(A) Force required to seperate two glass slab b/w which a liquid flim is enclosed :-

R & r be radius of Curvature of liquid drop in two perpendicular direction.

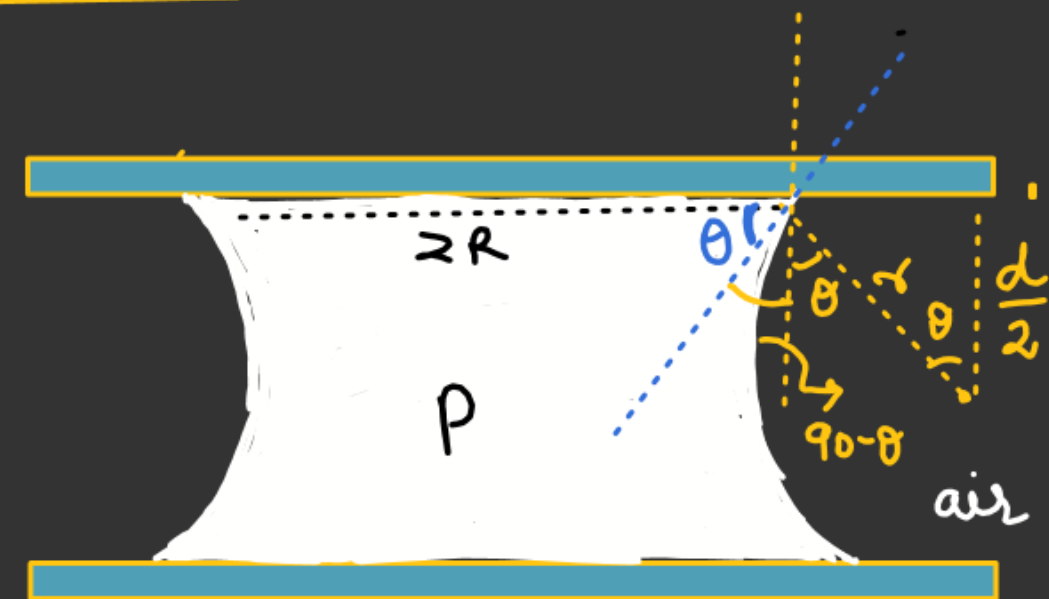θ = Angle of Contact.

d = Seperation b/w two plates

P = Excess Pressure inside the flim

$$P = T\left[\frac{1}{r} - \frac{1}{R}\right]$$

$R >> r$ ✓

$$P = \frac{T}{r}\left[1 - \frac{r}{R}\right]$$

$$P = \left(\frac{T}{r}\right)$$

$$P = \left(\frac{2T\cos\theta}{d}\right)$$

2R

θ

$\frac{d}{2}$

90-θ

air

A

R

$$A = \pi R^2$$

$$\cos\theta = \left(\frac{d}{2r}\right)$$

$$\frac{1}{r} = \left(\frac{2\cos\theta}{d}\right)$$

(A) Force required to seperate two glass slab b/w which a liquid flim is enclosed :-
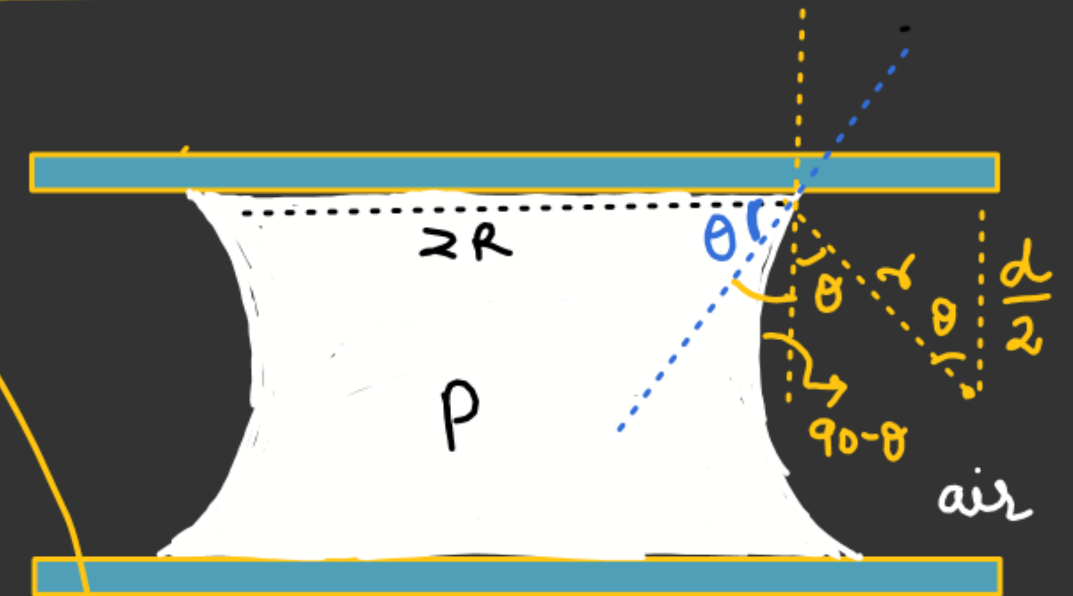
$$P = \left(\frac{2T\cos\theta}{d}\right)$$

A

R ✓

If $\theta \to 0$.

$$F = (2T\cos\theta)A.$$

$$F = \frac{2T\pi R^2}{d}$$

$$F = \frac{2T\cos\theta}{d}(\pi R^2)$$

$$\boxed{F = \frac{2T}{d} \times A}$$
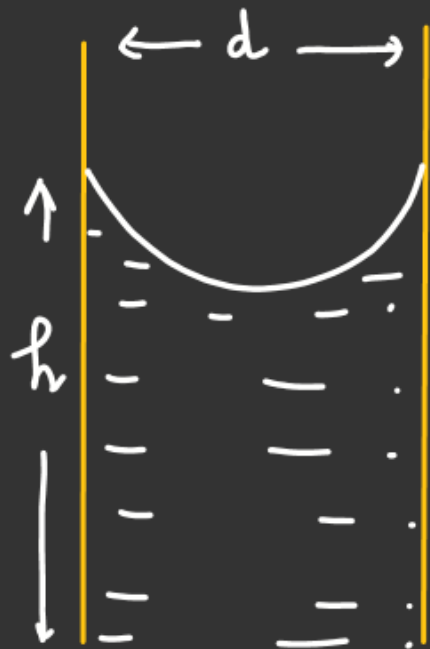
2R

θ

θ r θ $\frac{d}{2}$

90-0

P

air

A → Circular area on the glass Slab up to which liquid wet the glass slab.

liquid rise b/w two glass plate

$$h = \frac{2T\cos\theta}{d\rho g}$$

If $\theta = 0°$

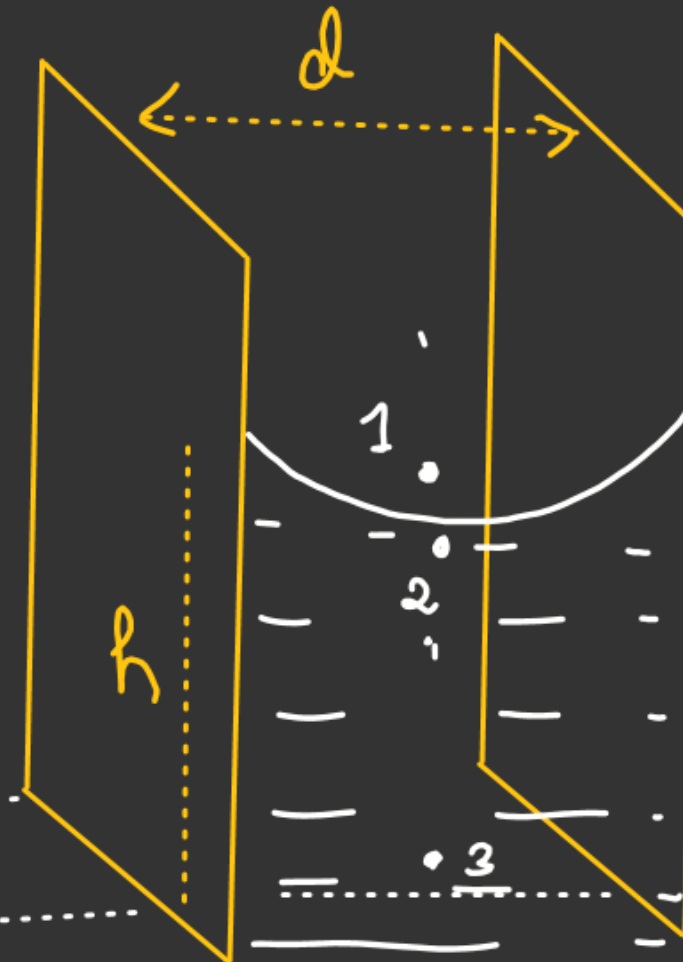$$h = \frac{2T}{d\rho g}$$

$$P_{1-2} = \left(\frac{2T\cos\theta}{d}\right)$$

$$P_{1-2} = \rho g h$$

$$\frac{2T\cos\theta}{d} = \rho g h$$

d

h

$$P_1 = P_3$$

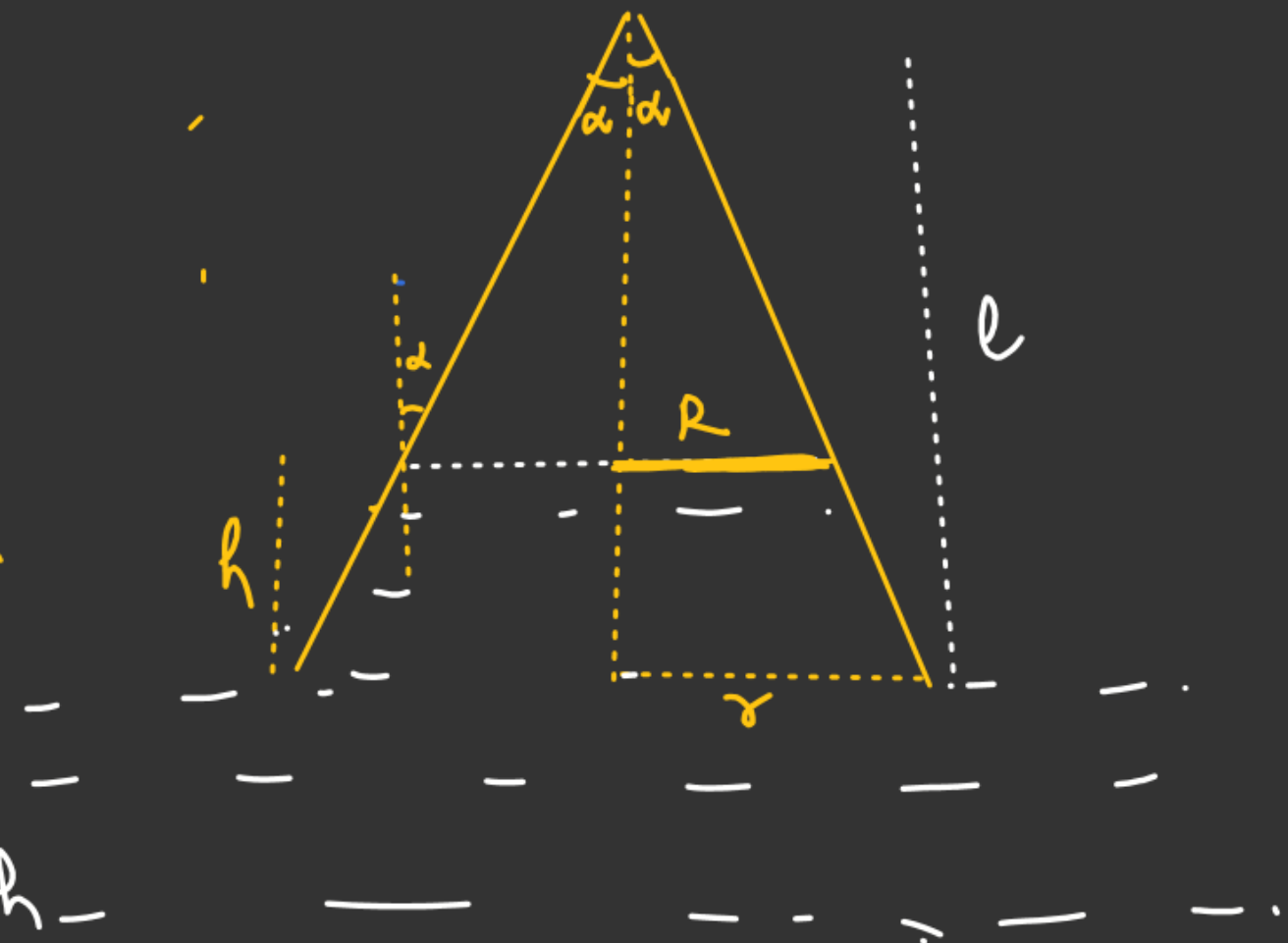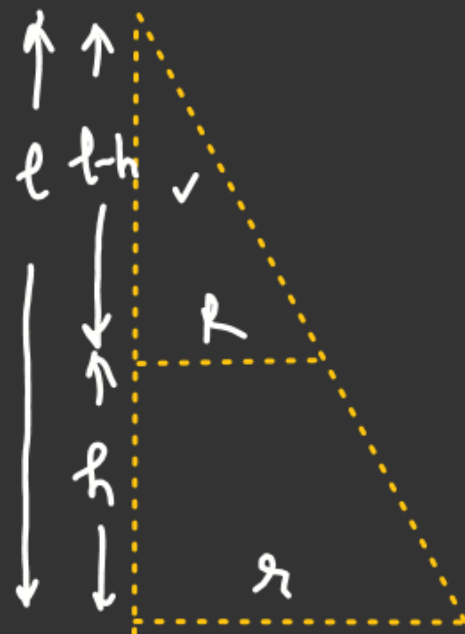$$P_3 - P_2 \text{ or } P_1 - P_2 = \rho g h$$

Liquid rise in a Conical vessel

$$\frac{r}{R} = \frac{l}{(l-h)}$$

$$R = \frac{r}{l}(l-h)$$

$$h = \frac{2T\cos\alpha}{\rho g R}$$

$$h = \frac{2T\cos\alpha}{\rho g \frac{r}{l}(l-h)}$$

$$h(l-h) = \frac{2T\cos\alpha \, l}{\rho g r}$$

quadratic in h — — — — — — —.

$$(\rho g r l)h - (\rho g r)h^2 = 2T\cos\alpha \, l$$

$$(\rho g r)h^2 - (\rho g r l)h + 2T\cos\alpha \, l = 0$$

$$h^2 - lh + \frac{2T\cos\alpha \, l}{\rho g r} = 0$$

$$h^2 - lh + \frac{2T\cos\alpha l}{\rho g r} = 0$$

$$h = \frac{l \pm \sqrt{h^2 - 4\left(\dfrac{2Tl\cos\alpha}{\rho g r}\right)}}{2}$$

$$\boxed{h = \frac{l}{2} \pm \sqrt{\frac{h^2}{4} - \frac{2Tl\cos\alpha}{\rho g r}}}$$
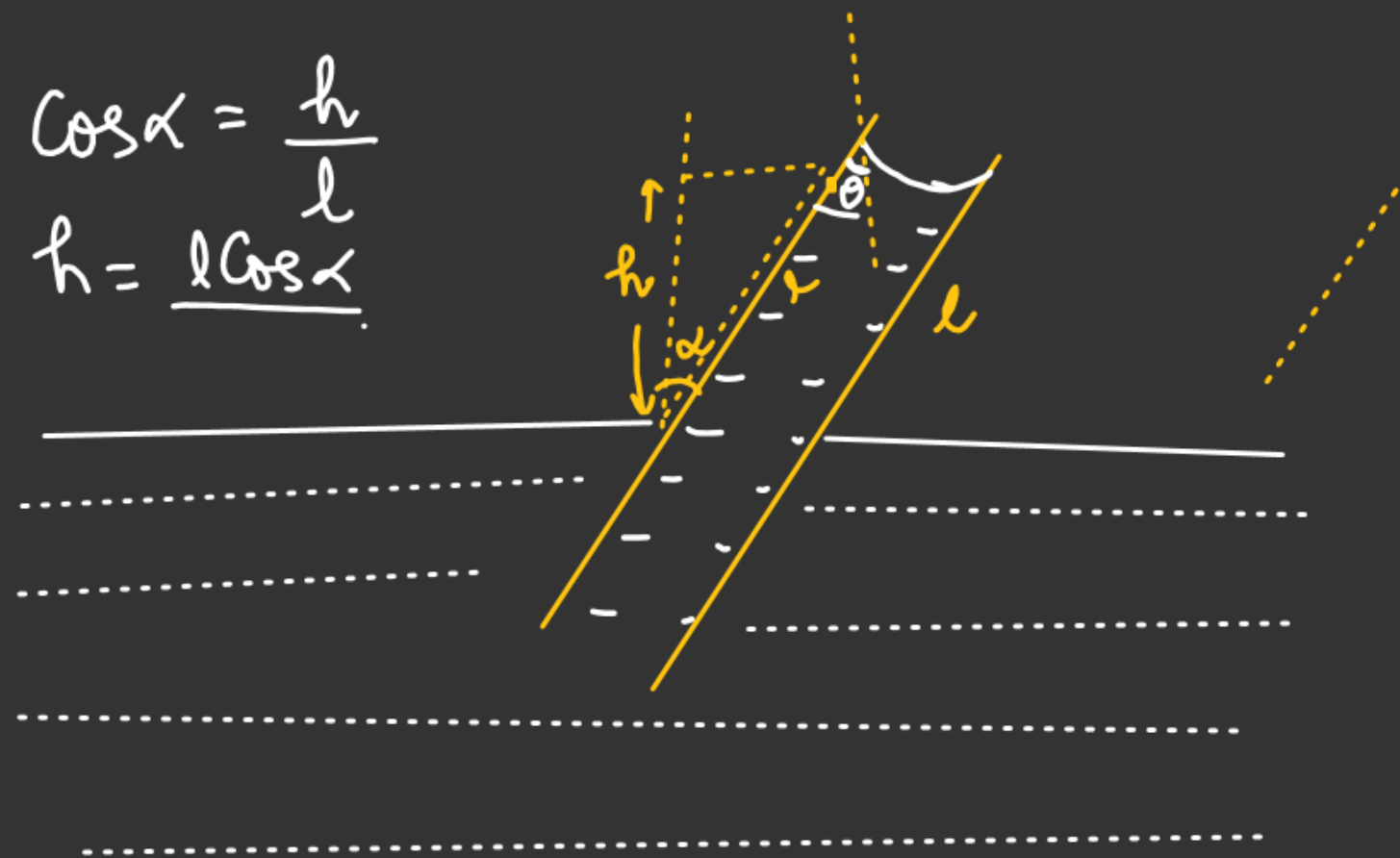
When Capillary is inclined

$$h = \frac{2T\cos\theta}{\rho g r}$$

$$\boxed{l\cos\alpha = \frac{2T\cos\theta}{\rho g r}}$$

$$\cos\alpha = \frac{h}{l}$$

$$h = l\cos\alpha$$

Common Radius of Curvature When two Soap bubble Coalsec

Radius of Curvature of Common Surface.

P_{atm} ·3

P_{atm} ·4

Radius of Curvature of Common Surface.

$1 \to 3$

$P_1 - P_{atm} = \dfrac{4T}{R_1}$ — ①

$2 \to 4$

$P_2 - P_{atm} = \dfrac{4T}{R_2}$ — ②

②−①

$P_2 - P_1 = 4T\left[\dfrac{1}{R_2} - \dfrac{1}{R_1}\right]$

$1-2$

$P_2 - P_1 = \dfrac{4T}{R} - ③$

$$\boxed{\dfrac{1}{R_2} - \dfrac{1}{R_1} = \dfrac{1}{R}}$$

$R_2 < R_1$

$\dfrac{1}{R_2} > \dfrac{1}{R_1}$