



A Level Physics A

H556/02 Exploring physics

Question Set 3

1 (a) State the principle of superposition of waves.

When 2 waves meet at a point in space the resultant displacement is equal to the sum of the displacements of the individual waves at that point.

[1]

(b) Fig. 16.1 shows an arrangement to demonstrate the interference of monochromatic light.

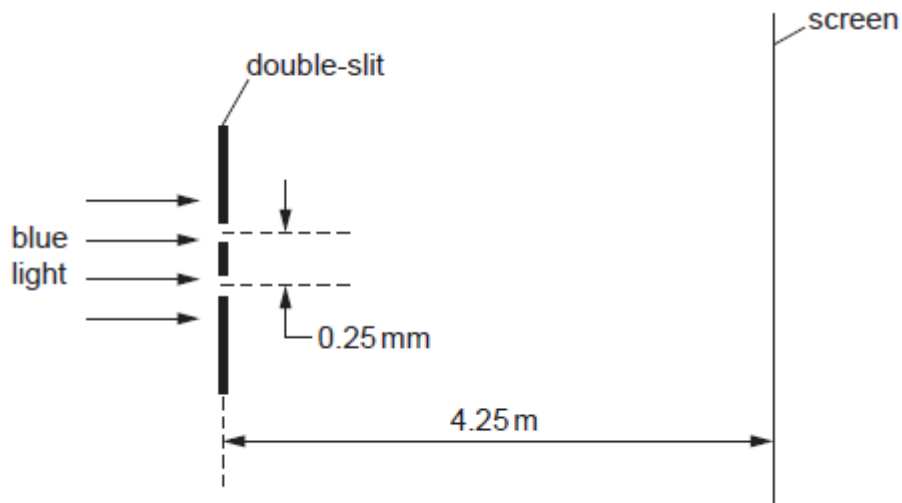


Fig. 16.1

Coherent blue light from a laser is incident at a double-slit. The separation between the slits is 0.25 mm. A series of dark and bright lines (fringes) appear on the screen. The screen is 4.25 m from the slits.

Fig. 16.2 shows the dark and bright fringes observed on the screen.

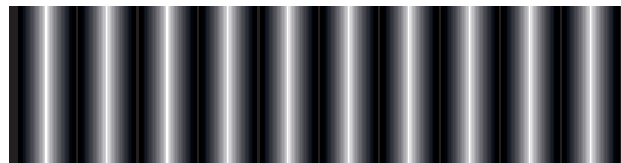


Fig. 16.2

The pattern shown in Fig. 16.2 is drawn to scale.

(i) Use Fig. 16.2 to determine accurately the wavelength of the blue light from the laser.

$$\text{Length of 9 fringes} = 72 \text{ mm} \rightarrow x = \frac{72}{9} = 8 \text{ mm}$$

$$\lambda = \frac{ax}{D} = \frac{0.25 \times 10^{-3} \times 8 \times 10^{-3}}{4.25} = 4.7 \times 10^{-7} \text{ m}$$

wavelength = 4.7×10^{-7} m [3]

(ii) The blue light is now replaced by a similar beam of red light. State and explain the effect, if any, on the fringes observed on the screen.

- Red light has a longer wavelength than blue
- $\lambda \propto x$ so fringes will be further apart.

[2]

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