Oxford Cambridge and RSA

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.

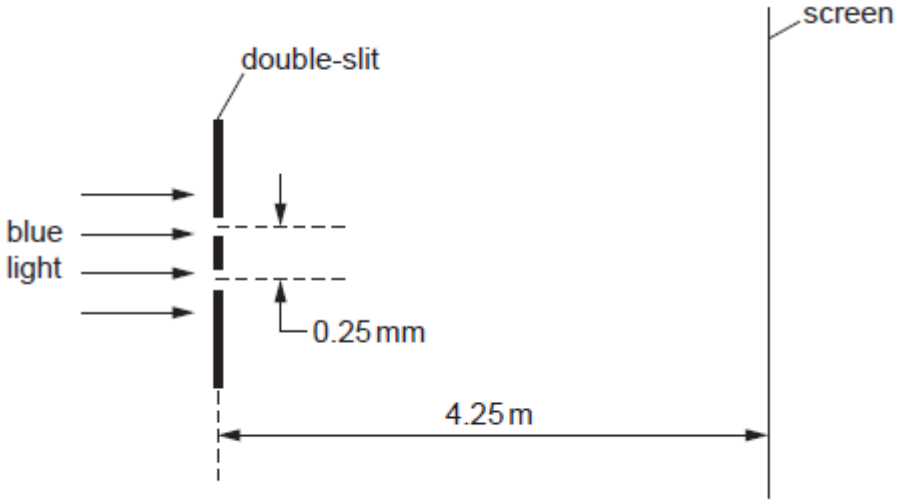

Fig. 16.1

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.

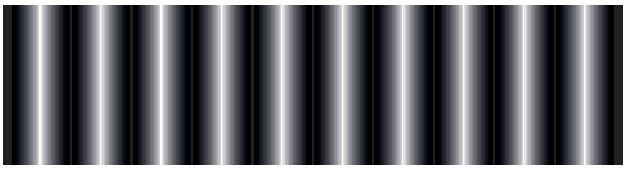

Fig. 16.2

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.

Length of 9 fringes = 72 mm → $x = \frac{72}{9} = 8\,mm$

$\lambda = \frac{ax}{D} = \frac{0.25\times10^{-3} \times 8\times10^{-3}}{4.25} = 4.7\times10^{-7}\ m$

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]

Total Marks for Question Set 3: 6