

CHAPTER 10: Fluids

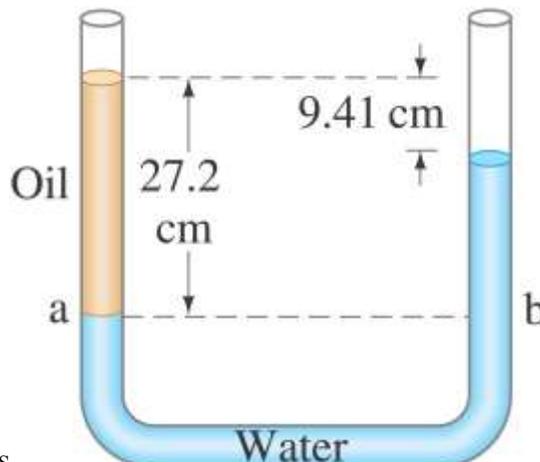
Problems

10–2 Density and Specific Gravity

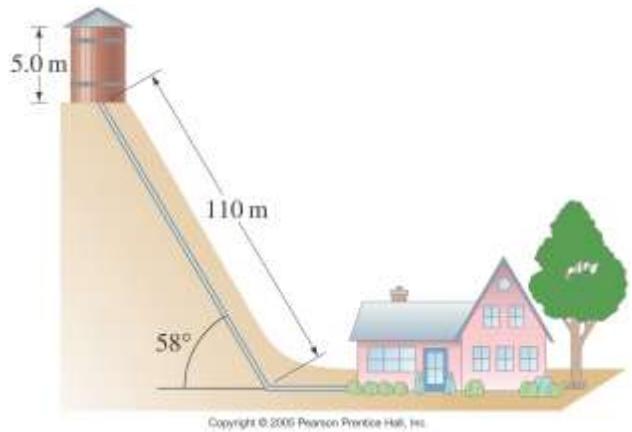
3. (I) If you tried to smuggle gold bricks by filling your backpack, whose dimensions are $60\text{ cm} \times 28\text{ cm} \times 18\text{ cm}$, what would its mass be?
5. (II) A bottle has a mass of 35.00 g when empty and 98.44 g when filled with water. When filled with another fluid, the mass is 88.78 g . What is the specific gravity of this other fluid?

10–3 to 10–6 Pressure; Pascal's Principle

9. (I) (a) Calculate the total force of the atmosphere acting on the top of a table that measures $1.6\text{ m} \times 2.9\text{ m}$. (b) What is the total force acting upward on the underside of the table?
10. (II) In a movie, Tarzan evades his captors by hiding underwater for many minutes while breathing through a long, thin reed. Assuming the maximum pressure difference his lungs can manage and still breathe is -85 mm-Hg , calculate the deepest he could have been.
12. (II) The maximum gauge pressure in a hydraulic lift is 17.0 atm . What is the largest size vehicle (kg) it can lift if the diameter of the output line is 28.0 cm ?
16. (II) Water and then oil (which don't mix) are poured into a U-shaped tube, open at both ends. They come to equilibrium as shown in Fig. 10–49. What is the density of the oil? [Hint: Pressures at points a and b are equal. Why?]



17. (II) A house at the bottom of a hill is fed by a full tank of water 5.0 m deep and connected to the house by a pipe that is 110 m long at an angle of 58° from the horizontal (Fig. 10–50). (a) Determine the water gauge pressure at the house. (b) How high could the water shoot if it came vertically out of a broken pipe in front of the house?



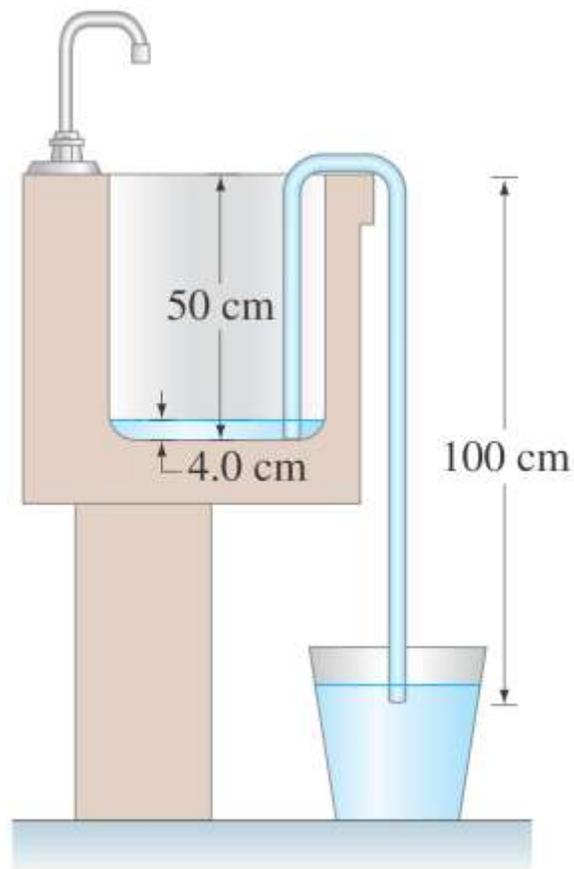
10–7 Buoyancy and Archimedes' Principle

22. (I) A geologist finds that a Moon rock whose mass is 9.28 kg has an apparent mass of 6.18 kg when submerged in water. What is the density of the rock?
24. (II) A crane lifts the 18,000-kg steel hull of a ship out of the water. Determine (a) the tension in the crane's cable when the hull is submerged in the water, and (b) the tension when the hull is completely out of the water.
28. (II) Calculate the true mass (in vacuum) of a piece of aluminum whose apparent mass is 2.0000 kg when weighed in air.

10–8 to 10–10 Fluid Flow; Bernoulli's Equation

38. (I) How fast does water flow from a hole at the bottom of a very wide, 4.6-m-deep storage tank filled with water? Ignore viscosity.
39. (II) A $\frac{5}{8}$ -inch (inside) diameter garden hose is used to fill a round swimming pool 6.1 m in diameter. How long will it take to fill the pool to a depth of 1.2 m if water issues from the hose at a speed of 0.40 m/s?
41. (II) A 6.0-cm-diameter pipe gradually narrows to 4.0 cm. When water flows through this pipe at a certain rate, the gauge pressure in these two sections is 32.0 kPa and 24.0 kPa, respectively. What is the volume rate of flow?

44. (II) What is the lift (in newtons) due to Bernoulli's principle on a wing of area 78 m^2 if the air passes over the top and bottom surfaces at speeds of 260 m/s and 150 m/s , respectively?
84. You need to siphon water from a clogged sink. The sink has an area of 0.48 m^2 and is filled to a height of 4.0 cm . Your siphon tube rises 50 cm above the bottom of the sink and then descends 100 cm to a pail as shown in Fig. 10–58. The siphon tube has a diameter of 2.0 cm . (a) Assuming that the water enters the siphon tube with almost zero velocity, calculate its velocity when it enters the pail. (b) Estimate how long it will take to empty the sink.



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