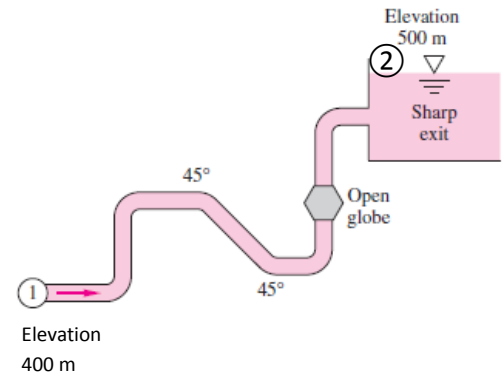


NAME _____

Fluids-ID _____

Quiz 14. The system consists of 1200 m of 5 cm diameter cast iron pipe, two 45° and four 90° flanged long-radius elbows, a fully open flanged globe valve, and a sharp exit into a reservoir. If the elevation at point 1 is 400 m, what gage pressure is required at point 1 to deliver 0.005 m³/s of water at 20 °C into the reservoir?

($\rho = 998 \text{ kg/m}^3$; $g = 9.81 \text{ m/s}^2$; $\mu = 0.001 \text{ kg/m}\cdot\text{s}$; $\varepsilon = 0.26 \text{ mm}$)



- **Energy Eq.:**

$$\frac{p_1}{\rho g} + \frac{V_1^2}{2g} + z_1 + h_p = \frac{p_2}{\rho g} + \frac{V_2^2}{2g} + z_2 + \frac{V^2}{2g} \left(\frac{f\ell}{d} + \sum K_L \right)$$

- **Friction factor, f :**

$$\frac{1}{\sqrt{f}} = -1.8 \log \left[\left(\frac{\varepsilon/d}{3.7} \right)^{1.11} + \frac{6.9}{Re} \right]$$

Loss	K_L
Open flanged globe valve	8.5
90° long-radius elbow	0.3
45° long-radius elbow	0.2
Sharp exit	1.0