

fluid is (a) water, (b) ammonia with a specific gravity of 0.83, (c) gas with a specific weight of  $12.5 \text{ N/m}^3$ .  
*Ans.* 8.89 m, 9.63 m, 2805.32 m

- 7.63.** A 12" pipe line carries oil of specific gravity 0.811 at a velocity of 80.0 ft/sec. At points *A* and *B*, measurements of pressure and elevation were 52.6 psi and 100.0 ft and 42.0 psi and 110.0 ft, respectively. For steady flow, find the lost head between *A* and *B*. *Ans.* 20.2 ft
- 7.64.** A stream of water 75 mm in diameter discharges into the atmosphere at a velocity 24.4 m/s. Find the power in the jet using the datum plane through the center of the jet. *Ans.* 33 kW
- 7.65.** A reservoir supplies water to a horizontal 6" pipe 800 ft long. The pipe flows full and discharges into the atmosphere at the rate of 2.23 cfs. What is the pressure in psi midway in the pipe, assuming the only lost head is 6.20 ft in each 100 ft of length? *Ans.* 10.7 psi
- 7.66.** A 100-mm-diameter jet of water is discharged (horizontally) from a nozzle into the air. The flow rate of the water jet is  $0.22 \text{ m}^3/\text{s}$ . Determine the power in the jet. Assume the jet of water is at the datum. *Ans.* 86.2 kW
- 7.67.** Oil of specific gravity 0.750 is pumped from a tank over a hill through a 24" pipe with the pressure at the top of the hill maintained at 25.5 psi. The summit is 250 ft above the surface of the oil in the tank, and oil is pumped at the rate of 22.0 cfs. If the lost head from tank to summit is 15.7 ft, what horsepower must the pump supply to the liquid? *Ans.* 645 hp
- 7.68.** A pump draws water from a sump through a vertical 6" pipe. The pump has a horizontal discharge pipe 4" in diameter that is 10.6 ft above the water level in the sump. While pumping 1.25 cfs, gages near the pump at entrance and discharge read  $-4.6 \text{ psi}$  and  $+25.6 \text{ psi}$ , respectively. The discharge gage is 3.0 ft above the suction gage. Compute the horsepower output of the pump and the head lost in the 6" suction pipe. *Ans.* 10.7 hp, 2.4 ft
- 7.69.** Compute the lost head in a 150-mm pipe if it is necessary to maintain a pressure of 231 kPa at a point upstream and 1.83 m below where the pipe discharges water into the atmosphere at the rate of  $0.0556 \text{ m}^3/\text{s}$ . *Ans.* 21.7 m
- 7.70.** A large tank is partly filled with water, the air space above being under pressure. A 2" hose connected to the tank discharges on the roof of a building 50 ft above the level in the tank. The friction loss is 18 ft. What air pressure must be maintained in the tank to deliver 0.436 cfs on the roof? *Ans.* 32.1 psi
- 7.71.** Water flows from section 1 to section 2 in the pipe shown in Fig. 7-20. For the data given in the figure, determine the velocity of flow and the fluid pressure at section 2. Assume that the total head loss from section 1 to section 2 is 3.00 m. *Ans.* 8.00 m/s, 260 kPa
- 7.72.** Water is pumped from reservoir *A* at elevation 750.0' to reservoir *E* at elevation 800.0' through a 12" pipeline. The pressure in the 12" pipe at point *D*, at elevation 650.0', is 80.0 psi. The lost heads are: *A* to pump suction *B* = 2.0 ft, pump discharge *C* to *D* =  $38V^2/2g$ , and *D* to *E* =  $40V^2/2g$ . Find discharge *Q* and horsepower supplied by pump *BC*. *Ans.* 5.95 cfs, 82 hp
- 7.73.** A horizontal Venturi meter has diameters at inlet and throat of 24" and 18", respectively. A differential gage connected to inlet and throat contains water that is deflected 4" when air flows through the meter. Considering the specific weight of air to be constant at  $0.0800 \text{ lb/ft}^3$  and neglecting friction, determine the flow in cfs. *Ans.* 276 cfs
- 7.74.** Water is to be siphoned from a tank at the rate of  $0.0892 \text{ m}^3/\text{s}$ . The flowing end of the siphon pipe must be 4.27 m below the water surface. The lost head terms are  $1.50V^2/2g$  from tank to summit of siphon and  $1.00V^2/2g$  from summit to end of siphon. The summit is 1.52 m above the water surface. Find the size pipe needed and the pressure at the summit. *Ans.* 150 mm,  $-45 \text{ kPa}$