

Review Sheet for Test 41, Physical Optics

Double Slit Interference

- Maxima and minima are evenly spaced bands.
- $m\lambda = d\sin \theta$ where $m = 0, \pm 1, \pm 2, \dots$ is the equation for maxima or bright bands.
- $\sin \theta$ is approximately y/L
- $(m - \frac{1}{2})\lambda = d\sin \theta$ where $m = \pm 1, \pm 2, \dots$ is the equation for minima or dark bands.
- Optical path length differences are whole number wavelengths for bright spots and whole plus half number wavelengths for dark bands.
- Thomas Young is associated with introducing these ideas.

Single Slit Diffraction

- $m\lambda = W\sin \theta$ where $m = 0, \pm 1, \pm 2, \dots$ is the equation for minima or dark bands.
- $\sin \theta$ is approximately y/L
- The central bright spot is twice as wide as the other bright spots. To get the width, solve for y value of first dark band and then double.
- Augustin Fresnel is associated with these concepts.

Diffraction Gratings

- ✓ $m\lambda = d\sin \theta$ where $m = 0, \pm 1, \pm 2, \dots$ is the equation for maxima or bright bands.
- ✓ You cannot approximate y/L for $\sin \theta$.
- ✓ For total number of bright spots use the above formula and let the angle go to 90° . $M_{\text{MAX}} = d/\lambda$. Round down to whole number then double and add 1.
- ✓ These are used to analyze spectral lines for emission of hot gases.

Light at a boundary of two media

- o Reflected light is polarized if the incident angle is greater than or equal to $\tan^{-1}(n_t/n_i)$. This is known as Brewster's Law. Know this for the test on Monday.
- o The speed of light in a medium is found using $n = c/v$.
- o The wavelength in the medium is found by using $\lambda_{\text{medium}} = \lambda_{\text{air}}/n$
- o You can use $c = f\lambda$ in air and $v = f\lambda$ in the medium.
- o Frequency is the same on both sides of boundary.
- o Snell's law shows $n_i \sin \theta_i = n_t \sin \theta_t$
- o Newton was wrong about refraction and Huygens was correct.