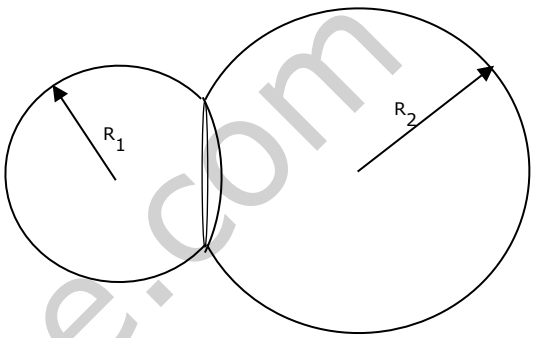
Q- Two soap bubbles of radii R_1 and R_2 coalesce to form a double bubble as in figure. Find the radius of curvature of their common surface.

The excess pressure (the difference between the pressure inside a curved surface of a liquid and the atmosphere) is given by

$$P - P_a = \frac{2T}{R}$$

Here T is the surface tension of the liquid and R is the radius of curvature of the surface of bubble (considered very thin).



Radius of curvature of the first bubble is R_1 and thus the pressure inside it is given by

$$P_1 - P_a = \frac{2T}{R_1}$$

Similarly, the pressure inside the other bubble will be

$$P_2 - P_a = \frac{2T}{R_2}$$

Therefore, pressure difference on the two sides of the common circular film will be

$$P_1 - P_2 = \frac{2T}{R_1} - \frac{2T}{R_2}$$

If the radius of curvature of the common surface is R then we can write that the pressure difference between the two sides of it is

$$P_1 - P_2 = \frac{2T}{R_1} - \frac{2T}{R_2} = \frac{2T}{R}$$

Gives $R = \frac{R_1 R_2}{R_2 - R_1}$