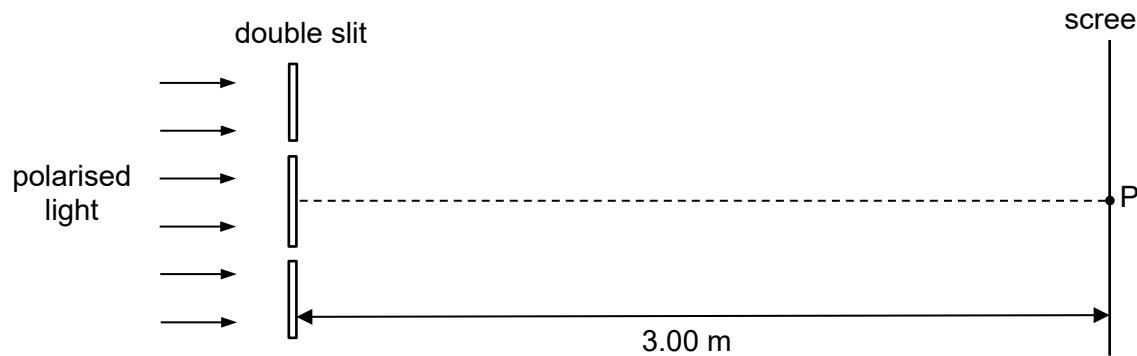


- 4 Polarised light of wavelength 590 nm is incident normally on a double slit, as shown in Fig. 4.1.



**Fig. 4.1** (not to scale)

The separation of the two slits of equal width is very small compared to the distance of 3.00 m between the slits and the screen. The double slit and the screen are parallel.

An interference pattern consisting of bright and dark fringes is observed on the screen. Point P is equidistant from both slits.

- (a) (i) Explain how the bright and dark fringes are formed.

.....  
.....  
.....  
.....  
.....  
.....  
.....

[3]

- (ii) Explain why some bright fringes are observed to be missing from the interference pattern.

.....  
.....

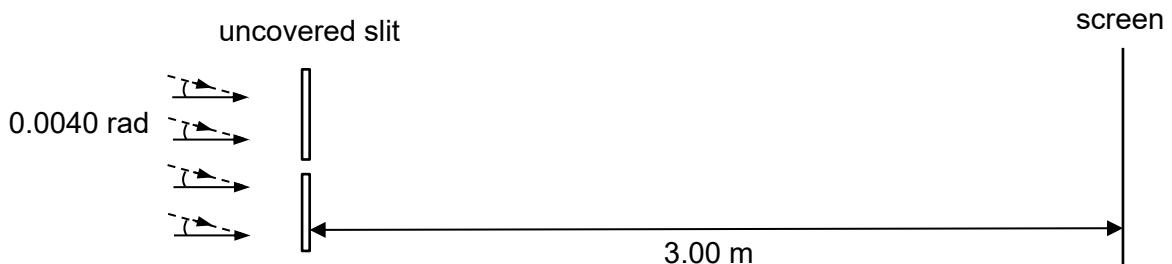
[1]

(b) One of the two slits is covered.

- (i) The distance between the first dark fringes on either side of point P on the screen is 35.4 mm. Determine the width of each slit.

$$\text{width} = \dots \text{mm} \quad [3]$$

- (ii) Parallel light from a second source of the same wavelength of 590 nm is also incident on the uncovered slit. The angle between the two beams of light is 0.0040 rad, as shown in Fig. 4.2.



**Fig. 4.2 (not to scale)**

Each beam forms a separate diffraction pattern on the screen.

With reference to the Rayleigh criterion, explain whether the two diffraction patterns formed on the screen are seen as being separate.

.....

.....

.....

.....

.....

.....

.....

.....

[3]