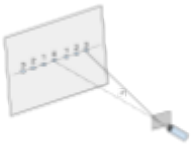
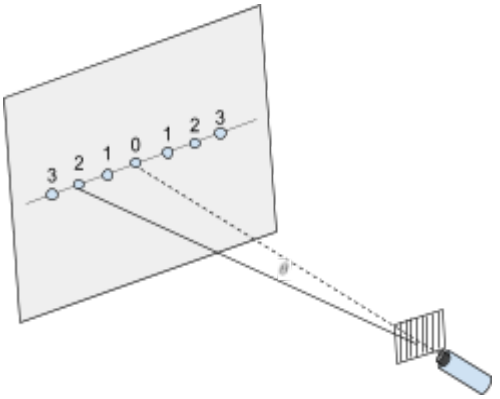
Particles and Waves

The Diffraction Grating 2

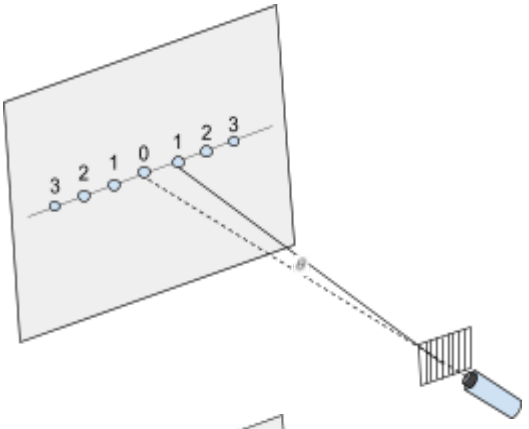


1. A physics student set up the experiment shown to measure the wavelength of light from a laser beam. The laser beam was shone through a grating. The distance between the slits was 1.67×10^{-6} metres.

   The angle from the central bright maximum to the 2nd order maximum was found to be 46°.
   Calculate the wavelength of the laser light.

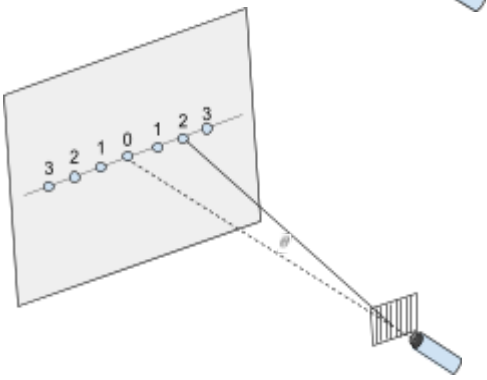


2. A laser beam of wavelength 650 nm is shone through a diffraction grating and an interference pattern is observed on a screen.
   The distance between the slits on the grating is 2×10^{-6} m.
   Calculate the angle between the central maximum and the first maximum on the screen.



3. A laser beam is passed through a diffraction grating of 500 lines per millimetre.
   A second order maximum is found at an angle of 41° from the central maximum.

   a. Calculate distance d between the slits of the grating.
   b. Calculate the wavelength of the laser light.
   c. State two changes to the experiment that would make the spacings between the interference maxima move further apart.



4. Red light of wavelength 650 nm is passed through a grating of 300 lines per millimeter.

   Calculate the angle between the first and second order maxima.