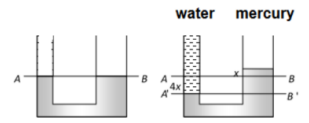
Ayman Ghannam
Chapter 14
Fluids



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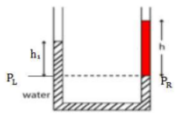
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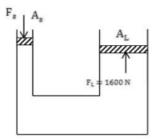
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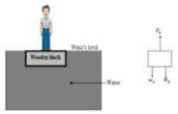
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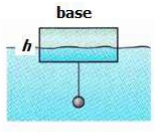

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Q.1 If pressure at half the depth of a lake is equal to 2/3 pressure at the bottom of the lake then what is the depth of the lake?(20m)

Q.2 A U-tube in which the cross-sectional area of the limb on the left is one quarter, the limb on the right contains mercury (density 13.6 g/cm3). The level of mercury in the narrow limb is at a distance of 36 cm from the upper end of the tube. What will be the rise in the level of mercury in the right limb if the left limb is filled to the top with water?

Q.3 A uniform U-tube is partially filled with water. Oil, of density 0.75 g/cm3 , is poured into the right arm until the water level in the left arm rises h1 = 3.0 cm (see Figure). The length of the oil column (h) is? (4cm)

Q.4(3.33)

A cylindrical container has a layer of oil of thickness 0.120 m floating on water that is 0.250 m deep. The density of oil is 750 kg/m^3. What is the gauge pressure, in kPa, at the bottom of the container?

Q.5 A hydraulic press has one piston of diameter 2.0 cm and the other piston of diameter 8.0 cm. What force must be applied to the smaller piston to obtain a force of 1600 N at the larger piston? (100N)

Q.6 A solid sphere has actual weight of 10 N. When it is suspended from a spring scale and submerged in water, the scale reads 6.0 N. What is the radius of the solid sphere? (R=4.6 cm)

Q.7 Example3: A 10 kg spherical object with a volume of 0.10 m3 is held in static equilibrium under water by a cable fixed to the bottom of a water tank. What is the tension T in the cable? (See the figure)

Q.8 A block of wood (ρ = 850 kg/m^3) floats on water with a 50.0 kg person standing on top of the block (see Figure). What minimum volume, in m^3, must the block have such that the top face of the block will be just in level with the water surface? (0.33 m^3)

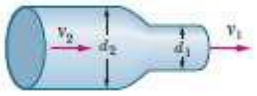
Q.9 A block of wood floats in fresh water with two-thirds of its volume V submerged and in oil with 0.90 V submerged. Find the density of (a) the wood and(670kg/m) (b) the oil. (740kg/m^3)

Q.10 What is the area of the smallest cylinder slab of ice, 0.5 m thick that will just support a man of mass 100 kg? The density of ice is 917 kg/m3 and the density of water is 103 kg/m^3(2.41m)

Q.11 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 *h* = 6.00 cm, a face area of. 12.0 cm2 on the top and bottom, and a density of 0.30 g/cm3, and 2.00 cm of its height is above the water surface. What is the radius of the iron ball? ρw = 9.98 g/cm^3 - $\rho iron$ = 7.9 g/cm^3 (R=9.7cm)

Q.12 In the figure, water flows through a horizontal pipe and then out into the atmosphere at a speed *v*1 = 15 m/s. The diameters of the left and right sections of the pipe are 5.0 cm and 3.0 cm.

(a) In the left section of the pipe, what are the speed *v*2? (5.4m/s)
(b) What volume of water flows into the atmosphere during a 10 min period? (6.4 m3)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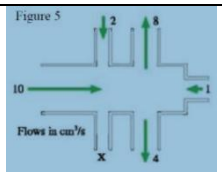

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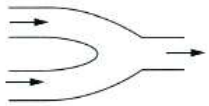
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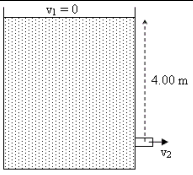

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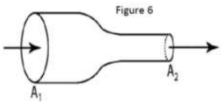

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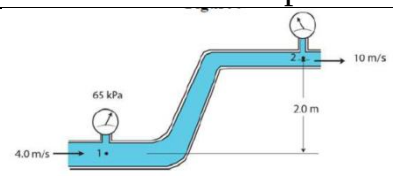
Q.13 shows volume flow rates (in cm^3 /s) of a fluid from all but one tube. Assuming steady flow of the fluid, find the volume flow rate through the **X** tube and its direction.(-1:out)

Q.14 Water is pumped out of a swimming pool at a speed of 5.0 m/s through a uniform hose of radius 1.0 cm. Find the mass of water pumped out of the pool in one minute. (Density of water = 1000 kg/m3).(94kg)

Q.15 Two streams merge to form a river. One stream has a width of 8.0 m, depth of 4.0 m, and current speed of 2.0 m/s. The other stream is 7.0 m wide and 3.0 m deep, and flows at 4.0 m/s. If the river has a width of 10.0 m and a speed of 4.0 m/s, what is its depth?(3.7m)

Q.16 A large tank open to atmosphere is filled with water. The figure shows this tank with a stream of water flowing through a hole (open to atmosphere) at a depth of 4.00 m. The speed of water, v2, leaving the hole is(8.85m/s)

Q.17 Water flows through a horizontal pipe of varying cross section, as shown in **Figure**, with A1 = 10.0 cm^2 and A2 = 5.00 cm^2. The pressure difference between the two sections is 300 Pa. What is the water speed at the left section of the pipe?(0.44m/s)



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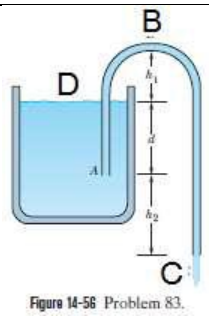

Figure 14-56 Problem 83.
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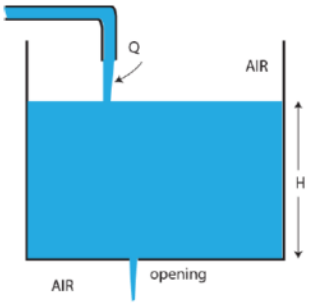

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Q.18 Water flows through a pipe as shown in **Figure**. The speed of water is 4.0 m/s at point 1 and 10 m/s at point 2. Find the gauge pressure at point 2 if the gauge pressure at point 1 is 65 kPa.(3.4kPa)

Q.19 Air flows over the upper surface of an aircraft's wing at a speed of 135 m/s and under the lower surface at a speed of 120 m/s. The total wing area is 28 m2. What is the lift on the wing? (Density of air = 1.20 kg/m3)(64.3kN)

Q.20 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 1000 kg/m3 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*?(3.2m/s)
(b) If the atmospheric pressure is 1.0 x 105 Pa, what is the pressure in the liquid at the topmost point *B*?(92kPa)

Q.21 Water pours into a very large open tank at a volume flow rate of Q(**Figure**). The tank has an opening at the bottom. The area of this opening for the water level in the tank to be maintained at a fixed level H is given by(A2=Q/(√2gH))