Oxford Cambridge and RSA

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.

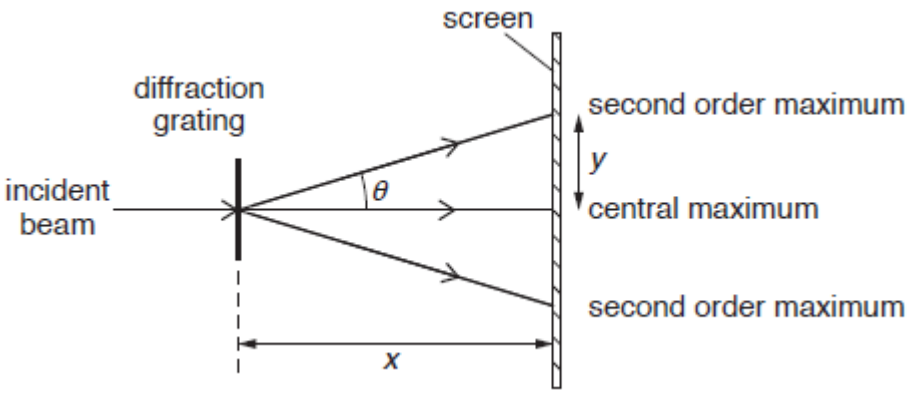

Fig. 24.1

The students use a diffraction grating with 600 lines mm^{-1}. They vary the distance x between the grating and the screen from 1.000 m to 2.000 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 θ, where θ is the angle between the central maximum and the **second** order maximum.

[1]

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

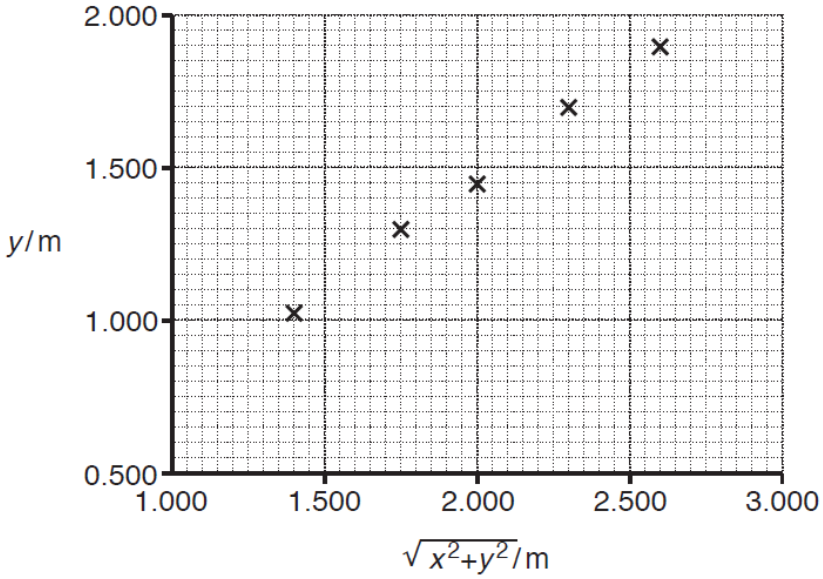

Fig. 24.2

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

λ = ... 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 tomeasure the angle θ. **[1]**

Total Marks for Question Set 20: 6