

**A Level Physics A**  
**H556/01** Modelling physics

**Question Set 20**

1

A group of students are conducting an experiment to determine the wavelength of monochromatic light from a laser.

Fig. 24.1 shows the laser beam incident normally at a diffraction grating.

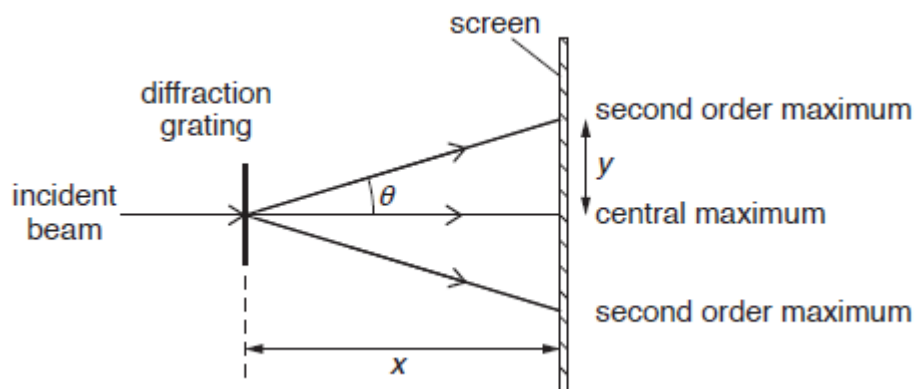


Fig. 24.1

The students use a diffraction grating with  $600 \text{ lines mm}^{-1}$ . They vary the distance  $x$  between the grating and the screen from  $1.000 \text{ m}$  to  $2.000 \text{ m}$ . They measure the distance  $y$  from the **central** maximum to the **second order** maximum.

(a)

The students decide to plot a graph of  $y$  against  $\sqrt{x^2 + y^2}$ .

Show that the gradient of the graph is equal to  $\sin \theta$ , where  $\theta$  is the angle between the central maximum and the **second** order maximum.

[1]

(b) Fig. 24.2 shows the graph plotted by the students.

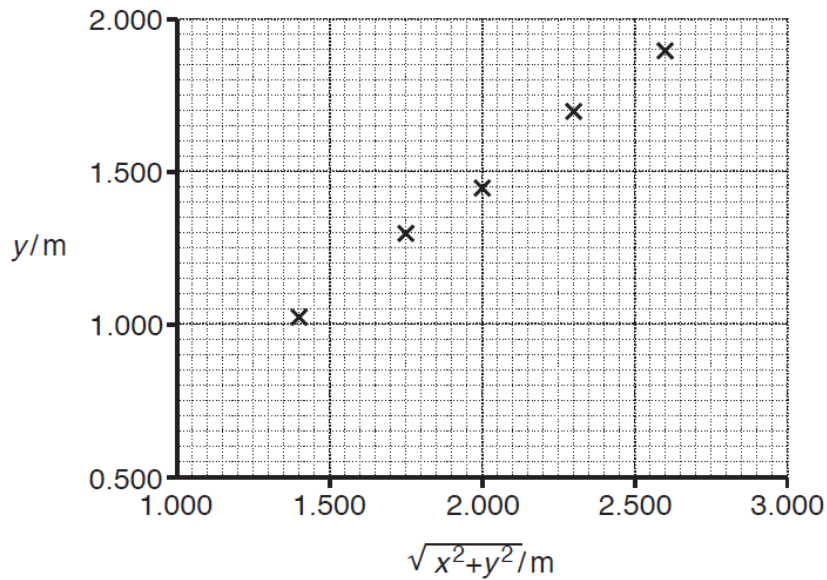


Fig. 24.2

(i) Use Fig. 24.2 to determine an accurate value of the wavelength  $\lambda$  of the light from the laser.

$\lambda = \dots\dots\dots$  m [3]

(ii) Suggest why there are no error bars shown in Fig. 24.2. [1]

(iii) Suggest how the precision of this experiment may be affected by using a protractor to measure the angle  $\theta$ . [1]

**Total Marks for Question Set 20: 6**

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