

- 6 (a) Interference fringes may be observed using a light-emitting laser to illuminate a double slit. The double slit acts as two sources of light.

Explain

- (i) the part played by diffraction in the production of the fringes,

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.....
.....[2]

- (ii) the reason why a double slit is used rather than two separate sources of light.

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.....
.....[1]

- (b) A laser emitting light of a single wavelength is used to illuminate slits S_1 and S_2 , as shown in Fig. 6.1.

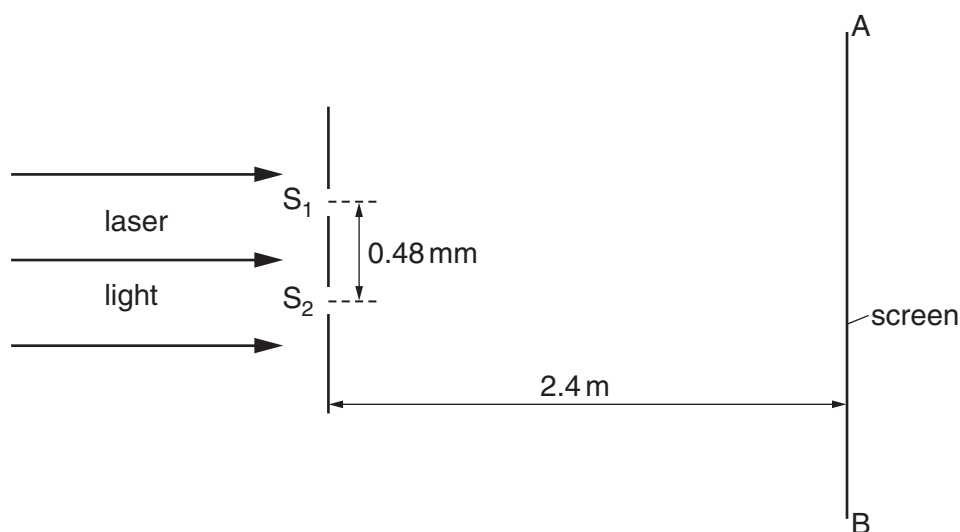


Fig. 6.1 (not to scale)

An interference pattern is observed on the screen AB. The separation of the slits is 0.48 mm . The slits are 2.4 m from AB. The distance on the screen across 16 fringes is 36 mm , as illustrated in Fig. 6.2.

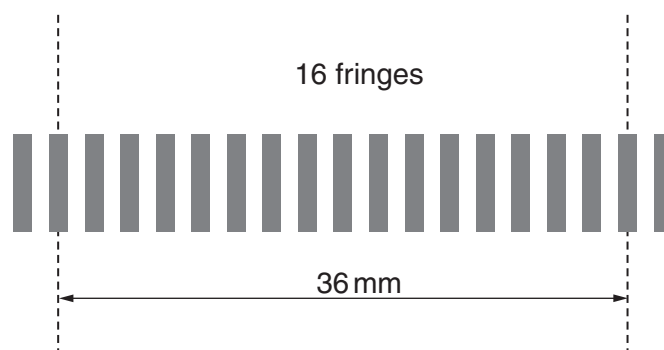


Fig. 6.2

Calculate the wavelength of the light emitted by the laser.

wavelength =m [3]

- (c) Two dippers D_1 and D_2 are used to produce identical waves on the surface of water, as illustrated in Fig. 6.3.

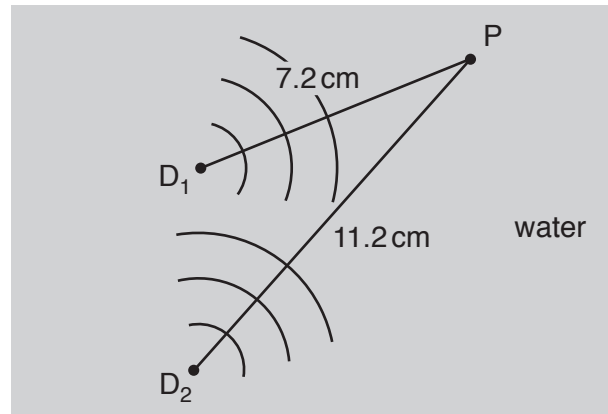


Fig. 6.3 (not to scale)

Point P is 7.2 cm from D_1 and 11.2 cm from D_2 .

The wavelength of the waves is 1.6 cm. The phase difference between the waves produced at D_1 and D_2 is zero.

- (i) State and explain what is observed at P.

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 [2]

- (ii) State and explain the effect on the answer to (c)(i) if the apparatus is changed so that, separately,

1. the phase difference between the waves at D_1 and at D_2 is 180° ,

.....

2. the intensity of the wave from D_1 is less than the intensity of that from D_2 .

.....

 [2]

[Total: 10]