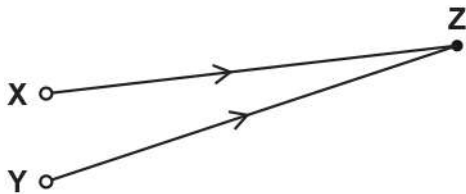


1. The waves from the sources **X** and **Y** are coherent and have wavelength 10.0 cm.
The waves are in phase at **X** and **Y**.



Which row gives the correct conditions for constructive interference at point **Z**?

	Distance XZ / cm	Distance YZ / cm
A	60.0	75.0
B	75.0	95.0
C	90.0	65.0
D	100.0	135.0

Your answer

[1]

2. The waves emitted from two sources are coherent.
Which quantity must be constant for these emitted waves?

- A amplitude
- B frequency
- C intensity
- D phase difference

Your answer

[1]

3. This question is about a laser pen.

Define the terms *phase difference* and *coherence*.
phase difference

coherence

[2]

4.

Fig. 25.2 shows an arrangement used to demonstrate the interference of transverse waves on the surface of water.

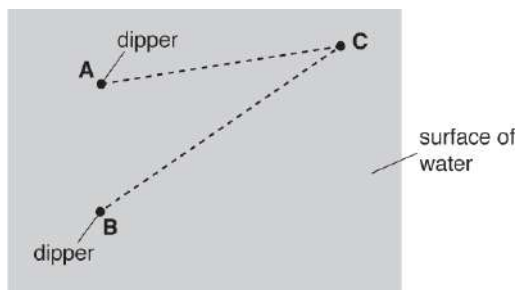


Fig. 25.2 (not to scale)

The dippers **A** and **B** oscillate in phase. Each dipper creates waves of wavelength 3.0 cm. **C** is a point on the surface of the water. The distance **AC** is 10.5 cm and the distance **BC** is 15.0 cm.

- i. Explain what is meant by *interference*.

[1]

- ii. State and explain the type of interference occurring at **C**.

[2]

5. At an open air concert two loudspeakers are placed 5.0 m apart at the front of a stage and are sounding a note of frequency 1200 Hz. A row of seats is 30 m from the stage and parallel to it.

Describe and explain, as precisely as possible, what different people along this row will hear. You must include calculations in your answer. The speed of sound in air is 330 m s^{-1} .

6. Fig. 5 shows the variation with distance of the displacement for two progressive waves **P** and **Q**.

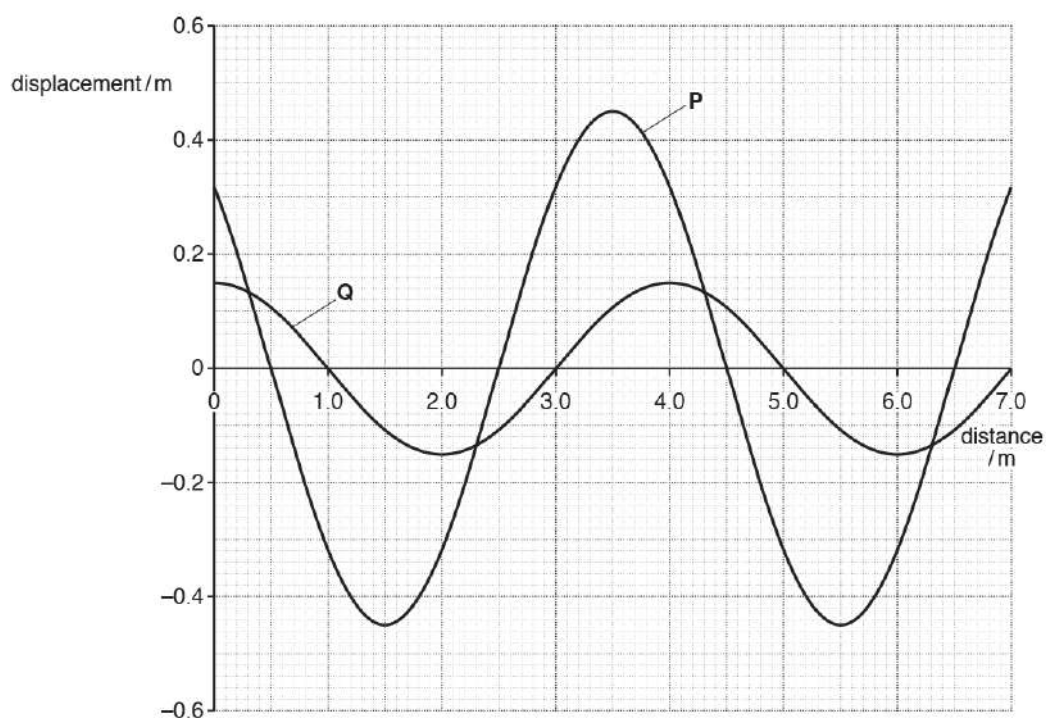


Fig. 5

i. State the amplitude of wave **P**.

amplitude = ... m [1]

i. State the wavelength of wave **P**.

wavelength = ... m [1]

iii. Determine the phase difference, in radians, between wave **P** and wave **Q**.

phase difference = ... rad [2]

$$\frac{\text{intensity of wave P}}{\text{intensity of wave Q}}$$

iv. Determine the ratio

ratio = ... [2]

7(a). State what is meant by *coherent waves*.

.....

.....

..... [1]

(b). Two transverse waves **P** and **Q** can pass through a point **X**. **Fig. 25.1** shows the displacement-time graphs of a particle at point **X** for each wave independently.

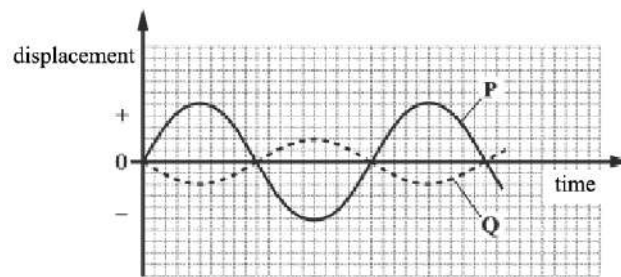


Fig. 25.1

State, with a reason, the motion of the particle at point **X** when both waves are present.

.....

.....

..... [2]

(c). A laser **A** is placed close to two slits as shown in **Fig. 25.2**.

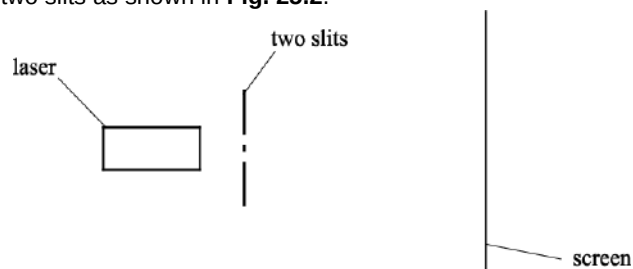


Fig. 25.2

The laser emits monochromatic light. Bright and dark fringes are observed on a screen.

i. Explain why bright and dark fringes are observed on the screen.

.....

.....

[3]

- ii. The laser **A** is replaced with another laser **B**. Laser **B** emits light of a different colour with a much greater intensity.

The fringe patterns observed on the screen with these two lasers are shown in **Fig. 25.3**.



Fig. 25.3 (drawn to scale)

According to a student, laser **B** produces a more spread out fringe pattern because the intensity of its light is much greater than that of laser **A**.

This suggestion is incorrect. Give the correct explanation.

[1]

- iii. State the effect on the pattern of light seen on the screen when one of the slits is blocked.

[1]

8(a). In an experiment to measure the wavelength of yellow light from a sodium lamp, a beam of light from a lamp passes through a pair of narrow slits **S₁** and **S₂**. This produces a pattern of regularly spaced bright and dark lines, called fringes, on a screen as shown in **Fig. 5.1**.

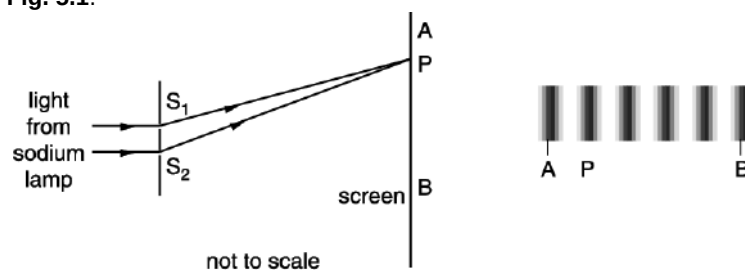


Fig 5.1

A student makes the following measurements:

distance **S₁S₂** = 0.8 mm

distance **AB** on screen = 6.0 mm

© OCR 2017. You may photocopy this page.

Calculate the wavelength, in nanometre, of the sodium light.

(b). *Fig. 5.2 shows a microscope slide, blackened with graphite paint, with the two slits S_1 and S_2 scratched through the paint, very close together, to form the double slit.



In your answer, include how to achieve the conditions necessary to produce a visible interference pattern on the screen and how you would make the measurements to calculate the wavelength, identifying the measurement which will give the greatest uncertainty.

(c). To reduce the uncertainty in the calculated value of the wavelength, one student suggests making a different slide with a greater slit separation.
Discuss whether you think this change will reduce the uncertainty.

-----[3]

END OF QUESTION PAPER