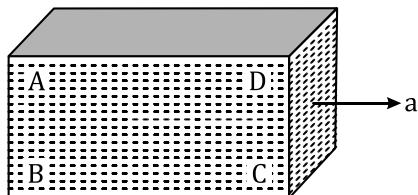


## DPP 01

Solution

1.



Due to acceleration towards right, there will be a pseudo force in a left direction. So, the pressure will be more on left side points A and B in comparison with front side points D and C.

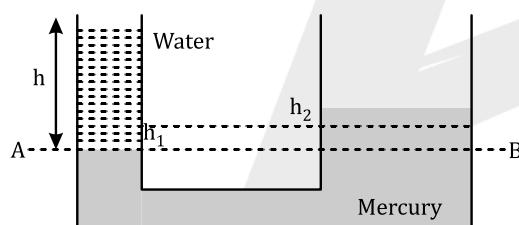
Also due to height of liquid, pressure will be more at the bottom points B and C in comparison with top points A and D.

So overall maximum pressure will be at point B and minimum pressure will be at point D.

2. Thrust on lamina = pressure at centroid  $\times$  Area

$$= \frac{h\rho g}{3} \times A = \frac{1}{3} A\rho gh$$

3.



If the level in narrow tube goes down by  $h_1$ , then in wider tube goes up to  $h_2$

$$\text{Now, } \pi r^2 h_1 = \pi (nr)^2 h_2 \Rightarrow h_1 = n^2 h_2$$

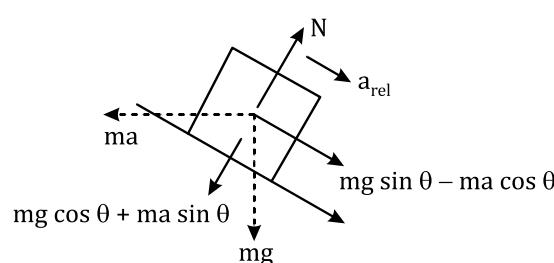
pressure at point A = pressure at point B

$$h\rho g = (h_1 + h_2)\rho'g$$

$$\Rightarrow h = (n^2 h_2 + h_2)sg \quad \left( \text{As } s = \frac{\rho'}{\rho} \right)$$

$$h_2 = \frac{h}{(n^2 + 1)s}$$

4.

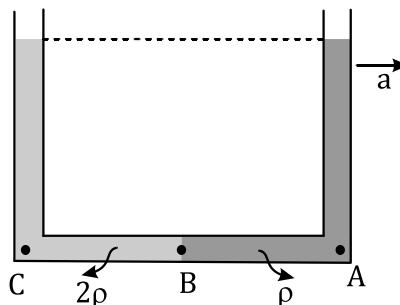


$$ma_{\text{rel}} = mg \sin \theta - ma \cos \theta$$

$$\text{But for water surface } \tan \theta = a/g \Rightarrow a_{\text{rel}} = 0$$



5. Liquid of density  $2\rho$  should be behind that of  $\rho$ . From right limb:



$$P_A = P_{\text{atm}} + \rho gh$$

$$P_B = P_A + \rho a \frac{l}{2} = P_{\text{atm}} + \rho gh + \rho_a \frac{l}{2}$$

$$P_C = P_B + (2\rho)a \frac{l}{2} = P_{\text{atm}} + \rho gh + \frac{3}{2}\rho al \quad \dots (1)$$

$$\text{From left limb } P_C = P_{\text{atm}} + (2\rho)gh \quad \dots (2)$$

From (1) and (2);

$$P_{\text{atm}} + \rho gh + \frac{3}{2}\rho al = P_{\text{atm}} + 2\rho gh$$

$$\Rightarrow h = \frac{3a}{2g}l$$

6. Gauge pressure =  $h\rho g$

$$h = \frac{H}{2}$$

$$\therefore \text{Gauge pressure is } \frac{H\rho g}{2}$$

7. Force acting on the base

$$F = P \times A = hdg A = 0.4 \times 900 \times 10 \times 2 \times 10^{-3} = 7.2 \text{ N}$$

8.  $\tan \theta = \frac{3b-b}{4b} = \frac{a}{g} \Rightarrow a = \frac{g}{2}$

9.  $F = PA = \rho ghA$

$$= 10^3 \times 10 \times 10 \times 3 \times 10^{-4} = 30 \text{ N}$$

10. Increase in pressure at pistons is  $\frac{F}{A}$ .

Increase in pressure at every point will be  $\frac{F}{A}$