# Phys 5B:

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Date March 17, 2017

- RP- Resolving power of microscope

  $l\Theta = l\frac{1.22\lambda}{D} = f\frac{1.22\lambda}{D}$ Typically $f \geqslant \frac{D}{2}$, so the minium RP

  $\mathrm{RP}_{\min} \approx \frac{\lambda}{2}$ resolve features on order of wavelength

- Interesting to note, Sensor density in th retina matches resolving power of eye.

  $$\mathrm{RP} = l\Theta = 2\mathrm{cm}\frac{1.22(550\mathrm{nm})}{.\mathrm{cm}} = 3\mu m$$

- Diffraction gratings

- $\mathrm{dsin}\Theta = m\lambda$ Where $d$ is distance between 2 slits

  Unlike 2 slit interference $\Theta$ might be large

  $\sin\Theta = \frac{\lambda}{d}m$

  $d$ can be small $1.00 \times 10^4$lines / cm $d = 1.00\mu m$

- Different $\lambda$ produce bright spots at different $\Theta$

- Example: light from sodium lamp falls on $a$ grating 1000lines / mn. two bright yellow lines on screen $l = 1.0\mathrm{mn}$ $y = 72.88\mathrm{cm}$ and 73.00cm from central max. What are the $\lambda$?

  $y = \mathrm{ltan}\Theta$

  $\Theta = \tan^{-1}\left(\frac{y}{l}\right)$

  $\Theta = 36.08, 36.13$

  $\lambda = \mathrm{dsin}\Theta \Rightarrow 1 \times 1.00^{-6}m(\sin(36.08)) \Rightarrow \lambda = 589\mathrm{nm}, 589.6\mathrm{nm}$

- Phase diagram for diffraction grating

  Each slit contributes 1 phasor with mag $E_0$

  No Phase difference: $\delta = \frac{2\pi}{\lambda}\mathrm{dsin}\Theta$

  $\lambda = \mathrm{dsin}\Theta$

  Phase difference for minium insenity:

- $\delta = \frac{2\pi}{\lambda} \Rightarrow \frac{\lambda}{N} = \mathrm{dsin}\Theta$