Wave Phenom #3

p 883 MC 6
p 885 P 16, 30, 47
p 771 P 37
Online Single Slit

p883 – Multiple Choice

6) Shine light on grating + observe pattern. Cover ½ grating, what see?

- The location of the fringes will not change but they will be a little bit wider + less bright

– Problems

16) $\lambda_1 = 630nm$
$x_1 = .51m$

$\frac{d}{l} = \frac{\lambda_1}{x_1} = \frac{\lambda_2}{x_2}$

$\lambda_2 = ?$
$x_2 = .43m$

$\frac{630nm}{.51m} = \frac{\lambda_2}{.43m}$

$\lambda = 530nm$

30) $f = 440\,Hz$ sound through door
$v = 340\,m/s$
$w = 1.2\,m$
$\theta_1 = ?$
$\theta_2 = ?$

① $\lambda = v/f = 340\,m/s \,/\, 440\,Hz$
$= .773\,m$

A) ② $w \sin\theta = m\lambda$
$\theta = \sin^{-1}\left(\frac{m\lambda}{w}\right) = \sin^{-1}\left(\frac{1(.773m)}{1.2m}\right)$
$= 40^\circ$

B) $\theta_2 = \sin^{-1}\left(\frac{m\lambda}{w}\right) = \sin^{-1}\left(\frac{2(.773m)}{1.2m}\right)$
$=$ undefined

* There is no 2nd order min

47) reflection grating (reflect not transmit)
white light on butterfly wings

$\lambda_{red} = 660nm$
$\theta_{red} = 1.2^\circ$

a) ① $d = \frac{m\lambda}{\sin\theta} = \frac{(1)(660\times10^{-9}m)}{\sin 1.2^\circ}$
$= 3.15\times10^{-5}m$

$\lambda_{blue} = 460nm$
$\theta_b = ?$

② $\theta_b = \sin^{-1}\left(\frac{m\lambda}{d}\right) = \sin^{-1}\left(\frac{460\times10^{-9}m}{3.15\times10^{-5}m}\right)$
$= .84^\circ$

b) $\lambda_{yellow} = 560nm$
$m = 3$
$\theta = ?$

$\theta = \sin^{-1}\left(\frac{m\lambda}{d}\right) = \sin^{-1}\left(\frac{3(560\times10^{-9}m)}{3.15\times10^{-5}m}\right)$
$= 3.1^\circ$

P771 - Problem

37) Use Huygen's Principal and a wave front representation of waves to show that if you place a screen w/ a small circular hole in a path of a wave w/ flat wave fronts, the fronts beyond screen will be circular

- Online - Single Slit Diffraction

- Experiment, red light, single slit
- which alterations decrease angle of diffracton

$$w\sin\theta = m\lambda \qquad \sin\theta = \frac{m\lambda}{w}$$

→ slit width doubled
→ water filled tank
→ green light source