

43. Consider the interference of waves reflected from the top and bottom surfaces of the air film. The wave reflected from the upper surface does not change phase on reflection but the wave reflected from the bottom surface changes phase by π rad. At a place where the thickness of the air film is L , the condition for fully constructive interference is $2L = (m + \frac{1}{2})\lambda$, where λ ($= 683 \text{ nm}$) is the wavelength and m is an integer. This is satisfied for $m = 140$:

$$L = \frac{(m + \frac{1}{2})\lambda}{2} = \frac{(140.5)(683 \times 10^{-9} \text{ m})}{2} = 4.80 \times 10^{-5} \text{ m} = 0.048 \text{ mm} .$$

At the thin end of the air film, there is a bright fringe. It is associated with $m = 0$. There are, therefore, 140 bright fringes in all.