

- 4 (a) A source oscillates with frequency f to produce a progressive wave of wavelength λ . The source takes time t to produce n complete oscillations.

- (i) State what is meant by a progressive wave.

..... [1]

- (ii) State expressions, in terms of some or all of f , λ and n , for:

- the distance moved by a wavefront in time t

distance =

- time t .

time t =

[2]

- (iii) Use your answers in (ii) to determine an expression for the speed v of the wave in terms of f and λ .

[1]

- (b) Two identical microwave sources X and Y emit waves in phase. The sources are separated by a distance of 30 cm, as shown in Fig. 4.1.

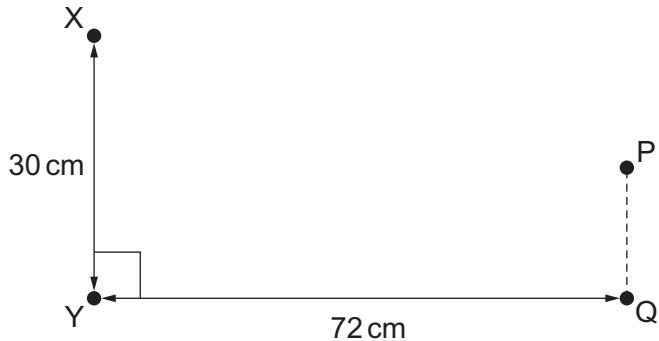


Fig. 4.1 (not to scale)

The intensity of the microwaves is to be investigated at points P and Q.

Line PQ is parallel to line XY. Distance XP is equal to distance YP. Distance YQ is 72 cm and angle XYQ is 90° .

The wavelength of the microwaves is 4.0 cm.



- (i) Calculate the frequency, in GHz, of the microwaves.

frequency = GHz [2]

- (ii) Show that the difference between the path lengths XQ and YQ is 6 cm.

[1]

- (iii) State and explain what may be deduced about the intensity of the microwaves at point Q.

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..... [3]

- (iv) A microwave detector is positioned at P and connected to a cathode-ray oscilloscope (CRO). The controls of the CRO are adjusted so that a waveform is shown on the screen.

Describe the changes to the amplitude of the waveform as the detector is moved from P to Q.

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..... [2]