

Physics Tutorial-1

13) $n_1 = 1.6, n_2 = 1.5$

$$\theta_c = \sin^{-1} \left(\frac{n_2}{n_1} \right)$$

$$= \sin^{-1} \left(\frac{1.5}{1.6} \right)$$

$$= 69^\circ 38'$$

$$N.A = \sqrt{n_1^2 - n_2^2}$$

$$= \sqrt{0.31} = 0.556$$

$$\sin \theta_A = N.A$$

$$\theta_A = \sin^{-1} (\sqrt{0.31})$$

$$= \sin^{-1} (0.556)$$

$$= 33^\circ 50'$$

$$\begin{aligned} \text{Angle of cone} &= 2 \times \text{acceptance angle} \\ &= 67^\circ 40' \end{aligned}$$

15) $n_1 = 1.480, n_2 = 1.47$

$$\lambda = 850 \text{ nm}$$

$$V = 2.405 \text{ for single mode step index}$$

$$N.A = \sqrt{n_1^2 - n_2^2}$$

$$= \sqrt{(1.48)^2 - (1.47)^2} = 0.1717 \text{ or } 0.172$$

$$V = \frac{2\pi(a)N.A}{\lambda} \quad (a \text{ is core radius})$$

$$\therefore a = \frac{V\lambda}{2\pi N.A} = \frac{2.405 \times 850 \times 10^{-9}}{2\pi \times 0.172} = 1891.5 \times 10^{-9} = 1.89 \mu\text{m}$$

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$$\theta_A = \sin^{-1} (NA)$$

$$= \sin^{-1} (0.172)$$

$$= 9^{\circ} 54'$$