

CHAPTER 08

FLOATING BODIES

Atmosphere Pressure:

In general, pressure is defined as force per unit area. Here the force can be replaced by thrust.

$$\therefore \text{Pressure} = \frac{\text{Thrust}}{\text{Area}}$$

Units: N/m^2 or Pascal

Pressure is a scalar quantity.

Atmosphere pressure is related to force of atmosphere acting on unit surface area of earth.

$$\therefore \text{Atmosphere Pressure} = \frac{\text{Force of atmosphere}}{\text{Surface area of earth}}$$

Mathematically,

$$P = \frac{mg}{A} \quad (\text{or})$$

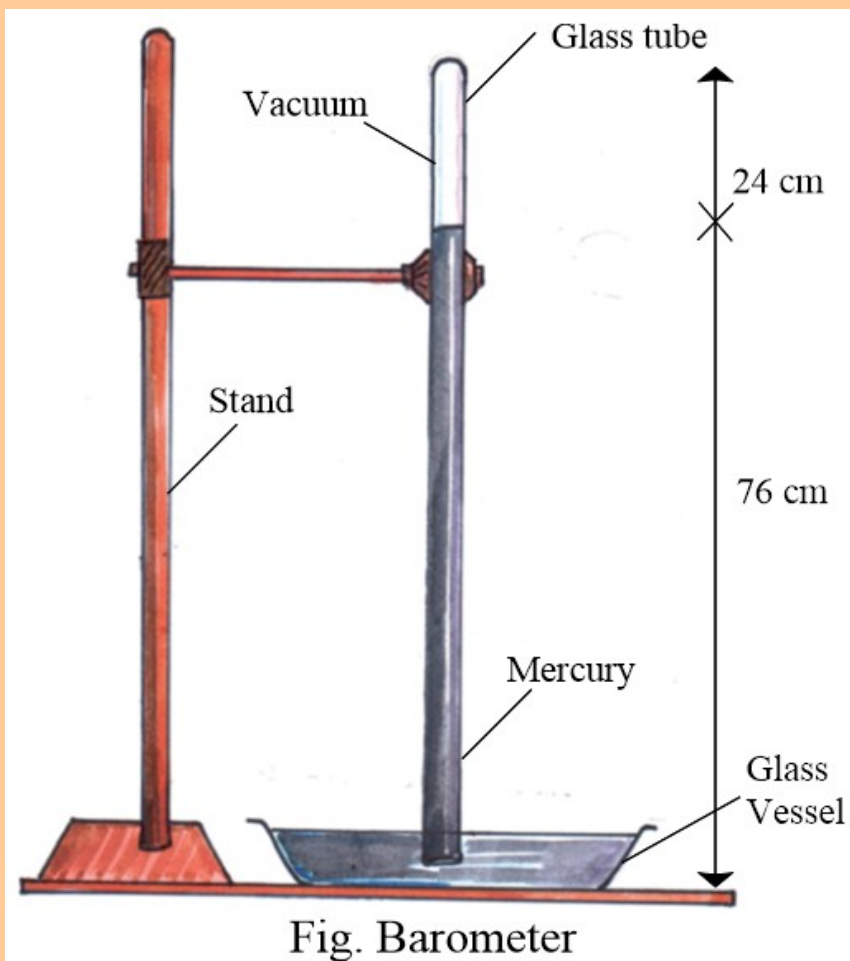
$$P = \frac{\rho Vg}{A} \quad (\text{or})$$

$$P = \frac{\rho (A \times h) g}{A}$$

$$\therefore P_0 = \rho gh$$

Measuring atmospheric pressure:

We do not directly experience this atmospheric pressure, but we can measure it with barometers. The first barometer was invented by 'Torricelli' using mercury.



Weight of the mercury column (W)

$$= \text{Mass of mercury (m)} \times g$$

$$= (\text{Volume}) (\text{Density}) g$$

= (Cross sectional area of the tube)

(Height of the column) ρg

$$= Ah \rho g$$

Let 'P₀' be the atmospheric pressure.

Force on the column due to the atmosphere pressure =
P₀A

Then,

$$Ah \rho g = P_0 A$$

$$P_0 = \rho g h \text{ (Of mercury)}$$

$$P_0 = h \rho g$$

$$P_0 = (76 \times 10^{-2} \text{ m}) \times (13.6 \times 10^3 \text{ Kg/m}^3) \times (9.8 \text{ m/s}^2)$$

$$P_0 = 1.01 \times 10^5 \text{ Kg. m/m}^2.\text{s}^2$$

$$1 \text{ Kg. m/s}^2 = 1 \text{ Newton}$$

$$\text{Hence, } P_0 = 1.01 \times 10^5 \text{ N/m}^2$$

This value is called one atmosphere pressure.

1 atmosphere = 1.01 x 10⁵ N/m² (1 N/M² is called Pascal)