PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT

1960 PHYSICS (HINGLISH)

FLUID MECHANICS

Pressure And Density

1. 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. $10m$

B. $20m$

C. $60m$

D. $30m$

Answer: B

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2. 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

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3. An inverted bell lying at the bottom of a lake $47.6m$ deep has $50cm^3$ of air trapped in it. The bell is brought to the surface of the lake. The volume of the trapped air will be (atmospheric pressure $= 70cm$ of Hg and density of $Hg = 13.6g/cm^3$).

A. $350cm$

B. $300cm$

C. $250cm$

D. $22cm$

Answer: B

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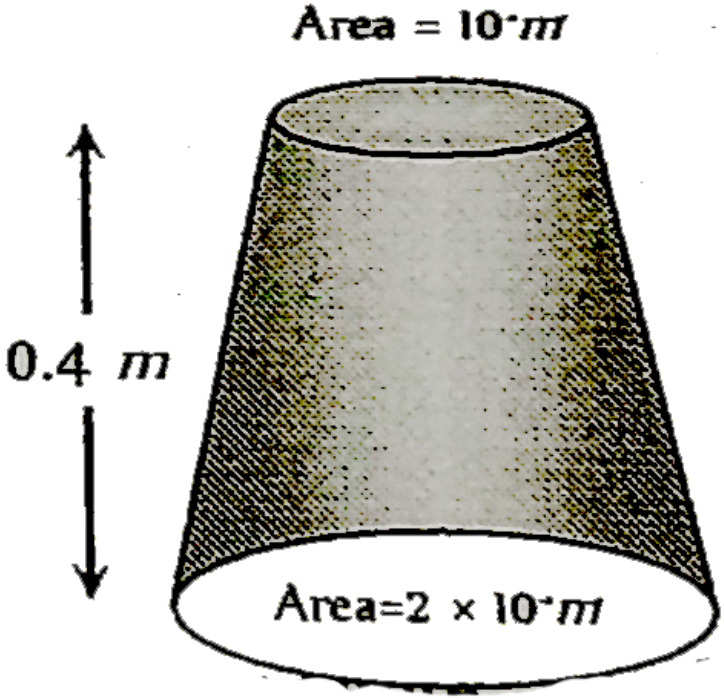
4. A uniformly tapering vessel is filled with a liquid of density $900kg/m$. The force that acts on the base of the vessel due to the liquid is $(g = 10ms^{-2})$(upper area=$10^{-3}m^2$,lower

area $= 2 \times 10^{-3} m^2$)



A. $3.6N$

B. $7.2N$

C. $9.0N$

D. $14.4N$

Answer: B

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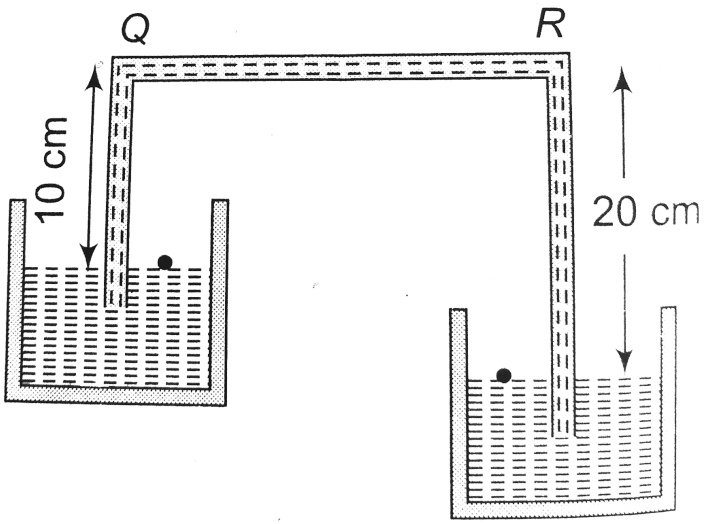
5. A siphon in use is demonstrated in the following in siphon is $1.5gm/cc$. The pressure

difference between the point P and S will be



A. $10Nm$

B. $2 \times 10Nm$

C. Zero

D. Infinity

Answer: C

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6. The height of a mercury barometer is 75 cm at sea level and 50 cm at the top of a hill. Ratio of density of mercury to that of air is 10. The height of the hill is

A. $250m$

B. $2.5km$

C. $1.25km$

D. $750km$

Answer: B

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

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

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

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

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

Answer: C

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8. Equal masses of water and a liquid of density $2g/(cm)^3$ are mixed together. The density of mixture is:

A. $2/3$

B. $4/3$

C. $3/2$

D. 3

Answer: B

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

A. M

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

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

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

Answer: D

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10. The pressure at the bottom of a tank containing a liquid does not depend on

A. Acceleration due to gravity

B. Height of the liquid column

C. Area of the bottom surface

D. Nature of the liquid

Answer: C

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11. When a large bubble rises from the bottom of a lake to the surface its radius doubles. If atmospheric pressure is equal to that of

column of water height H then the depth of lake is

A. H

B. $2H$

C. $7H$

D. $8H$

Answer: C

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12. The volume of an air bubble becomes three times as it rises from the bottom of a lake to its surface. Assuming atmospheric pressure to be 75 cm of Hg and the density of water to be $1/10$ of the density of mercury, the depth of the lake is

A. $5m$

B. $10m$

C. $15m$

D. $20m$

Answer: C

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13. The value of g at a place decreases by 2%.

The barometric height of mercury

A. Increases by 2%

B. Decreases by 2%

C. Remains unchanged

D. Sometimes increases and sometimes decreases

Answer: A

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14. A barometer kept in a stationary elevator reads $76cm$. If the element starts accelerating up the reading will be

A. Zero

B. Equal to $76cm$

C. More than $76cm$

D. Less than $76cm$

Answer: D

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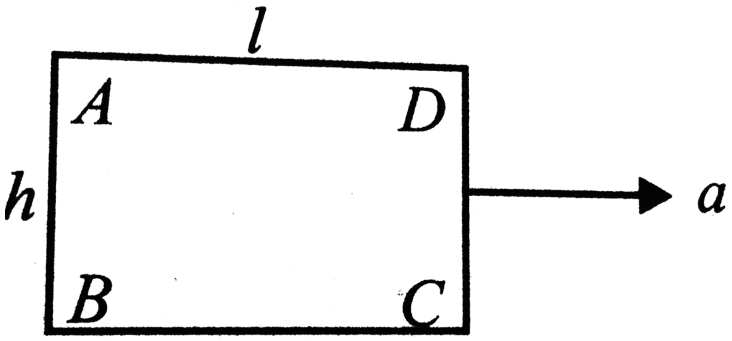
15. A closed rectangular tank is completely filled with water and is accelerated horizontally with an acceleration towards the right. Pressure is i. maximum and ii. minimum

at



A. (i) B (ii) D

B. (i) C and (ii) D

C. (i) B (ii) C

D. (i) B (ii) A

Answer: A

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16. A beaker containing a liquid is kept inside a big closed jar. If the air inside the jar is continuously pumped out, the pressure in the liquid near the bottom of the liquid will

A. Increases

B. Decreases

C. Remains constant

D. First decrease and then increase

Answer: B

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17. A barometer tube reads 76 cm of mercury. If the tube is gradually inclined at an angle of 60° with vertical, keeping the open end immersed in the mercury reservoir, the length of the mercury column will be

A. $152cm$

B. $76cm$

C. $38cm$

D. $38\sqrt{3}cm$

Answer: A

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18. The height to which a cylindrical vessel be filled with a homogenous liquid, to make the average force with which the liquid presses the side of the vessel equal to the force exerted by the liquid on the bottom of the vessel, is equal to.

A. Half of the radius of the vessel

B. Radius of the vessel

C. One-fourth of the radius of the vessel

D. Three-fourth of the radius of the vessel

Answer: B

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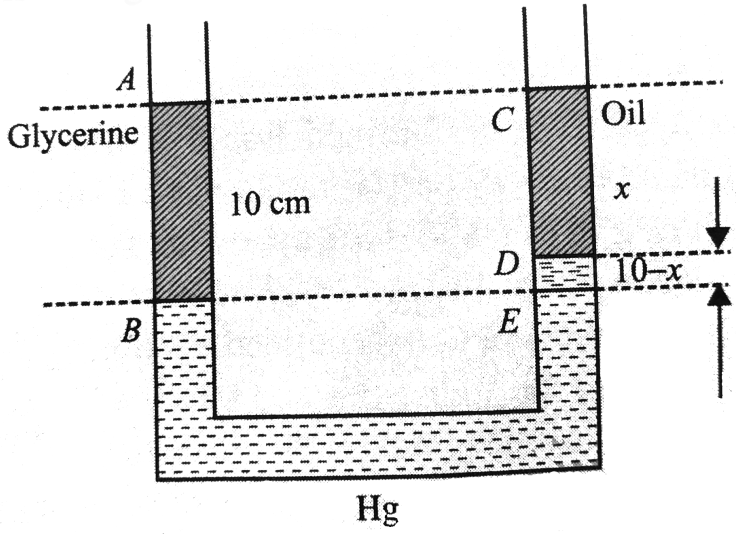
19. A vertical U tube of uniform cross section contains mercury in both of its arms. A glycerine $\left(d = 1.3g/cm^3\right)$ column of length

$10cm$ 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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20. A triangular lamina of area A and height h is immersed in a liquid of density ρ in a vertical plane with its base on the surface of the liquid. The thrust on the lamina is.

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

B. $\frac{1}{3}A\rho gh$

C. $\frac{1}{6}A\rho gh$

D. $\frac{2}{3}A\rho gh$

Answer: B

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

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

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

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

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

Answer: C

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

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

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

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

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

Answer: A

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23. The density ρ of water of buk modulus B at a depth y then ocean is related to the density at surface ρ_0 by the relation

A. $\rho = \rho_0\left[1 - \frac{\rho_0 gy}{B}\right]$

B. $\rho = \rho_0\left[1 + \frac{\rho_0 gy}{B}\right]$

C. $\rho = \rho_0\left[1 + \frac{B}{\rho_0 hgy}\right]$

D. $\rho = \rho_0\left[1 - \frac{B}{\rho_0 gy}\right]$

Answer: B

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24. With rise in temperature, density of a given body changes according to one of the following relations

A. $\rho = \rho_0[1 + \gamma d\theta]$

B. $\rho = \rho_0[1 - \gamma d\theta]$

C. $\rho = \rho_0 \gamma d\theta$

D. $\rho = \rho_0 / \gamma d\theta$

Answer: B

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25. Three liquids of densities d, $2d$, and $3d$ are mixed in equal volumes. Then the density of the mixture is

A. d

B. $2d$

C. $3d$

D. $5d$

Answer: B

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26. Three liquids of densities d, $2d$, and $3d$ are mixed in equal proportions of weights. The relative density of the mixture is

A. $\frac{11d}{7}$

B. $\frac{18d}{11}$

C. $\frac{13d}{9}$

D. $\frac{23d}{18}$

Answer: B

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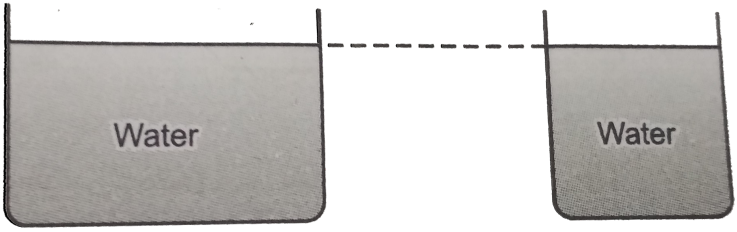

Tank I Tank II

27.

the correct observation is:

A. The pressure on the bottom of tank (a) is greater than at the bottom of (b).

B. The pressure on the bottom of the tank (a) is smaller than at the bottom of (b)

C. The pressure depend on the shape of the container

D. The pressure on the botton of (a) and (b) is the same

Answer: D

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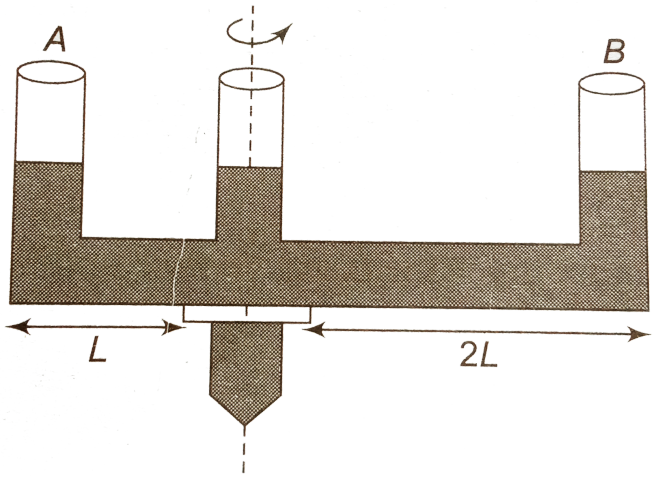
28. A given shaped glass tube having uniform cross-section is filled with water and is mounted on a rotatable shaft as shown in figure. If the tube is rotated with a constant

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 it goes up

D. Water levels remains same in both sections

Answer: A

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29. Why is the dam of water reservoir thick at the bottom?

A. Quantity of water increases with depth

B. Density of water increases with depth

C. Pressure of water increases with depth

D. Temperature of water increases with depth

Answer: C

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30. Air is blown through a hole on a closed pipe containing liquid. Then the pressure will

A. Increase on sides

B. Increase downwards

C. Increase in all directions

D. Never increases

Answer: C

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31. Radius of an air bubble at the bottom of the lake is r and it becomes $2r$ when the air bubbles rises to the top surface of the lake. If P cm of water be the atmospheric pressure, then the depth of the lake is

A. $2P$

B. $8P$

C. $4P$

D. $7P$

Answer: D

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Pascal S Law And Archmidies Principle

1. 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

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2. A log of wood of mass 120 Kg floats in water. The weight that can be put on the raft to make it just sink, should be (density of wood $= 600Kg/m$)

A. $80Kg$

B. $50Kg$

C. $60Kg$

D. $30Kg$

Answer: A

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3. 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

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4. In making an alloy, a substance of specific gravity s_1 and mass m_1 is mixed with another substance of specific gravity of the alloy is

A. $\left(\frac{m_1 + m_2}{s_1 + s_2}\right)$

B. $\left(\frac{s_1 s_2}{m_1 + m_2}\right)$

C. $\frac{m_1 + m_2}{\left(\frac{m_1}{s_1} + \frac{m_2}{s_2}\right)}$

D. $\frac{\left(\frac{m_1}{s_1} + \frac{m_2}{s_2}\right)}{m_1 + m_2}$

Answer: C

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5. 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

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

A. $5 \times 5 \times 5 \times 5gf$

B. $4 \times 4 \times 4 \times 4gf$

C. $5 \times 4 \times 4 \times 4gf$

D. $4 \times 5 \times 5 \times 5gf$

Answer: D

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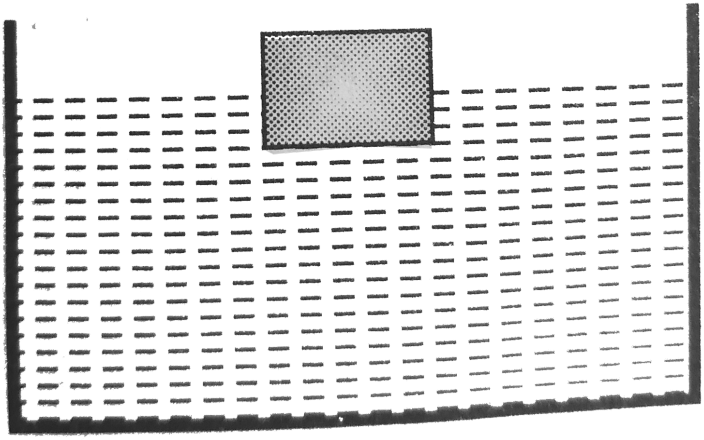
7. A cubical block is floating in a liquid with half of its volume immersed in the liquid. When the whole system accelerates upwards with acceleration of $g/3$, the fraction of

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

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8. A silver ingot weighing 2.1 kg is held by a string so s to be completely immersed in a liquid of relative density 0.8. The relative density of silver is 0.5. The tension in the string in $kg - wt$ is

A. 1.6

B. 1.94

C. 3.1

D. 5.25

Answer: B

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9. A sample of metal weights 210 grams in air 180 grams n water and 120 grams in an unknown liquid then

A. Metal is 3

B. Metal is 7

C. Liquid is 3

D. Liquid is $\frac{1}{3}$

Answer: B::C

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10. 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. $2:3$

C. $3:4$

D. $1:3$

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. Pressure applied to an enclosed fluid is transmitted undiminished to every portion of

the fluid and the walls of the containing vessel. This law was first formulated by

A. Bernoulli

B. Archimedes

C. Boyle

D. Pascal

Answer: D

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13. A block of steel of size $5cm \times 5cm \times 5cm$ is weighed in water. If the relative density of steel is 7. its apparent weight is:

A. $6 \times 5 \times 5 \times 5gf$

B. $4 \times 4 \times 4 \times 7gf$

C. $5 \times 5 \times 5 \times 7gf$

D. $4 \times 4 \times 4 \times 6gf$

Answer: A

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

A. It will slowly come back to its earlier position

B. It will remain submerged, where it is left

C. It will sink

D. It will come out violently

Answer: B

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15. A cork is submerged in water by a spring attached to the bottom of a bowl. When the bowl is kept in an elevator moving with acceleration downwards, the length of spring.

A. Increases

B. Decreases

C. Remains unchanged

D. None of these

Answer: B

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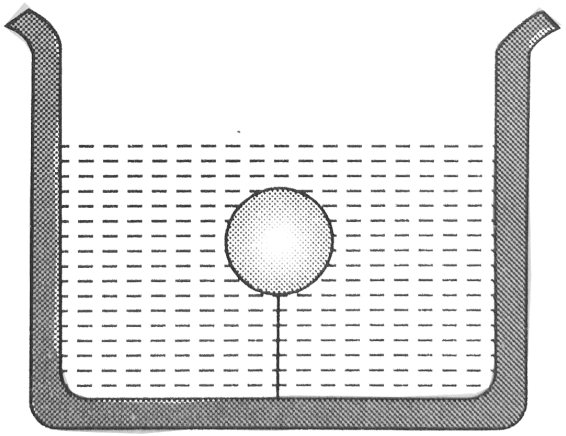
16. A solid sphere of density $\eta(>1)$ times lighter than water is suspended in a water tank by a string tied to its base as shown in fig. if the mass of the sphere is m then the

tension in the string is given by



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

B. ηmg

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

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

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 rectangular block is $5cm \times 5cm \times 10cm$ in size. The block is floating in water with 5 cm side vertical. If it floats with 10 cm side vertical, what change will occur in the level of water?

A. No change

B. It will rise

C. It will fall

D. It may rise or fall depending on the density of block

Answer: A

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19. 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. $9cm$

B. $6cm$

C. $4.5cm$

D. $2.25cm$

Answer: B

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20. Two solids A and B float in water. It is observed that A floats with $\frac{1}{2}$ of its body immersed in water and B floats with $\frac{1}{4}$ of its volume above the water level. The ratio of the density of A to that of B is

A. $4:3$

B. $2:3$

C. $3:4$

D. $1:2$

Answer: B

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21. A boat carrying steel balls is floating on the surface of water in a tank. If the balls are thrown into the tank one by one, how will it affect the level of water ?

A. It will remain unchanged

B. It will rise

C. It will fall

D. First it will first rise and then fall

Answer: C

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

A. Both pieces must have equal weights

B. Both pieces must have equal densities

C. Both pieces must have equal volumes

D. Both are floating to the same depth

Answer: C

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

A. Equal of that of water

B. Half the density of water

C. Double the density of water

D. The question is incomplete

Answer: B

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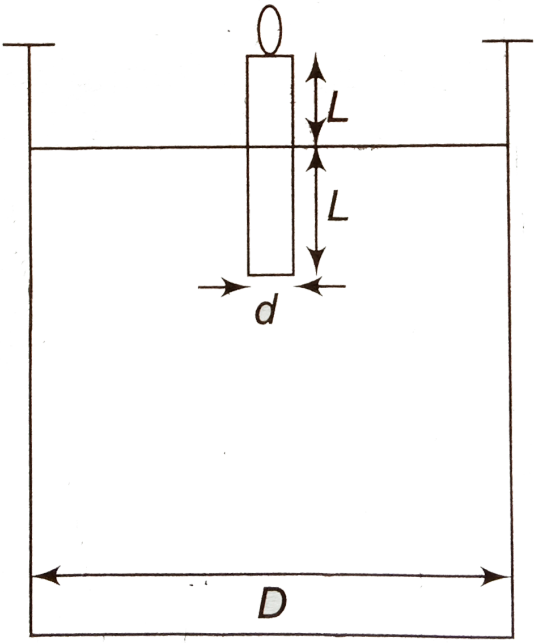
24. A candle of diameter d is floating on a liquid in a cylindrical container of diameter $D(D << d)$ as shown in figure. If is burning at the rate of $2cm/h$ then the top of the

candle will :



A. Remain at the same height

B. Fall at the rate of $1cm/\text{hour}$

C. Fall at the rate of $2cm/\text{hour}$

D. Go up the rate of $1cm/\text{hour}$

Answer: B

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25. An ice block contains a glass ball when the ice melts within the water containing vessel, the level of water

A. Rises

B. Falls

C. Unchanged

D. First rises and then falls

Answer: B

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26. A large ship can float but a steel needle sinks because of

A. Viscosity

B. Surface tension

C. Density

D. None of these

Answer: B

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27. The construction of a submarine is based on:

A. Archimedes's principle

B. Bernoulli's theorem

C. Pasca's law

D. Newton's laws

Answer: A

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Fluid Laq

1. In which one of the following cases will the liquid flow in a pipe be most streamlined

A. Liquid of high viscosity and high density flowing through a pipe of small radius

B. Liquid of high viscosity and low density flowing through a pipe of small radius

C. Liquid of low viscosity and low density flowing through a pipe of large radius

D. Liquid of low viscosity and high density flowing through a pipe of large radius

Answer: B

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2. Two water pipes of diameters 2 cm and 4 cm are connected with the main supply line. The velocity of flow of water in the pipe of 2 cm

A. 4 times that in the other pipe

B. $\frac{1}{4}$ times that in the other pipe

C. 2 times that in the other pipe

D. $\frac{1}{2}$ times that in the other pipe

Answer: A

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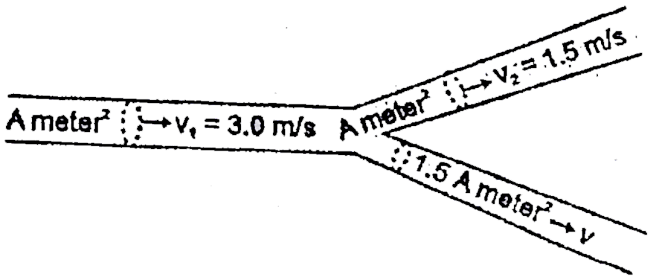
3. An incompressible liquid flows through a horizontal tube as shown in the figure. Then the velocity 'v' of the fluid is:



A. $3.0m/s$

B. $1.5m/s$

C. $1.0m/s$

D. $2.25m/s$

Answer: C

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4. Water enters through end A with a speed v_1 and leaves through end B with a speed v_2 of cylindrical tube AB. The tube is always completely filled with water. In case I the tube is horizontal, in case II it vertical with the end A upward and in case III it is vertical with the end B upward. We have $v_1 = v_2$for

A. Case I

B. Case II

C. Case III

D. Each case

Answer: D

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5. Water is moving with a speed of $5.18ms^{-1}$ through a pipe with a cross-sectional area of $4.20cm^2$. The water gradually descends $9.66m$

as the pipe increase in area to $7.60cm^2$. The speed of flow at the lower level is

A. $3.0ms$

B. $5.7ms$

C. $3.82ms$

D. $2.86ms$

Answer: D

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6. The velocity of kerosene oil in a horizontal pipe is $5m/s$. If $g = 10m/s^2$ then the velocity head of oil wlill be

A. $1.25m$

B. $12.5m$

C. $0.125m$

D. $125m$

Answer: A

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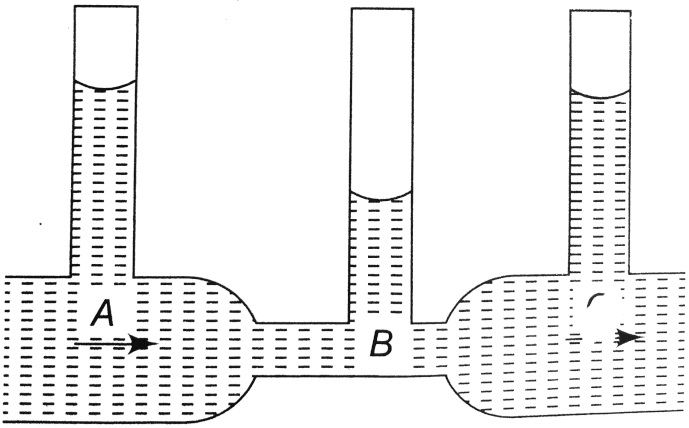
7. In the following fig., the flow of liquid through a horizontal pipe is shown. Three tubes A, B and C are connected to the pipe. The radii of the tubes A, B and C at the junction are respectively $2cm$, $1cm$ and $2cm$. It can be said that the



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

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8. 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 fall is $3.0 \times 10^5 N/m^2$, then velocity of flow of water is

A. $100m/s$

B. $10m/s$

C. $1m/s$

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

Answer: B

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9. Air is streaming past a horizontal airplane wing such that its speed is $90ms^{-1}$ at the lower surface and $120ms^{-1}$ over the upper surface. The wing is $10m$ long and has an average width of $2m$, the difference of pressure on the two sides and the gross lift on the wing respectively, are (density of air $= 1.3kgm^{-3}$)

A. 4095.0Pascal

B. 409.50Pascal

C. 40.950Pascal

D. 4.0950Pascal

Answer: A

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10. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level

of water to fall from h to $\frac{h}{2}$ and from $\frac{h}{2}$ to zero is

A. $\sqrt{2}$

B. $\frac{1}{\sqrt{2}}$

C. $\sqrt{2}-1$

D. $\frac{1}{\sqrt{2}-1}$

Answer: C

Watch Video Solution

11. A cylinder of height 20m is completely filled with water. The velocity of effux of water (in ms^{-1})` through a small hole on the side wall of the cylinder near its bottom is

A. 10

B. 20

C. 25.5

D. 5

Answer: B

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12. 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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13. There is a hole at the bottom of a large open vessel. If water is filled upto a height h, it flows out in time t. if water is filled to a height 4h, it will flow out in time

A. t

B. $4t$

C. $2t$

D. $t/4$

Answer: C

Watch Video Solution

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

A. $2.5cm$

B. $5cm$

C. $10cm$

D. $0.25cm$

Answer: A

Watch Video Solution

15. A square plate of 0.1 m side moves parallel to a second plate with a velocity of $0.1m/s$, both plates being immersed in water. If the viscous force is 0.002 N and the coefficient of

viscosity is 0.01 poise , distance between the plates in m is

A. 0.1

B. 0.05

C. 0.005

D. 0.0005

Answer: D

 Watch Video Solution

16. Spherical balls of radius 'R' are falling in a viscous fluid of viscosity $'\eta'$ with a velocity 'v'. The retarding viscous force acting on the spherical ball is

A. Inversely proportional to ' r ' but directly proportional to velocity ' v '

B. Directly proportional to both radius ' r ' and velocity ' v

C. Inversely proportional to both radius ' r ' and velocity ' v '

D. Directly proportional to ' r ' but inversely proportional to ' v '

Answer: B

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17. A small sphere of mass m is dropped from a height After it has fallen 100 m it has attained its terminal velocity and continues to fall at that speed. The work done by air friction

against the sphere during the first 100 m of fall is-

A. Greater than the work done by air friction in the second 100 m

B. Less than the work done by air friction in the second 100 m

C. Equal to 100 mg

D. Greater than 100 mg

Answer: B

 Watch Video Solution

18. Two drops of the same radius are falling through air with a steady velcoity of $5cms^{-1}$. If the two drops coalesce, the terminal velocity would be

A. 10 cm per sec

B. 2.5 cm per sec

C. $5 \times (4)^{1/3}$ cm per sec

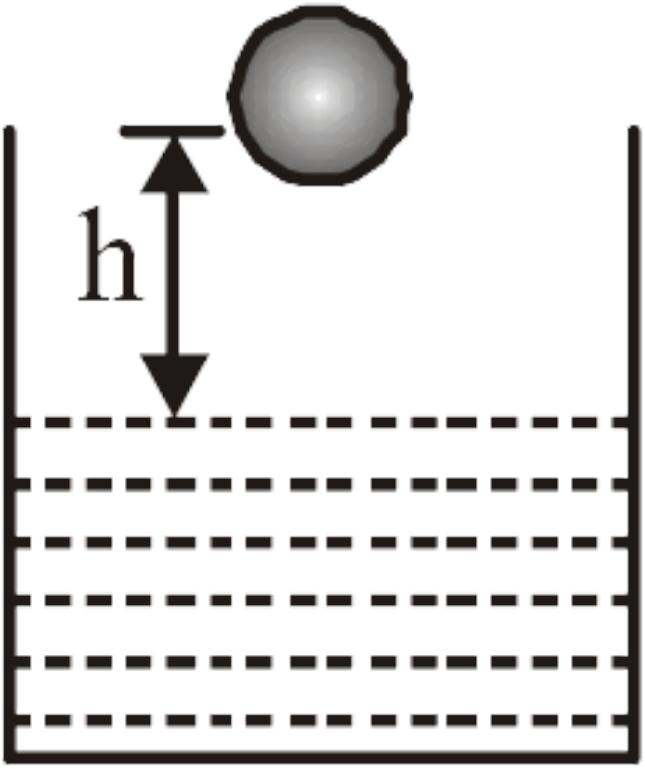
D. $5 \times \sqrt{21}$ cm per sec

Answer: C

Watch Video Solution

19. A ball of radius r and density r falls freely under gravity through a distance h before entering water. Velocity of ball does not change even on entering water. If viscosity of

water is η the value of h is given by



`

A. $\frac{2}{9}r^2\left(\frac{1-\rho}{\eta}\right)g$

B. $\frac{2}{81}r^2\frac{\rho-1}{\eta}g$

C. $\frac{2}{81}r^4\left(\frac{\rho-1}{\eta}\right)^2 g$

D. $\frac{2}{9}r^4\left(\frac{\rho-1}{\eta}\right)^2 g$

Answer: C

Watch Video Solution

20. The rate of steady volume flow of water through a capillary tube of length ' l ' and radius ' r ' under a pressure difference of P is V . This tube is connected with another tube of the same length but half the radius in series. Then the rate of steady volume flow through

them is (The pressure difference across the combination is P)

A. $\frac{V}{16}$

B. $\frac{V}{17}$

C. $\frac{16V}{17}$

D. $\frac{17V}{16}$

Answer: B

Watch Video Solution

21. A liquid is flowing in a horizontal uniform capillary tube under a constant pressure difference P . The value of pressure for which the rate of flow of the liquid is doubled when the radius and length both are doubled is

A. P

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

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

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

Answer: D

Watch Video Solution

22. We have two (narrow) capillary tubes T and T . Their lengths are l and l and radii of cross-section are r and r respectively. The rate of flow of water under a pressure difference P through tube T is $8cm3/\sec.$ If $l = 2l$ and $r = r$ what will be the rate of flow when the two tubes are connected in series and pressure difference across the combinatin is same as before $(= P)$

A. $4cm/\sec$

B. $(16/3)\sec$

C. $(8/17)cm/\sec$

D. None of these

Answer: B

Watch Video Solution

23. In laminar flow of fluid, the velocity of the fluid in contact with the walls of the tube is

A. Zero

B. Maximum

C. In between zero and maximum

D. Equal to critical velocity

Answer: A

Watch Video Solution

24. In turbulent flow the velocity of the liquid molecules in contact with the walls of the tube.

A. Zero

B. Maximum

C. Equal to critical velocity

D. May have any value

Answer: B

Watch Video Solution

25. The Reynolds number of a flow is the ratio of

A. Gravity to viscous force

B. Gravity force to pressure force

C. Inertial forces to viscous force

D. Viscous forces to pressure forces

Answer: C

Watch Video Solution

26. Water is flowing through a tube of non-uniform cross-section ratio of the radius at

entry and exit end of the pipe is $3:2$. Then the ratio of velocities at entry and exit of liquid is

A. $4:9$

B. $9:4$

C. $8:27$

D. $1:1$

Answer: A

 Watch Video Solution

27. Water is flowing through a horizontal pipe of non-uniform cross- section. At the extreme narrow portion of the pipe, the water will have

A. Maximum speed and least pressure

B. Maximum pressure and least speed

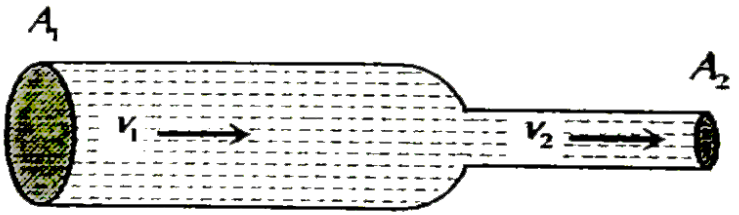
C. Both pressure and speed maximum

D. Both pressure special least

Answer: A

 Watch Video Solution

28. A liquid flows in a tube from left to right as shown in figure. A_1 and A_2 are the cross-section of the portions of the tube as shown. Then the ratio of speeds v_1 / v_2 will be



A. A_1 / A_2

B. A_2 / A_1

C. $\sqrt{A_2} / \sqrt{A_1}$

D. $\sqrt{A_1} / \sqrt{A_2}$

Answer: B

Watch Video Solution

29. In a streamline flow

A. The speed of a particle always remains same

B. The velocity of a particle always remains same

C. The kinetic energies of all the particles arriving at a given point are the same

D. The moments of all the particles arriving at a given point are the same

Answer: A

Watch Video Solution

30. An application of Bernoulli's equation for fluid flow is found in

A. Dynamic lift of an aeroplane

B. Viscosity meter

C. Capillary rise

D. Hydraulic press

Answer: A

Watch Video Solution

31. The Working of an atomizer depends upon

A. Bernoulli's theorem

B. Boyle's law

C. Archimedes principle

D. Newton's law of motion

Answer: A

Watch Video Solution

32. The pans of a physical balance are in equilibrium. Air is blown under the right hand pan, then the right hand pan will

A. Move up

B. Move down

C. Move erratically

D. Remain at the same level

Answer: B

Watch Video Solution

33. According to Bernoulli's equation

$$\frac{P}{\rho g} + h + \frac{1}{2}\frac{v^2}{g} = \text{constant}$$

The terms A, B and C are generally called respectively.

A. Gravitational head, pressure head and velocity head

B. Gravity, gravitational head and velocity head

C. Pressure head, gravitational head and velocity head

D. Gravity, pressure and velocity head

Answer: C

Watch Video Solution

34. At what speed the velocity head of a stream of water be equal to 40 cm of Hg

A. $282.8 cm / \sec$

B. $432.6 cm / \sec$

C. $632.6 cm / \sec$

D. $832.6 cm / \sec$

Answer: A

Watch Video Solution

35. The weight of an aeroplane flying in air is balanced by

A. Upthrust of the air which will be equal to the weight of the air having the same volume as the plane

B. Force due to the pressure difference between the upper and lower surfaces of

the wings, created by different air speeds on the surface

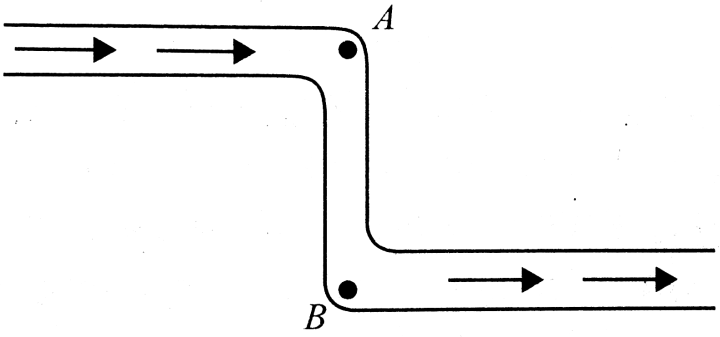
C. Vertical component of the thrust created by air currents striking the lower surface of the wings

D. Force due to the reaction of gases ejected by the revolving propeller

Answer: B

 Watch Video Solution

36. In the figure, an ideal liquid flows through the tube, which is of uniform cross section. The liquid has velocities v_A and v_B, and pressures P_A and P_B at the points A and B, respectively. Then



A. $v_A = v_B$

B. $v_B > v_A$

C. $P = P$

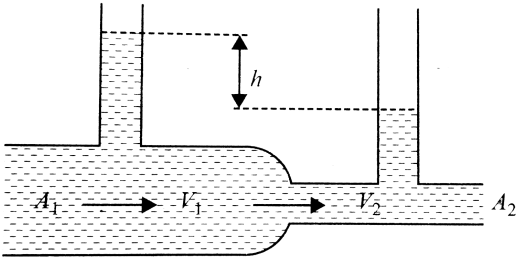
D. `P

Answer: A

Watch Video Solution

37. A liquid flows through a horizontal tube. The velocities of the liquid in the two sections, which have areas of cross section A_1 and A_2 are v_1 and v_2 respectively. The difference in the levels of the liquid in the two vertical

tubes is h. Then



A. The volume of the liquid flowing through the tube in unit time is $A_1 v_1$

B. $v_2 - v_1 = \sqrt{2gh}$

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

D. The energy per unit mass of the liquid is the same in both sections of the tube

Answer: A::C::D

Watch Video Solution

38. A sniper fires a rifle bullet into a gasoline tank making a hole $53.0m$ below the surface of gasoline. The tank was sealed at 3.10 atm . The stored gasoline has a density of $660kgm$. The velocity with which gasoline begins to shoot out of the hole is

A. $27.8ms^{-1}$

B. $41.0ms^{-1}$

C. $9.6ms^{-1}$

D. $19.7ms^{-1}$

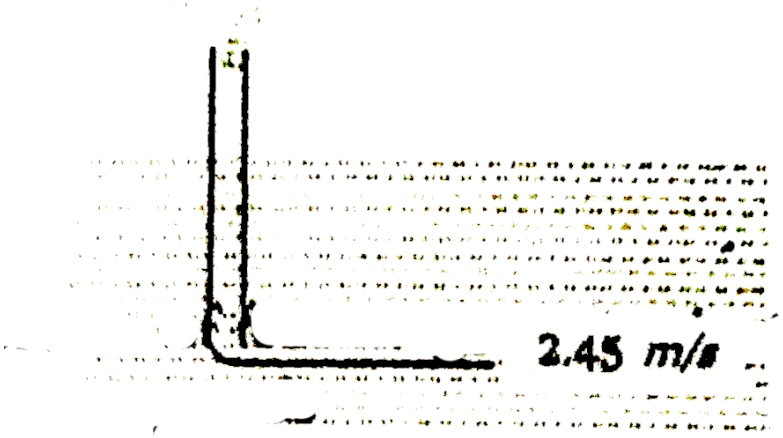
Answer: B

Watch Video Solution

39. 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 10.6 cm above the surface of water. What will be the height of

the jet of water coming from the orifice?

Velocity of water stream is $2.45m/s$



A. Zero

B. $20.0cm$

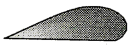
C. $10.6cm$

D. $40.0cm$

Answer: B

Watch Video Solution

40. Fig. represents vertical sections of four wings moving horizontally in air. In which case the force is upwards

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: A

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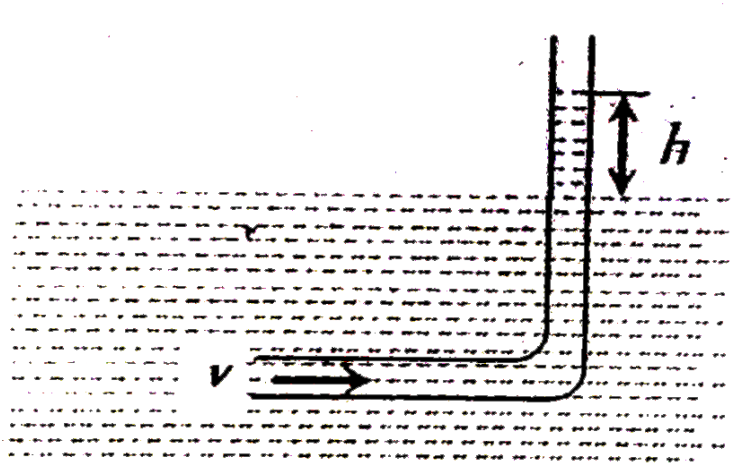
41. An L-shaped glass tube is just immersed in flowing water such that its opening is pointing against flowing water. If the speed of water

current is v, then



A. The water in the tube rises to height $\frac{v^2}{2g}$

B. The water in the tube rises to height $\frac{g}{2v^2}$

C. The water in the tube does not rise at all

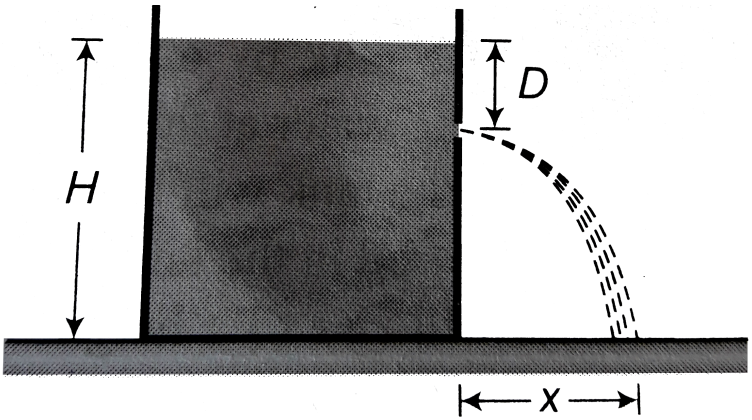
D. None of these

Answer: A

Watch Video Solution

42. A tank is filled with water up to a height H. Water is allowed to come out of a hole P in one of the walls at a depth D below the surface of water. Express the horizontal

distance x in terms of H and D



A. $x = \sqrt{D(H - D)}$

B. $x = \sqrt{\dfrac{D(H - D)}{2}}$

C. $x = 2\sqrt{D(H - D)}$

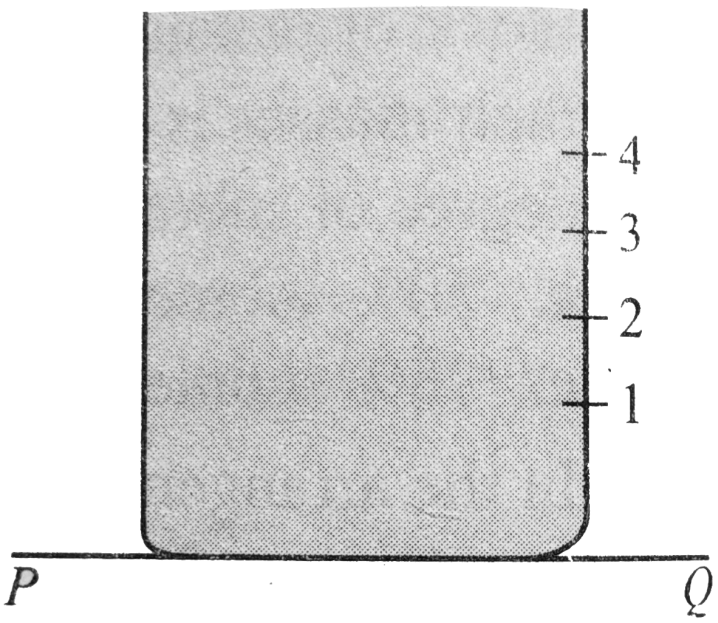
D. $x = 4\sqrt{D(H - D)}$

Answer: C

Watch Video Solution

43. A cylindrical vessel of $90cm$ height is kept filled up to the brim. It has four holes $1, 2, 3$ and 4 which are, respectively, at heights of $20cm, 30cm, 40cm$ and $50cm$ from the horizontal floor PQ. The water falling at the maximum horizontal distance from the vessel

comes from



A. Hole number 4

B. Hole number 3

C. Hole number 2

D. Hole number 1

Answer: B

Watch Video Solution

44. A rectangular vessel when full of water takes 10 minutes to be emptied through an orifice in its bottom. How much time will it take to be emptied when half filled with water

A. 9 minute

B. 7 minute

C. 5 minute

D. 3 minute

Answer: B

Watch Video Solution

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

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

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

Answer: D

Watch Video Solution

46. 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 times 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

47. Velocity of water in a river is

A. Same everywhere

B. More in the middle and less near its banks

C. Less in the middle and more near its banks

D. Increase from one bank to other bank

Answer: B

Watch Video Solution

48. As the temperature of water increases, its viscosity

A. Remains unchanged

B. Decreases

C. Increases

D. Increases or decreases depending on the external pressure

Answer: B

Watch Video Solution

49. The coefficient of viscosity for hot air is

A. Greater than the coefficient of viscosity for cold air

B. Smaller than the coefficient of viscosity for cold air

C. Same as the coefficient of viscosity for cold air

D. Increases or decreases depending on the external pressure

Answer: A

Watch Video Solution

50. A good lubricant must have

A. High viscosity

B. Low viscosity

C. Moderate viscosity

D. High density

Answer: A

Watch Video Solution

51. We have three beakers A , B and C containing glycerine, water and kerosene respectively. They are stirred vigorously and placed on a table. The liquid which comes to rest at the earliest is

A. Glycerine

B. Water level in Section A goes up and that in B comes down

C. Kerosene

D. All of them at the same time

Answer: A

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52. A small drop of water falls from rest through a large height h in air, the final velocity is

A. $\propto \sqrt{h}$

B. $\propto h$

C. $\propto (1/h)$

D. Almost indepdent of h

Answer: D

Watch Video Solution

53. The rate of flow of liquid ina tube of radius r, length l, whose ends are maintained at a

pressure difference P is $V = \frac{\pi Q P r^4}{\eta l}$ where η is coefficient of the viscosity and Q is

A. 8

B. $\frac{1}{8}$

C. 16

D. $\frac{1}{16}$

Answer: B

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54. In Poiseuilli's method of determination of coefficient of viscosity, the physical quantity that requires greater accuracy in measurement is

A. Pressure difference

B. Volume of the liquid collected

C. Length of the capillary tube

D. Inner radius of the capillary tube

Answer: D

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55. Two capillary tubes of the same length but different radii r and r are fitted in parallel to the bottom of a vessel. The pressure head is P . What should be the radius of a single tube that can replace the two tubes so that the rate of flow is same as before

A. $r_1 + r_2$

B. $r_1^2 + r_2^2$

C. $r_1^2 + r_2^4$

D. None of these

Answer: D

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56. Two capillaries of same length and radii in the ratio $1:2$ are connected in series. A liquid flows through them in streamlined condition. If the pressure across the two extreme ends of the combination is 1 m of water, the pressure difference across first capillary is

A. $9.4m$

B. $4.9m$

C. $0.49m$

D. $0.94m$

Answer: D

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57. Water flows in a streamline manner through a capillary tube of radius a. The pressure difference being P and the rate of

flow is Q . If the radius is reduced to $a/2$ and the pressure difference is increased to 2P, then find the rate of flow.

A. $4Q$

B. Q

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

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

Answer: D

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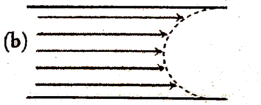
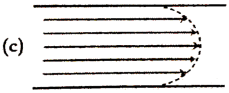
58. A viscous fluid is flowing through a cylindrical tube. The velocity distribution of the fluid is best represented by the diagram

A. 

B. 

C. 

D. None of these

Answer: C

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59. Water is flowing in a pipe of diameter 4 cm with a velocity $3m/s$. The water then enters into a tube of diameter 2 cm . The velocity of water in the other pipe is

A. $3m/s$

B. $6m/s$

C. $12m/s$

D. $8m/s$

Answer: C

Watch Video Solution

60. Two capillary of length L and 2L and of radius R and 2R are connected in series. The net rate of flow of fluid through them will be (given rate to the flow through single capillary, $\left(\mathrm{X}=\frac{\pi \mathrm{PR}^4}{8 \eta \mathrm{L}}\right)$

A. $\frac{8}{9} X$

B. $\frac{9}{8} X$

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

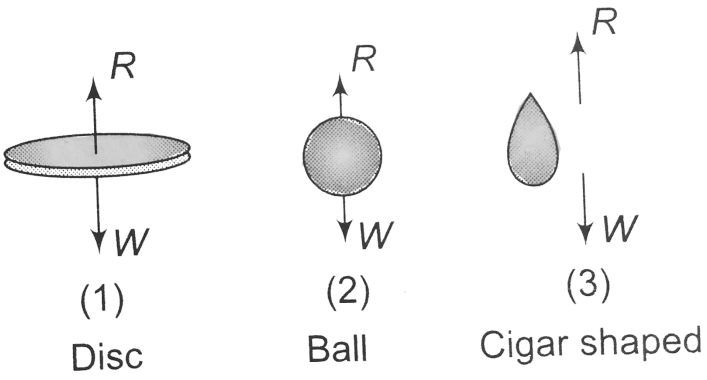
D. $\frac{7}{5} X$

Answer: A

Watch Video Solution

61. 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

Watch Video Solution

62. Water falls from a tap, down the streamline

A. Area decreases

B. Area increases

C. Velocity remains same

D. Area remains same

Answer: A

Watch Video Solution

63. A manometer connected to a closed tap reads 4.5×10^5 pascal. When the tap is opened the reading of the monometer falls is 4×10^5 pascal. Then the velocity of flow of water is

A. $7ms^{-1}$

B. $8ms^{-1}$

C. $9ms^{-1}$

D. $10ms^{-1}$

Answer: D

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64. What is the velocity v of a metallic ball of radius r falling in a tank of liquid at the instant when its acceleration is one-half that of a freely falling body ? (The densities of metal and of liquid are r and s respectively, and the viscosity of the liquid is η).

A. $\frac{r^2 g}{9\eta}(\rho - 2\sigma)$

B. $\frac{r^2 g}{9\eta}(2\rho - \sigma)$

C. $\frac{r^2 g}{9\eta}(\rho - \sigma)$

D. $\frac{2r^2g}{9\eta}(\rho - \sigma)$

Answer: C

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65. Consider the following eqaution of Bernouilli's theorem.

$P + \frac{1}{2}\rho v^2 + \rho gh = K$ (constant)

The dimensions of K/P are same as that of which of the following

A. Thrust

B. Pressure

C. Angle

D. Viscosity

Answer: C

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66. An incompressible fluid flows steadily through a cylindrical pipe which has radius 2 R at point A and radius R at point B farther

along the flow direction. If the velocity at point A is v, its velocity at point B is

A. $2v$

B. v

C. $v/2$

D. $4v$

Answer: D

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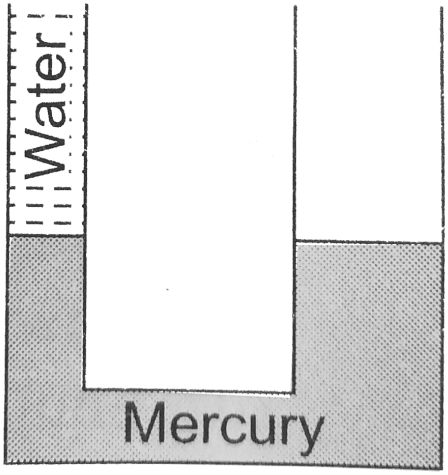
Critical Thinking

1. 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. $1.2cm$

B. $2.35cm$

C. $0.56cm$

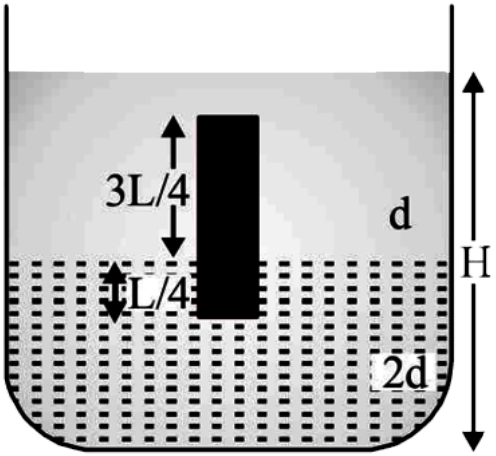
D. $0.8cm$

Answer: C

Watch Video Solution

2. 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. d

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

Answer: A

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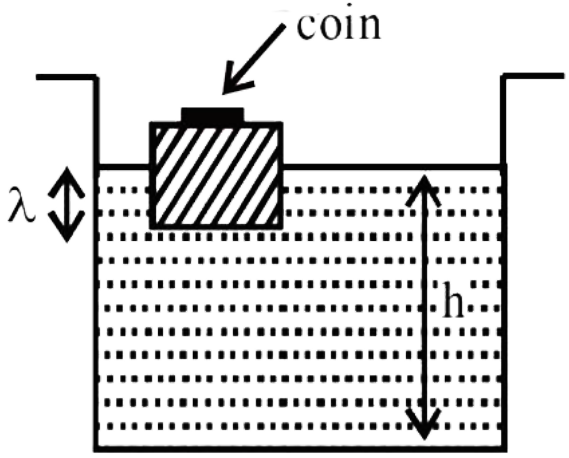
3. A wooden block, with a coin placed on its top, floats in water as shown in figure. The distance l and h are shown here. After some time the coin falls into water. Then



A. l decreases and h increases

B. l increases and h decreases

C. Both and h increase

D. Both l and h decrease

Answer: D

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4. 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. 12.8

Answer: C

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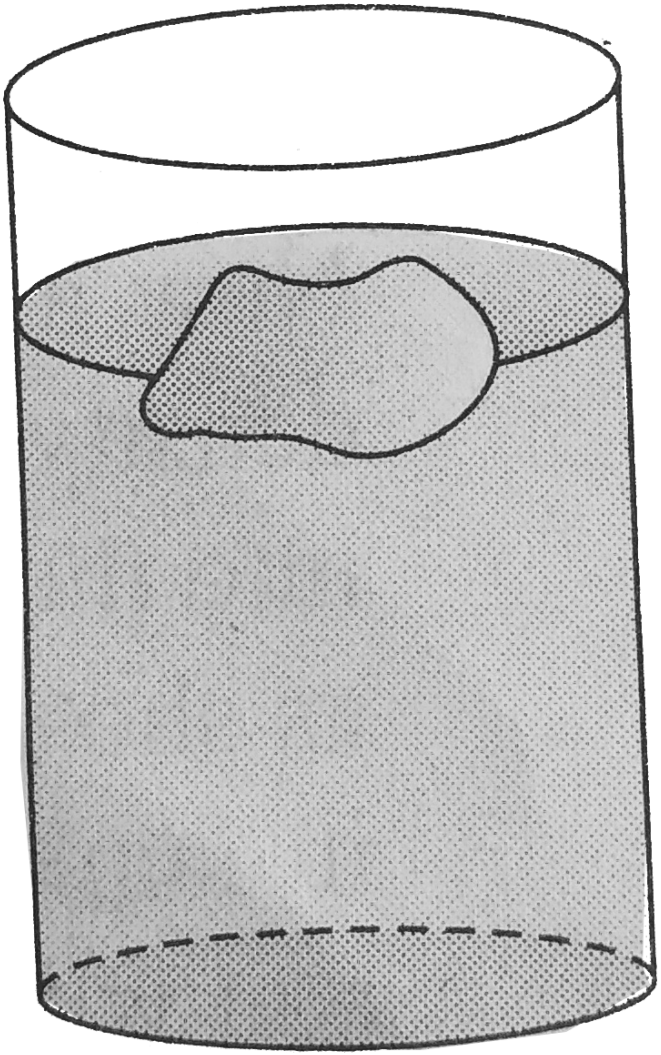
5. A body floats in a liquid contained in a beaker. The whole system as shown falls freely under gravity. The upthrust on the body due

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

 Watch Video Solution

6. A liquid is kept in a cylindrical vessel which is being rotated about a vertical axis through the centre of the circular base. If the radius of the vessel is r and angular velocity of rotation is ω, then the difference in the heights of the liquid at the centre of the vessel and the edge is.

A. $\frac{r\omega}{2g}$

B. $\frac{r^2\omega^2}{2g}$

C. $\sqrt{2gr\omega}$

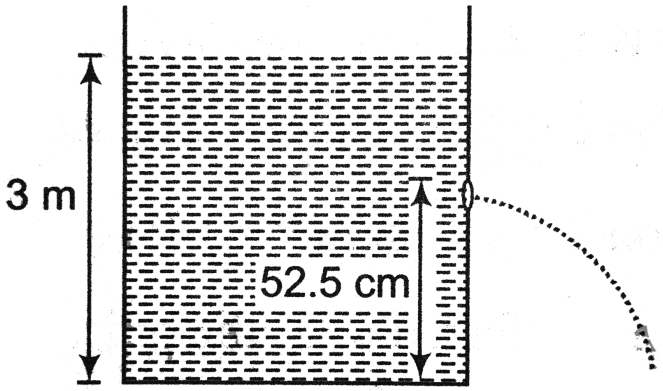
D. $\frac{\omega^2}{2gr^2}$

Answer: B

Watch Video Solution

7. 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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8. 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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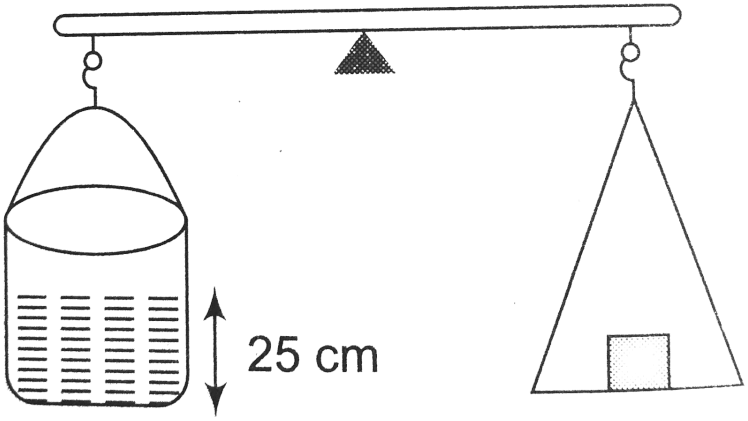
9. A cylinder containing water up to a height of $25cm$ has a hole of cross-section $\frac{1}{4}cm^2$ in its bottom. It is counterpoised in a balance. What is the initial change in the balancing

weight when water begin to flow out?



A. Increase of $12.5gm - wt$

B. Increase of $6.25gm - wt$

C. Decrease of $12.5gm - wt$

D. Decrease of $6.25gm - wt$

Answer: C

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10. There are two identical small holes of area of cross section a on the opposite sides of a tank containing liquid of density ρ. The differences in height between the holes is h. The tank is resting on a smooth horizontal surface. The horizontal force which will have to be applied on the tank to keep it in

equilibrium is

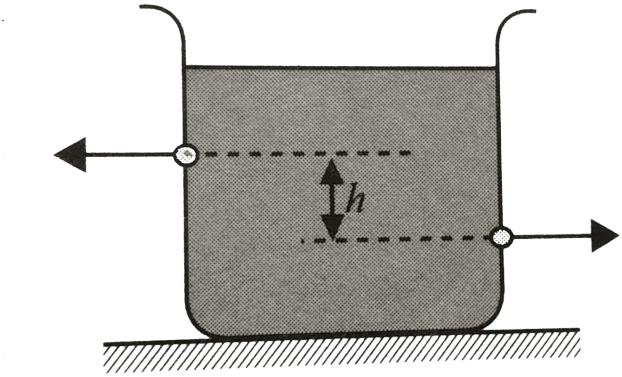

Fig. 4.184

A. $gh\rho a$

B. $\frac{2gh}{\rho a}$

C. $2\rho agh$

D. $\frac{\rho gh}{a}$

Answer: C

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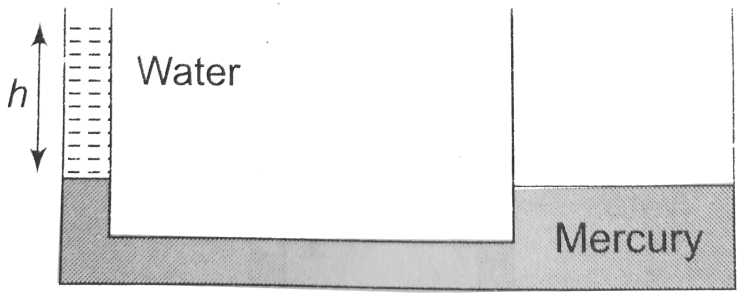
11. Two communicating vessels contain mercury. The diameter of one vessel in n times larger then the diameter of the other. A column of water of height h is poured into the left vessel. The mercury level will rise in the right hand vessel (s = relative density of mercury and ρ = density of water) by



A. N/A

B. N//A

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

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

Answer: B

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12. A uniform rod of density ρ is placed in a wide tank containing a liquid of density $\rho_0 (\rho_0 > \rho)$. The depth of liquid in the tank is

half the length of the rod. The rod is in equilibrium, with its lower end resting on the bottom of the tank. In this position the rod makes an angle θ with the horizontal.

A. $\sin\theta = \frac{1}{2}\sqrt{\rho_0/\rho}$

B. $\sin\theta = \frac{1}{2}.\frac{\rho_0}{\rho}$

C. $\sin\theta = \sqrt{\rho/\rho_0}$

D. $\sin\theta = \rho_0/\rho$

Answer: A

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13. A block of ice is floating in a liquid of specific gravity 1.2 contained in the beaker. What will be the effect on the level of liquid in the beaker when the whole ice melts?

A. Remain same

B. Rises

C. Lowers

D. (a), (b) or (c)

Answer: B

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14. A vessel of area of cross-section A has liquid to a height H . There is a hole at the bottom of vessel having area of cross-section a . The time taken to decrease the level from H_1 to H_2 will sec

A. $\frac{A}{a}\sqrt{\frac{2}{g}}\left[\sqrt{H_1}-\sqrt{H_2}\right]$

B. $\sqrt{2gh}$

C. $\sqrt{2gh(H_1-H_2)}$

D. $\frac{A}{a}\sqrt{\frac{g}{2}}\left[\sqrt{H_1}-\sqrt{H_2}\right.$

Answer: A

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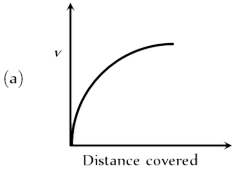
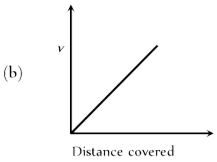
Graphical Questions

1. A lead shot of a 1mm diameter falls through a long column of glycerine.The variation of its velocity v with distance covered is represented by,

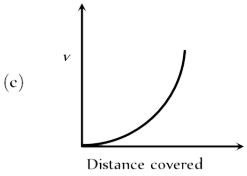
A.



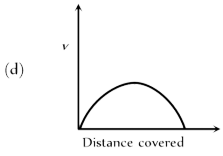
B.



C.



D.



Answer: A

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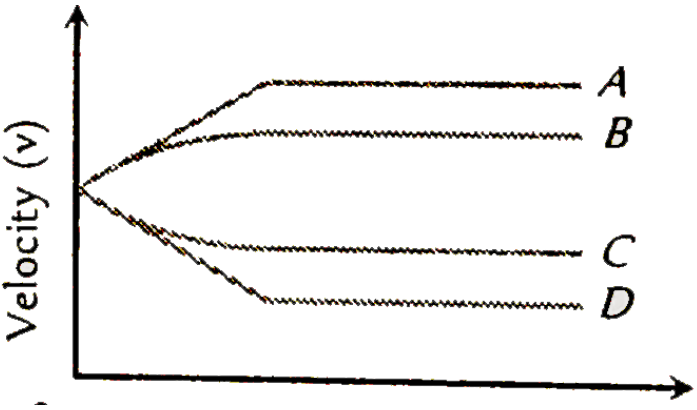
2. A small spherical solid ball is dropped from a great height in a viscous liquid. Its journey in the liquid is best described in the diagram given below by the



A. Curve A

B. Curve B

C. Curve C

D. Curve D

Answer: B

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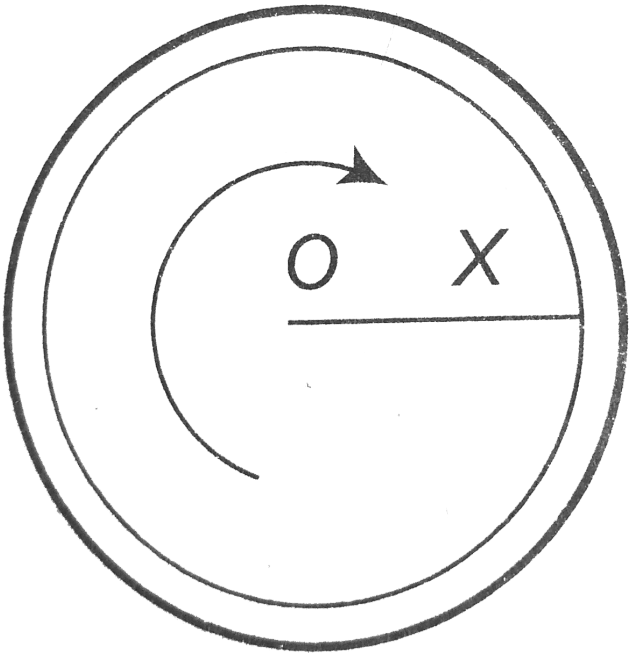
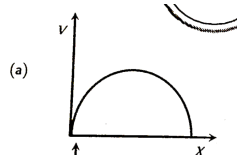


3.

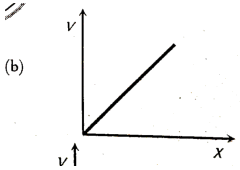
The diagram shows a cup of tea seen from above. The tea has been stirred and is now rotating without turbulence. A graph showing the speed v with which the liquid is crossing

points at a distance X from O along a radius OX would took like

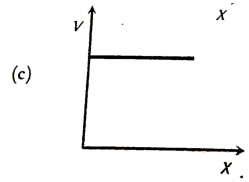
A.



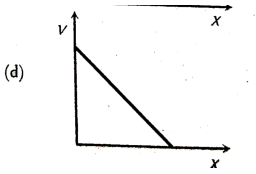
B.



C.



D.



Answer: D

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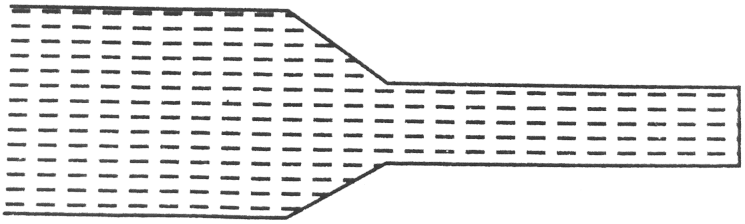
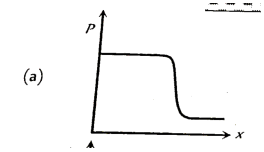
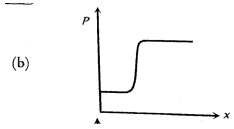
4. Water flows through a frictionless duct with a cross-section varying as shown in fig. Pressure p at points along the axis is represented by



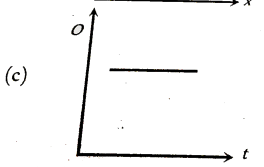
A.



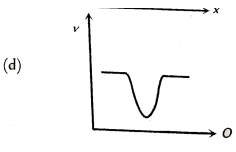
B.



C.



D.



Answer: A

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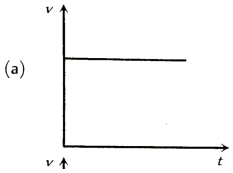
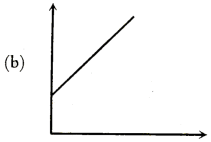
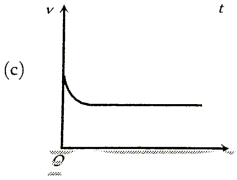
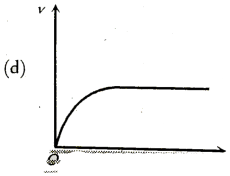
5. From amongst the following curves, which one shows the variation of the velocity v with time t for a small sized spherical body falling vertically in a long column of a viscous liquid

A. 

B. 

C. 

D. 

Answer: D

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Asseration And Reason

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

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

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

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

explanation of the assertion.

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: B

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

Reason : Pressure of liquid at any point is

proportional to height, density of liquid and acceleration due to gravity.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

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3. Assertion : Hydrostatic pressure is a vector quantity.

Reason : Pressure is force divided by area, and force is a vector quantity.

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

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

C. If assertion ture but reason is false.

D. If assertion is false but reason is true.

Answer: D

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4. 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 the reason is the correct explanation of the assertion.

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: C

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

Reason : According to Archimede's principle the weight displaced by body is equal to the weight of the body.

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

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

C. If assertion ture but reason is false.

D. If assertion is false but reason is true.

Answer: D

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

Reason : According to Archimede's principle, the loss in weight of the body in the liquid is equal to the weight of the liquid displaced by the immersed part of the body.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

 Watch Video Solution

7. 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 the reason is the correct explanation of the assertion.

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

explanation of the assertion.

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

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8. Assertion : The velocity of fall of a man jumping with a parachute first increases and then becomes constant.

Reason : The constant velocity of fall of man is called terminal velocity.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: B

 Watch Video Solution

9. Assertion: The velocity of flow of a liquid is smaller when pressure is larger and vice versa. Reason: According to Bernoulli's theorem, for the stream line flow of an ideal liquid, the total energy per unit mass remains constant.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

10. 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 the reason is the correct explanation of the assertion.

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: C

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11. Assertion : The size of the needle of a syninge controls flow rate better than the thumb pressure exerted by a doctor while administering an injection.

Reason : Flow rate is independent of pressure exerted by the thumb of the doctor.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: C

 Watch Video Solution

12. 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 the reason is the correct explanation of the assertion.

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

 Watch Video Solution

13. Assertion : For a floating body to be in stable equilibrium, its centre of buoyancy must be located above the centre of gravity.

Reason : The torque produced by the weight of the body and the upthrust will restore body back to its normal position, after the body is disturbed.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

 Watch Video Solution

14. Assertion : Water flows faster than honey.

Reason : The coefficient of viscosity of water is less than honey.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

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15. Assertion : The viscosity of liquid increases rapidly with rise of temperature.

Reason : Viscosity of a liquid is the property of the liquid by virtue of which it opposes the relative motion amongst its different layers.

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

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

C. If assertion ture but reason is false.

D. If assertion is false but reason is true.

Answer: D

 Watch Video Solution

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

Reason : According to Bernoulli's theorem, as velocity increases pressure decreases and viceversa.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

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17. 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 the reason is the correct explanation of the assertion.

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

18. Statement-1: Machine parts are jammed in winter.

Statement-2: The viscosity of lubricant used in machine part decrease at low temperature.

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

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

C. If assertion true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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19. Statement -1 : A block of wood is floating in a tank containing water. The apparent weight of the floating block is equal to zero.

Statement -2 : Because the entire weight of the block is supported by the buoyant force (the upward thrust) due to water.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

 Watch Video Solution

20. Statement -1 : A rain drop after fallling through some height attains a constant velocity.

Statement -2 : At constant velocity, the viscous drag is just to its weight.

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

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

explanation of the assertion.

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

21. Assertion : paper pins are made to have pointed end.

Reason : Because pointed pins have very small

area due to which even for small applied force it exert large pressure on the surface.

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: A

 Watch Video Solution

22. Assertion : Railways tracks are laid on small sized wooden sleepers.

Reason : Small sized wooden sleepers are used so that rails exert more pressure on the

railway track. Due to which rail does not leave the track

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

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

C. If assertion ture but reason is false.

D. If the assertion and reason both are false.

Answer: D

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23. Assertion : It is difficult to stop bleeding from a cut in the body at high altitudes.

Reason : The atmospheric pressure at high altitude is lesser than the blood pressure.

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

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

C. If the assertion and reason both are true.

D. If the assertion and reason both are false.

Answer: A

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24. Assertion : To empty an oil tank, two holes are made.

Reason : Oil will come out two holes so it will emptied faster.

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

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

C.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

25. Assertion : Terminal velocity is same as the critical velocity.

Reason : The constant velocity of fall of a body through a viscous fluid is called terminal velocity.

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

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

explanation of the assertion.

C.

D. If the assertion and reason both are false.

Answer:

Watch Video Solution

26. Assertion : When two boats sails parallel in the same direction and close to each other, they are pulled towards each other.

Reason : The viscous drag on a spherical body moving with speed v is proportional to v.

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

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

C.

D.

Answer: B

Watch Video Solution

27. Assertion : Cars and aeroplanes are streamlined.

Reason : This is done to reduce the backward drag due to atmosphere.

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

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

C.

D.

Answer: A

Watch Video Solution

28. Statement-1 : Bernoulli's theorem holds for incompressible, non-viscous fluids. Statement-2 : The factor $\frac{v^2}{2g}$ is called velocity head.

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

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

C.

D.

Answer: B

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Fluid Mechanics

1. 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. $1.85g/cm$

B. $89.25g/cm$

C. $462.5g/cm$

D. $500g/cm$

Answer: C

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2. 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. $\rho_1 = 6$ and $\rho_2 = 2$

B. $\rho_1 = 3$ and $\rho_2 = 5$

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

D. None of these

Answer: A

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3. A wooden block of volume $1000cm^3$ is suspended from a spring balance its weight is 12 N in air. It is suspended in water such that half of the block is below the surface of water. The reading of spring balance is

A. $10N$

B. $9N$

C. $8N$

D. $7N$

Answer: D

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4. Two different liquids are flowing in two tubes of equal radius. The ratio of coefficients of viscosity of liquids is 52:49 and the ratio of their densities is $13:1$, then the ratio of their critical velocities will be

A. $4:49$

B. $49:4$

C. $2:7$

D. $7:2$

Answer: A

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5. Two capillary tubes of same radius r but of lengths l_1 and l_2 are fitted in parallel to the bottom of a vessel. The pressure to the bottom of a vessel. The pressure head is P. What should be the length of a single tube of

same radius that can replace the two tubes so that the rate of flow is same as before?

A. $l_1 + l_2$

B. $\frac{1}{l_1} + \frac{1}{l_2}$

C. $\frac{l_1 l_2}{l_1 + l_2}$

D. $\frac{1}{l_1 + l_2}$

Answer: C

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6. A capillary tube is attached horizontally to a constant pressure head arrangement. If the radius of the capillary tube is increased by $10\,\%$, then the rate of flow of the liquid shall change nearly by

A. $+10\,\%$

B. $+46\,\%$

C. $-10\,\%$

D. $-40\,\%$

Answer: B

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7. 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. $2:3$

Answer: A

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8. Three identical vessels are filled to the same height with three different liquids A, B and $C(\rho_A > \rho_B > \rho_C)$. The pressure at the base will be

A. Equal in all vessels

B. Maximum in vessel A

C. Maximum in vessel B

D. Maximum in vessel C

Answer: B

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9. Three identical vessels are filled with equal masses of three different liquids A, B and $C(\rho_A > \rho_B > \rho_C)$. The pressure at the base will be

A. Equal in all vessels

B. Maximum in vessel A

C. Maximum in vessel B

D. Maximum in vessel C

Answer: A

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

A. $100cm^2$

B. $10cm^2$

C. $1.96 \times 10^4 cm^2$

D. $2 \times 10cm$

Answer: C

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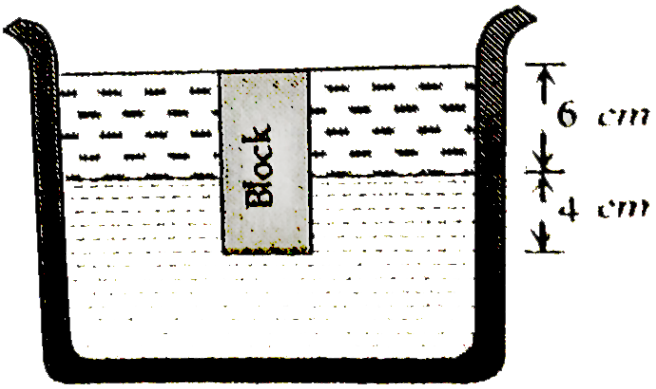
11. A cubical block of wood 10 cm on a side floats at the interface between oil and water with its lower surface horizontal and 4 cm below the interface. The density of oil is

$0.6 g cm^{-3}$. The mass of block is



A. $706 g$

B. $607 g$

C. $760 g$

D. $760 g$

Answer: C

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12. A sperical ball of radius r and relative density 0.5 is floating in equilibrium in water with half of it immersed in water. The work done in water. The work done in pushing the ball down so that whole of it is just immersed in water is [ρ is the density of water]-

A. $\frac{5}{12}\pi r^2 \rho g$

B. $0.5\rho r g$

C. $\frac{4}{3}\pi r^3 \rho g$

D. $\frac{2}{3}\pi\rho^4\rho g$

Answer: A

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13. If W be the weight of a body of density ρ in vacuum then its apparent weight in air of density σ is

A. $\frac{W\rho}{\sigma}$

B. $W\left(\frac{\rho}{\sigma}-1\right)$

C. $\frac{W}{\rho}\sigma$

D. $W\left(1-\frac{\sigma}{\rho}\right)$

Answer: D

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14. Which of the following is a characteristic of turbulent now?

A. Velocity more than the critical velocity

B. Velocity less than the critical velocity

C. Irregular flow

D. Molecules crossing from one layer to another

Answer: B

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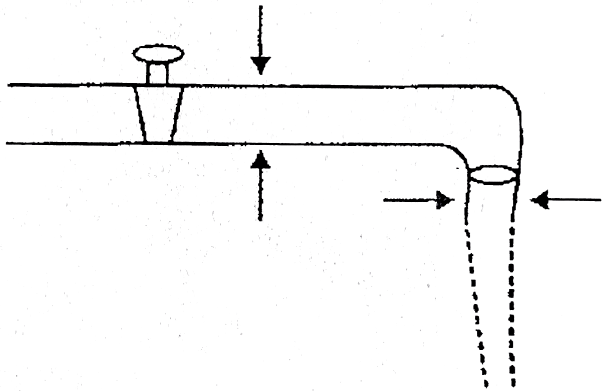

15.

Water coming out of the mouth of a tap and falling vertically in stream line flow forms a tapering column. i.e., the area of cross-section of the liquid column decreases as it moves down which of the following is the most accurate explanation for this-

A. As the water moves down, its speed increases and hence its pressure decreases. It is then compressed by the atmosphere

B. Falling water tries to reach a terminal velocity and hence reduces the area of cross-section to balance upward and downward forces

C. The mass of water flowing past any cross-section must remain constant.

Also, water is almost incompressible. Hence, the rate of volume flow must remain constant. As this is equal to velocity × area, the area decreases as velocity increases

D. The surface tension causes the exposed surface area of the liquid to decrease continuously

Answer: C

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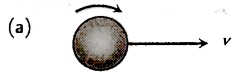
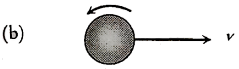
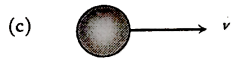
16. To get the maximum flight a ball must be thrown as :

A. 

B. 

C. 

D. None of these

Answer: B

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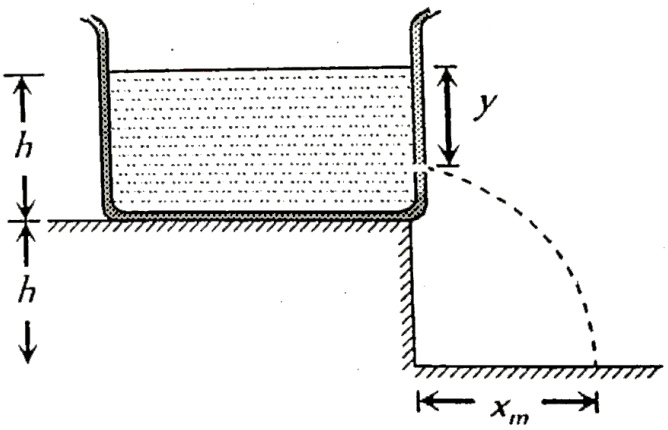
17. A tank is filled upto a height h with a liquid and is placed on a platform of height h from the ground. To get maximum range x_m a small hole is punched at a distance of y from the free surface of the liquid. Then



A. $x_m = 2h$

B. $x_m = 1.5h$

C. $y = h$

D. $y = 0.75h$

Answer: A::C

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18. The relative velocity of two parallel layers of water is 8 cm/sec. If the perpendicular distance between the layers is 0.1 cm, then velocity gradient will be

A. $8\,\text{sec}$

B. $80\,\text{sec}$

C. $0.8\,\text{sec}$

D. $0.08cm$

Answer: B

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19. Under a constant pressure head, the rate of streamlined volume flow of a liquid through a capillary tube is V. if the length of the capillary

tube is double and diameter of the bore is halved, find the rate of flow of the liquid through the capillary tube.

A. $V/4$

B. $16V$

C. $V/8$

D. $V/32$

Answer: D

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