5

(a)

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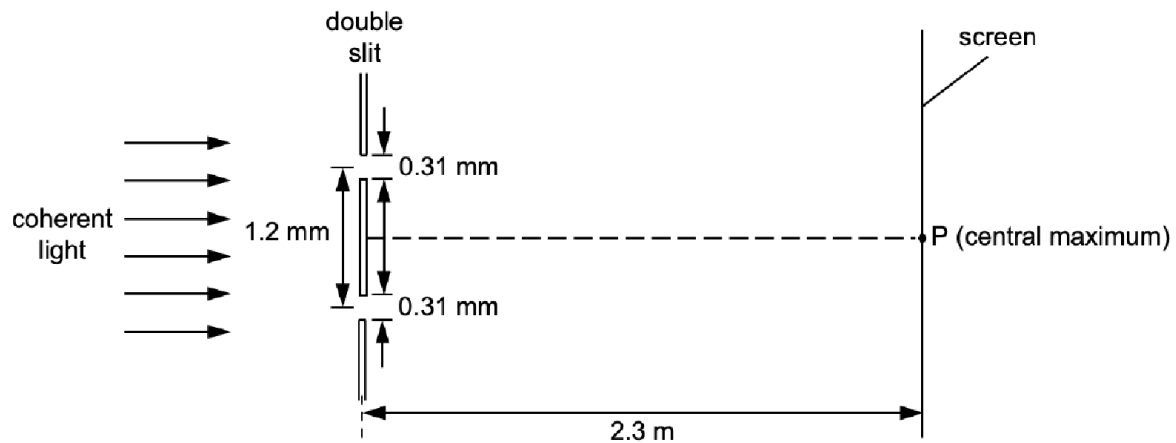

Fig. 5.1 (not to scale)

The separation of the slits is 1.2 mm and the width of each slit is 0.31 mm.

P is equidistant from the slits.

Fig. 5.2 shows the interference fringes observed near point P on a screen placed parallel to the plane of the double slit and 2.3 m from it. The central maximum is at P.

central maximum   bright fringes

third order   first order   first order   third order

second order   second order

Fig. 5.2

(i)

Explain why bright fringes are produced.

....

....

....

....

.... [2]

(ii)

Determine the separation of the bright fringes.

separation = …………………….……………….. mm [2]

(b)

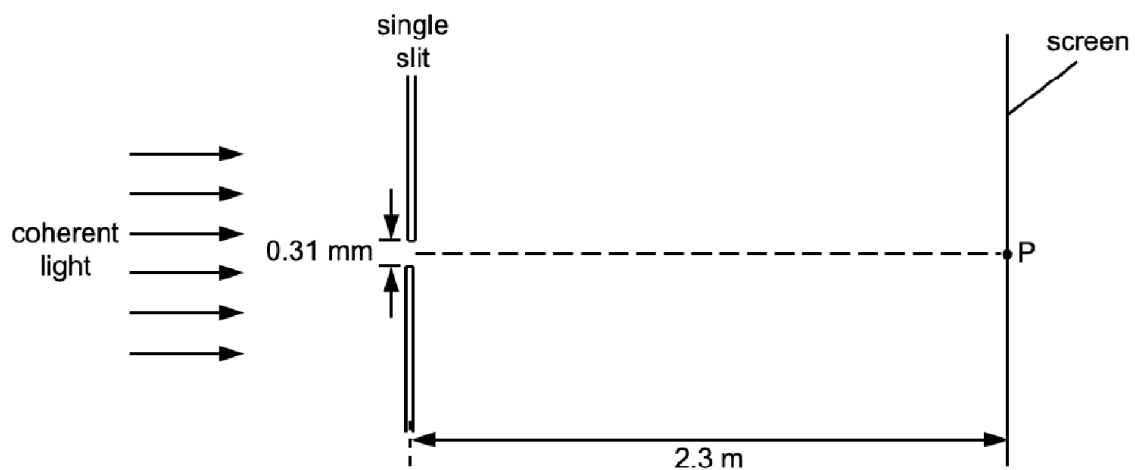The double slit in **(a)** is replaced by a single slit of width 0.31 mm, as shown in Fig. 5.3.

Fig. 5.3 (not to scale)

The centre of the interference pattern formed on the screen is at P.

Show that the width of the central fringe observed on the screen is 8.8 mm.

[2]

(c)

The fourth order bright fringes in Fig. 5.2 are "missing".

Explain the reason for the missing fringes.

……….

……….

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

[Total: 8]