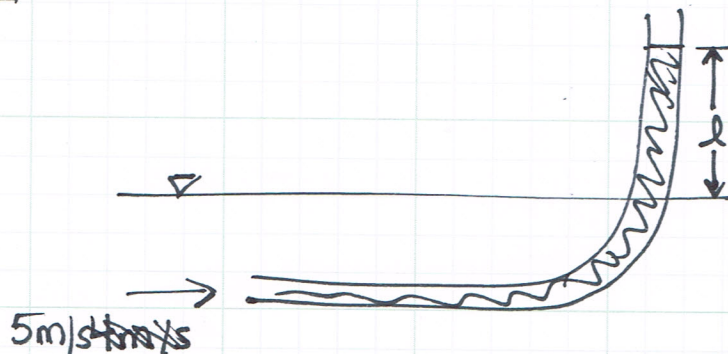


4.55) A glass tube is inserted into a flowing stream of water with one opening directed upstream and the other end vertical. If the water velocity is 5 m/s, how high will the water rise in the vertical leg relative to the level of the water surface of the stream?

SKETCH:



KNOWN:

$V = 5 \text{ m/s}$
90° bend

UNKNOWN:

Rise in vertical leg, h

GOVERNING EQN:

$$\frac{P_1}{\gamma} + \frac{V_1^2}{2g} + z_1 = \frac{P_2}{\gamma} + \frac{V_2^2}{2g} + z_2$$

SOLUTION:

Between stagnation point and water surface in tube

$$\frac{P_s}{\gamma} = h + d$$

Between free stream and stagnation point

$$\frac{P_s}{\gamma} = d + \frac{V^2}{2g}$$

$$h + d = d + \frac{V^2}{2g}$$

$$h = \frac{V^2}{2g} = \frac{(5 \text{ m/s})^2}{2(9.81 \text{ m/s}^2)} = \boxed{1.27 \text{ m} = h}$$