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PHYSICS

BOOKS - BITSAT GUIDE

FLUID MECHANICS

Practice Exercise

1. The pressure at the bottom of a tank of liquid is not proprtional to

A. thedensity of the liquid

B. the area of the liquid

C. the height of the liquid

D. the acceleration

Answer:

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2. If a vessel containing a fluid of density ρ upto height h is accelerated vertically

downwards with accelerations a_0. Then the pressure by fluid at the bottom of a vessel is

A. $p = p_0 + \rho g h + \rho h a_0$

B. $p = p_0 + \rho g h$

C. $p = p_0 + \rho h(g - a_0)$

D. $p = p_0 \rho g h$

Answer:

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3. In each heart beat, a heart pumps 80 ml blood at an average pressure of 100 ml of Hg. What will be the power output of the herat? (Assume 60 heart beat per minute

A. 1 W

B. $2.75W$

C. $1.06W$

D. $0.5W$

Answer:

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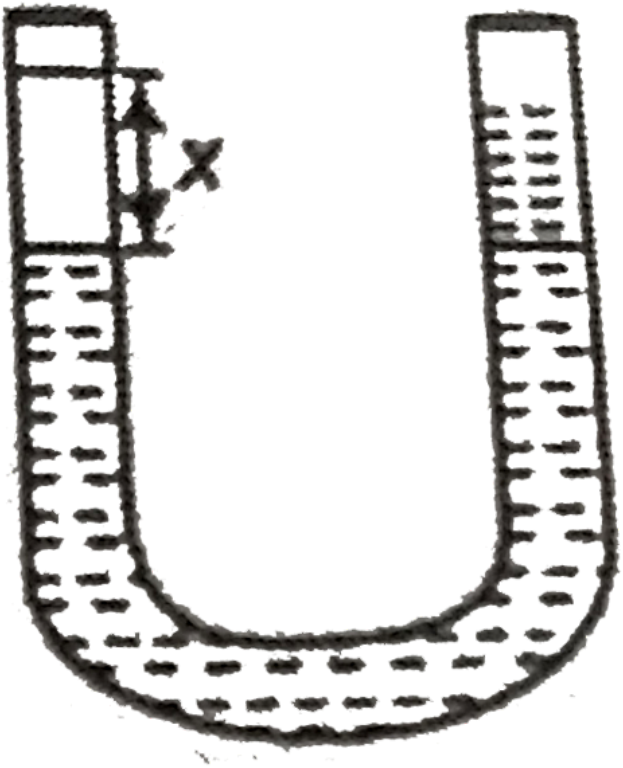
4. One end a U-tube of unifrom bore (area A) cpmtaining mercury is connected to sunction pump . Because of it the level of liquid of density ρ falls in one limb. When the pump is removed, the restoring force in the other limb

is



A. $2x\rho Ag$

B. $x\rho g$

C. $A\rho g$

D. $x\rho Ag$

Answer:

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5. A cylindrical vessel of radius r containing a liqiud is rotating about a vertical axis through the centre of circular base, If the vessel is rotating with angular velocity ω then what is the difference of the heights of liquid at centre of vessel and edge?

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

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

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

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

Answer:

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6. If the weight of a body in vacuum is w and w_1 and w_2 are weights when it is immersed in a liquid of specific gravity ρ_1 and ρ_2

respectively, then find the relation among w, w_1 and w_2

A. $w = \frac{w_1\rho_2 + w_2\rho_1}{w_1 + w_2}$

B. $w = \frac{w_1\rho_2 - w_2\rho_1}{\rho_2 - \rho_1}$

C. $w = \frac{w_1\rho_2 + w_2\rho_1}{\rho_1 + \rho_2}$

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

Answer:

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7. A closed rectangular tank 10 m long, 5 m, wide and 3 m deep is completely filled with and oil of specific gravity 0.92 . Find the preesure difference betweenn the nrear and front cornrers of the tank, if is moving with an acceleration of $3m/s^2$ in the horizontal direction

A. $27.6kPa$

B. $50kPa$

C. $60kPa$

D. $70kPa$

Answer:

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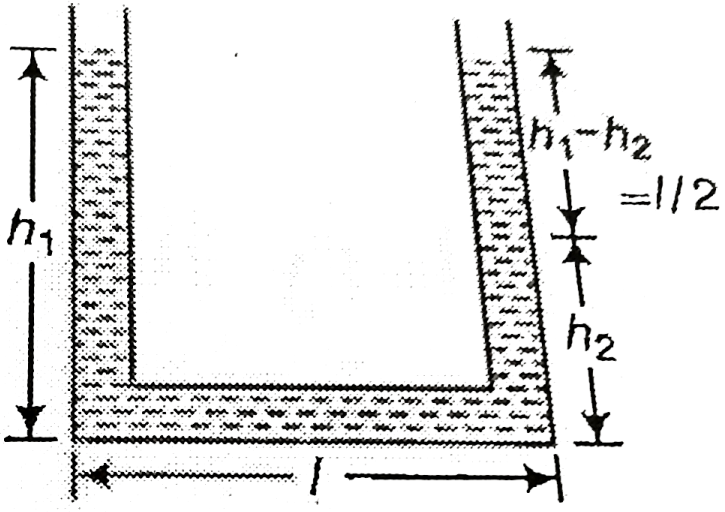
8. A U-tube having a liquid of density ρ is accelerated at a m/s^2 , so as to create be the height difference between two columns of l/2 (as shown if figure) . If/is the length of the base of U-tube the value of acceleration given

to the system is



A. $4.9m/s^2$

B. $9.8m/s^2$

C. $5.6m/s^2$

D. $6.4m/s^2$

Answer:

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9. A body weight 5 N in air and 2 N when immersed in a liquid. The buoyant force is

A. 2 N

B. 3 N

C. 5 N

D. 7 N

Answer:

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

A. $m = 25g$

B. $m = 30g$

C. $m = 35g$

D. $m = 20g$

Answer:

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11. If air of weight w is filled in a empty ballon which weights w_1 the weight of ballon will become w_2 Suppose the density of air inside and out side the vallon is same, then,

A. $w_2 = w_1 + w$

B. $w_2 = \sqrt{w_1 w}$

C. $w_2 = w_1$

D. $w_2 = w_1 - w$

Answer:

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12. A soft plastic bag of weight w_0 is filled with air at STP Now, weigth of the bag is w in air. Then,

A. $w > w_0$

B. $w = w_0$

C. $w \leq w_0$

D. $w < w_0$

Answer:

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13. 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 100 kg , the area A should be

(specific gravity of ice 0.917 and density of water $= 1000kg/m^2$)

A. $1.24m^2$

B. $4.21m^2$

C. $2.41m^2$

D. $7.23m^2$

Answer:

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14. A pieceo of ice is floating in water . Find the fraction of volume of he piece of ice outside the water

(Given density of ice $= 900kg/m^3$ and density of water $= 1000kg/m^3$)

A. 0.21

B. 0.01

C. 0.1

D. 0.9

Answer:

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15. A block of wood floats with 1//4 of its volume under water. What is he density of wood? (Density of water $= 1000kg/m^3$)

A. $750kg/m^3$

B. $250kg/m^3$

C. $300kg/m^3$

D. $260kg/m^3$

Answer:

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16. A block weights 15 N and 12 N in air and water respectively . When it is immeresed in another liquid, it weights 13 N then find the relative density of ice is block.

A. 5

B. 6

C. 10

D. 2

Answer:

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17. In English the phrase tip of the iceberg is used to mean a small visible fraction of something that is mostly hidden . For a real iceberg. What is this fraction. If the density of sea water is $1.03kg/cc$ and that of ice is $0.92g/cc$?m

A. 0.106

B. 10.6

C. 0.901

D. 0.801

Answer:

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18. Vessel contains oil $(density 0.8 g/cc)$ over mercury (density $13.6 g/cc$) A homogeneous sphere floats with half its volume immersed in

mercury and the other half in oil. The density of the sphere in g/c c is

A. 6.4

B. 7.2

C. 12.8

D. 12.8

Answer:

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19. In a steady icnompressible flwo of a liquid

A. the sped does change, if the area of cross-section changes

B. the speed increases. If the area of cross-section increaseses

C. the speed decreases, if the area of cross-section increases

D. bubbles are produced when the aea of the cross-section increases

Answer:

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20. Water from a tap emerges vertically downwards an intial speed of 1 m/s . The cross-sectional area of the tap is $10^{-4}m^2$. Assume that the pressure is contant throughout the stream of water and that the flow is steady . The cross-sectional area of the steam. 0.15 m below the tap is

A. $5 \times 10^{-4} m^2$

B. $1 \times 10^{-5} m^2$

C. $5.83 \times 10^{-5} m^2$

D. $2 \times 10^{-5} m^2$

Answer:

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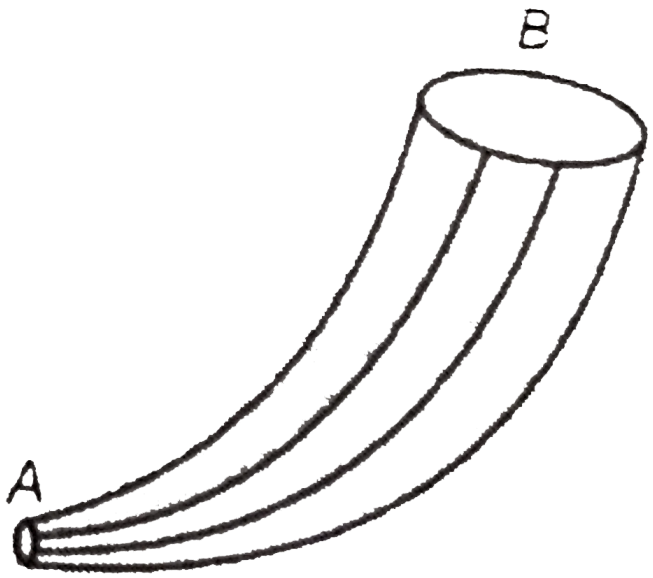
21. A tube of flow is shown in the figure.



A. The fluid particles must be accelerated from A to B

B. Fluid particles may accelerate from A to B

C. The fluid particles must be decelerated from A to B

D. The fluid particeles may be decelerated from A to B

Answer:

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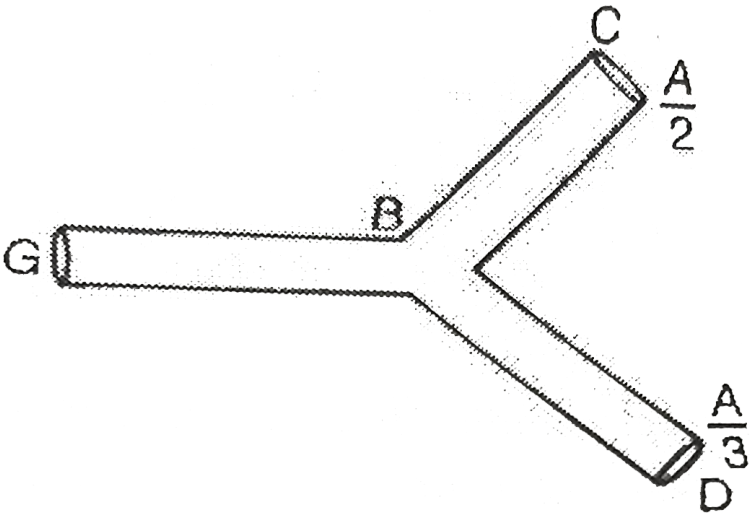
22. A pipe GB is fitted withb two pipes C and D as shown in the figure. $A = 24m^2$ at G and velocity of water at G is 10 m/s and at C is 6

m/s . The velocity of water at D is



A. 21 m/s

B. $3.3m/s$

C. 30 m/s

D. None of these

Answer:

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23. Bernoulli's equation is applicable to points

A. in a steadily flowing liquid

B. in a stream line

C. in a straight line perpendicular to stream line

D. in any non-viscous liquid

Answer:

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24. The horizontal flow of fluid depends upon

A. pressure of liquid

B. amount of fluid

C. density of fluid

D. All of the above

Answer:

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25. in steday horizontal flow,

A. the pressure is greatest where the speed is least

B. the pressure is independent of speed

C. the pressure is least where the speed is least

D. Both a and c are correct

Answer:

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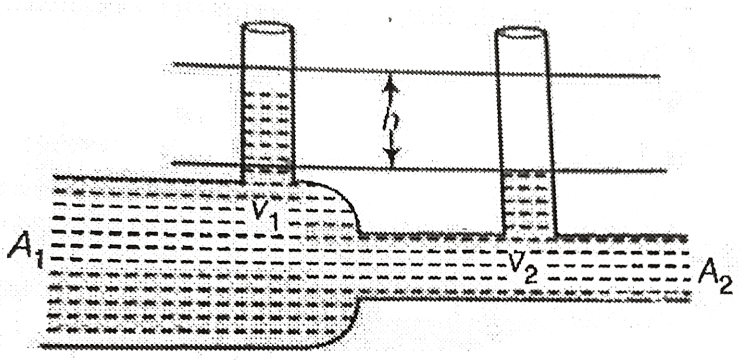
26. From a horizontal tube with area of cross-section A_1 and A_2 as shosn in fiugre liquid is flowing in the level of the liauid in the two veritcal tunes is h.



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

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

C. $v_2^2 - v_1^1 = 2gh$

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

Answer:

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27. A vessel is filled with water and kerosence oil. The vessel has a small hole in the bottom. Neglecting viscosity if the thickness of water layer is h_1 and kerosens layer is h_2 then the velocity v of flow of water will be (density of water is ρ_1b g/c c and that of kerosense is ρ_2 g/c c

A. $v = \sqrt{2g(h_1 - h_2)}$

B. $v = \sqrt{\left[2g\left(h_1 - h_2\frac{\rho_2}{\rho_1}\right)\right)}$

C. $v = \sqrt{2g(h_1\rho_1 + h\rho_2)}$

D. $v = \sqrt{2g\left(h_1\frac{\rho_1}{\rho_2} + h_2\right)}$

Answer:

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28. Mark the correct options (s).

A. two stram lines may cross each other

B. two stram lines must cross each other

C. two stram lines never cross each other

D. None of the above

Answer:

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29. Water flows along horizontal pipe whose cross-section is not constant. The pressure is 1 cm of Hg, where the veloecity is 35 cm/s . At a point where the velocity is 65cm/s then pressure will be

A. $0.89cmofHg$

B. $89cmofHg$

C. $0.5cmofHg$

D. $1cmofHg$

Answer:

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30. A pilot tube was inserted in a pipe to measure the velocity of water in it. If the water rises in the tube is 200 mm . Find the velocity of water.

A. $9.8m / s$

B. $1.98m / s$

C. $19.6m / s$

D. $196m / s$

Answer:

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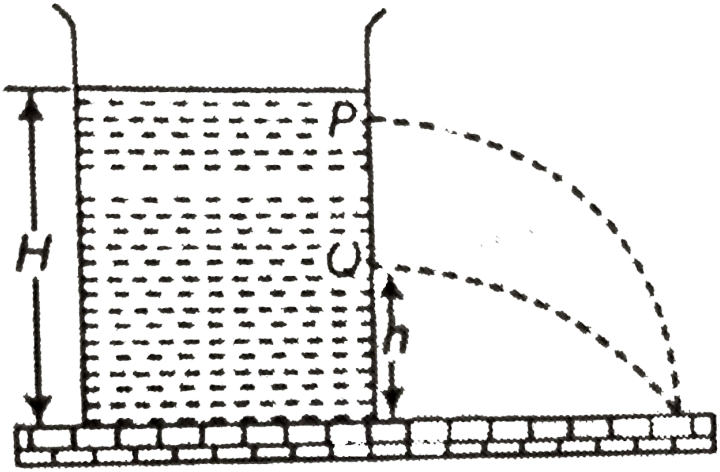
31. A cylindrical vessel filled with water to a hight H. A vessel has two small holes in the side, from which water iins rushing out

horizontal and the two steams stike the ground at the same poin, if the lower hole Q Q is h height above the ground, then the height of hole P above the ground will be



A. 2h

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

C. H-h

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

Answer:

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32. A liquid having area of free surface A and has an orifice at a depth of h with an area a, below the liquid surface, then find the velocity v of flow through the orifice

A. $v = \sqrt{2gh}$

B. $v = \sqrt{2gh}\sqrt{\frac{A^2}{A^2 - a^2}}$

C. $v = \sqrt{2gh}\sqrt{\frac{A}{A - a}}$

D. $v = \sqrt{2gh}\sqrt{\frac{A^2 - a^2}{A^2}}$

Answer:

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33. A capillary tube of area of cross-section A is dipped in water veritcally. Calculate the amount of heat evolved as the water rises in

the capillary tunbe upto height h. The density of water is ρ

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

B. $Agh^2\rho$

C. $2Agh^2\rho$

D. None of these

Answer:

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34. The radius of the biggest metal coin of thickness t and density ρ which would be able to float on water surface of surface of water is ρ

A. $\frac{S}{2\rho gt}$

B. $\frac{S}{\rho gt}$

C. $\frac{2S}{\rho gt}$

D. $\frac{4S}{3\rho gt}$

Answer:

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35. An open glass tube is immersed in mercury in such a way that a length of 8 cm extends above the mercury level. The open end of the tube is then closed and sealed and the tube is raised vertically up by additional 46 cm. what will be length of the air column above mercury in the above now ?

(Atmospheric pressure = 76 cm of Hg)

A. 38 cm

B. 6 cm

C. 16 cm

D. 22 cm

Answer:

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36. While measuring surface temsoion of water using capillary rise method, heihgt of the lowr meniscus from free surface of water is 3 cm while inner radius of capillary tube is found to be 0.5 cm. Then compute tension of

water using this data. (Take contact angle between glass and water and a 0 and $g = 9.81 m / s^2$

A. $0.72 N / m$

B. $0.77 N / m$

C. $1.67 N / m$

D. None of the above

Answer:

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37. To what depth must a rubber ball be taken in deep sea so that its volume is decreases by $0.1\,\%$ (The bulk modulus of rubber is $9.8 \times 10^8 N/m$, and the density of sea water is $10^3 kg/m^3$)

A. 100 m

B. 60 m

C. 75 m

D. 65 m

Answer:

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38. A wooden block or mass m and density ρ is tied to a string, the other end of the string is fixed to bottom of a tank. The tank is filled with a liquid of density σ with $\sigma > \rho$. The tension in the string will be

A. $\left(\frac{\sigma - \rho}{\sigma}\right) mg$

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

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

D. $\frac{\sigma mg}{\rho}$

Answer:

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39. Assume that a drop of liquid evaporates by decreases in its surface energy, so that its temperature remains unchanged. What should be the minimum radius of the drop for this to be possible? The surface tension is T, density of liquid is ρ and L is its latent heat of vaporization.

A. $\rho L / T$

B. $\sqrt{T / \rho L}$

C. $T / \rho L$

D. $2T / \rho L$

Answer:

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40. Water is flowing continuously from a tap having an internal dimeter $8 \times 10^{-3} m$. The water then, water rises up in it leaves the tap

is $0.4ms^{-1}$. The diameter of the water stream at a distance 2×10^{-1}m beblow the tap is close to

A. $7.5 \times 10^{-3}m$

B. $9.6 \times 10^{-3}m$

C. $3.6 \times 10^{-3}m$

D. $5.0 \times 10^{-3}m$

Answer:

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41. In an experiment a capillary tube is kept vertical , then water rises up in the tube upt 3mm height . When the tube is fitted at an angle of 60° with verical , what should be the height of water rise

A. 6 mm

B. 4 mm

C. 3 mm

D. None of these

Answer:

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42. Calculate for the rise of water in a capillary tube when kept veritcal in water whose radii is 1/4th of that capillry tube which when kept veritcal water rise in it upto a height of 3 mm

A. 12 mm

B. 10 mm

C. 4 mm

D. 3 mm

Answer:

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43. Calculate the heat evolved for the rise of water when one end of the capillary tube of radius r is immeresed vartically into water. Asssume surface tension =T and density of water to be ρ

A. $\frac{2\pi T}{\rho g}$

B. $\frac{\pi T^2}{\rho g}$

C. $\frac{2\pi T^2}{\rho g}$

D. None of these

Answer:

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44. In a liquid threr is air bubble of radius 1 mm at a depth 10 cm below the free space. The surface tension of liquid $0.075n/m$ and density is $1000kg/m^2$. By what amout is the

pressure indide the bubble greater than the atmospheric preesure ?

A. 1130 pascal

B. 1200 pascal

C. 1100 pascal

D. 1000 pascal

Answer:

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45. Calculate the work done by a boy In making a soap bubble of diameter $1.4cm$ by blowing .if he surface tension of soap solution is $0.03N/m$

A. $3 \times 10^{-5}J$

B. $3.696 \times 10^{-5}J$

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

D. $4.2 \times 10^{-5}J$

Answer:

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46. A drop of radius r is broken into n equal drips. Calulate the work done if surface tension of water is T.

A. $4r\pi R^2 nT$

B. $4r\pi R^2 T\left(n^{2/3-1}\right)$

C. $4r\pi R^2 T\left(n^{1/3-1}\right)$

D. None of the above

Answer:

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47. What will happen if n drops of a liquid each has surface energy E, combine to form a single drop.

A. No energy will be released in the precess

B. Some energy will be absorbed in the process

C. Energy released or absorbed will be $E\left(n - n^{2/3}\right)$

D. Energy released or absorbed will be

$$nE\left(n - n^{2/3-1}\right)$$

Answer:

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48. If a bigger drop of liquid at temperature t, breaks up into number of small droplets, then what is temperature of the droplests ? (Assume bigger drop is isolated from its surroundings)

A. Equal to t

B. Greater than t

C. Less that t

D. Either (a),(b) and (c) dpending on surface tension of liquid

Answer:

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49. The excess pressure inside a soap bubble of radius 4 cm is $30\text{dyne}/cm^2$. The surface tension is

A. 30 dyne/cm

B. 20 dyne/cm

C. 40 dyne/cm

D. 80 dyne/cm

Answer:

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50. Calculate the work done against surface tention in fromation of a drop of mercury of radius 4 cm (Surface tension for murcury =465 dyne/cm)

A. $9.34 \times 10^{-3} J$

B. $10 \times 10^{-2} J$

C. $4 \times 10^{-3} J$

D. 466 J

Answer:

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51. Calculate the energy required to increases the radius of a soap bubble from 1 cm to 2 cm (The surface tansion is 30 dyne/cm.)

A. 240π erg

B. 720π erg

C. 480π erg

D. None of these

Answer:

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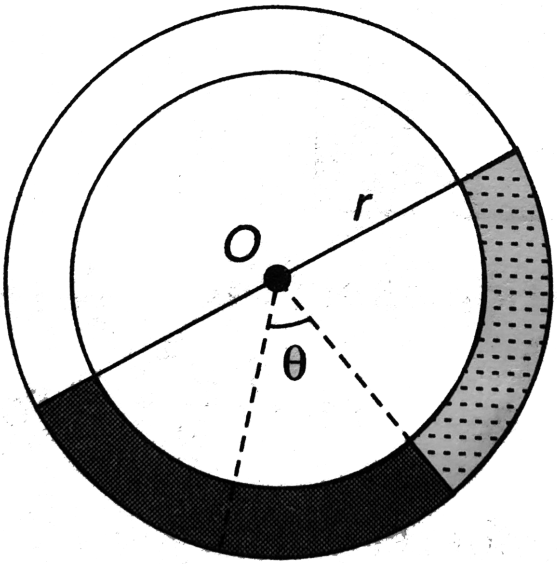
52. A small uniform tube is bent into a circle of radius r whose plane is vertical. Equal volumes of two fluids whose densities are ρ and $\sigma(\rho > \sigma)$ fill half the circle. Find the angle that the radius passing through the interface

makes with the vertical.



A. $\cot\theta = \dfrac{\rho - \sigma}{\rho + \sigma}$

B. $\tan\theta = \dfrac{\rho - \sigma}{\rho + \sigma}$

C. $\sin\theta = \dfrac{\rho + \sigma}{\rho - \sigma}$

D. $\sin\theta = \dfrac{\rho}{\sigma}$

Answer:

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53. A liquid drop of radius R breaks into N smaller droplets of radii r, If liquid has density ρ, specific heat s and surface tension, T, than the drop in temeperature is given

A. $\frac{NT}{\rho s}\left(\frac{1}{R}-\frac{1}{r}\right)$

B. $\frac{3NT}{\rho s}\left(\frac{R}{r}-1\right)$

C. $\frac{3}{4}\frac{NT}{\rho s}\left(\frac{1}{R}-\frac{1}{r}\right)$

D. $\frac{3NT}{\rho s}\left(\frac{1}{R}-\frac{1}{r}\right)$

Answer:

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54. body of density ρ is dropped from height h into a liquid having density $\sigma(\sigma > \rho)$ .If the body just touches the of the container, then the distance of fallen would be proprotional to (Neglect viscous forces)

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

B. $\frac{h}{\sigma + \rho}$

C. $h \times (\sigma - \rho)$

D. $\frac{h\rho}{\sigma - \rho}$

Answer:

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55. A block of mass m and density p is hanging from a string . If it is lowered into a vessel of cross-sectional area A containing a liquid of density $\sigma(< \rho)$ and gets fully immered, the

increase in pressure at the bottom of vessel would be

A. $\frac{m\rho g}{\sigma A}$

B. $\frac{m\rho g}{\rho A}$

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

D. zero

Answer:

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56. A solid sphere falls with a terminal velocity of 32 m/s in air . If it is allowed to fall in vacuum, then

A. the termilinal velocity will be 32 m/s

B. the termilinal velocity will be less than 32 m/s

C. the termilinal velocity will be greater than 32 m/s

D. there will be no teminal velocity

Answer:

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57. Find the common radius of curvature when two soap bubbles with radii r_1

A. $r = \frac{r_1 + r_2}{2}$

B. $r = \frac{r_1 + r_2}{r_1 - r_2}$

C. $r = \frac{r_1 r_2}{r_1 + r_2}$

D. $r = \sqrt{r_1 r_2}$

Answer:

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58. Water is following in a river. If the velocity of a layer at a distance 10 cm from the bottom is 20n cm/s. Find the velocity of layer at a height of 40 cm from the bottom.

A. 10 m/s

B. 20 m/s

C. 30 m/s

D. 80 m/s

Answer:

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59. A horizontal plate $(10cm \times 10cm)$ moves on a layer of oil of thickness 4 mm with a constant speed of 10 cm/s . The coefficient of viscosity of oil is 4 poise. The constant speed of the plae is

A. 10^3 dyne

B. 10^4 dyne

C. 10^5 dyne

D. None of these

Answer:

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60. A liquid is flowing through a narrow tube. The coefficient of viscosity of liquid is 0.1308 poise. The length and inner radius of tube are 50 cm and 1 min respectively . The rate of flow

or liquidn is $360cm^3 / \min$. Find the pressue difference between ends of tube.

A. $10^6 \frac{\text{dyne}}{c} m^2$

B. $10^4 \frac{\text{dyne}}{c} m^2$

C. $10 \frac{\text{dyne}}{c} m^2$

D. None of the above

Answer:

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61. Find the terminal velocity of solid shpere or radius $0.1m$ moving in air in vertically downward direction . $\left(\eta = 18 \times 10^{-5} Ns/m^2\right.$, density of sphere $= 1000kg/m^2$ and $\left. g = 10^m/s^2\right)$

A. 2 m/s

B. $1.2m/s$

C. 4 cm/s

D. None of these

Answer:

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62. Eight equal drops of water each of radius r=2 mm are falling through air with a teminaln velocity of 16 cm/s . The eight drops combine to be from a big drop. Calculate the terminal velocit of big drop.

A. 16 cm/s

B. 32 cm/s

C. 64 cm/s

D. None of these

Answer:

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63. At $20.$ C, to attain the terminal velocity how fast willan aluminium sphre of radii 1 mm fall though water. Assume flow to be laminar flow and specific gravity (Al) $= 2.7\eta_{\text{water}} = 8 \times 10^{-4} Pa$

A. 5 m/s

B. $4.6m/d$

C. 4 m/s

D. 2 m/s

Answer:

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Bitsat Achives

1. The work done in blowina siap bubble of surface tension $0.06N,^{-1}$ from 2 cm radius to

5 cm radiu is

A. $0.004168J$

B. $0.003168J$

C. $0.003158J$

D. $0.004158J$

Answer:

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2. A ball whose density is $0.4z \times 1^3 kg/m^3$ falls into water from a height of 9 cm.To what depth does the balll sink?

A. 9 cm

B. 6 cm

C. $4.5cm$

D. $2.25cm$

Answer:

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3. The realativen humidity on day when partial pressure of water vapour is 0.12×10^6 Pa at 12° C is (Take vapour pressure of water at this temperatue as $0.06 \times 10^5 Pa$)

A. 0.7

B. 0.4

C. 0.75

D. 0.25

Answer:

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4. In the absence of intermoecular forces of attraction . The observed pressure p will be

A. ramin same

B. decreas

C. Increases

D. zero

Answer:

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5. 10000 small ball, each weighting 1g. Strike one square centimetre of area second with a velocity 100 m/s in normal directions and rebound with the same velocity . The volue of pressure on the surface will be

A. $2 \times 10^{10} \frac{N}{m^2}$

B. $2 \times 10^{5} \frac{N}{m^2}$

C. $10^{7} N/m$

D. $2 \times 10^{7} \frac{N}{m^2}$

Answer:

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6. At a given place where acceleration due to gravity is gm/s^2 a sphere of lead of density d kgg/m^3 is gently released in a column o liquid of desnsity $\rho k\frac{g}{m^3}$. If $d > \rho$, the sphere will

A. fall vetically with an acceleration gm/s^2

B. fall vetically with an acceleration

C. fall vetically with no acceleration

$$g\left(\frac{d-\rho}{d}\right)$$

D. fall vetically with no acceleration

$$g\left(\frac{\rho}{d}\right)\Big)$$

Answer:

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7. Motion of fluid in a tube is best descrined by

A. Bernoulli's theorem

B. Poiseuillie's principle

C. Archimedes'principle

D. Stokes'law

Answer:

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8. The velocity of efflux of a liquid through an orific in the bottom of the tank does not depend upon

A. size of orifice

B. Poiseuillie's principle

C. acceleration due to gravity

D. density of liquid

Answer:

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9. Density of sea water is $1.03ghcc^{-1}$. A ship passes from fresh water into sea water. It will

A. rise

B. sink

C. reamin at the same depth

D. rise or sink depending on its shape and size

Answer:

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10. water is flowing through a tube of non-uniform cross-section. If the radii of the tube at the ebtrance and the exit are in the ratio $3:2$ then the ratio of the velocites of flow of watern at the entrance and the exit is

A. $9:4$

B. $4:9$

C. $8:27$

D. $27:8$

Answer:

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11. A liquid X of density $3.36g/cm^3$ poured in a U-tube which contains Hg. Another liquid Y is poured in left arm with heght 8 cm upper levels of X and Y are same. What is density of Y?

A. $0.8g/c$

B. $1.2g/c$

C. $1.4g/c$

D. $1.6g/c$

Answer:

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12. The surface tension of soap solution is $0.03N/m$. The work done in blowing to from a soap bublle of surface area $40cm^2$, (in J) , is

A. $1.2XX10^{-4}$

B. $2.4XX10^{-4}$

C. $12XX10^{-4}$

D. $24XX10^{-4}$

Answer:

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13. Two rain drops reach the earth with different terminal velocities having ratio $9:4$. Then , the ratio of their volumes is

A. $3:4$

B. $4:9$

C. $9:4$

D. $27:8$

Answer:

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14. Water falls from a top down the streamline,

A. area decreases

B. area increases

C. velocity remains same

D. area remains same

Answer:

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15. If a liquid does not wet glass, its angle of contact is

A. zero

B. acute

C. right angle

D.

Answer:

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