Exp 3 :- Density of Liquids

The aim :
is to determine an unknown liquid density

Theory :

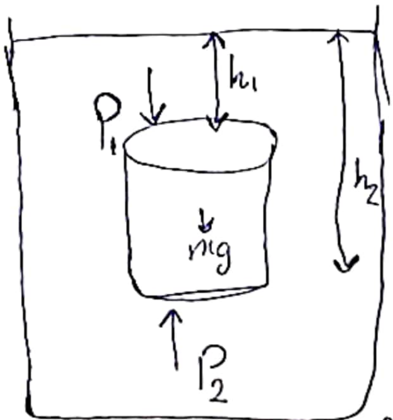
- Fluids :: material which flows such as gases and liquids
- Fluids exert forces on the walls of their containers or any surface they touch
- The pressure of the fluide on a surface is defined as : The force exerted by the fluid per unit area

$$P = \frac{F}{A}$$

- if the fluid at rest ∴ $F \perp$ to the surface

→ since the cylindrical portion of liquid is in static equilibrium ∴ net force acting on it is zero

$$P_2 A - mg - P_1 A = 0$$



Forces acting on fluid imaginary volume element.

Mass = density x volume

$$m = \rho V$$

$$\boxed{m = \rho A(h_2 - h_1)}$$

$$P_2 A - \rho A(h_2 - h_1)g - P_1 A = 0$$

$$P_2 - \rho(h_2 - h_1) - P_1 = 0$$

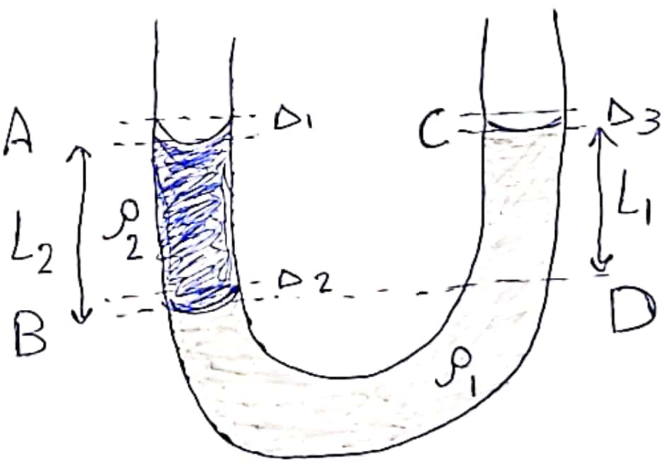
$$\boxed{P_2 - P_1 = \rho(h_2 - h_1)}$$

- which means that the ~~difference~~ difference in pressure depends only on the difference in vertical height.

* In our exp

$$P_B - P_A = \rho_2 g L_2$$

$$P_D - P_C = \rho_1 g L_1$$



⇒ $P_A = P_C$ why?

$P_B = P_D$ why?

Therefore, we add the two equations

$$\rho_1 L_1 = \rho_2 L_2$$

$\rightarrow \rho_1 = 1 \frac{g}{cm^3}$ for water

$$\therefore \rho = \frac{L_1}{L_2}$$

The uncertainty:

$$\rho = \frac{L_1}{L_2}$$

$$\Delta L_1 = \Delta_3 + \Delta_2$$

$$\Delta L_2 = \Delta_1 + \Delta_2$$

$$\frac{\Delta \rho}{\rho} = \frac{\Delta L_1}{L_1} + \frac{\Delta L_2}{L_2}$$

L_1(cm)						
L_2(cm)						