5 **(a)** By reference to two waves, state:

(i) the principle of superposition

.....

.....

.....

.....[2]

(ii) what is meant by *coherence*.

.....

.....[1]

(b) Two coherent waves P and Q meet at a point in phase and superpose. Wave P has an amplitude of 1.5 cm and intensity I. The resultant intensity at the point where the waves meet is $3I$.

Calculate the amplitude of wave Q.

amplitude = ... cm [2]

(c) The apparatus shown in Fig. 5.1 is used to produce an interference pattern on a screen.

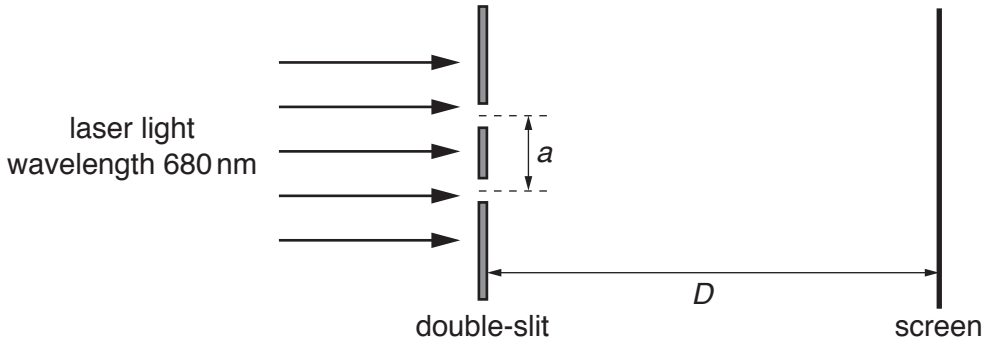

Fig. 5.1 (not to scale)

Light of wavelength 680 nm is incident on a double-slit. The slit separation is a. The separation between adjacent fringes is x. Fringes are viewed on a screen at distance D from the double-slit.

Distance D is varied from 2.0 m to 3.5 m. The variation with D of x is shown in Fig. 5.2.

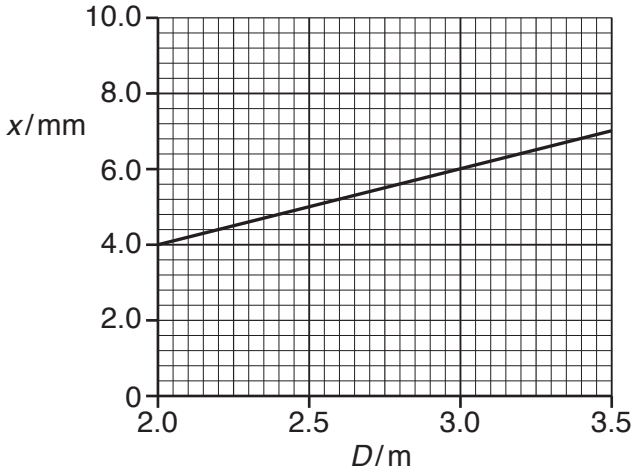

Fig. 5.2

(i) Fig. 5.2 to determine the slit separation a.

a = ... m [3]

(ii) The laser is now replaced by another laser that emits light of a shorter wavelength.

On Fig. 5.2, sketch a possible line to show the variation with D of x for the fringes that are now produced. [2]

[Total: 10]