

Name of the Student: _____

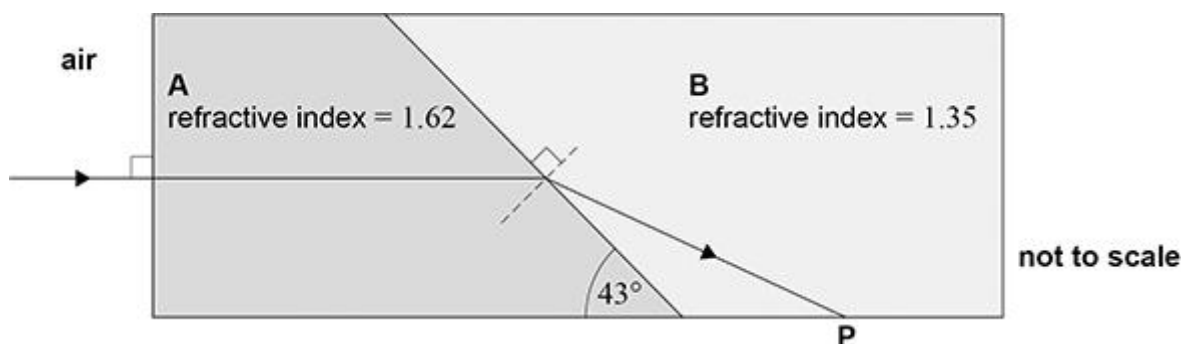
Max. Marks : 17 Marks

Time : 17 Minutes

Q1.

Two transparent prisms **A** and **B** of different refractive indices are placed in contact to produce a rectangular block.

The figure below shows the path of a ray, incident normally on **A**, refracting as it crosses the boundary between the prisms.



- (a) Explain how the path of the ray shows that the refractive index of **A** is greater than the refractive index of **B**.

(1)

- (b) Show that the angle of refraction of the ray in **B** is about 60°.

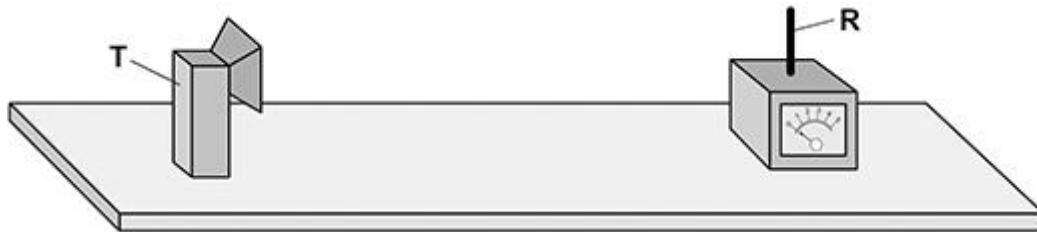
(2)

- (c) Draw, on the figure above, the path of the ray immediately after it reaches **P**. Justify your answer with calculations.

Q2.

Figure 1 shows apparatus used to investigate the properties of microwaves. The microwaves from the transmitter **T** are vertically polarised and have a wavelength of about 3 cm. The microwaves are detected at the receiver by a vertical metal rod **R**.

Figure 1



(a) Explain how the apparatus can be used to demonstrate that the waves from **T** are vertically polarised.

(3)

Figures 2a and **2b** show **T** and **R** and two different positions of a metal plate **M** that reflects microwaves. **M** is vertical and parallel to the direct transmission from **T** to **R**.

Figure 2a

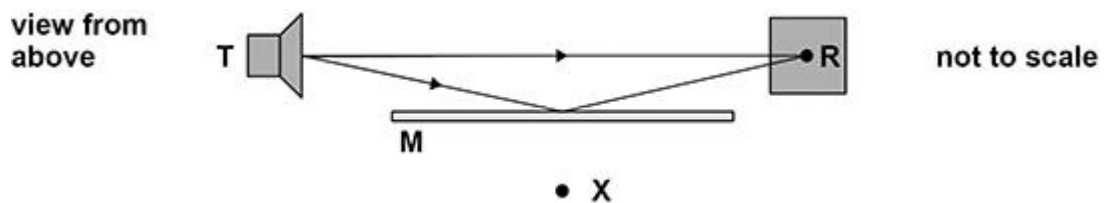
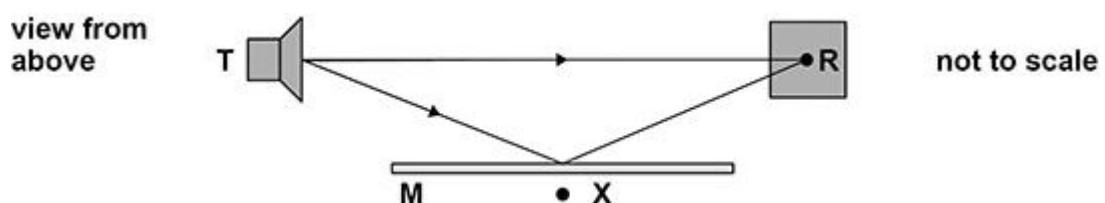


Figure 2b



In an experiment, **T** and **R** are about two metres apart. **M** is moved slowly towards **X**.

Figure 2a shows the initial position of **M**.

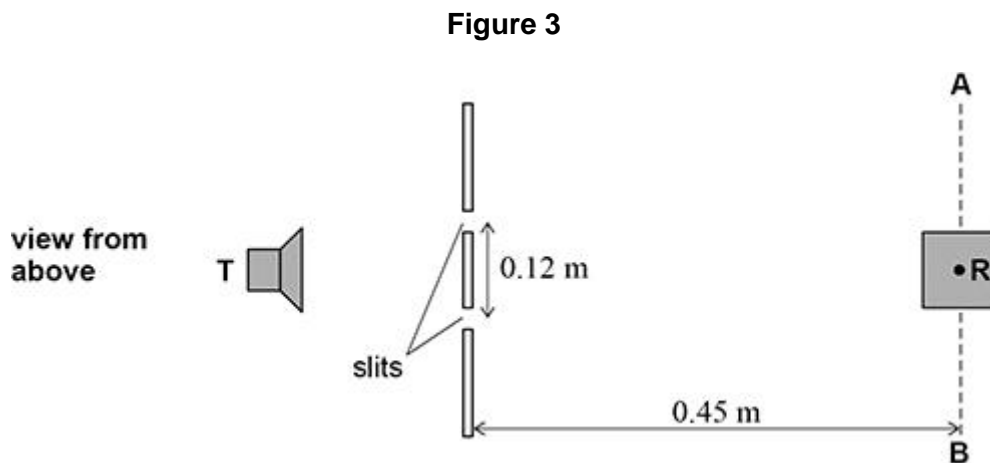
Figure 2b shows **M** when it has been moved a few centimetres.

The arrowed lines show the path of waves that reach **R** directly and the path of waves that reach **R** by reflection from **M**.

(b) Explain what happens to the signal detected by **R** as **M** is moved slowly towards **X**.

(4)

Figure 3 shows an arrangement used in a different experiment to try to determine the wavelength of the microwaves.



A double-slit arrangement is placed between **T** and **R**.

The initial position of **R** is the same distance from each slit and is 0.45 m from the midpoint of the two slits.

AB is a line perpendicular to the line between **T** and the initial position of **R**.

R can be moved 0.25 m towards **A** and 0.25 m towards **B** along **AB**.

The two slits act as two coherent sources with a separation of 0.12 m .

(c) Suggest why Young's double-slit equation should **not** be used to determine the wavelength.

(1)

(d) The wavelength is known to be about 3 cm.

Deduce whether this practical arrangement is suitable for a determination of a value for the wavelength.

(3)

(Total 11 marks)