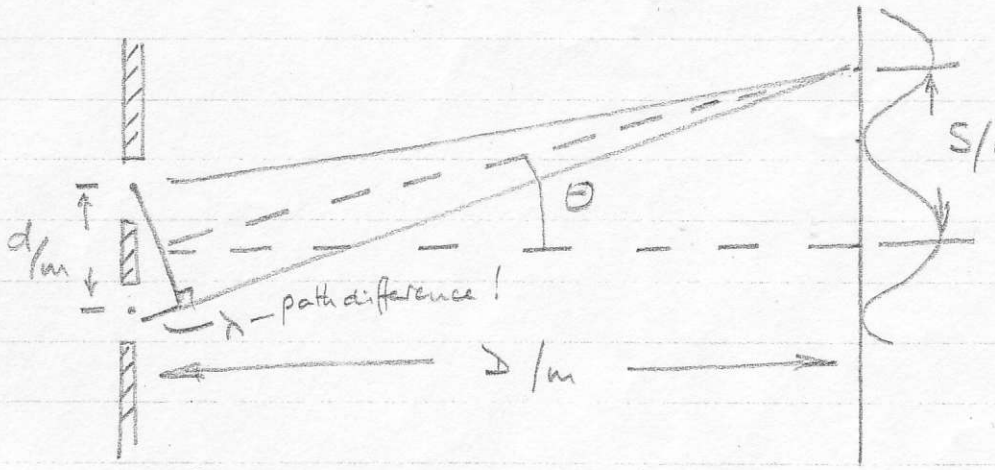
Diffraction Grating

AS Phys. 2h

Remember the 2-gap situation....



$\sin\theta = \frac{\lambda}{d}$

$\tan\theta = \frac{S}{D}$

for small θ... $\sin\theta = \tan\theta$

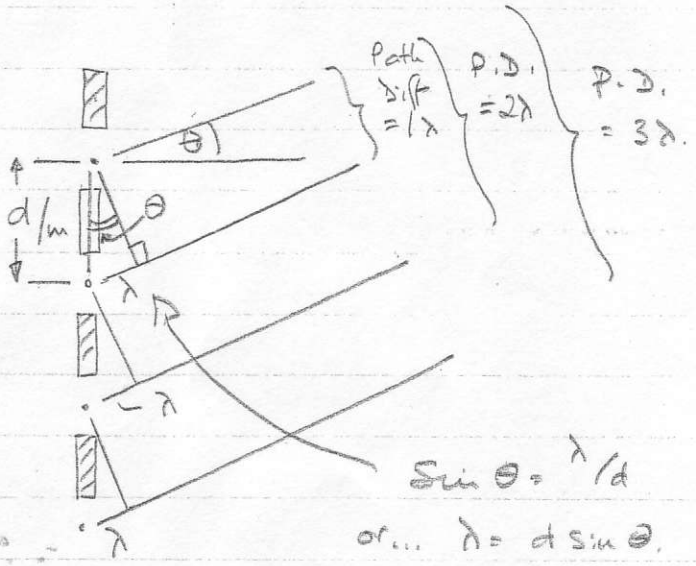
So $\frac{\lambda}{d} = \frac{S}{D}$

Diffraction Grating

Now imagine lots of gaps all with the same spacing.

At a certain angle θ.... the Path Difference between 2 adjacent gaps is λ... So the P.D. between any 2 gaps is a multiple of λ.... So all the diffracted rays are in phase.... So Constructive Interference... So a big amplitude wave... So a bright light

There are a number of angles producing Constructive Interference.



$\sin\theta = \lambda/d$

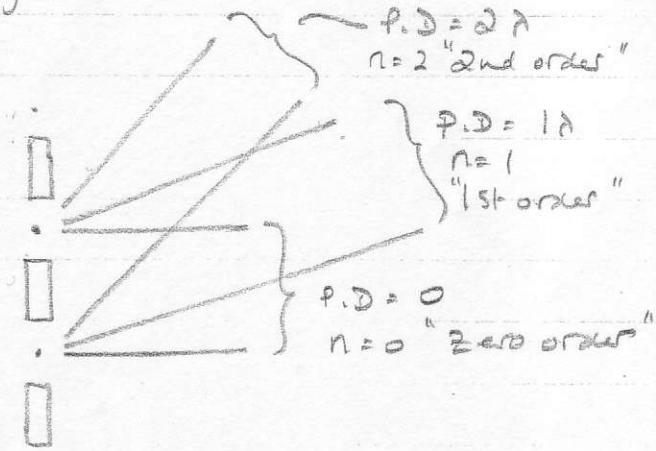
or... $\lambda = d\sin\theta$

General formula....

orders, n = 0, 1, 2, 3...

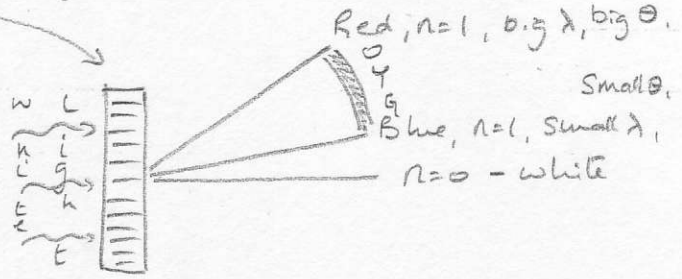
$n\lambda = d\sin\theta$

- λ: wavelength / m (1 nm = 1×10^{-9} m)
- d: distance between gaps in m; so, if N lines/m then $d = 1/N$
- θ: angle to straight through



(DG)

Diffraction gratings are used to spread out a light spectrum and examine the colours (wavelengths) in it.



TJN
03.05.