

5 (a) Low-pressure vapour in a lamp emits monochromatic light that is not coherent.

(i) State what is meant by *coherent* light.

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[1]

(ii) Explain, by reference to the mechanism by which the vapour produces light, why the emitted light is not coherent.

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[3]

(b) Coherent light of wavelength 590 nm is incident normally on a double slit, as shown in Fig. 5.1.

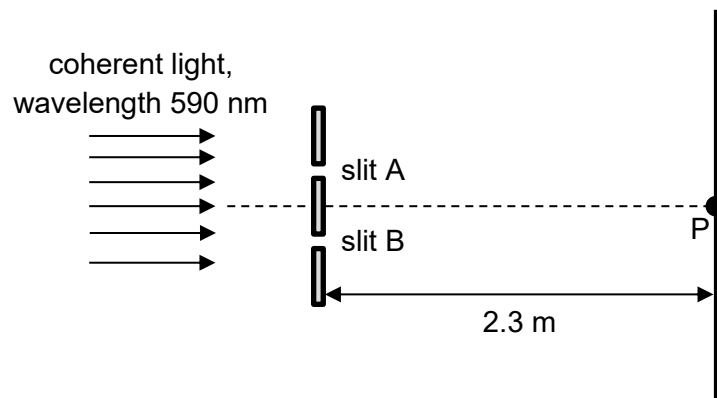


Fig. 5.1

The separation of the slits A and B in the double slit arrangement is 1.2 mm.

Interference fringes are observed on a screen placed parallel to the plane of the double slit and 2.3 m from it.

Assume that, for the fringes near point P on the screen, the light reaching the screen from slit A alone has intensity I and that from slit B alone has intensity $\frac{1}{3}I$.

- (i) Apart from coherence, state two other conditions required for two-source interference fringes to be observed.

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2.

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[2]

- (ii) Determine the separation of the bright fringes.

separation = m [2]

- (iii) Point P on the screen is equidistant from the two slits A and B.

Determine the intensity, in terms of I , of a dark fringe near P.

intensity = I [4]