

4

A ripple tank is used to demonstrate the interference of water waves.

Two dippers D1 and D2 produce coherent waves that have circular wavefronts, as illustrated in Fig. 4.1.

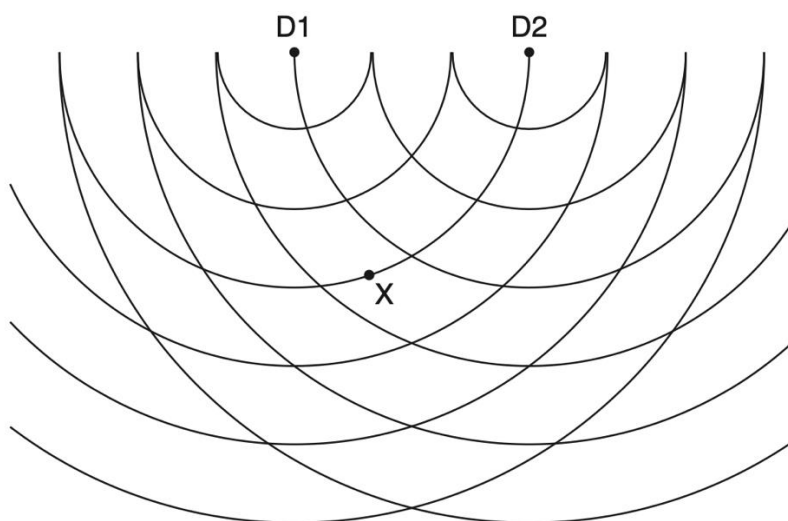


Fig. 4.1 (not to scale)

The lines in the Fig. 4.1 represent crests.

|

(a)

(i)

1.

Explain what is meant by *coherent* waves produced by the dippers.

.....
.....

[1]

|

2.

Describe how the apparatus can be arranged to ensure that the waves from the dippers are coherent.

.....

.....

[1]



(ii)

State one other condition that must be satisfied by the waves in order for the interference pattern to be observable.

.....

.....

[1]



(b)

Light from a lamp above the ripple tank shines through the water onto a screen below the tank. Describe one way of seeing the illuminated pattern more clearly.

.....

.....

[1]

(c)

Fig. 4.2 shows the water level at one of the dippers.

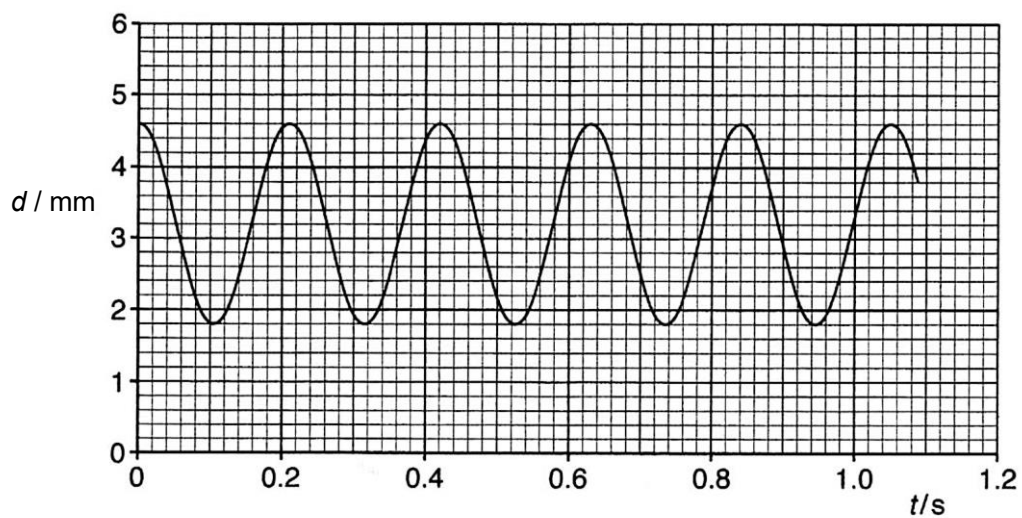


Fig. 4.2

The speed of waves is 0.40 m s^{-1} .

Show that the waves have a wavelength of 8.4 cm .

[2]



(d)

Fig. 4.1 shows a point X that lies on a crest of the wave from D1 and midway between two adjacent crests of the wave from D2.

For the waves at point X,



(i)

determine the path difference,

path difference = cm

[2]



(ii)

state the phase difference.

phase difference = °

[1]



(e)

On Fig. 4.1, draw **one** line, at least 4 cm long, which joins points of the interference pattern where only maxima of path difference equal to two wavelengths are observed.

[1]

|

[Total: 10]