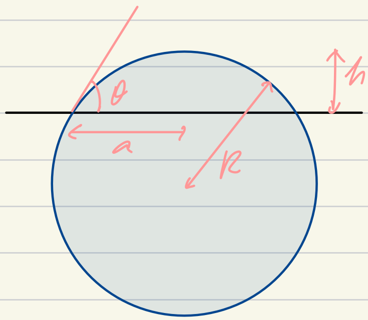

$$a = R\cos(90-\theta) = R\sin\theta$$
$$h = R - R\sin(90-\theta) = R(1-\cos\theta)$$

$$V = \frac{1}{3}\pi h^2(3R-h)$$
$$= \frac{1}{3}\pi R^3(1-\cos\theta)^2(2+\cos\theta)$$

where V is a volume of a spherical cap

If V is constant, $R(\theta) = \left(\dfrac{3V}{\pi(1-\cos\theta)^2(2+\cos\theta)}\right)^{1/3}$

Liquid vapour interface $A_{LV} = 2\pi R h = 2\pi R^2(1-\cos\theta)$
Solid liquid interface $A_{SL} = \pi a^2 = \pi R^2\sin^2\theta$

total solid surface area

Total interfacial energy $E = \gamma_{LV}A_{LV} + \gamma_{SL}A_{SL} + \gamma_{SV}(A_S - A_{SL})$
$= \gamma_{LV}A_{LV} + (\gamma_{SL}-\gamma_{SV})A_{SL} + \text{constant}$

Ignore constant, $E' = \pi R^2\left[2\gamma_{LV}(1-\cos\theta) + (\gamma_{SL}-\gamma_{SV})\sin^2\theta\right]$

Use the principle of energy minimization $\left(\dfrac{dE'}{d\theta}\right)_V = 0$

*) $\gamma_{LV} = 72.8\,mN/m$ for water at room temp (see Wiki)
$\gamma_{SV} \approx 18\,mN/m$ for Hydrophobic surface (Teflon/PTFE)