DETERMINATION OF WAVELENGTH USING A DIFFRACTION GRATING

Specification reference: **AS Component**   **2.5 – Wave properties**

                                                A level Component   3.2 – Wave properties

Theory:

The diffraction grating equation is given by $n\lambda = d\sin\vartheta$. The spacing between the lines in a diffraction grating is usually specified or can be found from the grating ruling. By measuring the angle θ, the wavelength of the light can be determined.

Apparatus:
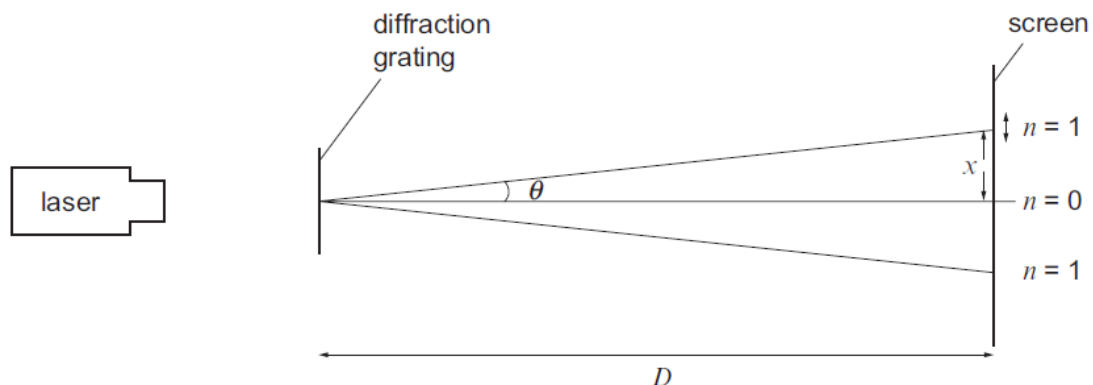
Laser pen
Diffraction grating of known d value or ruling e.g. 300 lines cm^{-1}
Metre rule
Screen
Stand and clamp for laser pen and grating

Further Guidance for Technicians:

The experiment can be undertaken in the main laboratory and does not require dark room facilities.

Experimental method:

The apparatus should be set-up as follows:

The value of θ can be determined from $\tan\vartheta = \frac{x}{D}$.

Using the equation $n\lambda = d\sin\vartheta$ then the wavelength can be determined for various orders of diffraction.

Extension:

A spectrometer could be used with different spectra lamps and the wavelength of various lines in the spectra could be determined.

Practical Techniques:

- Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.
- Use laser or light source to investigate characteristics of light, including interference and diffraction.