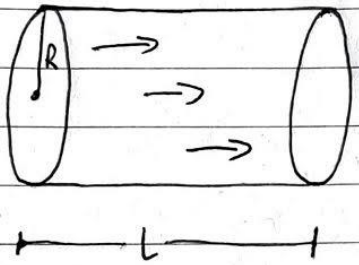
Poiseuille's Equation and Blood Flow

Real fluids have a viscosity so a pressure difference between ends of a vessel/tube is required for fluid flow.

If we assume: (a) incompressible fluid
(b) laminar fluid flow

$$Q = \frac{\pi R^4 (P_1 - P_2)}{8 \eta L}$$

R: radius of vessel
P: pressure
η: viscosity
L: length of vessel
Q: Volume flow rate



This theory is applicable in fluid flow

From the formula we can observe that blood volume flow rate is directly proportional to the pressure gradient in the blood vessels.

$$Q \propto \frac{P_1 - P_2}{L} = \frac{\Delta P}{L}$$

Blood flow rate is inversely proportional to the viscosity of the blood

$$Q \propto \frac{1}{\eta}$$

If radius is decreased, the blood volume flow rate is also decreased

$Q \propto R^4$ => if $\left(\frac{R}{2}\right)^4$, then $\frac{Q}{16}$.