OCR A Physics A-Level

PAG 5.1

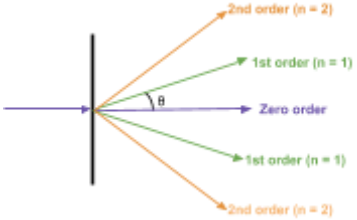
Determining the wavelength of light using a diffraction grating

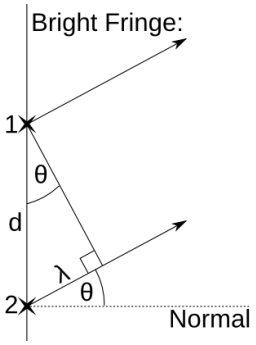
Equipment

- Diffraction grating
- Laser
- Screen
- Ruler

Method

1. Shine the laser through the diffraction grating onto the screen.
2. Measure the distance between the central fringe and the one beside it (1st order - see below).
3. Measure the distance between the grating and the screen.





Calculations

- The formula associated with diffraction gratings is $d\ sin\theta\ = n\lambda.$
  Where d is the distance between the slits, θ is the angle to the normal made by the maximum, n is the order and λ is the wavelength.
- To find tan θ divide the distance between the central fringe and the one beside it by the distance between the grating and the screen (tanθ=opp/adj) then use inverse tan (tan^{-1} θ) to find θ.
- To find d read the information on the packaging, it will say how many lines per mm. Note that if it has 350 lines/mm that is 350,000 lines/m and 1/350,000 is the slit spacing.
- We measured the distance to the first order hence n = 1.
- Substitute all these values into $\lambda = dsin\theta$ (n is not included as n = 1) to find the wavelength of the laser.

Notes

- Also calculate the wavelength using 2nd and 3rd order measurements and find the average of these values for the mean wavelength.
- Vary different properties such as the number of lines in the diffraction grating and the wavelength of the light to see how they affect θ.