PHYSICS

BOOKS - RESNICK AND HALLIDAY PHYSICS (HINGLISH)

FLUIDS

Sample Problem 14 01

1. A living room has floor dimensions of 3.5 m and 4.2 m and a height of 2.4 m .

(a) What does the air in the room weigh when the air pressure is 1.0 atm ?

What is the magnitude of the atmosphere's downward force on the top of the your head .which we take to have an area of $0.040m^2$?

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Sample Problem 14 02

1. A novice scuba diver practicing in a swimming pool takes enough air from his tank

to fully expand his lungs before abandoning the tank at depth l. and swimming to the surface , failing to exhale during his ascent . At the surface , the difference Δ p between the external pressure on him and the air pressure in his lungs is 9.3 kPa . From what depth does he start ? What potentially lethal danger does he face ?

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Sample Problem 14 03

1. The U-tube in Fig contains two liquids in static equilibrium : Water of density $\rho_w = \left(998 kg/m^3\right)$ is in the right arm , and oil of unknown density ρ , is in the left . Measurement gives l = 135 mm and d = 12.3 mm .what is the density of the oil ?

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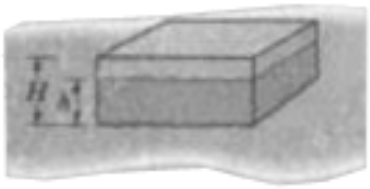
Sample Problem 14 04

1. In Fig , a block of density $\rho = 800kg/m^3$ floats face down in a fluid of density $\rho_f = 1200kg/m^3$. The block has height H = 6.0 m

(a) By what depth h is the block submerged ?

Floating means that the buoyant force matches the gravitational force.



(b) If the block is held fully submerged and then released , what is the magnitude of its acceleration ?

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Sample Problem 14 05

1. In part a of Fig , a surfer rides on the front side of a wave , at a point where a tangent to the wave has a slope of $\theta = 30.0^\circ$. The combined mass of surfer and surfboard is m = 83.0 kg , and the board has a submerged volume of $V = 2.50 \times 10^{-2} m^3$. The surfer maintains his position on the wave as the wave moves at constant speed toward shore .

What is the magnitude and direction (relative to the positive direction of the x-axis in part b of Fig) of the drag force on the surfboard from the water ?

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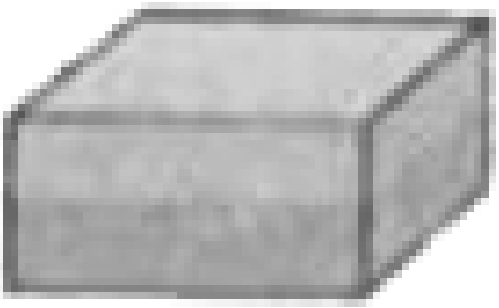
Sample Problem 14 06

1. In Fig. , a rectangular block floats in a liquid . A block of mass m = 0.500 kg and density $\rho = 700kg/m^3$ floats face down in a liquid of

density $\rho_f = 1200 kg/m^3$. What are the magnitude of the buoyant force on the block from the liquid , the weight of the liquid displaced by the block (liquid that would be in the space now occupied by the block) , and the mass of that displaced liquid ? What fraction of the block's volume is submerged ? What fraction of its height is submerged ?



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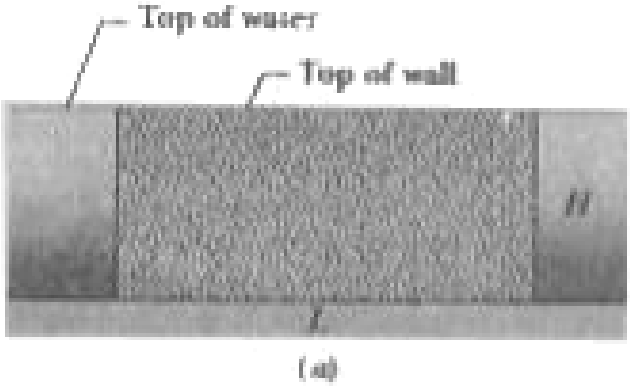
Sample Problem 14 07

1. Figure shows a vertical wall of horizontal length L = 5.0 m and depth H = 3.0 m that is fully submerged in water , with its top surface of the water . What is the force on the wall

due to the water pressure ?



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Sample Problem 14 08

1. A vessel with a body floating in it is kept in an lift accelerating downward with

acceleration a such that $a < g$. Will the body rise or sink further in the vessel ?

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Sample Problem 14 09

1. Three vessels having different shapes are shown in Fig , having the same base area and the same weight when empty . The vessels are filled with mercury to the same level . (Neglect the effect of the atmosphere) .

(a) Find which vessel has the maximum and which vessel has the minimum pressure at the bottom , or is the pressure same ?

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Sample Problem 14 10

1. Three vessels having different shapes are shown in Fig , having the same base area and

the same weight when empty . The vessels are filled with mercury to the same level . (Neglect the effect of the atmosphere) .

(b) Which vessel shows the maximum weight when weighed on a weighing scale or do they all weigh the same ?

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Sample Problem 14 11

1. Three vessels having different shapes are shown in Fig , having the same base area and the same weight when empty . The vessels are filled with mercury to the same level . (Neglect the effect of the atmosphere) .

Even though mercury exerts the same downward force on the bottom of each vessel , then why do vessel weigh differently ?

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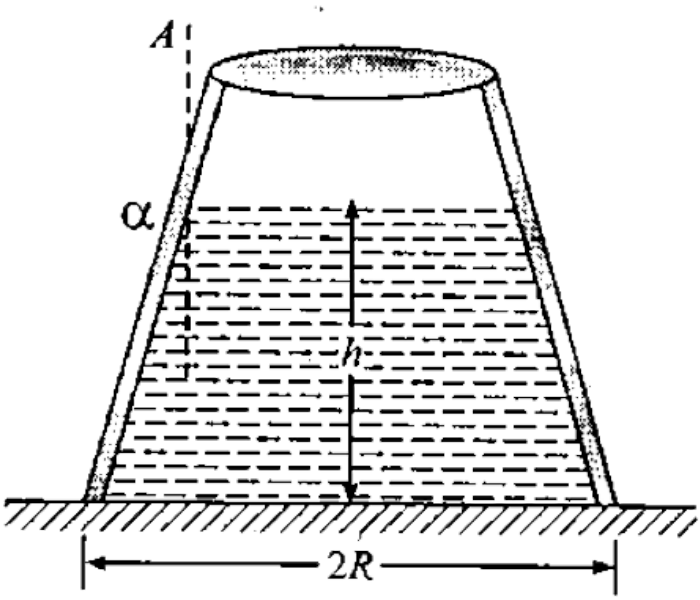
Sample Problem 14 12

1. A conical vessel wihout a bottom stands on a table. A liquid is poured with the vessel & as soon as the level reaches h, the pressure of the liquid raises the vessel. The radius of the base of the vessel is R and half angle of the cone α and the weight of the vessel is W. What

is the density of the liquid ?



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Sample Problem 14 13

1. The cross-section of a tank kept on a vehicle is shown in Fig. The rectangular tank is open to the atmosphere , During motion of the vehicle , the tank is subjected to a constant linear acceleration , a = $2.5m/s^2$. How much fluid will be left inside the tank if initially the tank is half filled . The vessel is 5 m wide and 2 m high .

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Sample Problem 14 14

1. The angular velocity , ω of a rotating body or shaft can be measured by attaching an open cylinder of liquid , as shown in Fig and measuring the change in the fluid level , $H - h_0$, caused by the rotation of the fluid . Determine the relationship between this change in fluid level and the angular velocity . Assume no fluid is spilling out of the vessel.

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Sample Problem 14 15

1. A square with side b and rectangle with side b and 2b are cut out from two plates of equal thickness with densities of $3.5g/cm^3$ and $2g/cm^3$, the square being cut out of the heavier material . The square and the rectangle are fastened together in the form of the letter L and placed upside down on the bottom of an empty vessel . Will the object be

stable if the vessel is filled with water ?

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Sample Problem 14 16

1. One end of a board of length l is hinged on top of a stone protruding from water . Length a of the board is above the point of support (Fig) . What part of the board is below the surface of the water in equilibrium state , if the density of wood is γ ?

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Sample Problem 14 17

1. Fig shows how the stream of water emerging from a faucet "necks down" as it falls . This change in the horizontal cross- sectional area is characteristic of any laminar (nonturbulant) falling stream because the gravitational force increases the speed of the stream . Here the indicated cross-sectional areas are $A_0 = 1.2cm^2$ and $A = 0.35cm^2$. The two levels are separated by a vertical distance h = 45 mm . What is the volume flow

rate from the tap ?

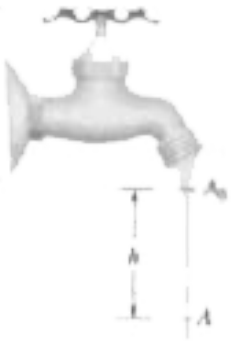

Figure 14-33 As water falls from a tap, its speed increases. Because the volume flow rate must be the same at all horizontal cross sections of the stream, the stream must "neck down" (narrow).

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Sample Problem 14 18

1. Ethanol of density $\rho = 791 kg/m^3$ flows smoothly through a horizontal pipe that tapers (as in Fig) in cross-sectional area from $A_1 = 1.20 \times 10^{-3} m^2$ to $A_2 = A_1/2$. The pressure difference between the wide and narrow sectional of pipe is 4120 Pa. What is the volume flow rate R_v of the ethanol ?

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Sample Problem 14 19

1. In the old West , a desperado fires a bullet into an open water tank Fig , creating a hole a distance h below the water surface . What is the speed v of the water exiting the tank ?

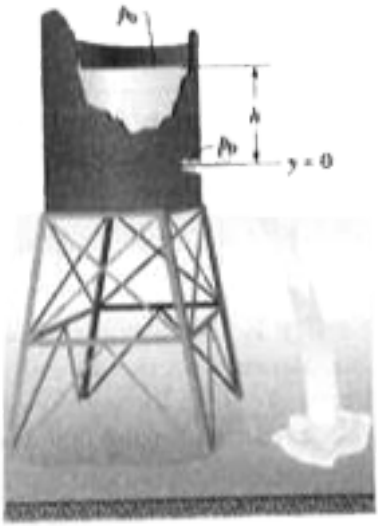

Figure 14-35 Water pours through a hole in a water tank, at a distance h below the water surface. The pressure at the water surface and at the hole is atmospheric pressure p_a.

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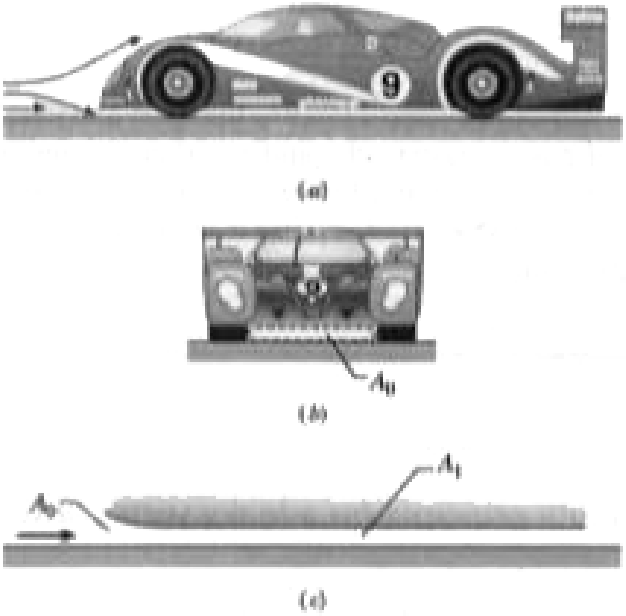
Sample Problem 14 20

1. Many types of race cars depend on negative lift (or down-force) to push them down against the track surface so they can take turns quickly without sliding out into the track wall . Part of the negative lift is the ground force , which is a force due to the airflow beneath the car . As the race car in Fig moves forward at 27.25 m/s , air is forced to flow over and under the car . The air forced to flow under the car . The air forced to flow under the

car enters through a vertical cross-sectional area is $A_1 = 0.0310m^2$. Treat this flow as steady flow through a stationary horizontal pipe that decreases in cross-sectional area from A_0 to A_1 (Fig)

(a) At the moment it passes through A_0 , the air is at atmospheric pressure p_0 . At what pressure p_0 . At what pressure p_1 is the air as

it moves through A_1 ?



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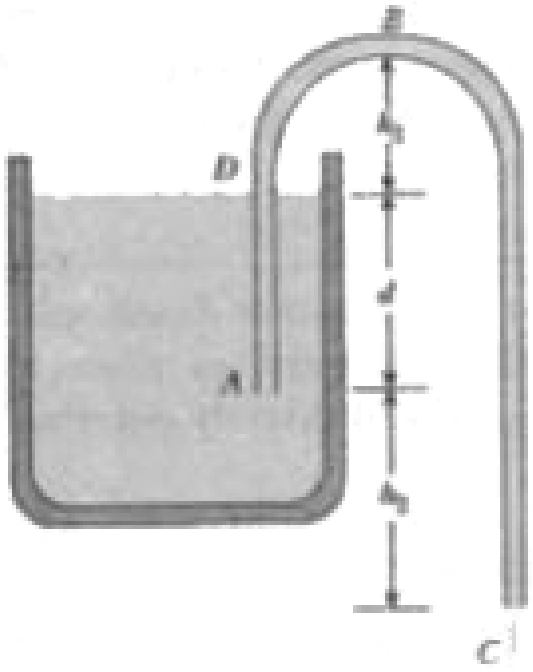
Sample Problem 14 21

1. Figure shows a siphon , which is a device for removing liquid from a container . Tube ABC must initially be filled , but once this has been done , liquid will flow through the tube until the liquid surface in the container is level with the tube opening at A . The liquid has density $1000kg/m^3$ and negligible viscosity . The distances shown are $h_1 = 25$ cm d = 12 cm and $h_2 = 40$ cm

(a) With what speed does the liquid emerge

from the tube at C ?



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Sample Problem 14 22

1. Figure shows a siphon , which is a device for removing liquid from a container . Tube ABC must initially be filled , but once this has been done , liquid will flow through the tube until the liquid surface in the container is level with the tube opening at A . The liquid has density $1000kg/m^3$ and negligible viscosity . The distances shown are $h_1 = 25$ cm d = 12 cm and $h_2 = 40$ cm

If the atmospheric pressure is $1.0 \times 10^5 Pa$, what is the pressure in the liquid at the topmost point B ?

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Sample Problem 14 23

1. Figure shows a siphon , which is a device for removing liquid from a container . Tube ABC must initially be filled , but once this has been done , liquid will flow through the tube until the liquid surface in the container is level with the tube opening at A . The liquid has density $1000kg/m^3$ and negligible viscosity . The distances shown are $h_1 = 25$ cm d = 12 cm and

$h_2 = 40$ cm

Theoretically , what is the greatest possible height h_1 that a siphon can lift water ?

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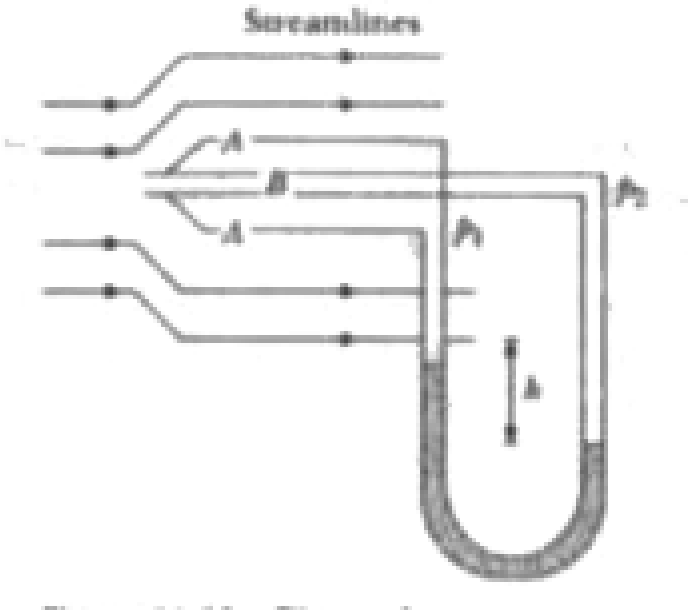
Sample Problem 14 24

1. Figure shows a device called Pitot tube . It measures the velocity of moving fluids . Determine the velocity of the fluid in terms of the density ρ the density of the fluid in

manometer (U-tube) σ and the height h .



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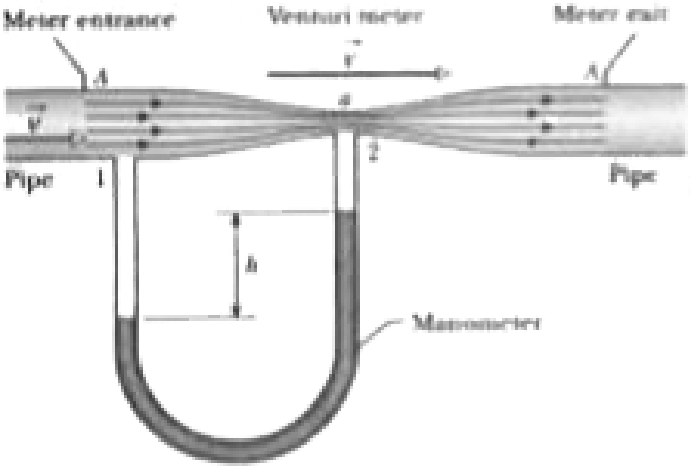
Sample Problem 14 25

1. A venturi meter is used to measure the flow speed of a fluid in a pipe . The meter is connected between two sections of the pipe (Fig) the cross-sectional area A of the entrance and exit of the meter matches the pipe's cross-sectional area a with speed v . A manometer connects the wider portion of the meter to the narrower portion . The change in the fluid's speed is accompanied by a change Δp in the fluid 's pressure , which causes a height difference h of the liquid in the two arms of the manometer. (Here , Δp means pressure in

the throat minus pressure in the pipe).



(a) By applying Bernoulli's equation and the equation of continuity to points 1 and 2 in Fig show that

$$V = \sqrt{\frac{2a^2\Delta p}{\rho(a^2 - A^2)}}$$

where r is the density of the fluid .

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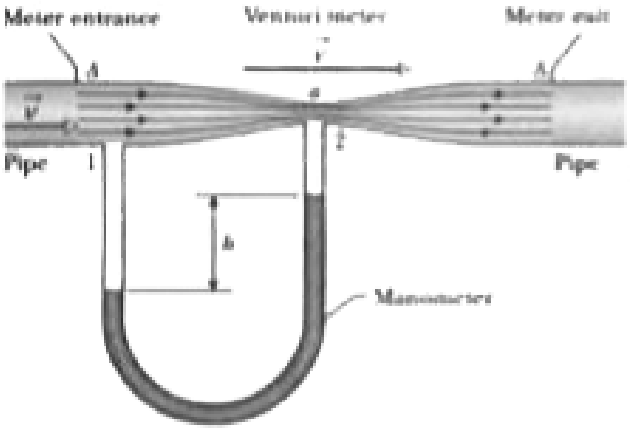
Sample Problem 14 26

1. A venturi meter is used to measure the flow speed of a fluid in a pipe . The meter is connected between two sections of the pipe (Fig) the cross-sectional area A of the entrance and exit of the meter matches the pipe's cross-sectional area a with speed v . A manometer connects the wider portion of the meter to the narrower portion . The change in the fluid's speed is accompanied by a change Δp

in the fluid 's pressure , which causes a height difference h of the liquid in the two arms of the manometer. (Here , Δp means pressure in the throat minus pressure in the pipe).



Suppose that the fluid is fresh water , that the cross-sectional areas are $64cm^2$ in the pipe and $32cm^2$ in the throat , and that the pressure is 55 kPa in the pipe and 41 kPa in the

throat , and that the pressure is 55 kPa in the pipe and 41 kPa in the throat . What is the rate of water flow in cubic meters per second ?

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Sample Problem 14 27

1. In Fig , water flows through a pipe that tapers from radius $r_1 = 0.020$ m where the water has a uniform speed $v_1 = 1.5$ m/s , to a radius $r_2 = 0.010$ m . What is the speed in the

smaller pipe ?

Figure 14-40 Water flows through a pipe that has different radius.

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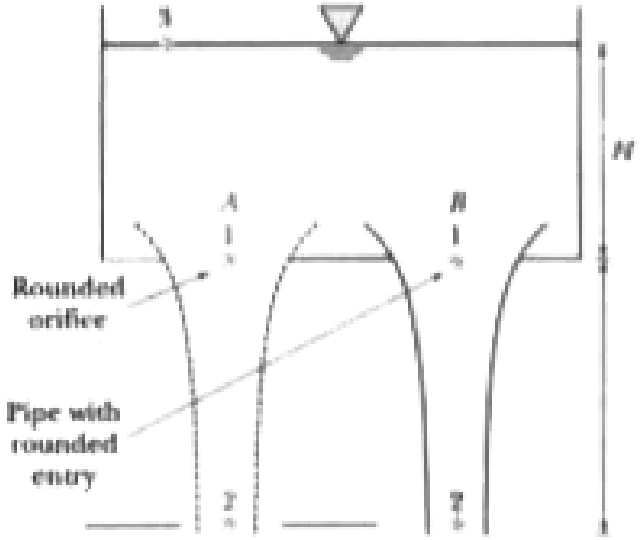
Sample Problem 14 28

1. A tank has two outlets (i) a rounded orifice A of diameter D and (ii) a pipe B with well -

rounded entry and of length L , as shown in Fig. For a height of water H in the tank , determine the (a) discharge from the outlets A and B , (b) velocities in the two outlets at levels 1 and 2 indicated in Fig .



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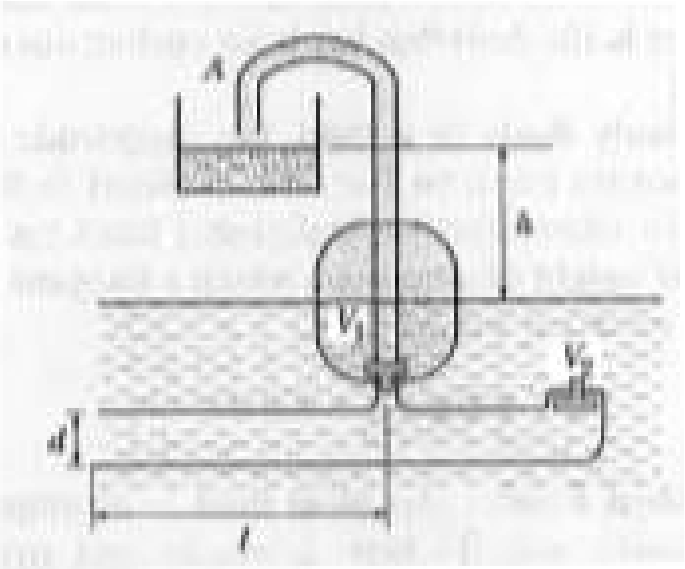
Sample Problem 14 29

1. Figure shows a self-acting water lifting device called a hydraulic ram . Its working is based on the phenomenon of hydraulic impact - when a liquid flowing along a tube is suddenly stopped , then there is a sharp increase in the pressure of the liquid . Its flow can be suddenly stopped , for example , by the shutting of a valve that discharges the water from the tube . A tube with a length of l = 2 m and a diameter of d = 20 cm is lowered into a

stream with a current velocity of v = 4 m/s .

First let valve V_2 be open and valve V_1 be shut . A sharp increase in pressure will cause value V_1 to open



(valve V_2 will close at the same time) and the water will flow up into vessel A . The pressure drops , value V_1 shuts and V_2 opens . The

water in the tube assumes its course and the phenomenon is repeated in the previous sequence .

Find the amount of water raised by the ram in one hour to a height of h = 30 m if each valve opens thirty times a minute.

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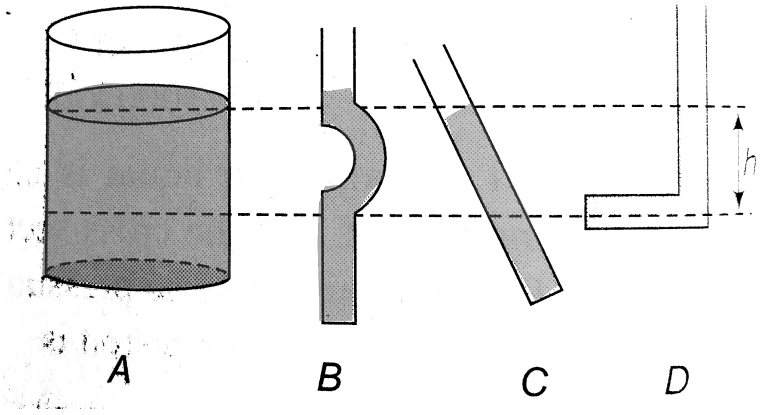
Checkpoint

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



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2. A penguin floats first in a fluid of density ρ_0 then in a fluid of density $0.95\rho_0$ and then in a

fluid of density $1.1\rho_0$. (a) Rank the densities according to the magnitude of the buoyant force on the penguin , greatest first . (b) Rank the densities according to the amount of fluid displaced by the penguin , greatest first.

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3. A wooden block floats vertically in a glass filled with water . How will the level of the water in the glass change if the block is kept in a horizontal position ?

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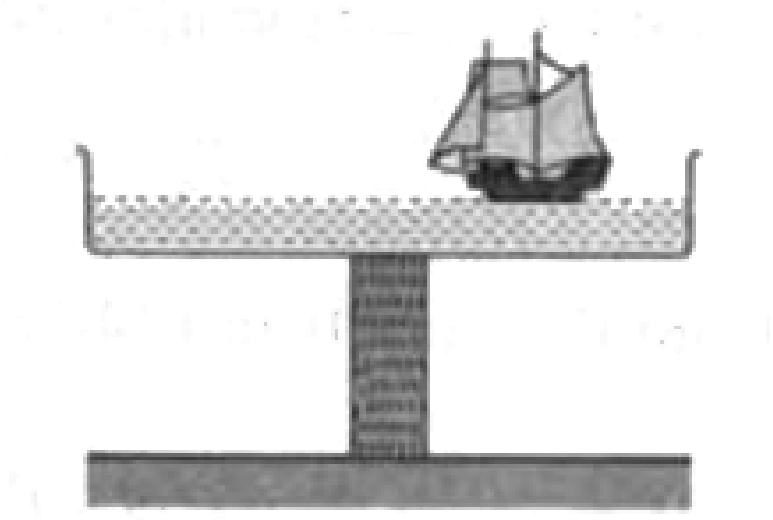
4. A vessel filled with water is placed exactly in middle of a thin wall as shown in figure . Will the system topple if a small wooden boat carrying some weight is floated in the vessel ?



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5. A piece of ice is floating in a tube filled with water . How will the level of the water in the tub change when the ice melts ? Consider the following cases :

(1) A stone is frozen in the ice .

(2) The ice contains an air bubble .

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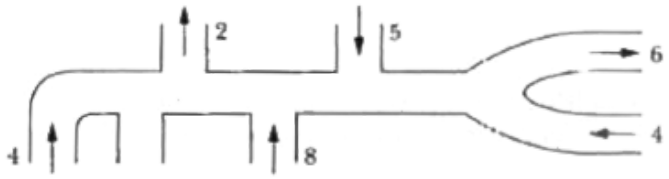
6. The figure shows a pipe and gives the volume flow rate (in cm^3/s) and the direction of flow for all but one section . What are the volume flow rate and the direction of flow for that section ?



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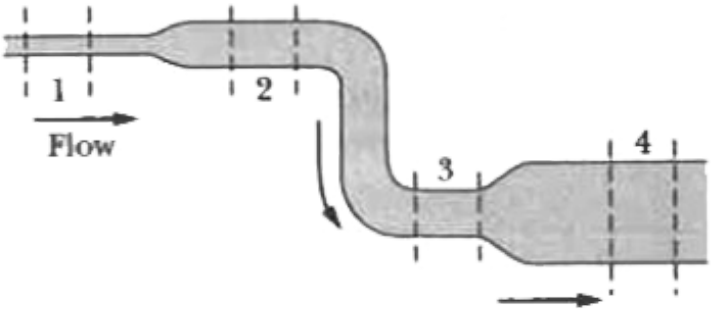
7. Water flows smoothly through the pipe shown in the figure , descending in the process . Rank the four numbered sections of pipe according to (a) the volume flow rate R_v through them , (b) the flow speed v through them and (c) the water pressure p within them , greatest first .



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8. A siphon of uniform diameter is used to drain water from a tank as illustrated in Fig. Assuming steady flow without friction, consider a small hole in the hose at location D as indicated . When the siphon is used , will water leak out of the hose , or will air leak into the hose and thus causing the siphon to stop ?

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Problems

1. Giraffe bending to drink. In a giraffe with its head 1.8 m above its heart, and its heart 2.0 m above its feet, the (hydrostatic) gauge pressure in the blood at its heart is 250 torr. Assume that the giraffe stands upright and the blood density is $1.06 \times 10^3 kg/m^3$. In torr (or mm Hg), find the (gauge) blood pressure (a) at the brain (the pressure is enough to perfuse the brain with blood, to keep the giraffe from fainting) and (b) at the feet (the

pressure must be countered by tight-fitting skin acting like a pressure stocking). (c) If the giraffe were to lower its head to drink from a pond without splaying its legs and moving slowly, what would be the increase in the blood pressure in the brain? (Such action would probably be lethal.)

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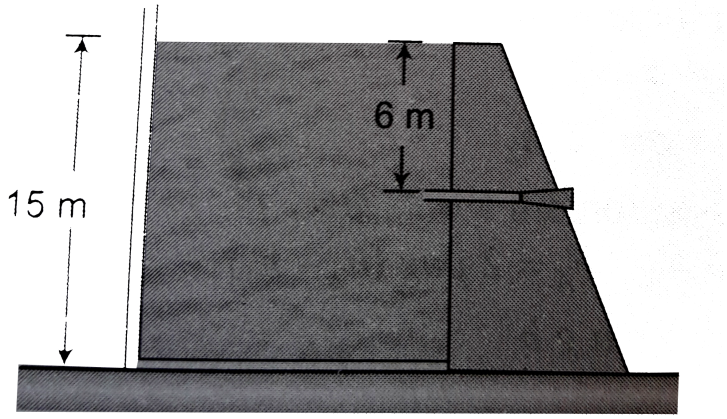
2. The fresh water behind a reservoir dam is $15m$ deep. A horizontal pipe $4.0cm$ in

diameter passes through the dam $6.0m$ below the water surface as shown in the figure. A plug secures the pipe opening :

(a) Find the friction force between the plug and the pipe wall.

(b) The plug is removed. What volume of water flows out of the pipe in 3.0 hour ? Assume that reservoir is large.



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3. In Fig ., the fresh water stands at depth D = 30.0 m behind the vertical upstream face of a dam of width W = 250 m. Find (a) the net horizontal force on the dam from the gauge pressure of the water and (b) the net torque due to that force about a horizontal line through O parallel to the (long) width of the dam. This torque tends to rotate the dam around that line, which would cause the dam

to fail. (c) Find the moment arm of the torque.

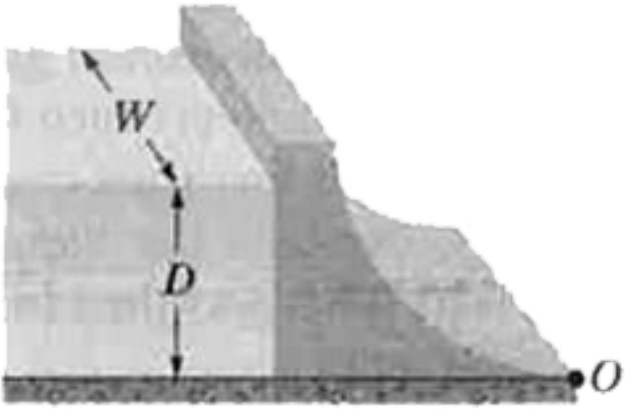

Figure 14-44 Problem 3.

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4. The volume of air space in the passenger compartment of an 1800 kg car is 5.00 m^3 . The volume of the motor and front wheels is

$0.710m^3$, and the volume of the rear wheels, gas tank, and trunk is $0.800m^3$, water cannot enter these two regions. The car rolls into a lake. (a) At first, no water enters the passenger compartment. How much of the car, in cubic meters, is below the water surface with the car floating (Fig. 14-45)? (b) As water slowly enters, the car sinks. How many cubic meters of water are in the car as it disappears below the water surface? (The car, with a heavy load in the

trunk, remains horizontal.)

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5. The maximum depth $d_{\max}$ that a diver can snorkel is set by the density of the water and the fact that human lungs can function against a maximum pressure difference between inside and outside the chest cavity) of 0.050 atm. What is the difference in $d_{\max}$

for fresh water and the water of the Dead Sea (the saltiest natural water in the world, with a density of $1.5x10^3 kg/m^3$)?

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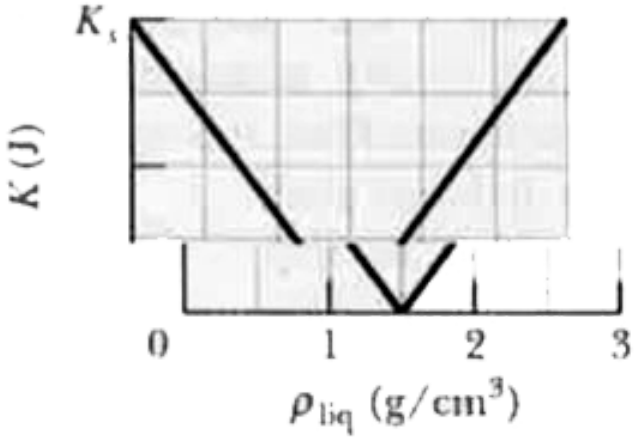
6. A small solid ball is released from rest while fully sub merged in a liquid and then its kinetic energy is measured when it has moved 2.0 cm in the liquid. Figure 14.46 gives the results after many liquids are used: The kinetic energy K is plotted versus the liquid density

ρ_{liq} and K_s = 2.4 J sets the scale on the vertical axis. What are (a) the density and (b) the volume of the ball?



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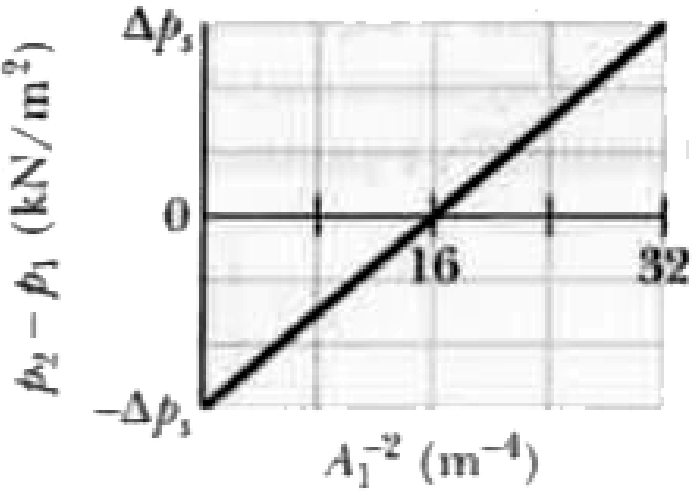
7. Fresh water flows horizontally from pipe section 1 of cross-sectional area A, into pipe

section 2 of cross-sectional area A_2 Figure gives a plot of the pressure difference $p_2 - p_1$ versus the inverse area squared A_1^{-2} that would be expected for a volume flow rate of a certain value if the water flow were laminar under all circumstances. The scale on the vertical axis is set by $\Delta p_s = 600 kN/m^2$. For the conditions of the figure, what are the

values of (a) A_2 and (b) the volume flow rate?



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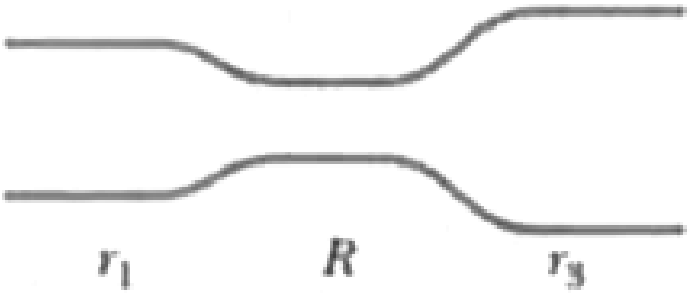
8. In Fig. water flows steadily from the left pipe section (radius r_1 = 2.00R), through the middle section (radius R), and into the right section

(radius r_3 = 3.00R). The speed of the water in the middle section is 0.620 m/s. What is the net work done on $0.700m^3$ of the water as it moves from the left section to the right section?



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9. A fluid is to be pushed through a narrow tube of radius 0.56 cm. What is the pressure increase in the fluid when the applied force is 120 N?

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10. A liquid of density 900 kg/m flows through a horizontal pipe that has a cross-sectional area of $1.90 \times 10^{-2} m^2$ in region A and a cross-sectional area of $9.50 \times 10^{-2} m^2$ in

region B. The pressure difference between the two regions is 720×10^3 Pa. What are (a) the volume flow rate and (b) the mass flow rate?

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11. The plastic tube in Fig. has a cross-sectional area of 5.00 cm^2. The tube is filled with water until the short arm (of length d = 0.800 m) is full. Then the short arm is figure sealed and more water is gradually poured into the long arm. When the total height of water in the

long arm reaches 2.80 m, the seal is on the verging of popping. What force is then on the seal?

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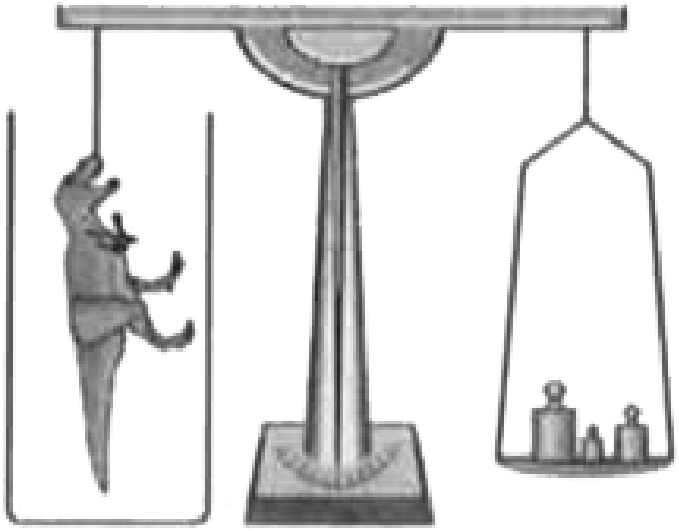
12. When researchers find a reasonably complete fossil of a dinosaur, they can determine the mass and weight of the living dinosaur with a scale model sculpted from plastic and based on the dimensions of the fossil bones. The scale of the model is 1/20, that is, lengths are 1/20 actual length, areas are $(1/20)^2$ actual areas, and volumes are $(1/20)^3$ actual volumes. First, the model is suspended from One arm of a balance and weights are added to the other arm until equilibrium is reached. Then the model is fully

submerged in water and enough weights are removed from the second arm to reestablish equilibrium (Fig.). For a model of a particular T. rex fossil 791.10 g had to be removed to a reestablish equilibrium . what was the volume of (a) the model and (b) the actual T . rex ? (c) if the density of T.rex was approximately the

density of water , what was its mass ?



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13. Two streams merge to form a river. One stream has a width of 8.2 m, depth of 3.4 m, and current speed of 2.3 m/s. The other

stream is 6.8 m wide and 3.2 m deep, and flows at 2.6 m/s. If the river has width 10.5 m and depth 4.5 m, what is its speed?

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14. A partially evacuated airtight container has a tight-fitting lid of surface area 50 cm^2 and negligible mass. If the force required to remove the lid is 480 N and the atmospheric pressure is $1.0x\ 10^5$ Pa, what is the internal air pressure?

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15. A 3.00 kg object is released from rest while fully sub merged in a liquid. The liquid displaced by the submerged object has a mass of 5.00 kg. How far and in what direction does the object move in 0.200 s, assuming that it moves freely and that the drag force on it from the liquid is negligible?

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16. Blood pressure in Argentinosaurus. (a) If this long-necked, gigantic sauropod had a head height of 18 m and a heart height of 8.0 m, what (hydrostatic) gauge pressure in its blood was required at the heart such that the blood pressure at the brain was 80 torr (just enough to perfuse the brain with blood)? Assume the blood had a density of $1.06 \times 10 kg/m^3$. (b) What was the blood pressure (in torr or mm Hg) at the feet?

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17. A boat floating in fresh water displaces water weighing 50.1 KN. (a) What is the weight of the water this boat displaces when floating in salt water of density $1.10 \times 10^3 kg/m^3$? (b) What is the difference between the volume of fresh water displaced and the volume of salt water displaced?

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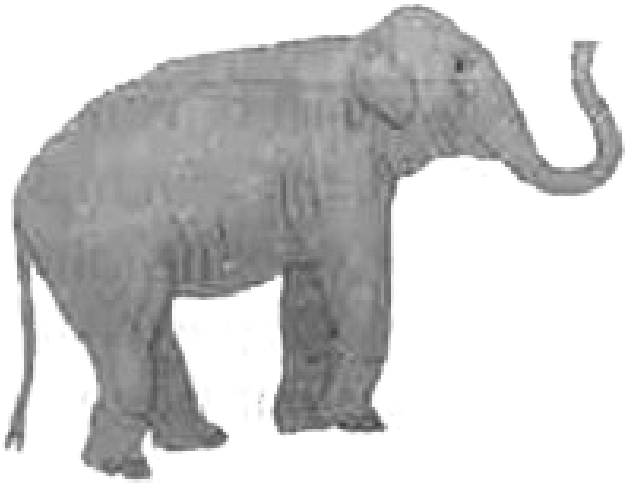
18. Snorkeling by humans and elephants. When a person snorkels, the lungs are connected directly to the atmosphere through the snorkel tube and thus are at atmospheric pressure. In atmospheres, what is the difference Δp between this internal air pressure and the water pressure against the body if the length of the snorkel tube is (a) 20 cm (standard situation) and (b) 3.5 m (probably lethal situation)? In the latter, the pressure difference causes blood vessels on the walls of the lungs to rupture, releasing

blood into the lungs. As depicted in Fig. 14-52, an elephant can safely snorkel through its trunk while swimming with its lungs 3.5 m below the water surface because the membrane around its lungs contains connective tissue that holds and protects the blood vessels, preventing rupturing.



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19. Three children, each of weight 356 N, make a log raft by lashing together logs of diameter 0.30 m and length 2.00 m. How many logs will be needed to keep them afloat in fresh water? Take the density of the logs to be 800 kg/m^3

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20. What gauge pressure must a machine produce in order to suck mud of density 1800

kg/m^3 up a tube by a height of 2.0 m?

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21. A garden hose with an internal diameter of 1.9 cm is connected to a (stationary) lawn sprinkler that consists merely of a container with 20 holes, each 0.15 cm in diameter. If the water in the hose has a speed of 0.91 m/s, at what speed does it leave the sprinkler holes?

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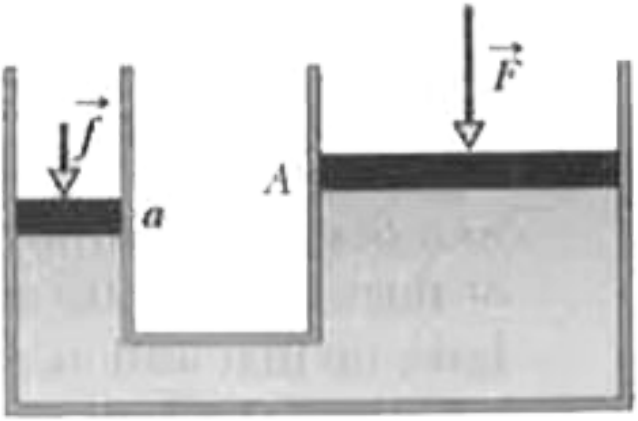
22. A piston of cross-sectional area a is used in a hydraulic press to exert a small force of magnitude f on the enclosed liquid. A connecting pipe leads to o a larger piston of cross sectional area A (Fig. 14-53). (a) What force magnitude F will the larger piston sustain without moving? (b) If the piston diameters are 3.50 cm and 60.0 cm, what force magnitude on the large piston will balance a

20.0 N force on the small piston?



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23. How much work is done by pressure in forcing $2.0m^3$ of water through a pipe having an internal diameter of 13 mm if the difference

in pressure at the two ends of the pipe is 1.0 atm?

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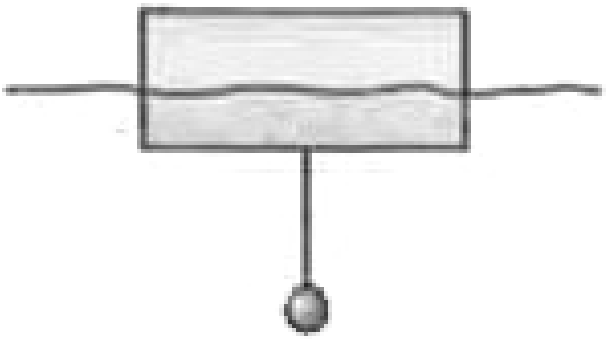
24. Calculate the hydrostatic difference in blood pressure between the brain and the foot in a person of height 1.50 m. The density of blood is $1.06 \times 10^3 kg/m^3$.

Watch Video Solution

25. Figure shows an iron ball suspended by thread of negligible mass from an upright cylinder that floats partially submerged in water. The cylinder has a height of 6.00 cm, a face area of $12.0cm^2$ on the top and bottom, and a density of $0.25g/cm^2$, and 1.00 cm of its height is above the water surface. What is

the radius of the iron ball?



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26. A flotation device is in the shape of a right cylinder, with a height of 0.650 m and a face area of $4.00m^2$ on top and bottom, and its density is 0.300 times that of fresh water. It is

initially held fully submerged in fresh water, with its top face at the water surface. Then it is allowed to ascend gradually until it begins to float. How much work does the buoyant force do on the device during the ascent?

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27. Suppose that two tanks, 1 and 2, each with a large opening at the top, contain different liquids. A small hole is made in the side of each tank at the same depth h below the

liquid surface, but the hole in tank 1 has half the cross-sectional area of the hole in tank 2. (a) What is the ratio ρ_1 / ρ_2 of the densities of the liquids if the mass flow rate is the same for the two holes? (b) What is the ratio R_{v_1} / R_{v_2} of the volume flow rates from the two tanks? (c) At one instant, the liquid in tank 1 is 16.0 cm above the hole. If the tanks are to have equal volume flow rates, what height above the hole must the liquid in tank 2 be just then?

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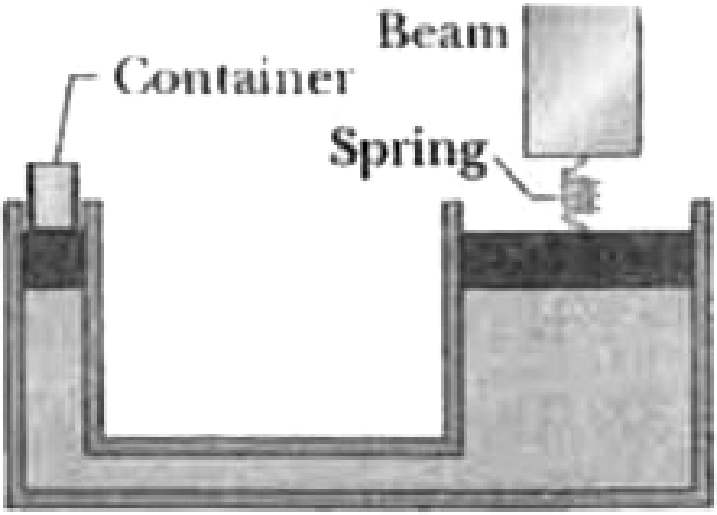
28. In Fig. a spring of spring constant 3.75×10^4 N/m Container is between a rigid beam Spring and the output piston of a hydraulic lever. An empty container with negligible mass sits on the input piston. The input piston has area A_i and the output piston has area $18.0A_i$ Initially the spring is at its rest length. How many kilograms of sand must be (slowly) poured into the container to

compress the spring by 5.00 cm?



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29. Two identical cylindrical vessels with their bases at the same level each contain a liquid of density $1.30 \times 10^3 kg/m^3$. The area of each

base is $4.25cm^2$, but in one vessel the liquid height is 0.854 m and in the other it is 1.560 m. Find the work done by the gravitational force in equalizing the levels when the two vessels are connected

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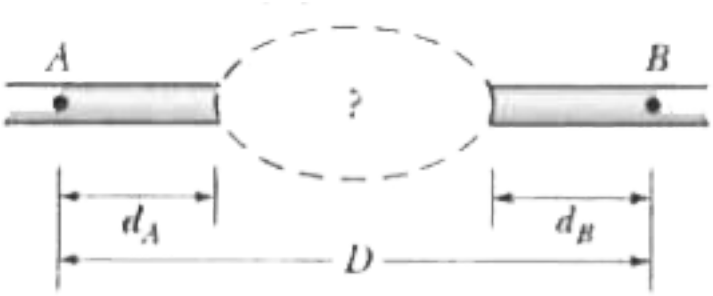
30. Figure shows two sections of an old pipe system that runs through a hill, with distances $d_A = d_B = 40$ m and D=110 m. On each side of the hill, the pipe radius is 2.00 cm. However,

the radius of the pipe inside the hill is no longer known. To determine it, hydraulic engineers first establish that water flows through the left and right sections at 2.50 m/s. Then they release a dye in the water at point A and find that it takes 88.8 s to reach point B. What is the average radius of the pipe within the hill?



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31. A hollow spherical iron shell floats almost completely submerged in water. The outer diameter is 50.0 cm, and the density of iron is $7.87 g / cm^3$ Find the inner diameter.

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32. An office window has dimensions 3.4 m by 2.1 m. As a result of the passage of a storm, the outside air pressure drops to 0.93 atm, but

inside the pressure is held at 1.0 atm. What net force pushes out on the window?

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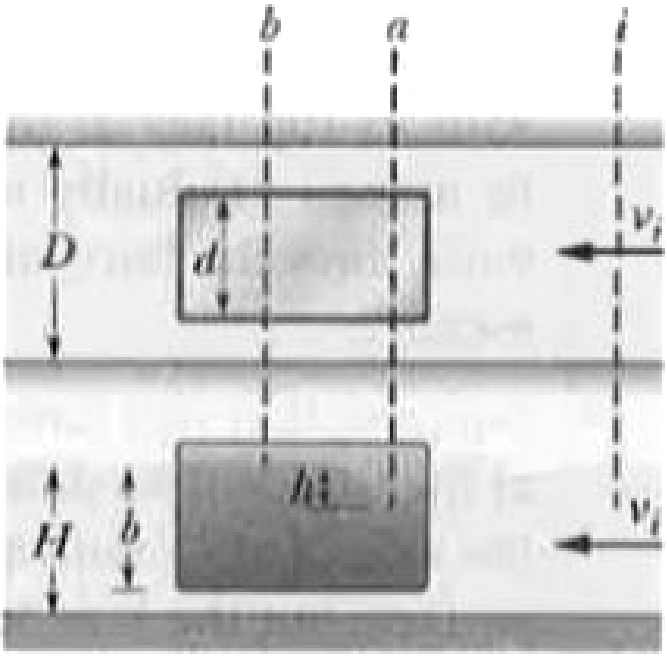
33. Canal effect. Figure shows an anchored barge that extends across a canal by distance d = 30 m and into the water by distance b = 12 m. The canal has a width D = 55 m, a water depth H = 14 m, and a uniform water-flow speed $v_i = 1.2$ m/s. Assume that the flow around the barge is uniform. As the water .

passes the bow, the water level undergoes a dramatic dip known as the canal effect. If the dip has depth h = 0.80 m, what is the water speed alongside the boat through the vertical cross sections at (a) point a and (b) point b? The erosion due to the speed increase is a

common concern to hydraulic engineers.



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34. What would be the height of the atmosphere if the air density (a) were uniform

and (b) decreased linearly to zero with height? Assume that at sea level the air pressure is 1.0 atm and the air density is 1.3 kg/m^3

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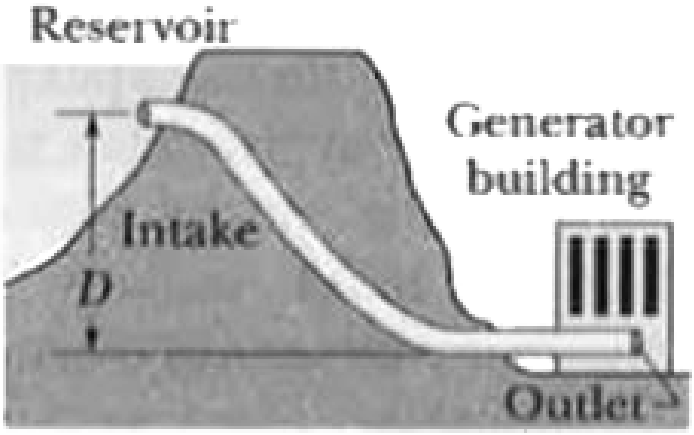
35. The intake in Figure, Reservoir has cross-sectional area of $0.740m^2$ and water flows in at 0.400 m/s. At the outlet, the cross-sectional area is smaller than at the intake and the water flows out at 9.50 m/s. The pressure difference between intake and outlet is 3.00

MPa. What is vertical distance D?



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36. A cylindrical tank with a large diameter is filled with water to a depth D =0.30 m. A hole of cross-sectional area A = 6.2 cm^2 in the bottom of the tank allows water to drain out.

(a) What is the drainage rate in cubic meters per second? (b) At what distance below the bottom of the tank is the cross-sectional area of the stream equal to one half the area of the hole?

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37. You inflate the front tires on your car to 32 psi. Later, you measure your blood pressure, obtaining a reading of 135/70, the readings being in mm Hg. In metric countries (which is

to say, most of the world), these pressures are customarily reported in kilopascals (kPa). In kilopascals, what are (a) your tire pressure and (b) your blood pressure?

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38. If you can produce a minimum gauge pressure of -2.5×10^{-3} atm in your lungs, to what maximum height can you suck tea (density 1000 kg/m^3) up a straw?

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39. The water flowing through a 1.9 cm (inside diameter) pipe flows out through three 1.5 cm pipes. (a) If the flow rates in the three smaller pipes are 26, 21, and 16 L/min, what is the flow rate in the 1.9 cm pipe? (b) What is the ratio of the speed in the 1.9 cm pipe to that in the pipe carrying 26 L/min?

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40. An inflatable device with a density of 1.20 g/cm^3 is fully submerged in fresh water and then inflated enough for the device's density to match that of the water. What then is the ratio of the expanded volume to the full volume of the device?

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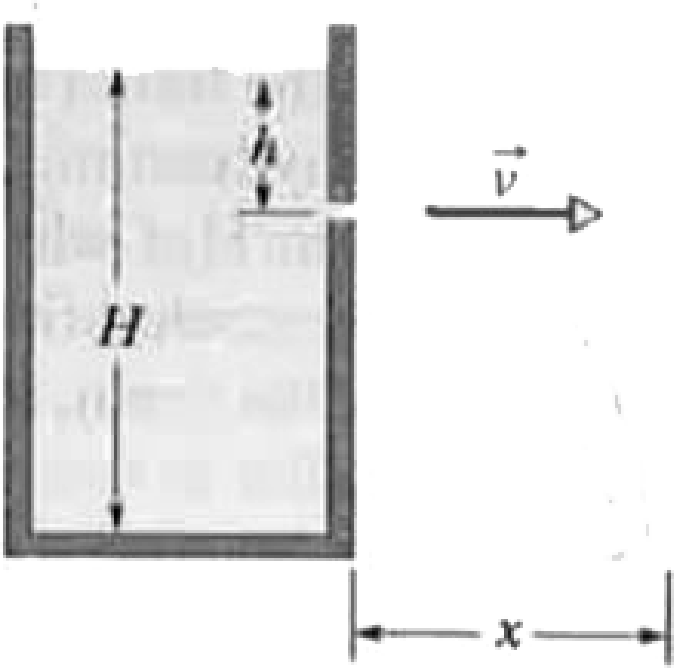
41. Figure shows a stream of water flowing through a hole at depth h = 12 cm in a tank

holding water to height H = 40 cm. (a) At what distance x does the stream strike the floor? (b) At what depth should a second hole be made to give the same value of x? (c) At what depth should a hole be made to maximize x?



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42. A large aquarium of height 5.00 m is filled with fresh water to a depth of 2.00 m. One wall of the aquarium consists of thick plastic 9.00 m wide. By how much does the total force on that wall increase if the aquarium is next filled to a depth of 4.00 m?

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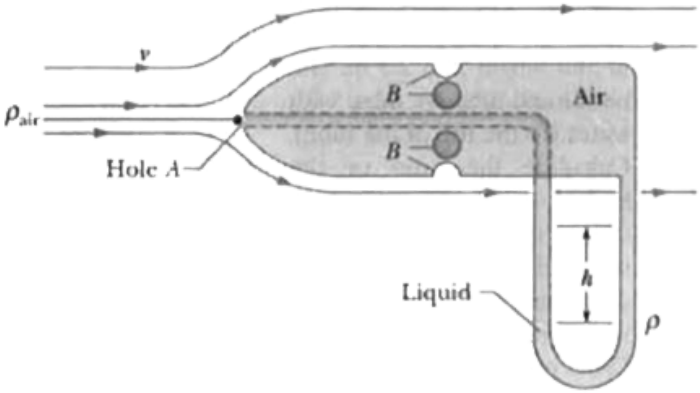
43. A pitot tube Fig. is used to determine the air speed of an airplane. It consists of an outer

tube with a number of small holes B (four are shown that allow air into the tube, that tube is connected to one arm of a U-tube. The other arm of the U-tube is connected to hole A at the front end of the device, which points in the direction the plane is headed. At A the air becomes stagnant so that v_A = 0. At B, however, the speed of the air presumably equals the airspeed v of the plane. (a) Use Bernoulli's equation to show that

$$v = \sqrt{\frac{2\rho gh}{\rho_{air}}}$$

where ρ is the density of the liquid in the U-

tube and his the difference in the liquid levels in that tube. (b) Suppose that the tube contains alcohol and the level difference h is 20.0 cm. What is the plane's speed relative to the air? The density of the air is $1.03kg/m^3$ and that of alcohol is 810 kg/m^3



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44. A pitot tube (see Problem 46) on a high-altitude aircraft measures a differential pressure of 150 Pa. What is the air craft's airspeed if the density of the air is $0.031 kg/m^3$?

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45. Models of torpedoes are sometimes tested in a horizontal pipe of flowing water, much as a wind tunnel is used to test model airplanes. Consider a circular pipe of internal diameter

25.0 cm and a torpedo model aligned along the long axis of the pipe. The model has a 6,00 cm diameter and is to be tested with water flowing past it at 2.00 m/s. (a) With what speed must the water flow in the part of the pipe that is unconstricted by the model? (b) What will the pressure difference be between the constricted and unconstricted parts of the pipe?

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46. In one observation, the column in a mercury barometer (as is shown in Fig.) has a measured height h of 740.35 mm. The temperature is -5.0° C, at which temperature the density of mercury ρ is $1.3608 \times 10^{4} kg/m^{3}$. The free-fall acceleration g at the site of the barometer is 9.7828 m/s^{2}. What is the atmospheric pressure at thal site in pascals and in torr (which is the common unit for barometer readings)?

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47. What fraction of the volume of an iceberg (density 917kg/m^3) would be visible if the iceberg floats (A) in the ocean (salt water density 1024kg/m^3) and (B) in a river (fresh water density 1000 kg/m^3)?(when salt water freezes to form ice, the salt is excluded. So an iceberg could provide fresh water to a community)

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48. Water is pumped steadily out of a flooded basement at 4.5 m/s through a hose of radius 1.0 cm, passing through a window 3.5 m above the waterline. What is the pump's power?

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49. At a depth of 10.9 km, the Challenger Deep in the Marianas Trench of the Pacific Ocean is the deepest site in any ocean. Yet, in 1960, Donald Walsh and Jacques Piccard reached the

Challenger Deep in the bathyscaph Trieste. Assuming that seawater has a uniform density of 1024 kg/m^3, approximate the hydrostatic pressure (in atmospheres) that the Trieste had to withstand. (Even a slight defect in the Trieste structure would have been disastrous.)

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50. A water pipe having a 2.5 cm inside diameter carries water into the basement of a house at a speed of 0.90 m/s and a pressure of

190 kPa. If the pipe tapers to 1.2 cm and rises to the second floor 7.6 m above the input point, what are the (a) speed and (b) water pressure at the second floor ?

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51. A hollow sphere of inner radius 8.0 cm and outer radius 9.0 cm floats half-submerged in a liquid of density 820 kg/m^3. (a) What is the mass of the sphere? (b) Calculate the density of the material of which the sphere is made.

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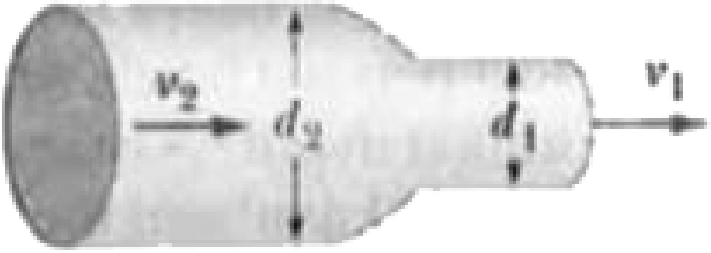
52. In Fig. water flows through a horizontal pipe and then out into the atmosphere at a speed v_1 = 23.0 m/s. The diameters of the left and right sections of the pipe are 5.00 cm and 3.00 cm. (a) What volume of water flows into the atmosphere during a 20.0 min period? In the left section of the pipe, what are (b) the

speed v_2 and (c) the gauge pressure?



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53. Three liquids that will not mix are poured into a cylindrical container. The volumes and densities of the liquids are 1.50 L, 2.6 g/cm^3: 0.75 L, 1.0 g/cm^3 , and 0.60 L, 0.80 g/cm^3. What is the force on the bottom of the container

due to these liquids? One liter = 1 L = 1000 cm^3 (Ignore the contribution due to the atmosphere.)

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54. Consider the venturi tube of Sample Problem 14.21 and Fig.without the manometer. Let A equal 5a. Suppose the pressure p_1 at A is 3.0 atm. Compute the values of (a) the speed V at A and (b) the speed vat a that make the pressure p_2 , at a equal to zero. (c) Compute

the corresponding volume flow rate if the diameter at A is 5.0 cm. The phenomenon that occurs at a when p, falls to nearly zero is known as cavitation. The water vaporizes into small bubbles.

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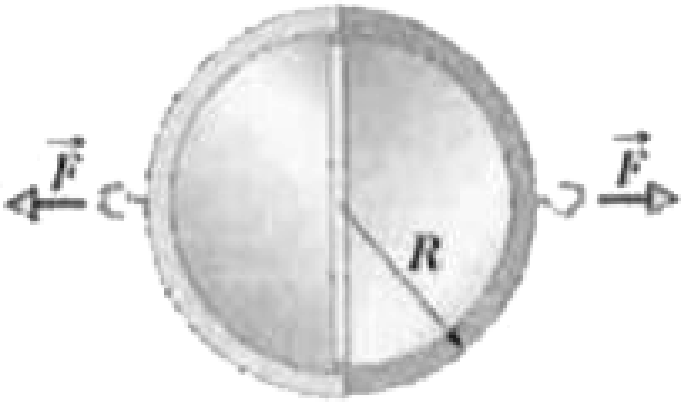
55. In 1654 Otto von Guericke, inventor of the air pump, gave a demonstration before the noble-men of the Holy Roman Empire in which two teams of eight horses could not pull apart

two evacuated brass hemispheres. (a) Assuming the hemispheres have (strong) thin walls, so that R in Fig. 14-63 may be considered both the inside and outside radius, show that the force $\vec{F}$ required to pull apart the hemispheres has magnitude $F = \pi R^2 \Delta p$, where Δp is the difference between the pressures outside and inside the sphere,



(b) Taking R as 40 cm, the inside pressure as 0.10 atm, and the outside pressure as 1.00 atm, find the force magnitude the teams of horses would have had to exert to pull apart the hemispheres. (c) Explain why one team of horses could have proved the point just as well if the hemispheres were attached to a sturdy wall.

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56. A wood block (mass 3.67 kg, density 600 kg/m) is fitted with lead (density $1.14 \times 10^4 kg/m^3$) so that it floats in water with 0.700 of its volume submerged. Find the lead mass if the lead is fitted to the block's (a) top and (b) bottom

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57. A block of wood floats in fresh water with two-thirds of its volume V submerged and in

oil with 0.92V submerged. Find the density of (a) the wood and (b) the oil.

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58. Water is moving with a speed of 5.0 m/s through a pipe with a cross-sectional area of $4.0cm^2$. The water gradually descends 12 m as the pipe cross-sectional area increases to $8.0cm^2$ (a) What is the speed at the lower level? (b) If the pressure at the upper level is

1.5×10^5 Pa, what is the pressure at the lower level?

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59. Crew members attempt to escape from a damaged submarine 100 m below the surface. What force must be applied to a pop-out hatch, which is 1.2 m by 0.60 m, to push it out at that depth? Assume that the density of the ocean water is 1024 kg/m^3 and the internal air pressure is at 1.00 atm.

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60. A very simplified schematic of the rain drainage system for a home is shown in Fig. Rain falling on the slanted roof runs off into gutters around the roof edge, it then drains through downspouts (only one is shown) into a main drainage pipe M below the basement, which carries the water to an even larger pipe below the street. In Fig. a floor drain in the basement is also connected to drainage pipe M. Suppose the following apply:

(1) the downspouts have height h_1 = 11 m,

(2) the floor drain has height h_2 = 1.2 m,

(3) pipe M has radius 2.0 cm,

(4) the house has side width w = 40 m and front length L = 70 m,

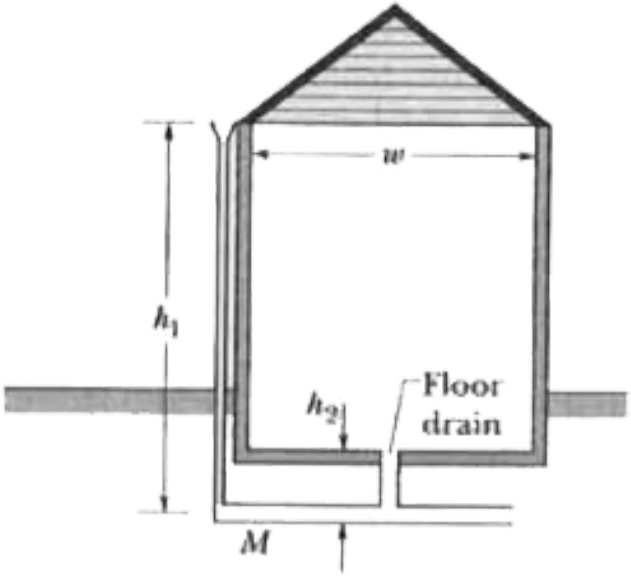
(5) all the water striking the roof goes through pipe M,

(6) the initial speed of the water in a downspout is negligible, and

(7) the wind speed is negligible (the rain falls vertically).

At what rainfall rate, in centimeters per hour, will water from pipe M reach the height of the

floor drain and threaten to flood the basement?



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61. An iron anchor of density 7870 kg/m^3 appears 200 N lighter in water than in air. (a) What is the volume of the anchor? (b) How much does it weigh in air?

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62. An iron casting containing a number of cavities weighs 6000 N in air and 4200 N in water. What is the total cavity volume in the casting? The density of solid iron is 7.87 g/cm^3

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63. Suppose that you release a small ball from rest at a depth of 0.400 m below the surface in a pool of water. If the density of the ball is 0.450 that of water and if the drag force on the ball from the water is negligible, how high above the water surface will the ball shoot as it emerges from the water? (Neglect any transfer of energy to the splashing and waves produced by the emerging ball.)

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64. In Fig. an open tube of length L = 2.3 m and crosssectional area A = 9.2 cm^2 is fixed to the top of a cylindrical barrel of diameter D = 1.2 m and height H = 2.3 m. The barrel and tube are filled with water to the top of the tube). Calculate the ratio of the hydrostatic force on the bottom of the barrel to the gravitational force on the water contained in the barrel. Why is that ratio not equal to 1.0? (You need

not consider the atmospheric pressure.)

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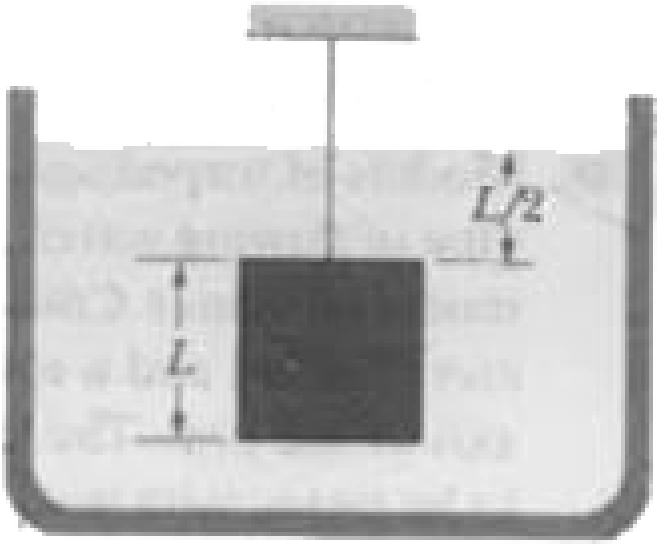
65. In Fig. a cube of edge length L=0.500 m and mass 450 kg is suspended by a rope in an open tank of liquid of density 1030 kg/m^3. Find (a) the magnitude of the total downward force on the top of the cube from the liquid and the atmosphere, assuming atmospheric pressure is 1.00 atm, (b) the magnitude of the total upward force on the bottom of the cube, and (c) the tension in the rope. (d) Calculate the magnitude of the buoyant force on the

cube using Archimedes' principle. What relation exists among all these quantities?



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66. The bends during flight. Anyone who scuba dives is advised not to fly within the next 24 h

because the air mixture for diving can introduce nitrogen to the bloodstream. Without allowing the nitrogen to come out of solution slowly, any sudden air-pressure reduction (such as during airplane ascent) can result in the nitrogen forming bubbles in the blood, creating the bends, which can be painful and even fatal. Military special operation forces are especially at risk. What is the change in pressure on such a special-op soldier who must scuba dive at a depth of 25 m in seawater one day and parachute at an altitude of 8.1 km the next day? Assume that

the average air density within the altitude range is 0.87 kg/m^3.

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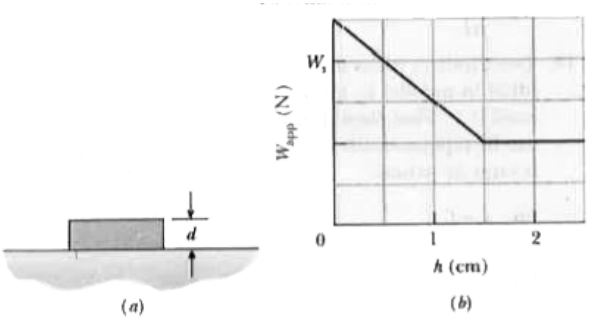
67. If Fig. 14-67a , a rectangular block is gradually pushed facedown into a liquid . The block has height d, on the bottom and top the face area is A = $8.00cm^2$. Figure gives the apparent weight W_{app} of the block as a function of the depth h of its lower face . The scale on the vertical axis is set by $W_a = 0.20$ N

. What is the density of the liquid ?



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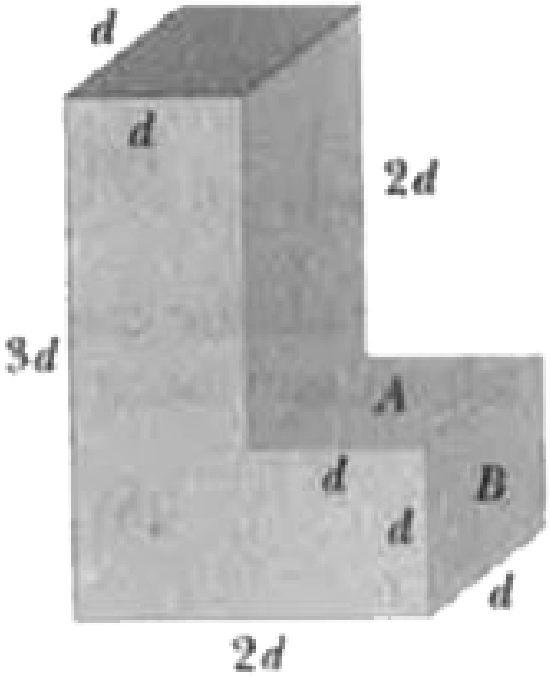
68. The L-shaped fish tank shown in Fig. is filled with water and is open at the top . Here , d = 70 m .

(a) What is the (total) force exerted by the water on face A ?

(b) What is the (total) force exerted by the water on face B ?



View Text Solution

Practice Questions Single Correct Choice Type

1. Which one of the following statements regarding a completely enclosed fluid is true?

A. Any change in the applied pressure of the fluid produces a change in pressure that depends on direction.

B. The pressure at all points within the fluid is independent of any pressure applied to it.

C. Any change in applied pressure produces an equal change in pressure at all points within the fluid.

D. An increase in pressure in one part of the fluid results in an equal decrease in pressure in another part.

Answer: C

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2. Which one of the following statements regarding streamline flow is true?

A. At any given point in the fluid, the velocity is constant in time.

B. Streamline flow occurs when there are sharp obstacles in the path of a fast-moving fluid

C. Streamline flow is described by Pascal's principle.

D. Streamline flow is described by Archimedes' principle.

Answer: A

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3. 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

Watch Video Solution

4. Oil is flowing with a speed of 1.22 m/s through a pipe line with a radius of 0.305 m. How many gallons of oil (1 gal- $3.79 \times 10^{-3} m^3$) flow in 1 day ?

A. 9.55×10^6 gal

B. 7.27×10^6 gal

C. 8.12×10^6 gal

D. 6.96×10^6 gal

Answer: C

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5. The property utilized in the manufacture of lead shots is

A. specific weight of liquid lead.

B. specific gravity of liquid lead.

C. compressibility of liquid lead.

D. surface tension of liquid lead.

Answer: D

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6. What mass of water (at 4.0°C) can be contained in a rectangular box whose dimensions are 10.0 cm by 5.00 cm by 1.00 cm? The density of water at 4.0°C is $1000 kg/m^3$.

A. 5.0 g

B. 10.0 g

C. 25.0 g

D. 50.0 g

Answer: D

Watch Video Solution

7. A film of water is formed between two straight parallel wires of length 10 cm each separated by $0.5cm$ If their separation is increased by $1mm$ while still maintaining their parallelism, how much work will have to be done (Surface tension of water $= 7.2 \times 10^{-2} \frac{N}{m}$)

A. $7.22 \times 10^{-6} J$

B. $1.44 \times 10^{-5} J$

C. $2.88 \times 10^{-5} J$

D. $5.76 \times 10^{-5} J$

Answer: B

Watch Video Solution

8. The amount of work done in blowing a soap bubble such that its diameter increases from d to D is (T=surface tension of the solution)

A. $4\pi\left(D^2 - d^2\right)T$

B. $8\pi\left(D-d^2\right)T$

C. $\pi\left(D^2-d^2\right)T$

D. $2\pi\left(D^2-d^2\right)T$

Answer: D

Watch Video Solution

9. A woman is enjoying a cold drink while lying on a beach. The acceleration due to gravity at her location is 9.85 m/s^8. What gauge pressure must exist in the woman's mouth if she is

drinking through a straw extending 0.085 m above the surface of the drink? (Assume the drink has a density of 1015 kg/m^3.)

A. 850 Pa

B. 970 Pa

C. 1100 Pa

D. 2100 Pa

Answer: A

Watch Video Solution

10. 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. $\rho = \rho_0\left(1 + \frac{\rho_0 gy}{B}\right)$

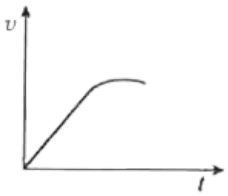
C. $\rho = \rho_0\left(1 + \frac{B}{\rho_0 hgy}\right)$

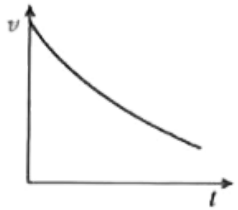
D. $\rho = \rho_0\left(1 - \frac{B}{\rho_0 gy}\right)$

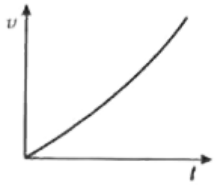
Answer: B

Watch Video Solution

11. Which of the following is the graph between the time and the velocity of a body moving in a viscous fluid?

A. 

B. 

C. 

D. 

Answer: A

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12. The excess pressure inside a spherical drop of water is four times that of another drop. Then, their respective mass ratio is

A. $1:16$

B. $8:1$

C. $1:4$

D. $1:64$

Answer: C

Watch Video Solution

13. The density of ice is 0.92 g/cm^3 and the density of seawater is 1.03 g/cm^3. A large iceberg floats in Arctic waters. What fraction of the volume of the iceberg is exposed?

A. $0.080\ \%$

B. $11\ \%$

C. 0.89

D. 0.92

Answer: B

Watch Video Solution

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

A. sink deeper in the liquid if a is upward.

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

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

D. remain in the same position relative to the water.

Answer: D

Watch Video Solution

15. Two spherical soap bubble coalesce. If V is the consequent change in volume of the contained air and S the change in total surface area, show that

$3PV + 4ST = 0$

where T is the surface tension of soap bubble and P is

Atmospheric pressure

A. $4PV + 3ST = 0$

B. $3PV + 4ST = 0$

C. $2PV + 3ST = 0$

D. $3PV + 2ST = 0$

Answer: B

Watch Video Solution

16. A full can of soda has a mass of 0.416 kg. It contains $3.54 \times 10^{-4} m^3$ of liquid. Assuming that the soda has the same density as water, find the volume of aluminum used to make the can.

A. $6.2 \times 10^{-5} m^3$

B. $4.2 \times 10^{-5} m^3$

C. $2.3 \times 10^{-5} m^3$

D. $1.8 \times 10^{-5} m^3$

Answer: C

Watch Video Solution

17. 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. $\sqrt{\frac{T}{\rho L}}$

B. $\frac{T}{\rho L}$

C. $\frac{2T}{\rho L}$

D. $\frac{\rho L}{T}$

Answer: C

Watch Video Solution

18. 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. $\frac{l}{l_1} + \frac{l}{l_2}$

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

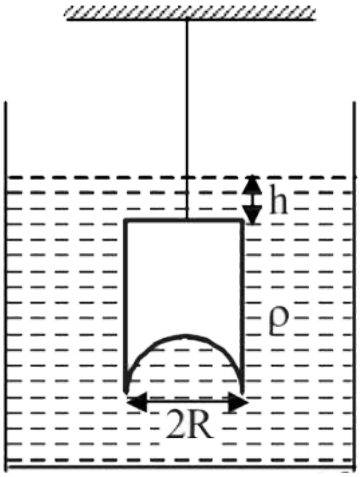
D. $\frac{l}{l_1 + l_2}$

Answer: C

Watch Video Solution

19. A hemispherical portion of radius R is removed from the bottom of a cylinder of radius R. The volume of the remaining cylinder is V and its mass M. It is suspended by a string in a liquid of density ρ where it stays vertical. The upper surface of the cylinder is at a depth h below the liquid surface. The force on the

bottom of the cylinder by the liquid is



A. Mg

B. $Mg - V\rho g$

C. $Mg + \pi R^2 h\rho g$

D. $\rho g\left(V + \pi R^2 h\right)$

Answer: D

Watch Video Solution

20. A capillary tube of inner diameter 0.5 mm is dipped in a liquid of specific gravity 13.6 and having surface tension 545 dyn/cm(angle of contact 130°) . Find the depression or elevation in the tube .

A. depressed 2.11 cm

B. elevated 2.11 cm

C. depressed , 3.71 cm

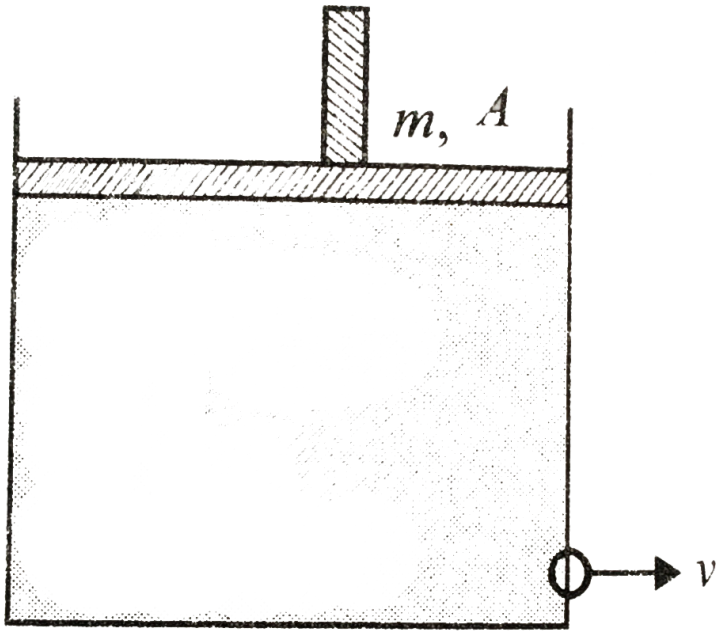
D. elevated , 3.71 cm

Answer: A

Watch Video Solution

21. A cylindrical vessel contains a liquid of density ρ up to height h. The liquid is closed by a piston of mass m and area of cross section A. There is a small hole at the bottom of the vessel. The speed v with which the

liquid comes out of the hole is



A. $\sqrt{2gh}$

B. $\sqrt{2\left(gh+\frac{mg}{\rho A}\right)}$

C. $\sqrt{2\left(gh+\frac{mg}{A}\right)}$

D. $\sqrt{2gh+\frac{mg}{A}}$

Answer: B

Watch Video Solution

22. In a car lift , compressed air with a gauge pressure of 4.0×10^5 Pa is used to raise a piston with a circular cross-sectional area . If the radius of the piston is 0.17 m , what is the maximum mass that can be raised using this piston ?

A. 530 kg

B. 3700 kg

C. 9800 kg

D. 22,000 kg

Answer: B

 Watch Video Solution

23. A capillary tube of radius r is immersed in water and water rises in to a height h. The mass of water in the capillary tube is 5g. Another capillary tube of radius 2 r is

immersed in water. The mass of water that will rise in this tube is

A. 2.5 g

B. 5.0 g

C. 10 g

D. 20 g

Answer: C

Watch Video Solution

24. The two dams are identical with the exception that the water reservoir behind dam A extends twice the horizontal distance behind it as that of dam B . Which one of the following statements regarding these two dams is correct ?

A. The force exerted by the water on dam A is greater than that on dam B .

B. The force exerted by the water on dam B is greater than that on dam A .

C. Dam A is more likely to collapse than dam B if the water level rises .

D. The horizontal distance of the water behind the two dams does not determine the force on them .

Answer: D

Watch Video Solution

25. A cylindrical air duct in an air conditioning system has a length of 5.5 m and a radius of 7.2×10^{-2} m . A fan forces air ($\eta = 1.8 \times 10^{-5} Pa - s$) through the duct , such that the air in a room (volume = $280 m^3$) is replenished every ten minutes . Determine the difference in pressure between the ends of the air duct .

A. 14 Pa

B. 4.4 Pa

C. 1.1 Pa

D. 0.47 Pa

Answer: B

Watch Video Solution

26. A balloon inflated with helium gas (density = $0.2kg/m^3$) has a volume of $6 \times 10^{-3}m^3$. If the density of air is $1.3kg/m^3$. What is the buoyant force exerted on the balloon ?

A. 0.01N

B. 0.8 N

C. $0.08N$

D. 1.3 N

Answer: C

Watch Video Solution

27. A glass bottle of soda is sealed with a screw cap . The absolute pressure of the carbon dioxide inside the bottle is 1.80×10^5 Pa. Assuming that the top and bottom

surfaces of the cap each have an area of $4.10 \times 10^{-4} m^2$, obtain the magnitude of the force that the screw thread exerts on the cap in order to keep it on the bottle . The air pressure outside the bottle is one atmosphere .

A. 18 N

B. 32 N

C. 26 N

D. 58 N

Answer: B

Watch Video Solution

28. At a given instant , the blood pressure in the heart is 1.60×10^4 Pa. If an artery in the brain is 0.45 m above the heart , what is the pressure in the artery ? Ignore any pressure changes due to blood flow ?

A. $1.6 \times 10^4 Pa$

B. $9.4 \times 10^3 Pa$

C. $1.1 \times 10^4 Pa$

D. $2.1 \times 10^4 Pa$

Answer: C

Watch Video Solution

29. Measured along the surface of the water , a rectangular swimming pool has a length of 15 m . Along this length , the flat bottom of the pool slopes downward at an angle of 11° below the horizontal , from one end to the other . By how much does the pressure at the

bottom of the deep end exceed the pressure at the bottom of the shallow end ?

A. $2.9 \times 10^4 Pa$

B. $6.1 \times 10^4 Pa$

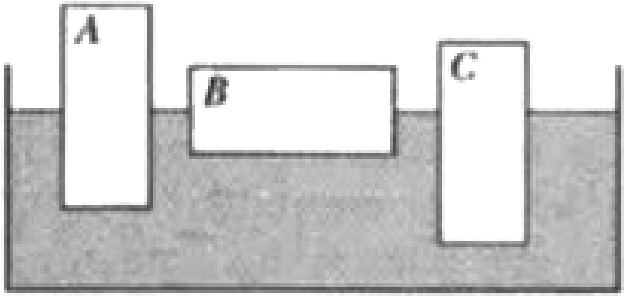
C. $4.3 \times 10^4 Pa$

D. $9.7 \times 10^4 Pa$

Answer: A

Watch Video Solution

30. Three blocks , labeled A , B and C , are floating in water as shown in the figure . Blocks A and B have the same mass and volume . Block C has the same volume , but is submerged to a greater depth than the other two blocks . Which one of the following statements concerning this situation is false ?



A. The density of block A is less than that of block C .

B. The buoyant force acting on block A is equal to that acting on block B .

C. The volume of water displaced by block C is greater than that displaced by block B .

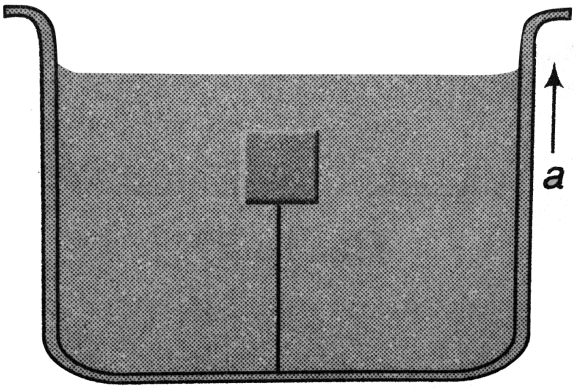
D. The volume of water displaced by block A is greater than that of displaced by block B .

Answer: D

Watch Video Solution

31. The tension in a string holding a solid block below the surface of a liquid (of density greater than that of solid) as shown in figure is T_0 when the system is at rest. What will be the tension in the string if the system has an

upward acceleration a?



A. $T\left(1-\frac{a}{g}\right)$

B. $T\left(1+\frac{a}{g}\right)$

C. $T\left(\frac{a}{g}-1\right)$

D. $\frac{a}{g}T$

Answer: B

Watch Video Solution

32. The main water line enters a house on the first floor . The line has a gauge pressure of $1.90 \times 10^5 Pa$. A faucet on the second floor , 6.50 m above the first floor , is turned off . What is the gauge pressure at this faucet ?

A. $1.45 \times 10^5 Pa$

B. $1.26 \times 10^5 Pa$

C. $2.29 \times 10^5 Pa$

D. $2.55 \times 10^5 Pa$

Answer: B

Watch Video Solution

33. The human lungs can function satisfactorily up to a limit where the pressure difference between the outside and inside of the lungs is one -twentieth of an atmosphere . If a diver uses a snorkel for breathing , how for below the water can she swim ? Assume the

diver is in salt water whose density is $1025 kg / m^3$.

A. 0.25 m

B. 0.35 m

C. 0.50 m

D. 0.20 m

Answer: C

Watch Video Solution

34. The blood speed in a normal segment of a horizontal artery is 0.11 m/s . An abnormal segment of the artery is narrowed down by plaque to one-fourth the normal cross-sectional area . What is the difference in blood pressure between the normal and constricted segments of the artery ? (Take density ρ of blood as 1060 kg/m^3)

A. 96 Pa

B. 100 Pa

C. 91 Pa

D. 87 Pa

Answer: A

Watch Video Solution

35. Water flows through a pipe of diameter 8.0 cm with a speed of 10.0 m/s . It then enters a smaller pipe of diameter 3.0 cm . What is the speed of the water as it flows through the smaller pipe ?

A. 1.4 m/s

B. 71 m/s

C. 2.8 m/s

D. 54 m/s

Answer: B

Watch Video Solution

36. Water enters a pipe of diameter 3.0 cm with a velocity of 3.0 m/s . The water encounters a construction where its velocity is

12 m/s . What is the diameter of the constricted portion of the pipe ?

A. 0.33 cm

B. 0.75 cm

C. 1.0 cm

D. 1.5 cm

Answer: D

Watch Video Solution

37. The vertical surface of a reservoir dam that is in contact with the water is 120 m wide and 12 m high . The air pressure is one atmosphere . Find the magnitude of the total force acting on this surface in a completely filled reservoir . (The pressure varies linearly with depth , so , you must use an average pressure)

A. $6.8 \times 10^8 N$

B. $3.1 \times 10^8 N$

C. $4.6 \times 10^8 N$

D. $2.3 \times 10^8 N$

Answer: D

Watch Video Solution

38. A pump and its horizontal intake pipe are located 12 m beneath the surface of a reservoir . The speed of the water in the intake pipe causes the pressure there to decrease , in accord with Bernoulli's principle . What is the maximum speed with which water can flow

through the intake pipe (assuming non-viscous flow) ?

A. 15 m/s

B. 18 m/s

C. 21 m/s

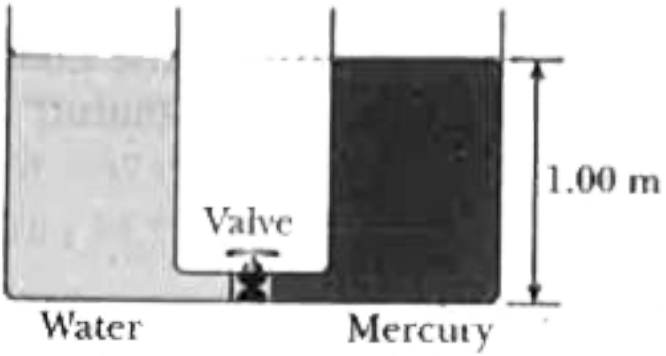
D. 24 m/s

Answer: C

Watch Video Solution

39. Two identical containers are open at the top and are connected at the bottom via a tube of negligible volume and a valve that is closed . Both containers are filled initially to the same height of 1.00 m , one with water , the other with mercury , as the figure indicates . The valve is then opened . Water and mercury are immiscible . Determine the fluid level in the left container when equilibrium is

reestablished .



A. 1.92 m

B. 1.22 m

C. 1.46 m

D. 0.54 m

Answer: C

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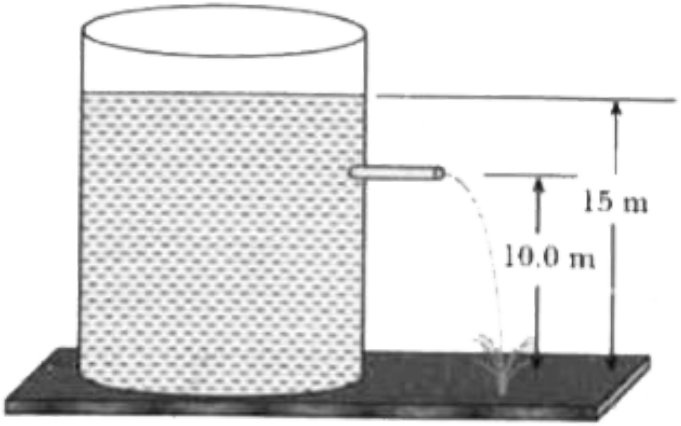
Watch Video Solution

40. A large tank is filled with water to a depth of 15 m . A spout located 10.0 m above the bottom of the tank is then opened as shown in the figure . With what speed will water emerge from the spout ?



A. 3.1 m/s

B. 9.9 m/s

C. 14 m/s

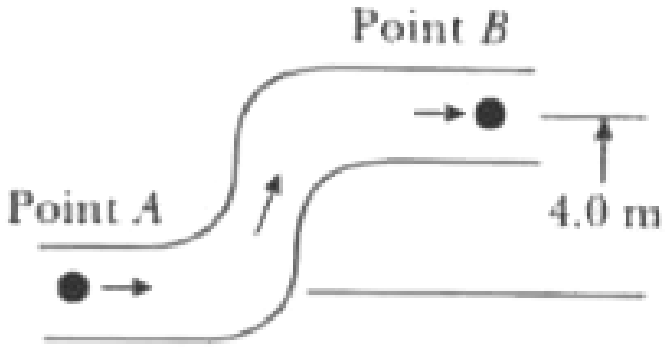
D. 17 m/s

Answer: B

Watch Video Solution

41. Oil ($\rho = 925kg/m^3$) is flowing through a pipeline at a constant speed when it encounters a vertical bend in the pipe raising

it 4.0 m. The cross-sectional area of the pipe does not change . What is the difference in pressure ($p_B - p_A$) in the portions of the pipe before and after the rise ?



A. $+2.4 \times 10^4$ Pa

B. -7.2×10^5 Pa

C. $-3.6 \times 10^4 Pa$

D. -1.8×10^3 Pa

Answer: C

Watch Video Solution

42. A 1.00 m tall container is filled to the brim , partway with mercury and the rest of the way with water . The container is open to the atmosphere . What must be the depth of the mercury so that the absolute pressure on the

bottom of the container is twice the atmospheric pressure ?

A. 0.74 m

B. 0.88 m

C. 0.43 m

D. 0.52 m

Answer: A

Watch Video Solution

43. A dentist's chair with a patient in it weighs 2100 N . The output plunger of a hydraulic system begins to lift the chair when the dentist's foot applies a force of 55 N to the plunger and the piston . What is the ratio of the radius of the plunger to the radius of the piston ?

A. 9.3

B. 2.6

C. 6.2

D. 0.64

Answer: C

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44. A submarine is operating at 100.0 m below the surface of the ocean . If the air inside the submarine is maintained at a pressure of 1.0 atmosphere , what is the magnitude of the force that acts on the rectangular hatch $2.0m \times 1.0$m on the deck of the submarine ?

A. 980 N

B. $2.0 \times 10^6 N$

C. $2.0 \times 10^3 N$

D. 9.8×10^5 N

Answer: B

Watch Video Solution

45. A duck is floating on a lake with 25 % of its volume beneath the water . What is the average density of the duck ?

A. $750kg/m^3$

B. $130kg/m^3$

C. $500kg/m^3$

D. $250kg/m^3$

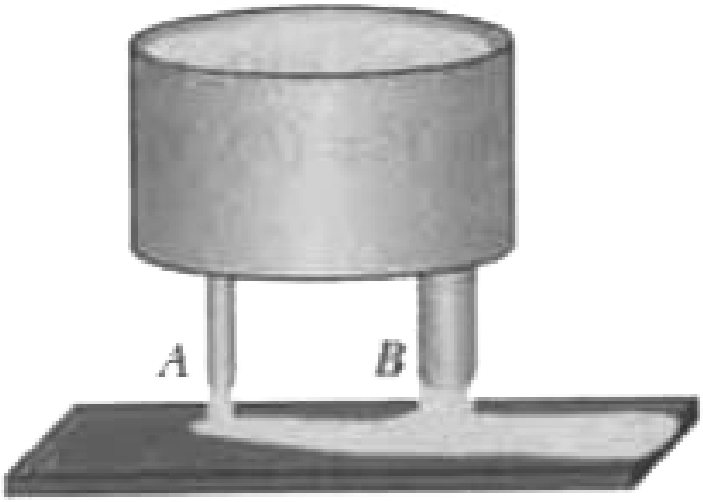
Answer: D

Watch Video Solution

46. A large container is continually filled with a viscous liquid that flows from two equally long , cylindrical pipes , labeled A and B , onto a

conveyer belt as shown in the figure . The diameter of pipe B is 1.75 times larger than that of pipe A .

What is the ratio of the average volume flow rate of the liquid exiting pipe B to that of the liquid exiting pipe A ?



A. 1.87

B. 9.38

C. 3.06

D. 4.33

Answer: B

 Watch Video Solution

47. An object is solid throughout . When the object is completely submerged in ethyl alcohol , its apparent weight is 15.2 N . When completely submerged in water , its apparent

weight is 13.7 N . What is the volume of the object ?

A. $1.6 \times 10^{-3} m^3$

B. $7.9 \times 10^{-4} m^3$

C. $1.0 \times 10^{-3} m^3$

D. $8.6 \times 10^{-4} m^3$

Answer: B

Watch Video Solution

48. A solid cylinder (radius = 0.150 m , height = 0.120 m) has a mass of 7.00 kg . This cylinder is floating in water . Then oil ($\rho = 725 kg/m^3$) is poured on top of the water until the situation shown in the figure results . How much of the height of the cylinder is in the oil ?

A. $8.2 \times 10^{-2} m$

B. $7.6 \times 10^{-2} m$

C. $9.5 \times 10^{-3} m$

D. 4.2×10^{-3} m

Answer: B

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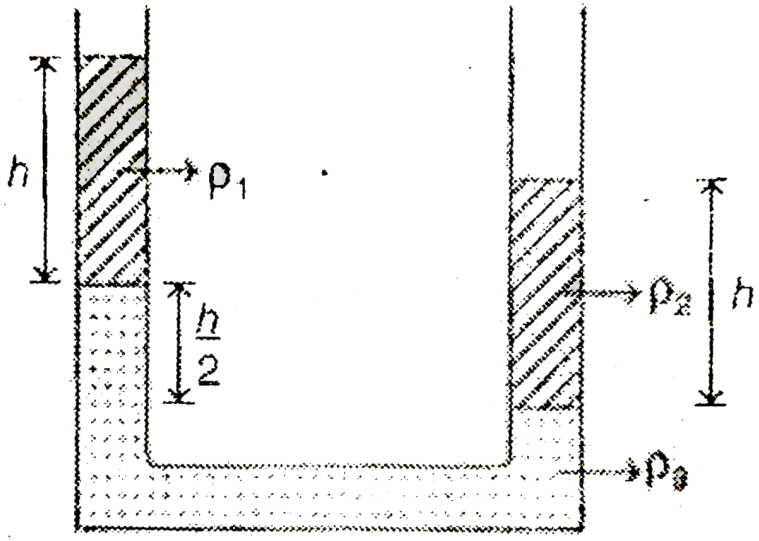
Practice Questions More Than One Correct Choice Type

1. Three different liquids are filled in a U-tube as shown in figure. Their densities are ρ_1, ρ_2 and ρ_3 respectively. From the figure we may conclude that



A. $\rho_2 > \rho_1$

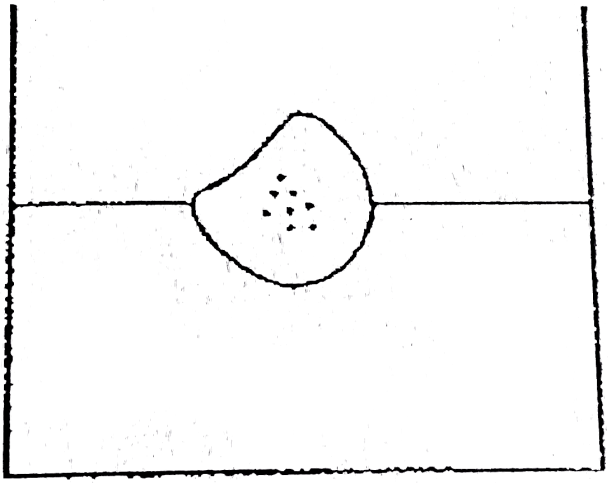
B. $\rho_1 > \rho_2$

C. $\rho_1 = 2(\rho_2 - \rho_1)$

D. $\rho_3 = \frac{\rho_2 + \rho_1}{2}$

Answer: A::C

Watch Video Solution



2.

Some pieces of impurity (density $= \rho$) is embedded in ice. This ice is floating in water (density ρ_w). When ice melts level of water will

(a). Fall if $\rho > \rho_w$

(b). Remain unchanged if $\rho < \rho_w$

(c). fall if $\rho < \rho_w$

(d). rise if $\rho > \rho_w$

A. fall if $\rho > \rho_w$

B. remain unchanged , if $\rho < \rho_w$

C. fall if $\rho < \rho_w$

D. rise if $\rho > \rho_w$

Answer: A::B

Watch Video Solution

3. An air bubble in a water tank rises from the bottom to the top. Which of the following statements are true?

A. Bubble rises upward because pressure at the bottom is less than at the top .

B. Bubble rises upward because pressure at the bottom is greater than that at the top.

C. As the bubble rises , its size increases .

D. As the bubble rises , its size decreases .

Answer: B::C

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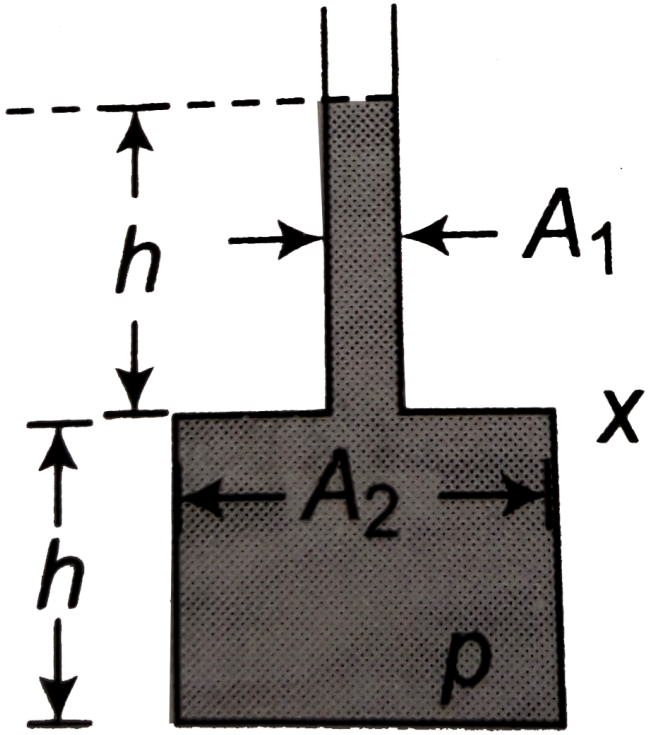
4. The vessel shown in the figure has a two sections of areas of cross-section A_1 and A_2. A liquid of density ρ fills both th sections, up to a height h in each Neglect atmospheric pressure. Choose the wrong option.



A. The pressure at the base of vessel is $2h\rho g$.

B. The force exerted by the liquid on the base of the vessel is $2h\rho gA_2$.

C. The weight of the liquid is $< 2h\rho gA_2$

D. The walls of the vessel at the level X exert a downward force $h\rho g(A_1 - A_2)$ on the liquid

Answer: A::B::C::D

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

A. metal is 3

B. metal is 7

C. liquid is 3

D. liquid is 1/3

Answer: B::C

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6. A vertical $U-tube$ contains a liquid. The total length of the liquid column inside the tube is 1. When the liquid is in equilibrium, the liquid surface in one of the arms of the $U-tube$ is pushed down slightly and released. The entire liquid column will undergo a periodic motion.

A. The motion is not simple harmonic motion

B. The motion is sample harmonic motion .

C. If it undergoes simple harmonic motion , the time period will be $2\pi\sqrt{l/g}$

D. if it undergoes simple harmonic motion , the time period will be $2\pi\sqrt{l/2g}$

Answer: B::D

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7. A solid floats in a liquid in a partialy dipped position.

A. The solid exerts a force equal to its weight on the liquid

B. The liquid exerts a force of buoyancy on the solid which is equal to the weight of the solid .

C. The weight of the displaced liquid equals the weight of the solid

D. The weight of the dipped part of the solid is equal to the weight of the displaced liquid .

Answer: A::C

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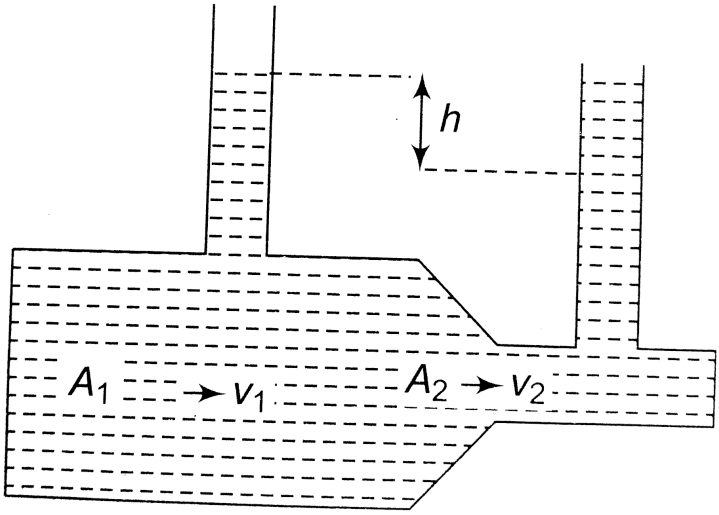
8. A liquid flows through a horizontal tube as shown in figure. The velocities of the liquid in the two sections, which have areas of cross-section A_1 and A_2 and v_1 and v_2 respectively.

The differnece 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_1Y_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

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9. An empty balloon weighs W_1. If air equal in weight to W is pumped into the balloon, the weight of the balloon becomes W_2. Suppose that the density of air inside and outside the balloon is the same. Then

A. $W_2 = W_1$

B. $W_2 = W_1 + w$

C. $W_2 < W_1 + w$

D. $W_2 > W_1$

Answer: A::C

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10. Water floows through two identical tubes A and B. A volume V_0 of water passes through

the tube A and $2V_0$ through B in a given time.

Which of the following may be correct?

A. Flow in both the tubes is steady

B. Flow in both the tubes is turbulent

C. Flow is steady in A but turbulent in B

D. Flow is steady in B but turbulent in A .

Answer: A::B::C

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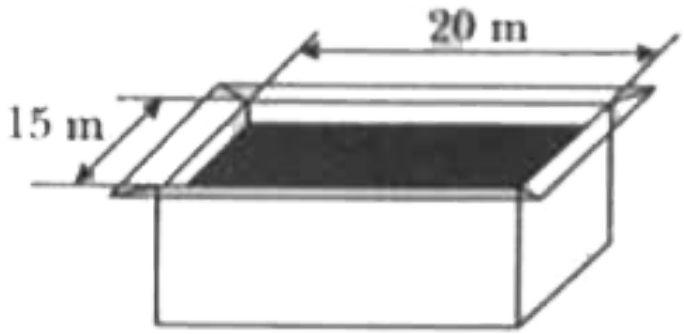
Practice Questions Linked Comprehension

1. A swimming pool has the dimensions shown in the figure . It is filled with water to a uniform depth of 8.00 m . The density of water = $1.00 \times 10^3 kg/m^3$



What is the total pressure exerted on the bottom of the swimming pool ?

A. 0.79×10^5 Pa

B. 1.80×10^5 Pa

C. 1.48×10^5 Pa

D. 1.97×10^5 Pa

Answer: B

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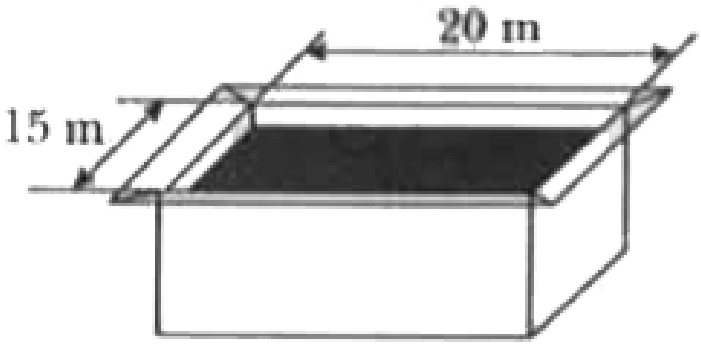
2. A swimming pool has the dimensions shown in the figure . It is filled with water to a uniform depth of 8.00 m . The density of water = $1.00 \times 10^3 kg/m^3$



What is the total force exerted on the bottom of the swimming pool ?

A. $2.40 \times 10^7 N$

B. $5.90 \times 10^7 N$

C. $5.40 \times 10^7 N$

D. 7.50×10^7 N

Answer: C

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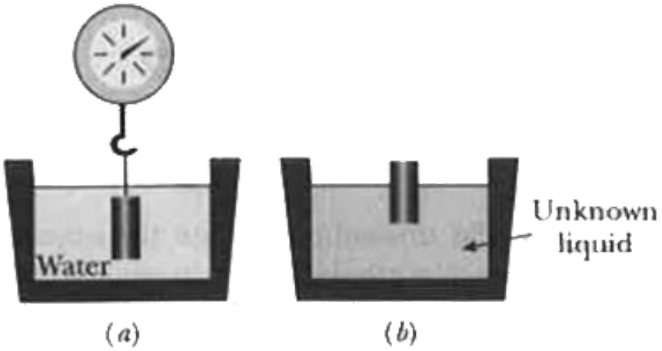
3. When a block of volume $1.00 \times 10^{-3} m^3$ is hung from a spring scale as shown in Fig. (a) the scale reads 10.0 N . When the same block is then placed in an unknown liquid , it floats with two -third of its volume submerged as suggested in Fig. (b) . The density of water is $1.00 \times 10^{-3} kg/m^3$



Determine the mass of the block .

A. 1.02 kg

B. 2.02 kg

C. 3.02 kg

D. 4.04 kg

Answer: B

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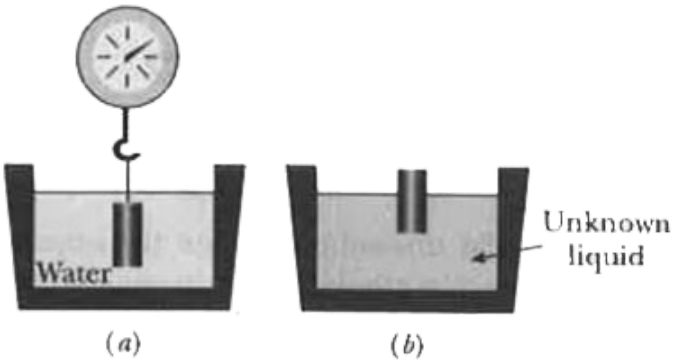
4. When a block of volume $1.00 \times 10^{-3} m^3$ is hung from a spring scale as shown in Fig. (a) the scale reads 10.0 N . When the same block is then placed in an unknown liquid , it floats with two -third of its volume submerged as suggested in Fig. (b) . The density of water is $1.00 \times 10^{-3} kg/m^3$



Determine the density of the unknown liquid .

A. $3.03 \times 10^3 kg/m^3$

B. $4.62 \times 10^3 kg/m^3$

C. $6.16 \times 10^3 kg/m^3$

D. $8.01 \times 10^3 kg/m^3$

Answer: A

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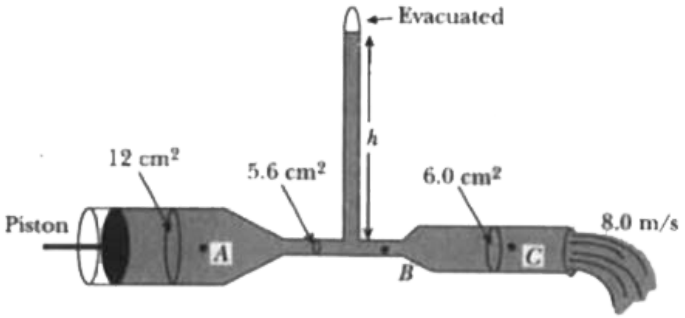
5. A glass tube has several different cross-sectional areas with the values indicated in the figure . A piston at the left end of the tube exerts pressure so that mercury within the tube flows from the right end with a speed of 8.0 m/s . Three points with in the tube are labeled A , B and C . (Atmospheric pressure is $1.01 \times 10^5 N/m^2$, Density of mercury is $13600 kg/m^3$) .



At what speed is mercury flowing past the point labeled A ?

A. 4.0 m/s

B. 2.0 m/s

C. 8.0 m/s

D. 12 m/s

Answer: A

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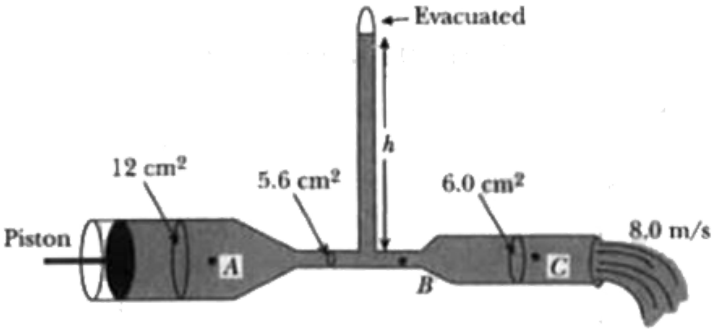
6. A glass tube has several different cross-sectional areas with the values indicated in the figure . A piston at the left end of the tube exerts pressure so that mercury within the tube flows from the right end with a speed of 8.0 m/s . Three points with in the tube are labeled A , B and C . (Atmospheric pressure is $1.01 \times 10^5 N/m^2$, Density of mercury is $13600 kg/m^3$) .



What is the total pressure at point A ?

A. $1.01 \times 10^5 Pa$

B. $4.27 \times 10^5 Pa$

C. 2.02×10^5 Pa

D. 3.26×10^5 Pa

Answer: B

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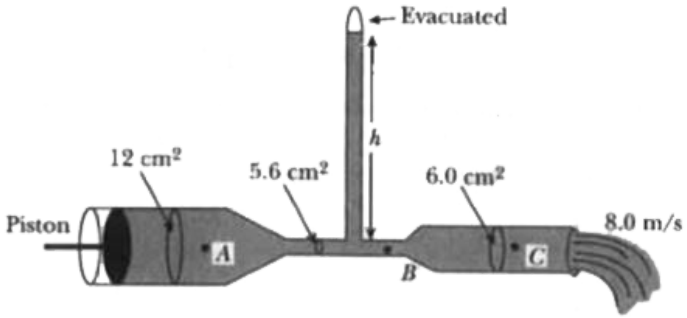
7. A glass tube has several different cross-sectional areas with the values indicated in the figure . A piston at the left end of the tube exerts pressure so that mercury within the tube flows from the right end with a speed of 8.0 m/s . Three points with in the tube are labeled A , B and C . (Atmospheric pressure is $1.01 \times 10^5 N/m^2$, Density of mercury is $13600 kg/m^3$) .



At what speed is mercury flowing past the point labeled B ?

A. 2.27 m/s

B. 7.47 m/s

C. 4.27 m/s

D. 8.57 m/s

Answer: D

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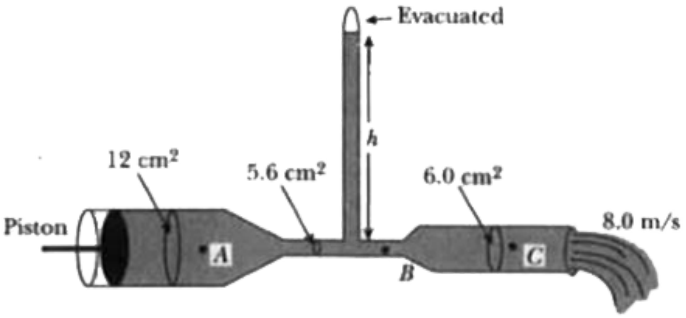
8. A glass tube has several different cross-sectional areas with the values indicated in the figure . A piston at the left end of the tube exerts pressure so that mercury within the tube flows from the right end with a speed of 8.0 m/s . Three points with in the tube are labeled A , B and C . (Atmospheric pressure is $1.01 \times 10^5 N/m^2$, Density of mercury is $13600 kg/m^3$) .



What is the total pressure at point B ?

A. $1.01 \times 10^5 Pa$

B. $4.27 \times 10^5 Pa$

C. $3.64 \times 10^4 Pa$

D. $6.44 \times 10^4 Pa$

Answer: C

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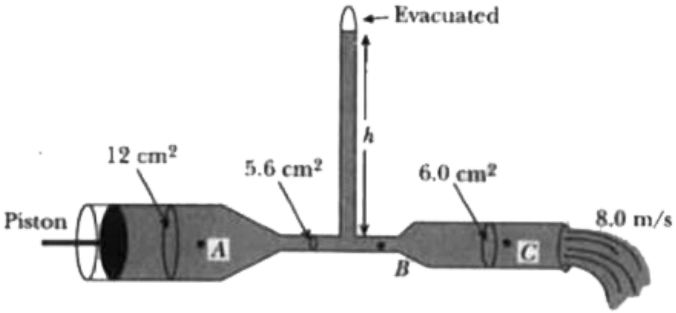
9. A glass tube has several different cross-sectional areas with the values indicated in the figure . A piston at the left end of the tube exerts pressure so that mercury within the tube flows from the right end with a speed of 8.0 m/s . Three points with in the tube are labeled A , B and C . (Atmospheric pressure is $1.01 \times 10^5 N/m^2$, Density of mercury is $13600 kg/m^3$) .



What is the total pressure at point C ?

A. $1.01 \times 10^5 Pa$

B. 3.26×10^5 Pa

C. $3.66 \times 10^5 Pa$

D. $6.44 \times 10^5 Pa$

Answer: A

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Practice Questions Matrix Match

1. Match the statements in Column I with the statements in Column II . One or more than one choice from Column II can match with a

statement from Column I.

Column I	Column II
(a) If the radius of a soap bubble A is 4 times that of another soap bubble B, then the ratio of excess pressure (P_B/P_A) is	**(p)** 16 : 9
(b) If two small drops of mercury, each of radius R, coalesce to form a single large drop, the ratio of the total surface energy before and after change is	**(q)** $2^{1/3}$: 1
(c) The energy required to blow a bubble of radius 4 cm and 3 cm in the same liquid is in the ratio of	**(r)** 4 : 1
(d) Two soap bubbles are blown. In the first bubble, excess pressure is four times that of the second soap bubble. The ratio of radii of first to second soap bubble is	**(s)** 1 : 4

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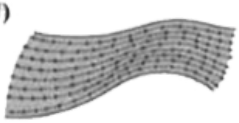
2. There is a table having 3 columns and 4 rows . Based on the table , there 3 questions . Question has 4 options (a) , (b) , (c) and (d) ,

Only one of the four options is correct .

Column I	Column II	Column III
(I) Velocity of fluid particles that are crossing a particular point is the same at all the times.	(i) Flow revolves around an axis line.	(J) 
(II) Velocity exceeds beyond the critical velocity, the paths and velocities of liquid change continuously and haphazardly.	(ii) Motion of a particle varies rapidly in magnitude and direction.	(K) 

Column I	Column II	Column III
(III) Velocity at any point in the fluid remains constant with time.	(iii) Each particle takes the same path as taken by a previous particle through the point.	(L) 
(IV) Fluid flow velocity is greatest next to its axis.	(iv) All particles passing through a point in a steady flow follow the same path.	(M) 

What are the characteristics of laminar flow ?

A. (IV) (iv) (J)

B. (III) (iv) (L)

C. (II) (i) (M)

D. (II) (i) (K)

Answer:

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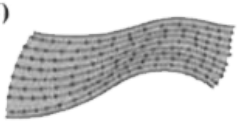
3. There is a table having 3 columns and 4 rows . Based on the table , there 3 questions . Question has 4 options (a) , (b) , (c) and (d) , Only one of the four options is correct .

Column I	Column II	Column III
(I) Velocity of fluid particles that are crossing a particular point is the same at all the times.	(i) Flow revolves around an axis line.	(J) 
(II) Velocity exceeds beyond the critical velocity, the paths and velocities of liquid change continuously and haphazardly.	(ii) Motion of a particle varies rapidly in magnitude and direction.	(K) 

Column I	Column II	Column III
(III) Velocity at any point in the fluid remains constant with time.	(iii) Each particle takes the same path as taken by a previous particle through the point.	(L) 
(IV) Fluid flow velocity is greatest next to its axis.	(iv) All particles passing through a point in a steady flow follow the same path.	(M) 

What are the characteristics of turbulent flow ?

A. (I) (iii) (K)

B. (IV) (iii) (L)

C. (III) (iii) (L)

D. (II) (ii) (K)

Answer:

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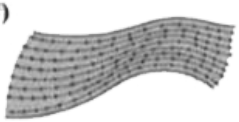
4. There is a table having 3 columns and 4 rows . Based on the table , there 3 questions . Question has 4 options (a) , (b) , (c) and (d) , Only one of the four options is correct .

Column I	Column II	Column III
(I) Velocity of fluid particles that are crossing a particular point is the same at all the times.	(i) Flow revolves around an axis line.	(J) 
(II) Velocity exceeds beyond the critical velocity, the paths and velocities of liquid change continuously and haphazardly.	(ii) Motion of a particle varies rapidly in magnitude and direction.	(K) 

Column I	Column II	Column III
(III) Velocity at any point in the fluid remains constant with time.	(iii) Each particle takes the same path as taken by a previous particle through the point.	(L) 
(IV) Fluid flow velocity is greatest next to its axis.	(iv) All particles passing through a point in a steady flow follow the same path.	(M) 

What are the characteristics of steady flow ?

A. (III) (i) (K)

B. (I) (i) (L)

C. (I) (iii) (J)

D. (I) (iv) (L)

Answer:

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5. Equation of continuity of a liquid that flows through a tube with four different specifications .

Column I	Column II	Column III
(I) $A_1 = 0.4\ m^2$	(i) $A_2 = 0.4\ m^2$	(J) $v_1 = 1\ m/s$
(II) $A_1 = 2 \times 10^{-4}\ m^2$	(ii) $A_2 = 0.3\ m^2$	(K) $v_1 = 6\ m/s$
(III) $A_1 = 0.3\ m^2$	(iii) $A_2 = 1.96 \times 10^{-5}\ m^2$	(L) $v_1 = 3\ m/s$
(IV) $A_1 = 3 \times 10^{-4}\ m^2$	(iv) $A_2 = 1.5 \times 10^{-5}\ m^2$	(M) $v_1 = 0.4\ m/s$

Choose the correct choice of flow specifications for which $v_2 = 8\ m/s$

A. (I) (iii) (L)

B. (IV) (i) (M)

C. (II) (iv) (K)

D. (I) (ii) (K)

Answer:

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6. Equation of continuity of a liquid that flows through a tube with four different specifications .

Column I	Column II	Column III
(I) $A_1 = 0.4\ m^2$	(i) $A_2 = 0.4\ m^2$	(J) $v_1 = 1\ m/s$
(II) $A_1 = 2 \times 10^{-4}\ m^2$	(ii) $A_2 = 0.3\ m^2$	(K) $v_1 = 6\ m/s$
(III) $A_1 = 0.3\ m^2$	(iii) $A_2 = 1.96 \times 10^{-5}\ m^2$	(L) $v_1 = 3\ m/s$
(IV) $A_1 = 3 \times 10^{-4}\ m^2$	(iv) $A_2 = 1.5 \times 10^{-5}\ m^2$	(M) $v_1 = 0.4\ m/s$

Choose the correct choice of flow specifications for which $v_2 = 30.6$ m/s

A. (II) (ii) (J)

B. (II) (iii) (L)

C. (II) (iii) (K)

D. (I) (i) (M)

Answer:

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7. Equation of continuity of a liquid that flows through a tube with four different specifications .

Column I	Column II	Column III
(I) $A_1 = 0.4\ m^2$	(i) $A_2 = 0.4\ m^2$	(J) $v_1 = 1\ m/s$
(II) $A_1 = 2 \times 10^{-4}\ m^2$	(ii) $A_2 = 0.3\ m^2$	(K) $v_1 = 6\ m/s$
(III) $A_1 = 0.3\ m^2$	(iii) $A_2 = 1.96 \times 10^{-5}\ m^2$	(L) $v_1 = 3\ m/s$
(IV) $A_1 = 3 \times 10^{-4}\ m^2$	(iv) $A_2 = 1.5 \times 10^{-5}\ m^2$	(M) $v_1 = 0.4\ m/s$

Choose the correct choice of flow specifications for which $v_2 = 20 m/s$

A. (IV) (iv) (J)

B. (I) (i) (K)

C. (III) (iii) (L)

D. (I) (ii) (L)

Answer:

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Practice Questions Integer Type

1. A soap bubble is blown to a diameter of 7 cm. if 36960 ergs of work is done in blowing if

further find the new radius, if surface tension of the soap solution is 40 dynes/cm.

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2. Water rises in a capillary tube to a height 2.0 cm. In an another capillary tube whose radius is one third of it, how much the water will rise ? If the first capillary tube is inclined at an angle of 60° with the vertical then what will be the position of water in the tube.

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3. The reading of pressure meter attached with a closed pipe is $3.5 \times 10^5 Nm^{-2}$. On opening the value of the pipe, the reading of the pressure meter is reduced to $3.0 \times 10^5 Nm^{-2}$. Calculate the speed of the water flowing in the pipe.

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4. Eight rain drops of radius $1mm$ each falling downwards with a terminal velocity of

$5cms^{-1}$ collapse to form a bigger drop. Find the terminal velocity of bigger drop.

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5. Find the depth at which an air bubble of radius 0.7 mm will remain in equilibrium in water . Given surface tension of water = 7.0×10^{-2} N/m.

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