6 Two coherent sources X and Y of microwaves of frequency 2.5×10^{10} Hz are a distance of 0.18 m apart in a vacuum, as shown in Fig. 6.1.

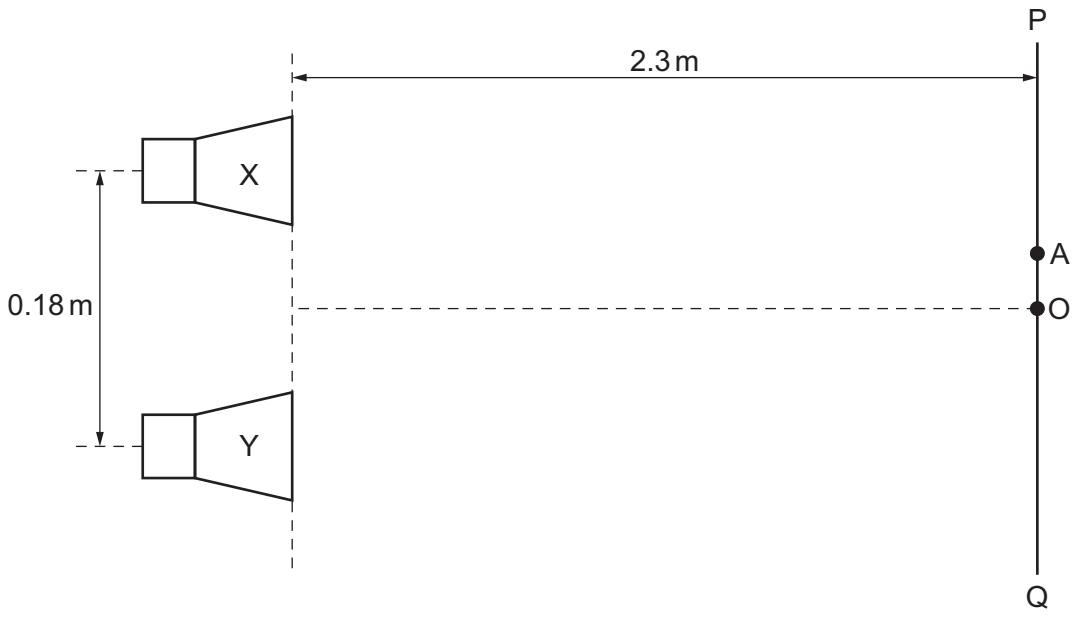

Fig. 6.1 (not to scale)

There is a phase difference of 90° between the waves emitted at the two sources.

A microwave detector moves along the line PQ, which is parallel to the line joining the two sources and 2.3 m away from it.

Point O is on the line PQ at a position that is equidistant from the two sources.
Point A is the position on line PQ where the intensity of the microwaves is the greatest.

(a) (i) Explain why the position of greatest intensity is **not** at point O.

.....

.....

.....

..... [2]

(ii) On Fig. 6.1, draw a cross (×) to show the position of the point on line PQ where the intensity minimum that is the closest to point O occurs. Label this point B. [2]

(b) **(i)** Show that the wavelength of the microwaves is 0.012 m.

[2]

(ii) For point A on line PQ, determine the difference in the distances Δx travelled by the microwaves from X and the microwaves from Y.

Δx = ... m [1]

(iii) Use the formula for the double-slit interference of light to calculate the distance between adjacent intensity maxima on line PQ.

distance = ... m [2]

[Total: 9]