

- 4 (a) State what is meant by the *diffraction* of a wave.

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- (b) A laser produces a narrow beam of coherent light of wavelength 632 nm. The beam is incident normally on a diffraction grating, as shown in Fig. 4.1.

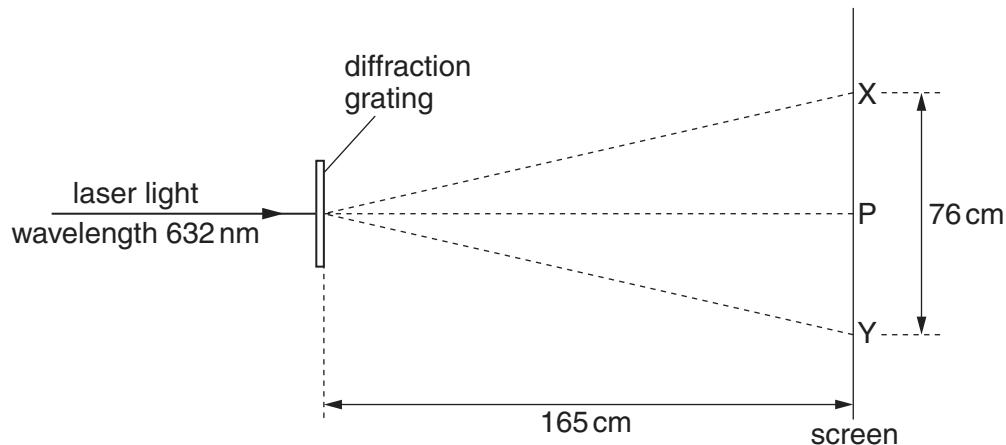


Fig. 4.1

Spots of light are observed on a screen placed parallel to the grating. The distance between the grating and the screen is 165 cm.

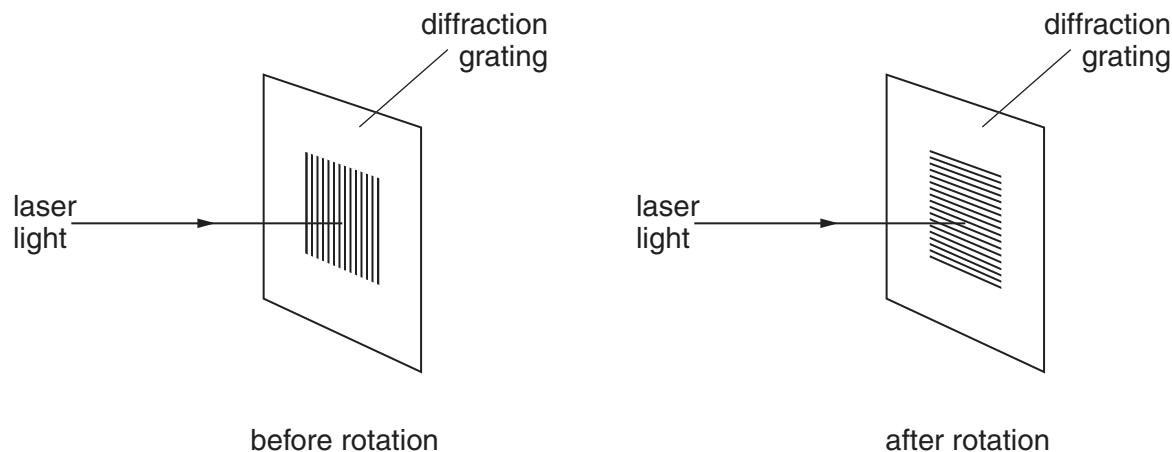
The brightest spot is P. The spots formed closest to P and on each side of P are X and Y.

X and Y are separated by a distance of 76 cm.

Calculate the number of lines per metre on the grating.

number per metre = ..... [4]

- (c) The grating in (b) is now rotated about an axis parallel to the incident laser beam, as shown in Fig. 4.2.



**Fig. 4.2**

State what effect, if any, this rotation will have on the positions of the spots P, X and Y.

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- (d) In another experiment using the apparatus in (b), a student notices that the distances XP and PY, as shown in Fig. 4.1, are not equal.  
Suggest a reason for this difference.

..... [1]