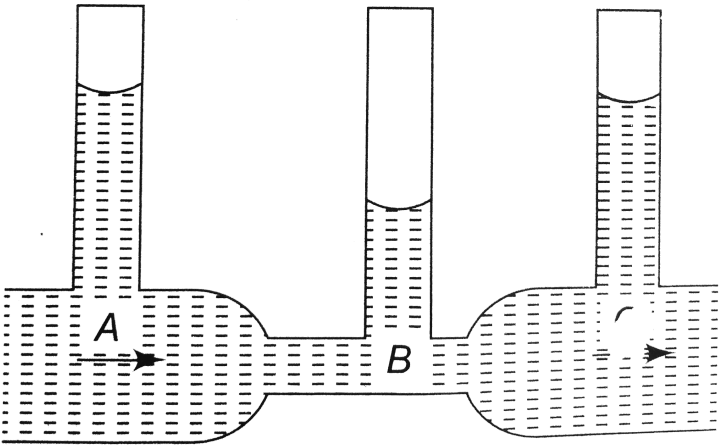
15. In the following fig., the flow of liquid through a horizontal pipe is shown. Three tubes A, B and C are connected to the pipe. The radii of the tubes A, B and C at the junction are respectively $2cm, 1cm$ and $2cm$.

It can be said that the



A. Height of the liquid in the tube A is maximum

B. Height of the liquid in the tubes A and B is the same

C. Height of the liquid in all the three tubes is the same

D. Height of the liquid in the tubes A and C is the same

Answer: D

Watch Video Solution

16. When a tap is closed, the manometer attached to the pipe reads $3.5 \times 10^5 Nm^{-2}$. When the tap is opened, the reading of manometer falls to $3.0 \times 10^5 Nm^{-2}$. The velocity of water in the pipe is

A. $100m/s$

B. $10m/s$

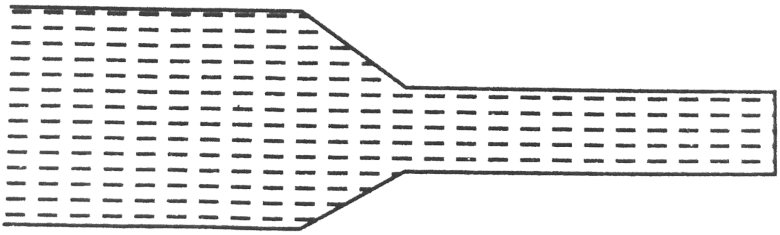
C. $1m/s$

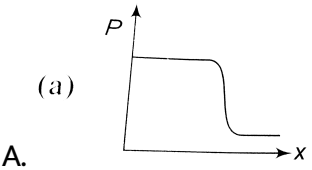
D. $10\sqrt{10}m/s$

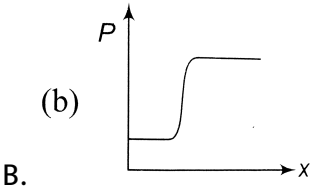
Answer: B

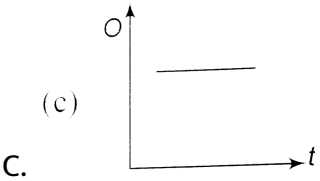
Watch Video Solution

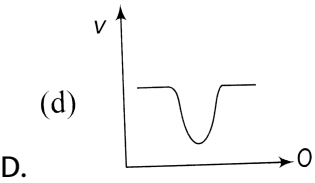
17. Water flows through a frictionless duct with a cross-section varying as shown in fig. Pressure P at points along the axis is represented by



A. 

B. 

C. 

D. 

Answer: A

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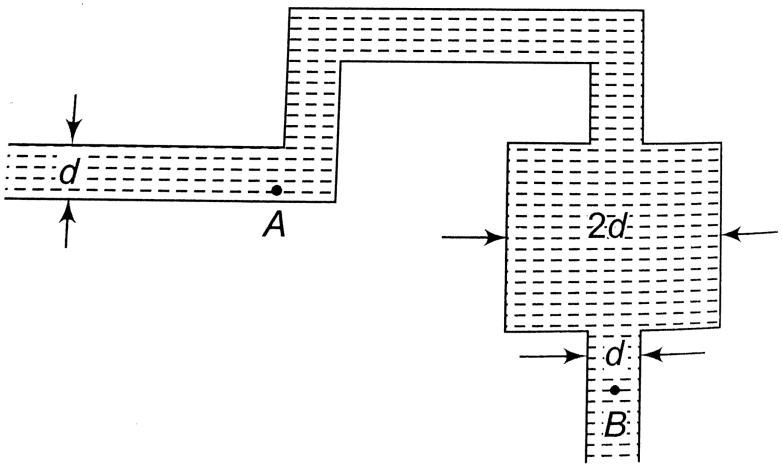
18. An ideal fluid is flowing through the given tubes which is placed on a horizontal surface. If the liquid has velocities V_A and V_B and pressure P_A and P_B at point A and B respectively, then the correct relation is (A and B are at same height from ground level. the figure shown is as in the system is seen from the top):



A. $V_A > V_B, P_A < P_B$

B. $V_A < V_B, P_A > P_B$

C. $V_A = V_B, P_A = P_B$

D. $V_A > V_B, P_A = P_B$

Answer: C

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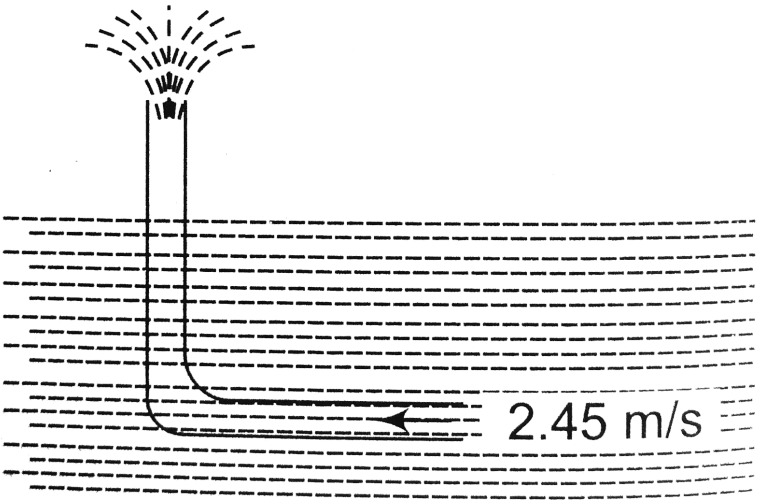
19. An L-shaped tube with a small orifice is held in a water stream as shown in fig. The upper end of the tube is $10.6cm$ above the surface of water. What will be the height of the jet of water coming from the orifice? (Velocity water steam is $2.45m/s$)



A. Zero

B. $20.8cm$

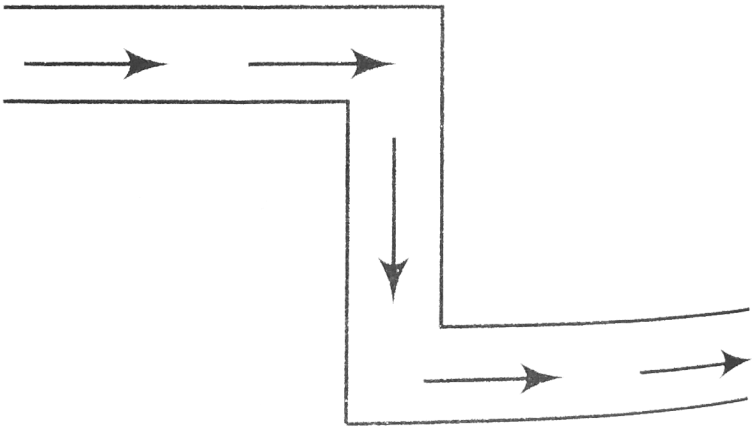
C. $10.6cm$

D. $40.0cm$

Answer: B

Watch Video Solution

20. The tube shown in figure is of unifrom corss-section. Liquid flows through it at a constant speed in the direction shown by arrows. Then the liquid exerts on the tube is:



A. a net force to the right

B. a net force to the left

C. a clockwise torque

D. an anticlockwise torque

Answer: C

Watch Video Solution

21. Water from a tap emerges vertically downwards with an initial velocity V_0. Assume pressure is constant throughout the stream of water and the flow is steady. Find the distance form the tap at which cross-sectional area of stream is half of the cross-sectional area of stream at the tap.

A. $V_0^2/2g$

B. $3V_0^2/2g$

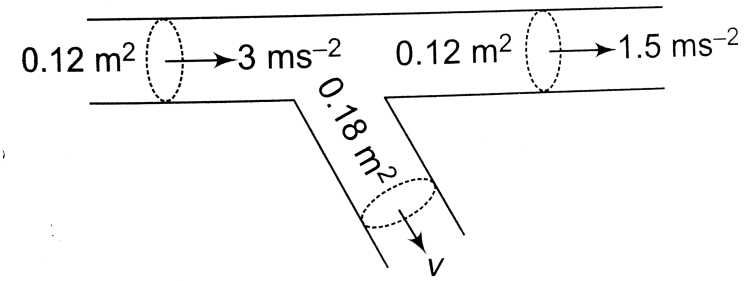
C. $2V_0^2/2g$

D. $5V_0^2/2g$

Answer: B

Watch Video Solution

22. An incompressible liquid travels as shown in fig. The speed of the liquid branch will be



A. $1ms^{-1}$

B. $1.5ms^{-1}$

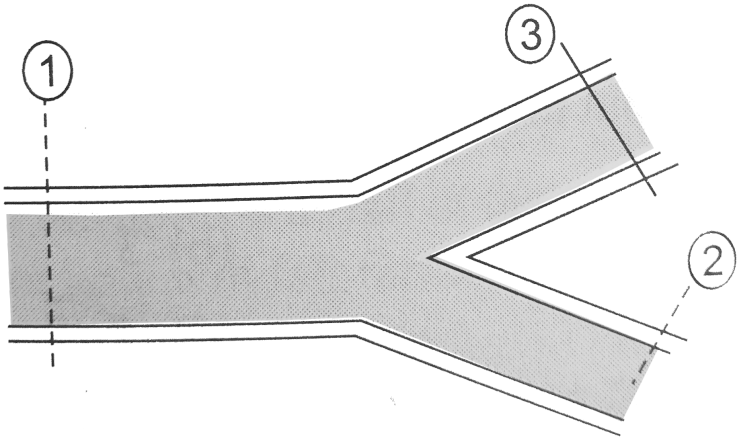
C. $2.25ms^{-1}$

D. $3ms^{-1}$

Answer: A

Watch Video Solution

23. A broad pipe having a radius $10cm$ branches into two pipes of radii, $5cm$ and $3cm$. If the velocity of flowing water in the pipe of radius $3cm$ be $5cm/s$, determine the velocities of water in the remaining two pipes. Given that the rate of discharge through the main branch, is $600\pi cm^3/s$



A. $v_1 = 6cm/s$ and $v_2 = 22.2cm/s$

B. $v_1 = 4cm/s$ and $v_2 = 12.2cm/s$

C. $v_1 = 4cm/s$ and $v_2 = 12.2cm/s$

D. None of these

Answer: A

Watch Video Solution

24. Consider ideal flow of water through a pipe with its axis horizontal. A and B are the two point in the pipe at the same horizontal level (A lies on the upstream), then

A. The pressure at A and B are equal for any shapes of the pipe

B. the pressure are never equal

C. The pressures are equal if the pipe has a uniform cross-section

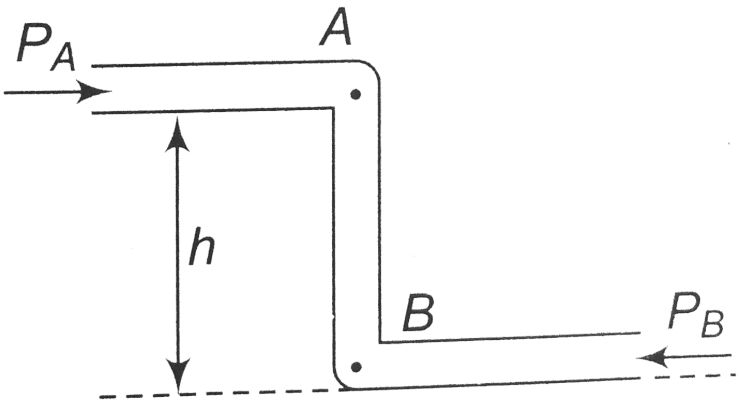
D. the pressure at A is always more than that at B.

Answer: C

Watch Video Solution

25. Figure shows an ideal fluid flowing through a uniform cross-sectional tube in the vertical tube with liquid velocities v_A and v_B and pressure P_A and P_B. Knowing that offers no resistance to fluid flow then which of the

following is true.



A. $P_A < P_B$

B. $P_B < P_A$

C. $P_A = P_B$

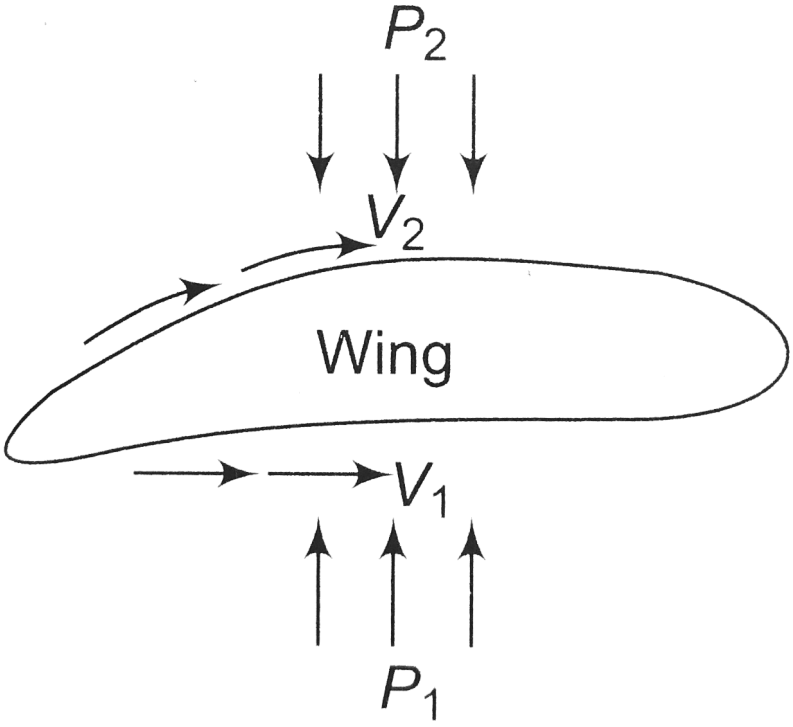
D. none of these

Answer: A

Watch Video Solution

26. The speed of flow past the lower surface of a wing of an aeroplane is $50ms^{-1}$. What speed of flow over the upper surface will give a dynamic

lift of $1000Pa$? Density of air $= 1.3kgm^{-3}$



A. $25.55m/s$

B. $63.55m/s$

C. $13.25m/s$

D. None of these

Answer: B

Watch Video Solution

27. A manometer connected to a closed tap reads $3.5 \times 10^5 N/m^2$.When the valve is opened, the reading of manometer falls to $3.0 \times 10^5 N/m^2$, then velocity of flow of water is

A. $100 m/s$

B. $10 m/s$

C. $1 m/s$

D. $10\sqrt{10} m/s$

Answer: B

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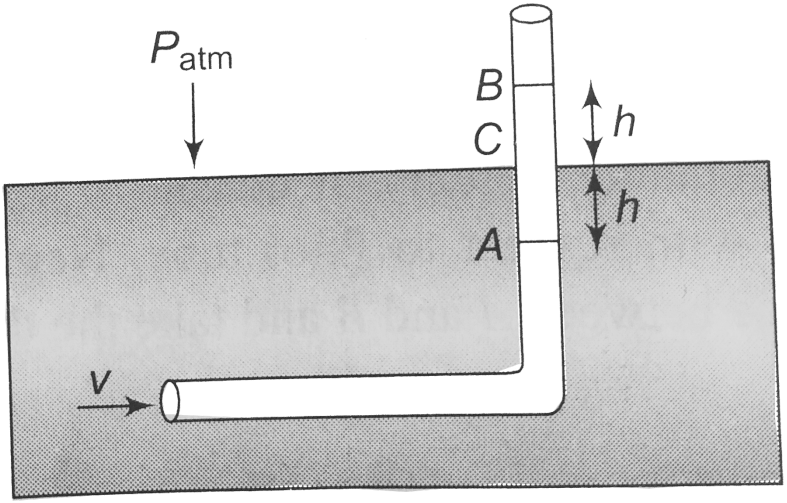
28. An L-shaped glass tube is immersed in a flowing liquid such that its opening is pointing against the currents. If the speed of flow is v



Study following statement:

(i) the liquid in the tube rises to a level A

(ii) The liquid in the tube rises to the level B

(iii) The liquid in the tube rises to the level C

(iv) The magnitude of h is $\frac{v^2}{2g}$

Choose the correct statement (s)

A. (i) & (ii)

B. (ii) & (iv)

C. (iii) & (iv)

D. (i) & (iii)

Answer: B

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29. A horizontal pipeline carries water in a streamline flow. At a point along the pipe, where the cross- sectional area is $10cm^2$, the water velocity is $1ms^{-1}$ and the pressure is 2000 Pa. The pressure of water at another point where the cross-sectional area is $5cm^2$, is.....Pa. (Density of water $= 10^3 kg.\, m^{-3}$)

A. $200Pa$

B. $400Pa$

C. $500Pa$

D. $800Pa$

Answer: C

Watch Video Solution

30. A long cylindrical tank of radius $1m$ is being filled by a pipe of radius $2cm$. The incoming water has a velocity of $1m/s$ and pressure is $2000Pa$. The pressure of water at another point where the cross-sectional area is $5cm^2$ is

A. $0.4m$

B. $0.6m$

C. $0.8m$

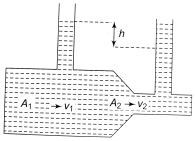
D. the level will continue to increase

Answer: C

Watch Video Solution

31. A liquid flows through a horizontal tube as shown in figure. The velocities of the liquid in the two sections, which have areas of cross-section A_1 and A_2 and v_1 and v_2 respectively. The difference in the levels

of the liquid in the two vertical tubes is h, then



A. $v_2^2 - v_1^2 = 2gh$

B. $v_2^2 + v_1^2 = 2gh$

C. $v_2^2 - v_1^2 = gh$

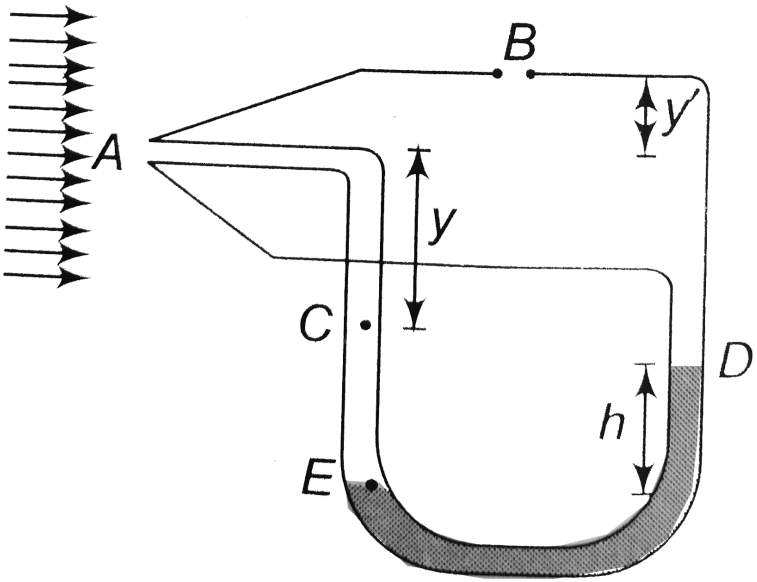
D. $v_2^2 + v_1^2 = gh$

Answer: A

Watch Video Solution

32. A Pitot tube is shown in figure. Wind blows in the direction shown. Air at inlet A is brought to rest, whereas its speed just outside of opening B is unchanged. The U tube contains mercury of density ρ_m. Find the speed of wind respect to Pitot tube. Neglect the height difference between A

and B and take the density of air as ρ_a.



A. $\sqrt{\left(2\frac{(\rho_m+\rho_a)gh}{\rho_a}\right)}$

B. $\sqrt{\left(2\frac{(\rho_m-\rho_a)gh}{\rho_a}\right)}$

C. $\sqrt{\frac{(\rho_m-\rho_a)gh}{\rho_a}}$

D. $\sqrt{\frac{(\rho_m+\rho_a)gh}{\rho_a}}$

Answer: B

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33. A large tank is filled with water to a height H. A small hole is made at the base of the tank. It takes T_1 time to decrease the height of water to $\frac{H}{\eta}(\eta > 1)$, and it takes T_2 time to take out the rest of water. If $T_1 = T_2$, then the value of η is

A. 2

B. 3

C. 4

D. $2\sqrt{2}$

Answer: C

Watch Video Solution

34. There is a small hole at the bottom of tank filled with water. If total pressure at the bottom is $3atm\left(1atm = 10^5 Nm^{-2}\right)$, then find the velocity of water flowing from hole.

A. $\sqrt{400}m/s$

B. $\sqrt{600}m/s$

C. $\sqrt{60}m/s$

D. None of these

Answer: A

Watch Video Solution

35. A cylindrical tank has a hole of $1cm^2$ in its bottom. If the water is allowed to flow into the tank from a tube above it at the rate of $70cm^3/\sec$, then the maximum height up to which water can rise in the tank is

A. 2.5 cm

B. 5cm

C. 10cm

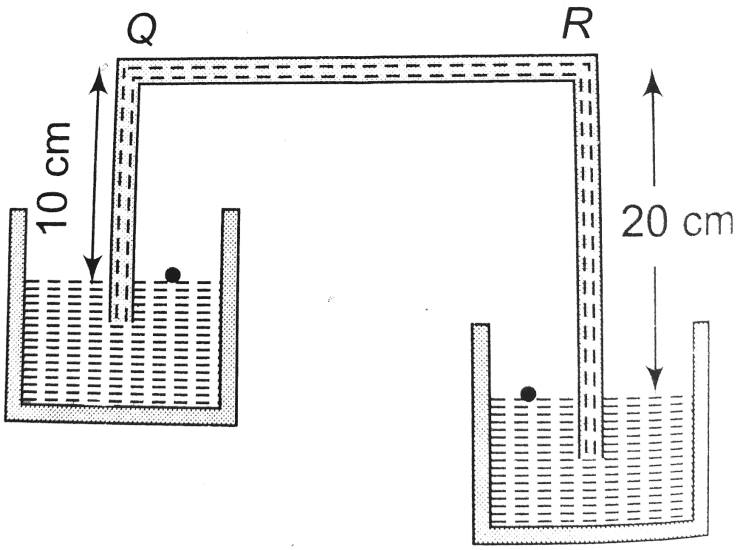
D. 0.25cm

Answer: A

Watch Video Solution

36. A siphon in use is demostrated in the following in siphon is $1.5gm/cc.$

The pressure differece between the point P and S will be



A. $10^5 N/m$

B. $2 \times 10^5 N/m$

C. zero

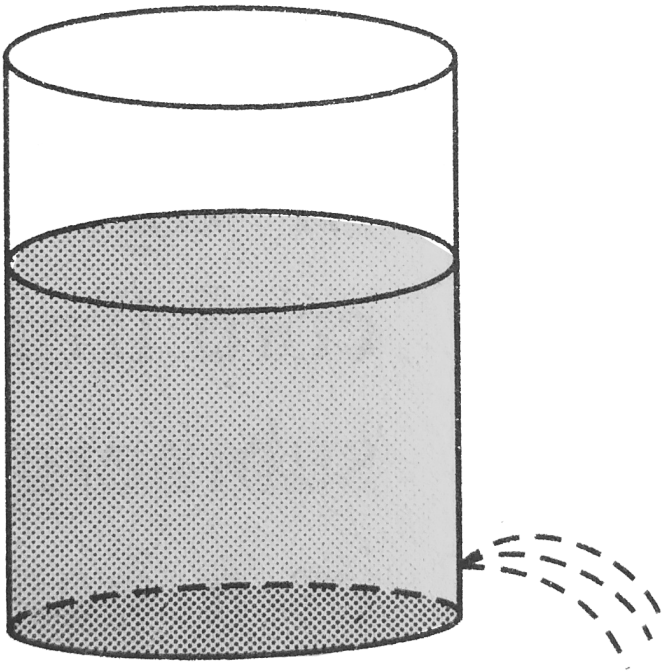
D. Infinity

Answer: C

Watch Video Solution

37. When a hole is made in the side of a container holding water, water flows out and follows a parabolic trajectory. If a hole is made in the side of the container and the container is dropped in free fall (just before the water starts coming out), the water flow (Neglect effect of surface

tension)



A. diminishes

B. stops altogether

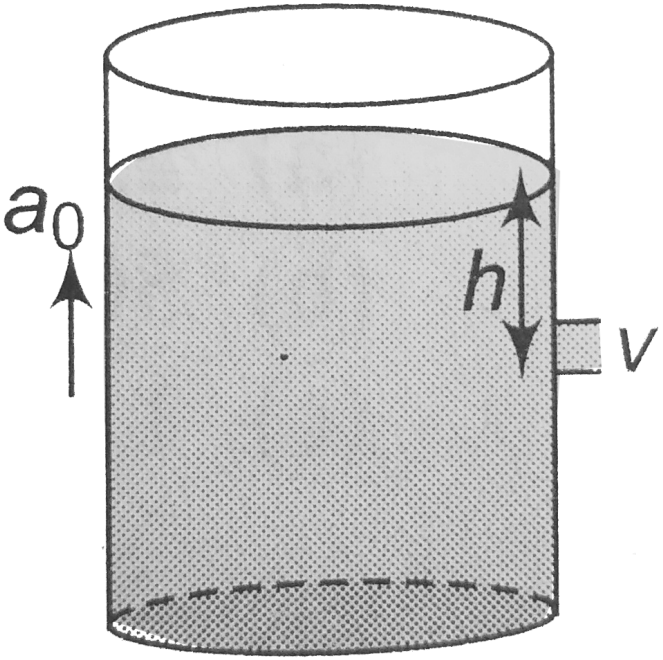
C. goes out in a straight line.

D. Curves upward.

Answer: B

Watch Video Solution

38. For the area a of the hole is much lesser than the area of the base of a vessel of liquid, velocity of efflux v of the liquid in an accelerating vessel is :



A. $\sqrt{2gh}$

B. $\sqrt{2|g-a_0|h}$

C. $\sqrt{2(g+a_0)h}$

D. None of these

Answer: C

Watch Video Solution

39. A water tank of height $10m$, completely filled with water is placed on a level ground. It has two holes one at $3m$ and the other at $7m$ form its base. The water ejecting from

A. both the holes will fall at the same spot

B. upper hole will fall farther than that form the lower hole

C. upper hole will fall closer than that form the lower hole

D. more information is required.

Answer: A

Watch Video Solution

40. Two holes are made in the side of the tank such that the jets of water flowing out of them meet at the same point on the ground. If one hole is at a height of $3cm$ above the bottom, then the distance of the other holes from the top surface of water is

A. $\frac{3}{2}cm$

B. $\sqrt{6}cm$

C. $\sqrt{3}cm$

D. $3cm$

Answer: D

Watch Video Solution

41. There is a small hole at the bottom of tank filled with water. If total pressure at the bottom is $3atm\left(1atm = 10^5 Nm^{-2}\right)$, then find the velocity of water flowing from hole.

A. $20ms^{-1}$

B. $10\sqrt{2}ms^{-1}$

C. $10\sqrt{6}ms^{-1}$

D. $10\sqrt{5}ms^{-1}$

Answer: A

Watch Video Solution

42. A liquid of density $800kgm^{-3}$ is filled in a tank open at the top. The pressure of the liquid, at the bottom of the tank is 6.4 atmospheres. The velocity of efflux through a hole at the bottom is ($1atmosphere = 10^5 Nm^{-2}$)

A. $10ms^{-1}$

B. $20ms^{-1}$

C. $30ms^{-1}$

D. $40ms^{-1}$

Answer: D

Watch Video Solution

43. There is a small hole at the bottom of tank filled with water. If total pressure at the bottom is $3atm\left(1atm = 10^5 Nm^{-2}\right)$, then find the velocity of water flowing from hole.

A. $\sqrt{400}m/s$

B. $\sqrt{600}m/s$

C. $\sqrt{60}m/s$

D. None of these

Answer: B

Watch Video Solution

44. A cylindrical tank has a holes of $3cm^2$ in its bottom. If the water is allowed to flow into the tank form a tube above it at the rate of $80cm^3/\sec$. Then the maximum height up to which water can rise in the tank is

A. $1.1cm$

B. $5cm$

C. $10cm$

D. $0.25cm$

Answer: A

Watch Video Solution

45. A water barrel stands on a table of height h. If a small hole is punched in the side of the barrel at its base, it is found that the resultant stream of water strikes the ground at a horizontal distance R from the table. What is the depth of water in the barrel?

A. $\frac{R^2}{h}$

B. $\frac{R^2}{2h}$

C. $\frac{R^2}{4h}$

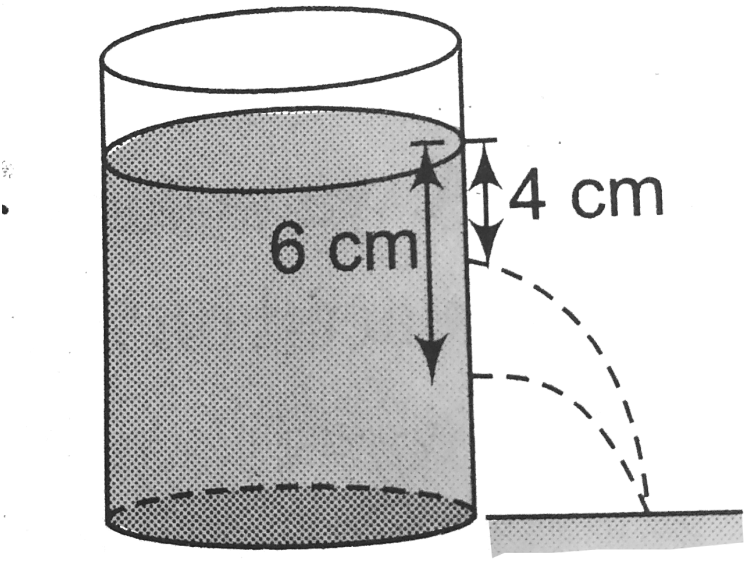
D. $\frac{4R^2}{h}$

Answer: C

Watch Video Solution

46. figure shows two holes in a wide tank containing a liquid common. The water streams coming out of these holes strike the ground at the

same point. The heigth of liquid column in the tank is



A. $10cm$

B. $8cm$

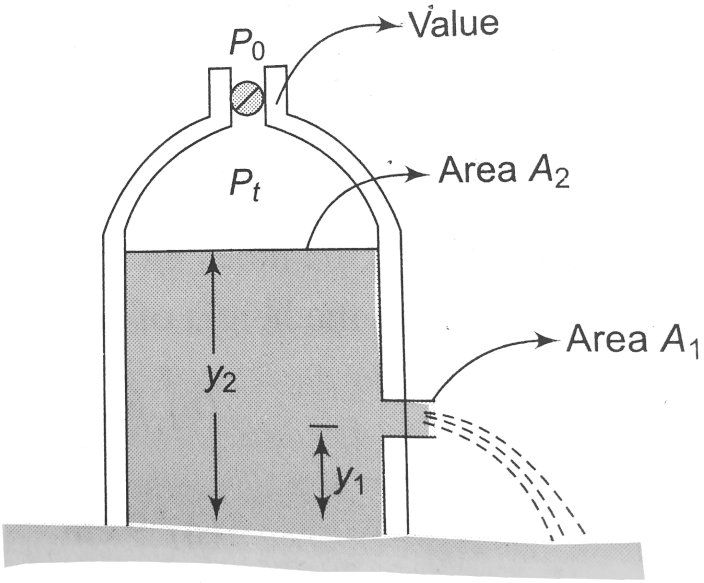
C. $9.8cm$

D. $980cm$

Answer: A

Watch Video Solution

47. A tank has a small hole on its side at a height y_1. It is filled with a liquid (density ρ) to a height y_2. If the absolute pressure at the top of the fluid is P_t, find the velocity with which it leaves the tank. Assume that the cross-sectional area of the tank is larger as compared to that of the hole.



A. $\sqrt{\dfrac{2(P_t - P_0)}{\rho} + 2g(y_2 - y_1)}$

B. $\sqrt{\dfrac{P_t - P_0}{\rho} + 2g(y_2 - y_1)}$

C. $\sqrt{\dfrac{P_t - P_0}{\rho} - 2g(y_2 - y_1)}$

D. $\sqrt{\dfrac{2P_t}{\rho} + 2g(y_2 - y_1)}$

Answer: A

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48. A large open tank has two holes in the wall. One is a square hole of side L at a depth y from the top and the other is a circular hole of radius R at a depth 4y from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then, R is equal to

A. $\frac{L}{\sqrt{2\pi}}$

B. $2\pi L$

C. $\sqrt{\frac{2}{\pi} \cdot L}$

D. $\frac{L}{2\pi}$

Answer: C

Watch Video Solution

49. A water tank of height H, completely filled with water is placed on a level ground. It has two holes one at a depth h from top and the other at height h form its base. The water ejecting from

A. both the holes will fall at the same spot

B. upper hole will fall farther than that form the lower hole

C. upper hole will fall closer than that form the lower hole

D. more information is required.

Answer: A

Watch Video Solution

50. A water tank placed on the floor has two small holes, pinched in the vertical wall, one above the other. The holes are $3.3cm$ and $4.7cm$ above the floor. If the jets of water issuing out from the holes hit the floor at the same point on the floor, then the height of water in the tank is

A. 3cm

B. 6cm

C. 8cm

D. 9cm

Answer: C

Watch Video Solution

51. There is a hole of area $\frac{1}{25}cm^2$ in the bottom of a cylindrical vessel containing fluid up to height h. The liquid flows out in time t. If the liquid were filled in the vessel up to height $4h$, then it would flow out in time

A. t

B. 2t

C. 4t

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

Answer: B

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