

$N = 215$
Average
 $= 24.5$



3

THIRD MIDTERM

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Discussion Section # 7, 9

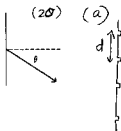
SHOW ALL WORK!!!!

REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!

Use the conversion constants and data given on the front page.

In a grating experiment, light is perpendicularly incident on the grating. Green light of wavelength 505 nm, is found to give a third order maximum at $\theta = 35.00^\circ$. A different wavelength is found to give a maximum in second order at $\theta = 22.00^\circ$.

- (a) Find this second wavelength.
(b) If we assume extremely narrow slits, calculate the intensity for 505 nm at $\theta = 32.0^\circ$, expressed as a fraction of the intensity in the exact center of the pattern.



First, find the spacing of rulings

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

For the 3rd order maximum, $m=3$

$$\therefore d = \frac{3\lambda}{\sin \theta} = \frac{3 \times 505 \text{ nm}}{\sin 35^\circ} = \frac{2.64 \times 10^3 \text{ nm}}{2.64 \times 10^{-6} \text{ m}}$$

For $m=2$, with $\theta = 22.00^\circ$

$$\lambda = \frac{d \sin \theta}{m} = \frac{2.64 \times 10^3 \text{ nm} \sin 22.00^\circ}{2} = \frac{4.95 \times 10^2 \text{ nm}}{4.95 \times 10^{-9} \text{ m}}$$

- (5) (b) Unfortunately this question was not good enough for the students to answer. Because the intensity of a grating system was not given in the text book, which is defined as follows:

$$I = I_0 \left| \frac{\sin(Nd)}{\sin d} \right|^2, \quad d = \pi \frac{d \sin \theta}{\lambda}$$

N is the number of rulings in a grating.

If you write anything here, it is creditable.