4 **(a)** State two conditions necessary for the formation of stationary waves.

.....

.....

.....

.....

.....

[2]

(b) With the aid of a labelled diagram, describe a laboratory experiment to demonstrate stationary waves in an air column.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[3]

(c) Fig. 4.1 shows an arrangement used to determine the speed of microwaves in the laboratory.

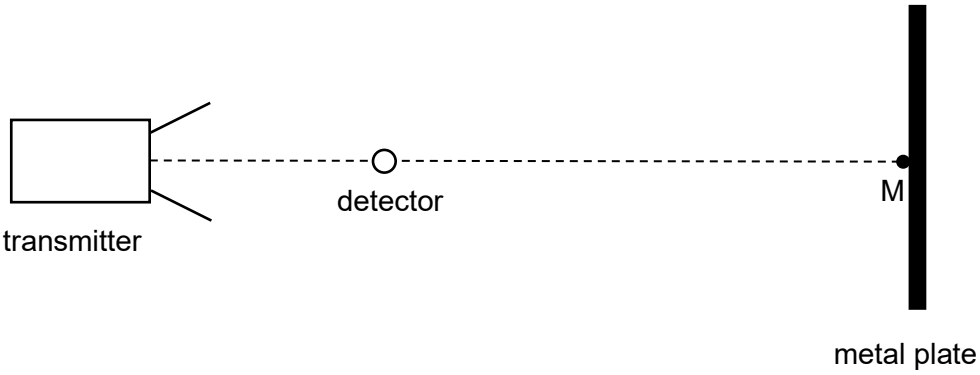

Fig. 4.1

A stationary wave is formed between the transmitter and the metal plate. As the detector is moved along the line between the transmitter and the point M, it registers a series of high intensity signals. The positions of these high intensity signals along an axis are marked by crosses on the x axis of the graph in Fig. 4.2.

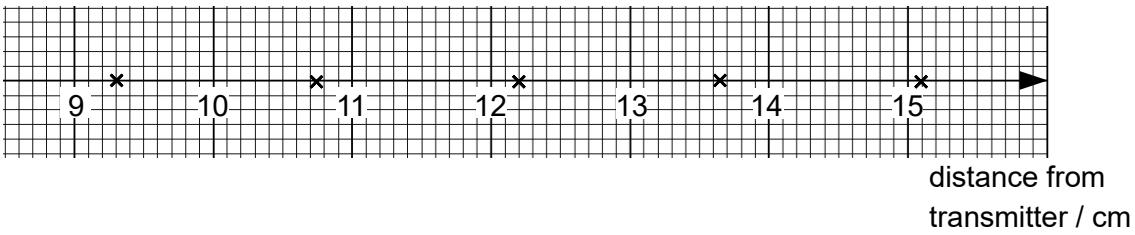

Fig. 4.2

The transmitter emits microwaves of frequency 1.0×10^{10} Hz. Use Fig. 4.2 to deduce an experimental value for the speed of the microwaves.

speed = ... m s^{-1} [2]

[Total: 7]