6.

$a) c = \tau\upsilon$

$3\times10^8\ \frac{m}{sec} = 589\times10^{-9}\,\upsilon$

$\upsilon = 5.1\times10^{14}\,Hz$

$b) \lambda_g = \frac{\lambda}{n} = \frac{589}{1.52} = 388nm$

$c) v = \frac{c}{n} = \frac{3\times10^8}{1.52} = 1.98\times10^8\ \frac{m}{sec}$

14.

$a) given \frac{d}{\lambda} = 100$

$d\sin\theta = m\lambda$ or maximum

$100\sin\theta = 1$

$\theta = .57°$ or .01radians

$b) y_1 = D\tan\Theta_1 = 500nm(\tan(.01rad)) = 5mm$

$separation\ \Delta y = y_1 - y_0 = 5mm$

19.

$\lambda = 500nm$

$d = 1.2mm$

$D = 5.4m$

$\Delta y = \frac{\lambda D}{d} = \frac{500\times10^{-9}\,m(5.4)}{1.2\times10^{-3}}50 = 2.25mm$

29.

$A^2 = a_1^2 + a_2^2 + 2a_1a_2\cos60°$

$1^2 + 2^2 + 2(1)(2)\cos60° = 7$

$\therefore A = 2.65$

31.

Suppose t = 0

Horizontal components:

$$10 \cos 0^o + 15 \cos 30^o + 5 \cos(-45^o) = 26.5$$

Vertical Components:

$$10 \sin 0^o + 15 \sin 30^o + 5 \sin(-45^o) = 4.0$$

Resultant $= ((26.5)^2 + 4^2)^{1/2} = 26.8 \quad \Theta = \tan^{-1}(4.0/26.5) = 8.5^o$

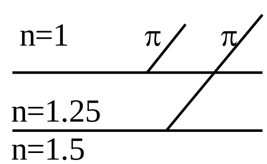
Sum $= 26.8 \sin(\omega t + 8.5^o)$

40.

destructive $(m + \frac{1}{2})\lambda$

$$d = \frac{(m + \frac{1}{2})\lambda}{2n}$$

constructive $2nd = m\lambda$



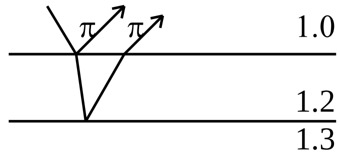
$$d = \frac{(m + \frac{1}{2})(600)}{2(1.25)}$$

$$d = \frac{m(700)}{2(1.25)}$$

solution $d = 840\text{nm}$

if $m = 3$

53.

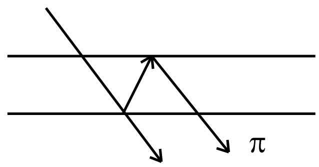


a) $2nd = m\lambda$

$$\lambda = \frac{2nd}{m} = \frac{2(4600)1.2}{1}$$

m = 2 to be visible

$\lambda = 5520Å$



b) under water; transmitted

$$\lambda = \frac{2(4600)1.2}{m + \frac{1}{2}}$$

$m = 1 \rightarrow \lambda = 7360Å$

$m = 2 \rightarrow \lambda = 4416Å$

73.

If the light is reflected in a region where film thickness is y,

max occurs at $2y = \left(n + \frac{1}{2}\right)\lambda$

for a max to appear at the end y = d

$$2d = \left(n + \frac{1}{2}\right)\lambda$$

$$2(48000) = \left(n + \frac{1}{2}\right)(680nm)$$

n = 140.7

∴ max nearest to the end is of order 140

Since there is a bright fringe @ other end for n = 0

there are 141 fringes in all

93.

$$\text{minima } d\sin\theta = (m + \frac{1}{2})\lambda$$

$$\sin\theta \approx \tan\theta = \frac{y}{d}$$

$$y_{10} = 10.5\lambda\frac{D}{d}$$

$$y_1 = 1.5\lambda\frac{D}{d}$$

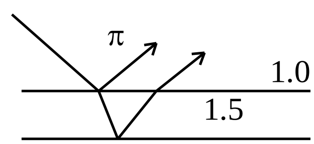
$$y_{10} - y_1 = 1.8\text{cm} = (10.5 - 1.5)\lambda\frac{D}{d}$$

$$= 9\lambda\frac{D}{d}$$

$$\lambda = \frac{1.8(.015)}{9(50)} = 600\text{nm}$$

100.

$$2dn = (m + \frac{1}{2})\lambda$$



$$\lambda = \frac{2(4.1 \times 10^{-7})1.5}{m + \frac{1}{2}}$$

$$\text{if } m = 2$$

$$\lambda = 492\text{nm}$$