

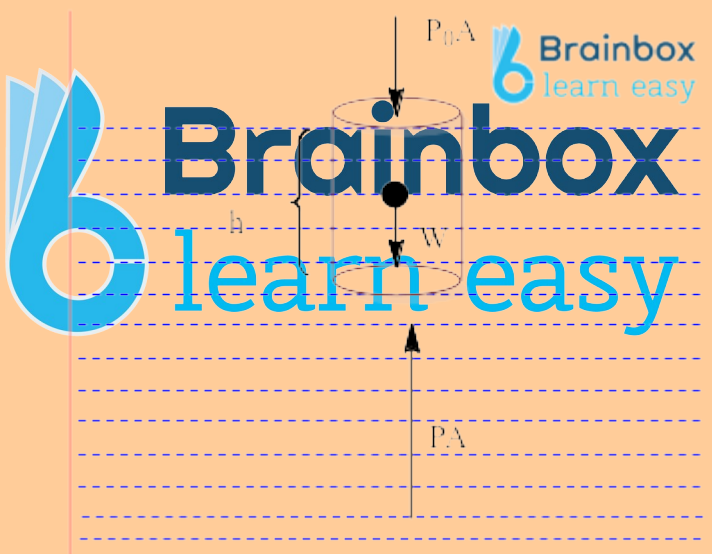
CHAPTER 08

FLOATING BODIES

Pressure at a depth 'h' in a liquid:

Let us consider a vessel in which a liquid of density ' ρ ' is taken.

Let a cylindrical column of area of cross section ' A ' and height ' h ' is considered. Then this column will be acted upon by three forces.



- Force due to atmospheric pressure $\rho_0 A$ downwards.
- Weight of column (W) downwards.
- Force on the column due to static pressure ρ_A upwards.

• From Newton's laws,

$$\rho A = \rho_0 A + W$$

$$\rho A = \rho_0 A + h \rho g A \quad [\because W = mg = V \rho g = Ah \rho g]$$

$$\therefore \boxed{\rho - \rho_0 = h \rho g}$$

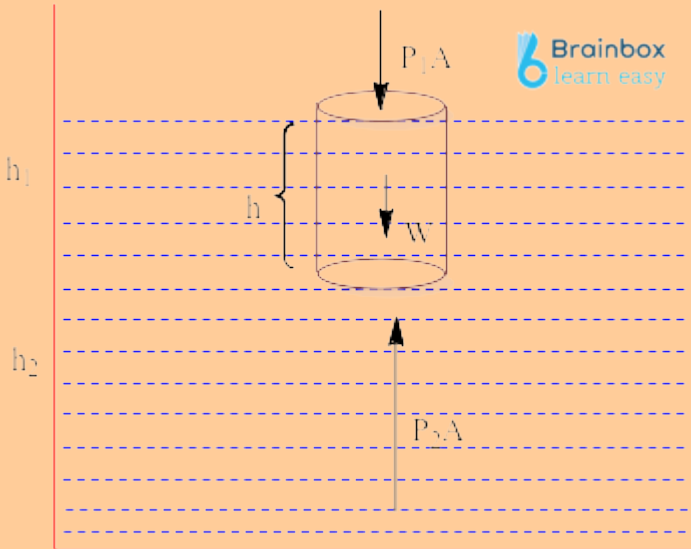
This gives the expression for pressure difference between point inside the column and on the surface called 'Gauge pressure'.

Also, pressure at a point inside the column.

$$\boxed{\rho = \rho_0 + \rho g h}$$

Pressure difference at different levels of depth in fluids:

If we take the cylindrical column, inside the water such, that upper surface is at h_1 and lower surface is at h_2 , from the equation of pressure at a point inside the liquid.



$$P_1 = P_0 + \rho gh_1$$

$$P_2 = P_0 + \rho gh_2$$

Pressure difference between the points at h_2 & h_1 can be,

$$P_2 - P_1 = P_0 + \rho gh_2 - P_0 - \rho gh_1$$

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

$$\therefore \boxed{\Delta P = \rho gh}$$

This equation gives us a concept that, pressure difference increases with the increase in depth.

$$\boxed{\Delta P \propto h}$$