

2

(a)

Point source P, consisting of light with wavelength 630 nm, passes through a narrow slit and is incident on a screen at a distance of 2.4 m from the slit. Fig. 2.1 below shows the variation of intensity I of the light on the screen with distance x along the screen.

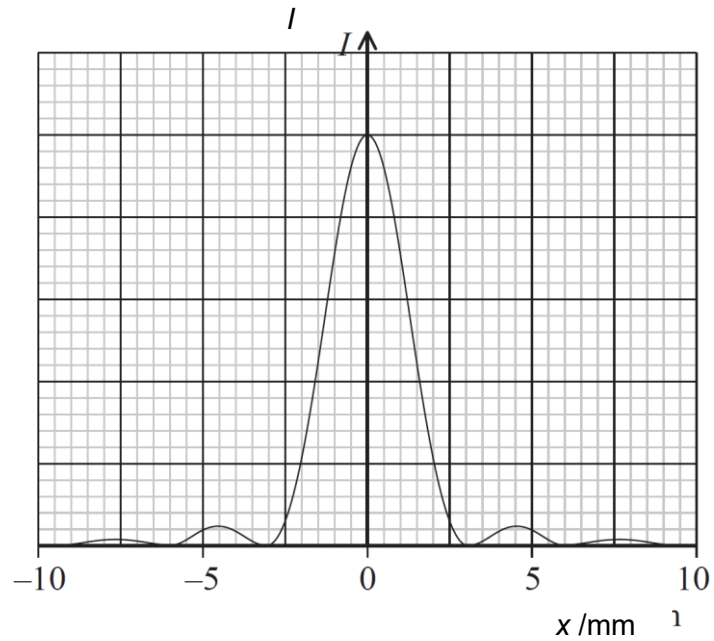
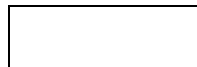


Fig. 2.1

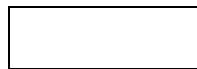


(i)

Use Fig. 2.1 to determine the width of the slit.

width = mm

[2]



(ii)

State the effect on the pattern on the screen in terms of width and intensity of central maximum if each of the following changes is made separately:

1.

the width of the single slit is reduced,

.....

.....[2]



2.

the red source is replaced with another source of violet light of the same intensity.

.....
.....[2]



(b)

Light of wavelength 633 nm from a laser is directed normally at a diffraction grating, as illustrated in Fig. 2.2.

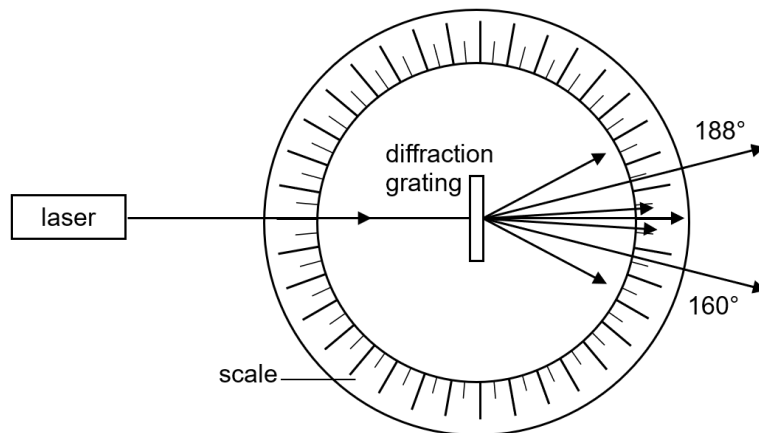


Fig. 2.2

The diffraction grating is situated at the centre of a circular scale, marked in degrees. The readings on the scale for the second order diffracted beams are 160° and 188°.

Calculate the number of lines per unit length of the slits in the diffraction grating.



number of lines per unit length = m⁻¹

[Total: 10]