

\[
\frac{100 \text{ L}}{\text{day}} = \frac{0.1 \text{ m}^3}{\text{day}} \times \frac{\text{day}}{24 \text{h}} \times \frac{1 \text{ h}}{3600 \text{s}}
\]

\[
\frac{0.1 \text{ m}^3}{86400 \text{s}} = 1.16 \times 10^{-6} \text{ m}^3/\text{s}
\]

\[
= 1.2 \text{ cm}^3/\text{s}
\]
Continuity Eqn

\[ \frac{V_1}{t} = \frac{V_2}{t} \]

[Volume]

\[ \frac{A_1 \Delta x_1}{t} = \frac{A_2 \Delta x_2}{t} \]

\[ A_1 v_1 = A_2 v_2 \]

whoa!

can rewrite volume flow as speed of flow thru some cross-section!

Continuity Equation.
Aneurysm blood velocities

aneurysm

normal

r vectors
**Bernoulli's Principle**

\[ p_1 + \frac{1}{2} \rho v_1^2 + \rho g y_1 = p_2 + \frac{1}{2} \rho v_2^2 + \rho g y_2 \]

\( \rho \)  
"rho"  
density of fluid (constant)

\( v \)  
velocity of liquid

\( y \)  
height above zero point  
(define your own zero point)
Aneurysm Pressures

\[ P = \frac{F}{A} \]

rupture if \( \Delta P \) too high!
Bernoulli: examples of flows

- High pressure
  - Low v

- Low pressures
  - Air and high v

- High pressure
  - Low v

- F_{air}

- F_{g}
\[ p_1 + \frac{1}{2} \rho v_1^2 + \rho g y_1 = p_2 + \frac{1}{2} \rho v_2^2 + \rho g y_2 \]

Know: \[ p = \frac{F}{A}, \quad A = 148.6 \text{m}^2 \]

\[ F = \rho A \]

\[ \Sigma F_y = p_1 A - p_2 A \]

\[ \Sigma F_y = A (p_1 - p_2) \]

**KNOWNS**: \[ A = 148.6 \text{m}^2 \]

\[ v_1 = 0 \text{m/s} \]

\[ v_2 = 62.6 \text{m/s} \]

\[ \Delta y = 0 \rightarrow y_1 = y_2 = h \]

\[ p_1 + \frac{1}{2} \rho v_1^2 + \rho g h = p_2 + \frac{1}{2} \rho v_2^2 + \rho g h \]

**WANT**: \[ (p_1 - p_2) = 0 \]

\[ p_1 - p_2 = \frac{1}{2} \rho v_2^2 - \frac{1}{2} \rho v_1^2 \]

\[ = \frac{1}{2} (1.225) (62.6)^2 \]

\[ = 2400.2 \text{Pa} \]

\[ \Sigma F_y = (p_1 - p_2)A = 2400.2 (148.6) \]

\[ = 3.6 \times 10^5 \text{N} \]