6 **(a)** Two overlapping waves of the same type travel in the same direction. The variation with distance x of the displacement y of each wave is shown in Fig. 6.1.

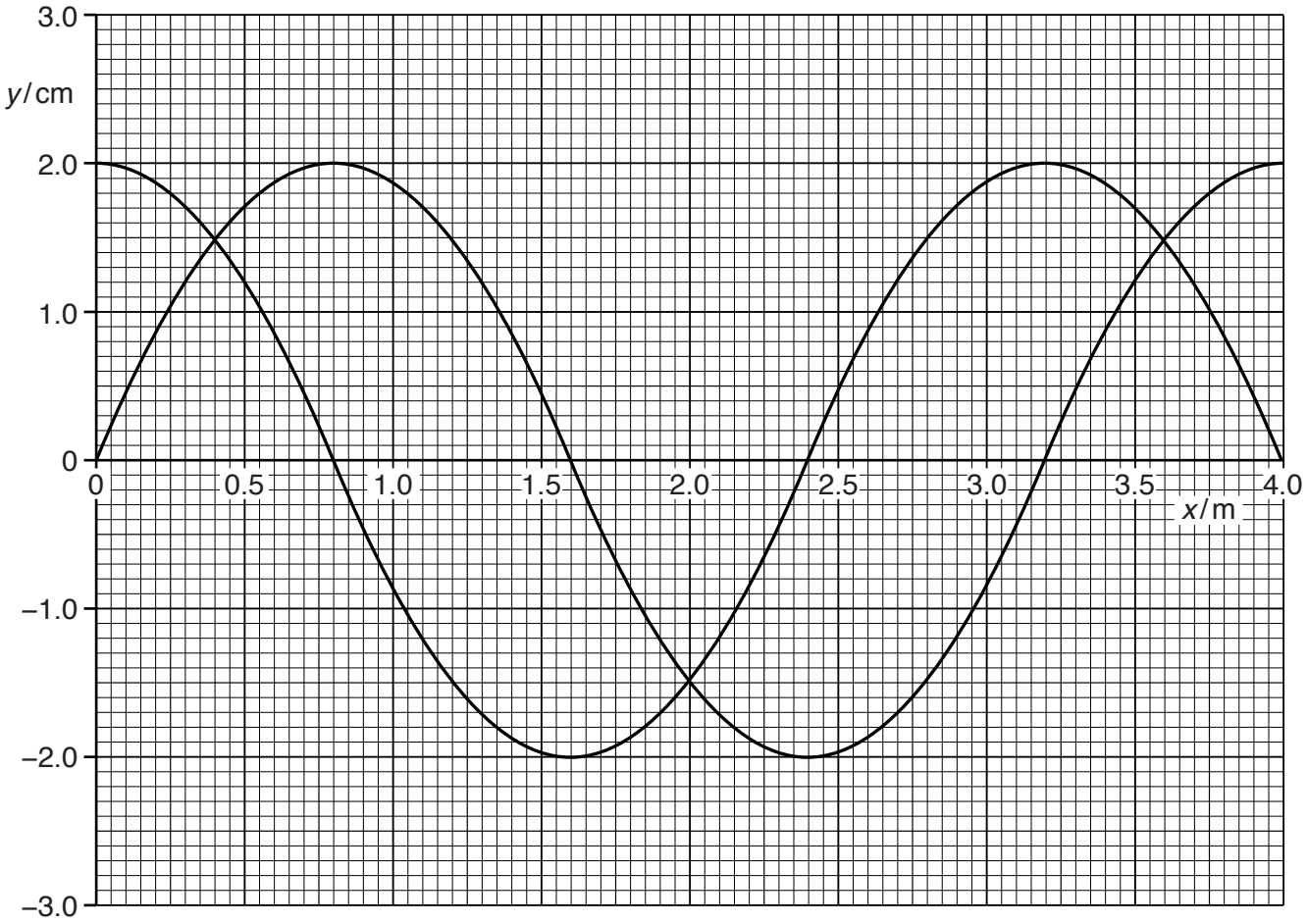

Fig. 6.1

The speed of the waves is $240\,m\,s^{-1}$. The waves are coherent and produce an interference pattern.

(i) Explain the meaning of *coherence* and *interference*.

coherence: .....

.....

interference: .....

.....

[2]

(ii) Use Fig. 6.1 to determine the frequency of the waves.

frequency = ... Hz [2]

(iii) State the phase difference between the waves.

phase difference = ... ° [1]

(iv) Use the principle of superposition to sketch, on Fig. 6.1, the resultant wave. [2]

(b) An interference pattern is produced with the arrangement shown in Fig. 6.2.

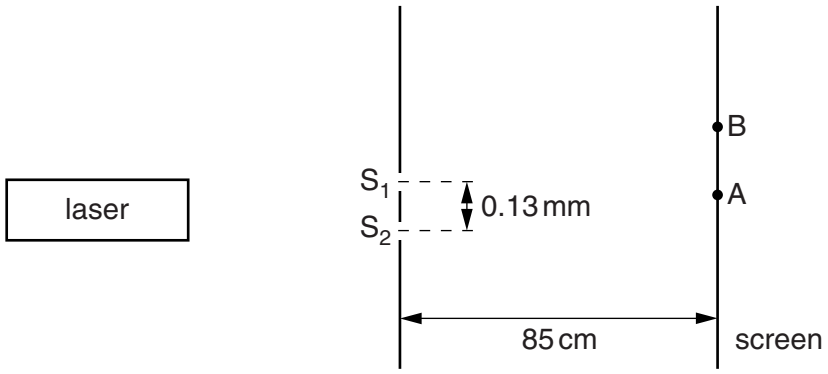

Fig. 6.2 (not to scale)

Laser light of wavelength λ of 546 nm is incident on the slits S_1 and S_2. The slits are a distance 0.13 mm apart. The distance between the slits and the screen is 85 cm.

Two points on the screen are labelled A and B. The path difference between S_1A and S_2A is zero. The path difference between S_1B and S_2B is 2.5λ. Maxima and minima of intensity of light are produced on the screen.

(i) Calculate the distance AB.

distance = ... m [3]

(ii) The laser is replaced by a laser emitting blue light. State and explain the change in the distance between the maxima observed on the screen.

.....

.....

.....[1]