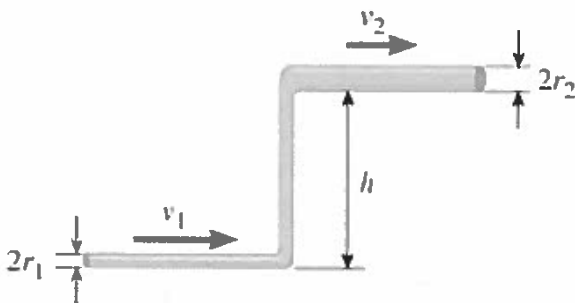


Physics 10154 - Quiz 11B

$$v_2 = \frac{20.99}{(21.0 \text{ also ok})}$$

For the pipe shown below, the radius of the opening at the bottom, $r_1 = 8.70 \text{ mm}$. The radius of the opening at the top is $r_2 = 13.4 \text{ mm}$. The height difference between the two parts of the pipe is $h = 4.50 \text{ meters}$. Both ends of the pipe are open to the air. Water flows into the lower part of the pipe with a speed of 23.0 m/s .

- A 50.0 gallon container acts as a reservoir for the water flowing into the bottom part of the pipe. If water is flowing into the bottom pipe with a speed of 23.0 m/s , how long does it take to drain that 50.0 gallon reservoir?
- With what speed does water emerge from the upper end of the pipe?



$$a) A_1 = \pi (8.70 \times 10^{-3})^2 = 2.378 \times 10^{-4} \text{ m}^2$$

$$A_1 v_1 = 0.005469 \frac{\text{m}^3}{\text{sec}}$$

$$0.005469 \frac{\text{m}^3}{\text{sec}} = \frac{50.0 \text{ gal} \cdot 3.786 \times 10^{-3} \text{ m}^3}{t \cdot \text{gal}}$$

$$0.005469 \frac{\text{m}^3}{\text{sec}} = \frac{0.1893 \text{ m}^3}{t} \Rightarrow t = \frac{0.1893}{0.005469} = \boxed{34.6 \text{ s}}$$

For $P_1 = P_2$, there is only one unique pair of v_1 & v_2 that is valid, and I assumed wrong value for v_1 . So instead of all problem-solving methods converging on same solution, there are 3 possible valid answers:

$$v_2 = 4.37 \text{ (Cont + Bernoulli)}$$

$$v_2 = 21.0 \text{ (Bernoulli only)}$$

$$v_2 = 9.70 \text{ (Continuity only)}$$

Giving all 3 answers full points.