3.3 Waves: 10-minute Pack

AQA 7408 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A microwave transmitter emits plane-polarised microwaves towards a receiver. A metal grille, which acts as a polarising filter for microwaves, is placed between the transmitter and the receiver.

(a) State what is meant by a transverse wave being 'plane polarised'. **(1)**

(b) The grille is initially oriented so the receiver detects a maximum signal. Predict and explain what happens to the signal detected as the grille is slowly rotated through 90 degrees (about the axis along which the microwaves travel). **(3)**

(c) State one everyday application of polarising filters, and briefly explain how polarisation is used in this application. **(2)**

(d) Sound waves cannot be polarised. Use this fact to justify that sound waves must be longitudinal rather than transverse. **(2)**

(Total for Question 1 is 8 marks)

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Mark scheme · 3.3 Waves: 10-minute Pack

Question 1

(a) the oscillations of the wave occur in one plane only, which contains the direction of propagation oe **B1**

(a) Answer: The oscillations occur in only one plane, which contains the direction of travel of the wave.

(b) the detected signal (amplitude/intensity) decreases as the grille is rotated **B1**

(b) the signal falls to (a) minimum/zero once the grille has been rotated through 90 degrees **B1**

(b) the grille only allows through the component of the oscillation aligned with its transmission direction, and this component reduces to zero at 90 degrees oe **B1**

(b) Answer: The signal decreases steadily and falls to a minimum (zero) at 90 degrees, because only the component of oscillation aligned with the grille's transmission direction is allowed through.

(c) named application, e.g. polaroid sunglasses, LCD screens, or aligning a radio/TV aerial with a transmitter **B1**

(c) valid explanation linked to the named application, e.g. sunglasses absorb the (partially) polarised glare reflected from horizontal surfaces such as water or a road oe **B1**

(c) Answer: Example: polaroid sunglasses, which absorb the horizontally polarised glare reflected from surfaces such as water or wet roads.

(d) only transverse waves can be polarised, because polarisation requires restricting the oscillation direction (perpendicular to propagation) to a single plane **B1**

(d) since sound cannot be polarised, it cannot be transverse, so it must be longitudinal oe **B1**

(d) Answer: Since only transverse waves can be polarised, and sound cannot be polarised, sound must be a longitudinal wave.

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