P37.1 $\Delta y_{bright} = \frac{\lambda L}{d} = \frac{(632.8 \times 10^{-9})(5.00)}{2.00 \times 10^{-4}}\text{ m} = \boxed{1.58\text{ cm}}$

P37.2 $y_{bright} = \frac{\lambda L}{d} m$

For $m = 1$, $\lambda = \frac{yd}{L} = \frac{(3.40 \times 10^{-3}\text{ m})(5.00 \times 10^{-4}\text{ m})}{3.30\text{ m}} = \boxed{515\text{ nm}}$

P37.7 (a) For the bright fringe,

$$y_{bright} = \frac{m\lambda L}{d} \text{ where } m = 1$$

$$y = \frac{(546.1 \times 10^{-9}\text{ m})(1.20\text{ m})}{0.250 \times 10^{-3}\text{ m}} = 2.62 \times 10^{-3}\text{ m} = \boxed{2.62\text{ mm}}.$$

(b) For the dark bands, $y_{dark} = \frac{\lambda L}{d}\left(m + \frac{1}{2}\right)$; $m = 0, 1, 2, 3, \ldots$

$$y_2 - y_1 = \frac{\lambda L}{d}\left[\left(1 + \frac{1}{2}\right) - \left(0 + \frac{1}{2}\right)\right] = \frac{\lambda L}{d}(1)$$

$$= \frac{(546.1 \times 10^{-9}\text{ m})(1.20\text{ m})}{0.250 \times 10^{-3}\text{ m}}$$

$$\Delta y = \boxed{2.62\text{ mm}}.$$

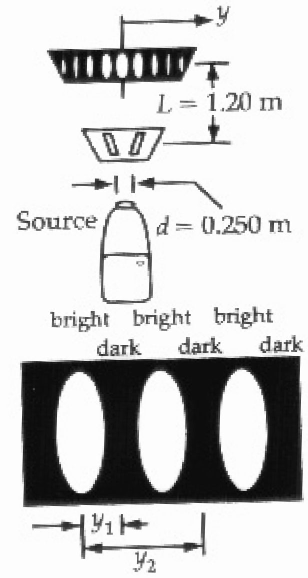

FIG. P37.7

P37.30 Light reflecting from the first surface suffers phase reversal. Light reflecting from the second surface does not, but passes twice through the thickness t of the film. So, for constructive interference, we require

$$\frac{\lambda_n}{2} + 2t = \lambda_n$$

where $\lambda_n = \frac{\lambda}{n}$ is the wavelength in the material.

Then $2t = \frac{\lambda_n}{2} = \frac{\lambda}{2n}$

$$\lambda = 4nt = 4(1.33)(115\text{ nm}) = \boxed{612\text{ nm}}.$$

P37.32 Since $1 < 1.25 < 1.33$, light reflected both from the top and from the bottom surface of the oil suffers phase reversal.

For constructive interference we require $2t = \frac{m\lambda_{\text{cons}}}{n}$

and for destructive interference, $2t = \frac{[m + (1/2)]\lambda_{\text{des}}}{n}$.

Then $\frac{\lambda_{\text{cons}}}{\lambda_{\text{dest}}} = 1 + \frac{1}{2m} = \frac{640\text{ nm}}{512\text{ nm}} = 1.25$ and $m = 2$.

Therefore, $t = \frac{2(640\text{ nm})}{2(1.25)} = \boxed{512\text{ nm}}$.

P37.37 If the path length difference $\Delta = \lambda$, the transmitted light will be bright. Since $\Delta = 2d = \lambda$,

$d_{\text{min}} = \frac{\lambda}{2} = \frac{580\text{ nm}}{2} = \boxed{290\text{ nm}}$.

P38.4 For destructive interference,

$$\sin\theta = m\frac{\lambda}{a} = \frac{\lambda}{a} = \frac{5.00\text{ cm}}{36.0\text{ cm}} = 0.139$$

and $\theta = 7.98°$

$$\frac{d}{L} = \tan\theta$$

gives $d = L\tan\theta = (6.50\text{ m})\tan 7.98° = 0.912\text{ m}$

$$d = \boxed{91.2\text{ cm}}.$$

P38.11 $\sin\theta = \frac{\lambda}{a} = \frac{5.00\times10^{-7}\text{ m}}{5.00\times10^{-4}} = \boxed{1.00\times10^{-3}\text{ rad}}$

P38.20 $1.22\frac{\lambda}{D} = \frac{d}{L}$ $\qquad$ $\lambda = \frac{c}{f} = 0.020\,0\text{ m}$

$D = 2.10\text{ m}$ $\qquad$ $L = 9\,000\text{ m}$

$$d = 1.22\frac{(0.020\,0\text{ m})(9\,000\text{ m})}{2.10\text{ m}} = \boxed{105\text{ m}}$$