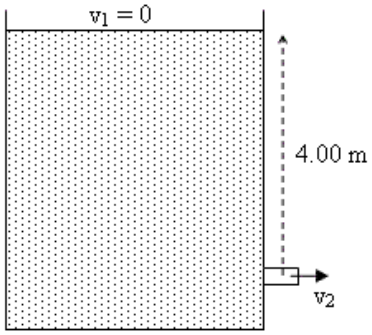
Old-Exam.Questions-Ch-14

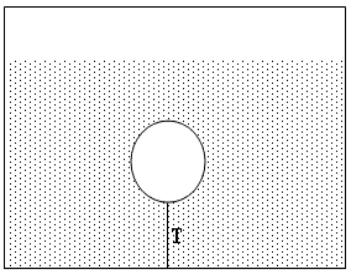
T072

Q23. 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/m^3). (Ans: 94 kg)

Q24. A large tank open to atmosphere is filled with water. Fig 6 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, v_2, leaving the hole is: (Ans: 8.85 m/s)

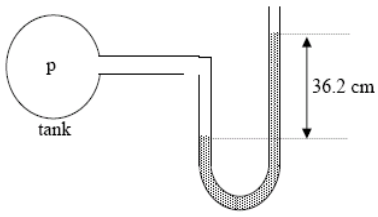


Q25. A 10 kg spherical object with a volume of 0.10 m^3 is held in static equilibrium under water by a cable fixed to the bottom of a water tank. What is the tension T in the cable? (See Fig. 7) (Ans: 880 N)

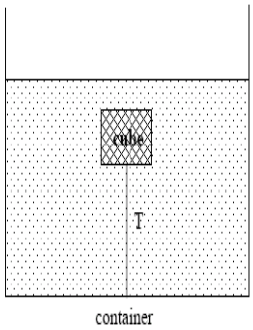


T071

Q8. The pressure of a gas in a tank is measured with a mercury manometer (Fig. 5). The mercury is 36.2 cm higher in the outside arm than in the arm connected to the gas cell. Find the gauge pressure of the gas cell. (Density of mercury is 13.6 g/cm3) (Ans: 4.82×10^4 Pa)

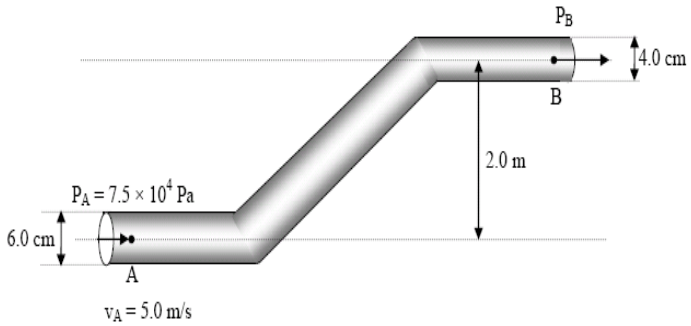


Q9. A cube of wood of side = 10 cm has a density of 700 kg/m^3. As shown in Fig. 6, the cube is held in equilibrium under water by a string tied to the BOTTOM of a container. Find the tension in the string. (Ans: 2.94 N)



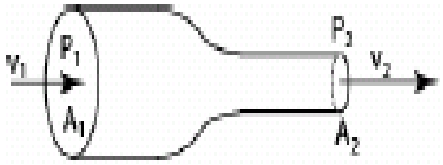
Q10. A garden hose has an inner diameter of 16 mm. The hose can fill a 10 liter bucket in 20 s. Find the speed of the water at the end of the hose (1 Liter = 10-3 m3).(Ans: 2.5 m/s)

Q11.Water flows through a pipe as shown in Fig. 7. At the lower elevation, the water's speed (v_A) is 5.0 m/s and the gauge pressure (P_A) is 7.5 × 104 Pa. Find the gauge pressure at the higher elevation (P_B). (Diameter at A = 6.0 cm, diameter at B = 4.0 cm and the elevation of B relative to A is 2.0 m) (Ans: 4.60 kPa)



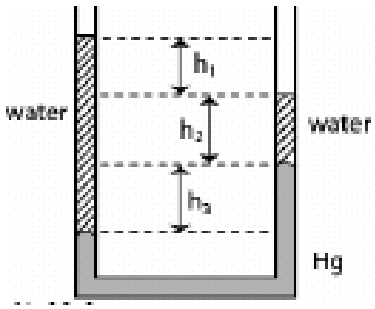
T062

Q7. Fig. 4 shows an ideal fluid flow in a horizontal tube. The pressure, velocity, and cross sectional area of fluid at point 1 and 2 are (P_1, v_1, A_1) and (P_2, v_2, A_2) respectively with $A_1 > A_2$. Which one of the following statements is correct? A) $v_1 < v_2$ & $P_1 > P_2$



Q8. A wooden box has been found to floats in three different fluids of densities: ρ_1 (fluid 1) = 0.9 g/cm^3, ρ_2 (fluid 2) = 1.0 g/cm^3, ρ_3 (fluid 3) = 1.1 g/cm^3. Which one of the following statements is true? (A) the three fluids exert the same buoyant force

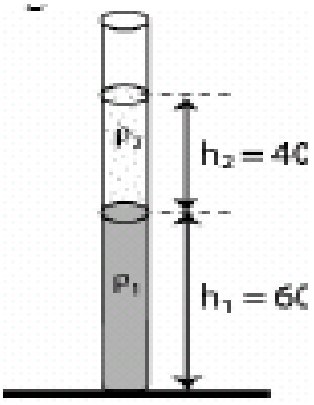
Q9.A U-tube of constant cross sectional area, open to the atmosphere, is partially filled with Hg (ρ_{Hg}=13.6 g/cm^3). Water (ρ_w=1.00 g/cm^3) is then poured into both arms. If the equilibrium configuration of the tube is as shown in the Fig. 5 with h_3= 1.00 cm, determine the value of h_1. (Note that h_1, h_2 and h_3 are not drawn to scale). A) 12.6 *cm*



Q10. The open end of a cylindrical pipe has a radius of 1.5 *cm*. Water (density = 1.0×10^3 kg/m^3) flows steadily out of this end at a speed of 7.0 *m*/*s*. The rate at which mass is leaving the pipe is: A) 4.9 *kg*/*s*

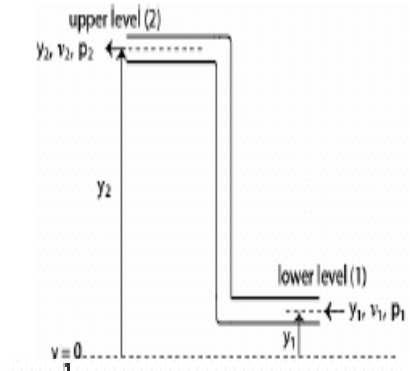
T061

Q23. The open vertical tube in Fig. 13 contains two liquids of densities $\rho_1 = 1000$ kg/m^3 and $\rho_2 = 800$ kg/m^3, which do not mix. Find the gauge pressure (pressure due to the liquids only) at the bottom of the tube. (A: 9000 Pa)

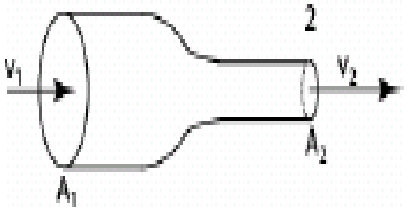


Q24. An Aluminum block of density 2.70 g/cm^3 has a weight *W* in air and has a weight W_{app} in water when completely submerged. If $(W- W_{app})$ is equal to 196 *N*, the volume of the block is: A) 0.020 m^3

Q25. Water is pumped through a hose of uniform cross-section as shown in Fig. 14, from the lower level (1) to the upper level (2). Which of the following expresses the correct relationship between velocity and pressure at the two levels? A) $v_1 = v_2$ and $p_2 < p_1$



Q26. Water flows through a horizontal tube from point 1 (cross sectional area A_1) to point 2 (cross sectional area A_2), as shown in Fig. 15. If $A_1 = 2A_2$ and $v_1 = 10$ *m*/*s*, the change in the kinetic energy (ΔK) of 1.0 m^3 of water in moving from point 1 to point 2 is: A) 1.5 x 10^5 *J*)



T052

Q23: A uniform U-tube is partially filled with water. Oil, of density 0.75 g/cm^3, is poured into the right arm until the water level in the left arm rises 3.0 cm (see Fig 8). The length of the oil column (*h*) is then: (Ans: 4.0 cm)

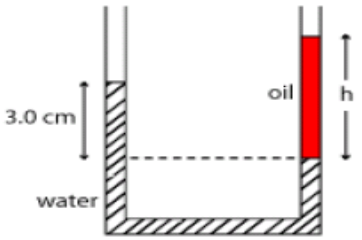


Figure 8

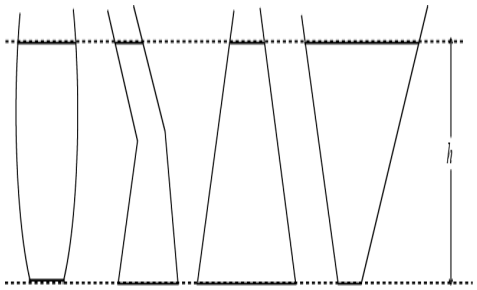
Q24: The dimensions of a boat (ρ_{boat} = 150 kg/m^3) is 3.00 m x 3.00 m x 1.00 m. What maximum load can it carry in sea water ($\rho_{sea\ water}$ = 1020 kg/m^3) without sinking? (Ans: 7830 kg)

Q25: A water line enters a house 2.0 m below ground. A smaller diameter pipe carries water to a faucet 5.0 m above ground, on the second floor. Water flows at 2.0 m/s in the main line and at 7.0 m/s on the second floor. If the pressure in the main line is 3.0 x 10^5 Pa, then the pressure on the second floor is: (Take the density of water to be 1.0 x 10^3 kg/m^3) (Ans: 2.1 x 10^5 P)

Q26: The rate of flow of water through a horizontal pipe is 2.00 m^3/min. Calculate the speed of flow at a point where the diameter of the pipe is 10.0 cm. (Ans: 4.24 m/s).

T051:

Q23: Several cans of different sizes and shapes are all filled with the same liquid to the same height *h* (See Fig. 6). Then: (Ans: the pressure on the bottom of each can is the same)



Q24: Fig. 7 shows a U-tube with cross-sectional area *A* and partially filled with oil of density ρ. A solid cylinder, which fits the tube tightly but can slide without friction, is placed in the right arm. The system is in equilibrium. The weight of the cylinder is: (Ans: ALρg)

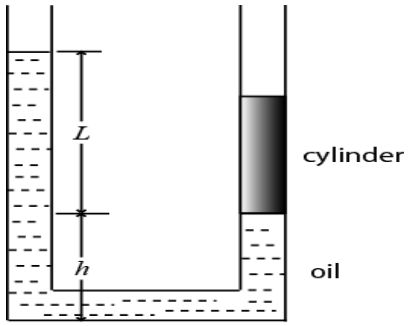


Figure 7

Q25: An object hangs from a spring balance The balance indicates 30N in air and 20N when the object is submerged in water. What does the balance indicate when the object is submersed in a liquid with a density that is half that of water? (Ans:25N)

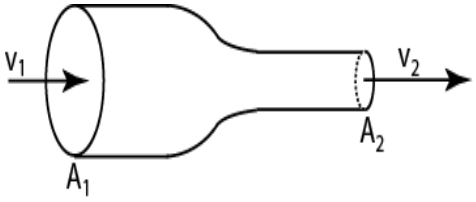


Figure 8

Q26: An incompressible liquid flows along the pipe as shown in Fig. 8 with $A_1=2A_2$. The ratio of the mass flow rate R_2/R_1 is: (show v_1 and v_2 in fig) (Ans: 1)

T042:

Q8 A water hose of 1.00 cm radius is used to fill a container of volume $20.0\text{x}10^3$ cm^3. It takes 60 s to fill the container. What is the speed at which the water leaves the hose? (Ans: 106 cm/s)

Q9. Water enters a house through a pipe with a velocity of 4.0 m/s at a pressure of $4\text{x}10^5$ Pa. The water in a narrower pipe at the second floor bathroom 5.0 m above has a velocity of 16 m/s. What is the pressure of water in the bathroom? (Density of water = $1.0\text{x}10^3$ kg/m^3) (Ans $2.3\text{x}10^5$ Pa)

Q10 A block of metal has mass of 0.50 kg and density of $8.0\text{x}10^3$ kg/m^3. It is suspended from a string and completely submerged in water. Find the tension in the string. (Density of water = $1.0\text{x}10^3$ kg/m^3) (Ans: 4.3 N)

Q11 A piston of radius R1= 5.0 cm is used in a hydraulic press to exert a force F1 on the enclosed liquid to raise a car of weight F2=13,500 N (see Fig 4). If the radius of the larger piston is R2 = 15 cm, Find F1. (Ans: $1.5\text{x}10^3$ N)

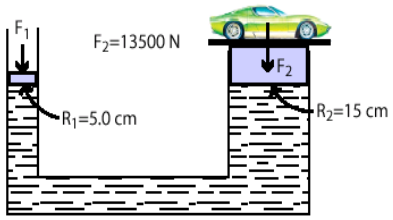
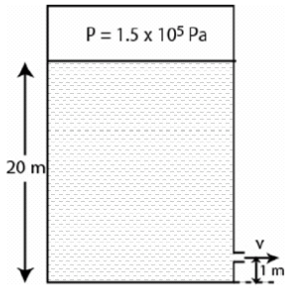


Figure 4

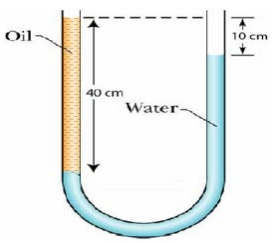
T041:

Q8 A solid sphere of mass 5.0 kg is floating in water with half of its volume submerged. The density of water is 1000 kg/m^3. The buoyant force on the sphere is (Ans: 49 N)



Q9 Fig 5 shows a very large, closed, oil tank with a hole at a height of 1.0 m from the bottom of the tank. The oil vapor pressure in the tank is maintained at $1.5\text{x}10^5$ Pa. Find the speed at which oil leaves the hole, when the oil level is 20 m from the bottom of the tank. The density of oil is 850 kg/m^3. (Ans: 22 m/s)

Q10 A U-tube of uniform cross-section, open at both ends, is filled with water (density 1000 kg/m^3) and oil as shown in Fig 2. Water and oil do not mix. Find the density of oil. (Ans: 750 kg/m^3)



Q11 Water flows through a horizontal pipe. The diameter of the pipe is reduced gradually as shown in Fig 3. Assume water is an ideal fluid. Which of the following statements is true? (Ans: The water flow rate is constant everywhere.)