

# SOUND WAVES

Q1 When sound waves reach a material, some of the energy of the sound is reflected and some is transmitted through the material.

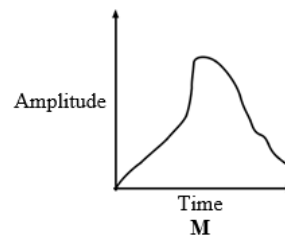
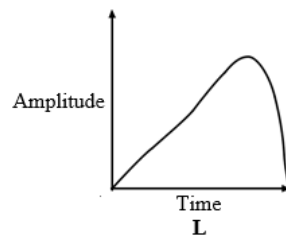
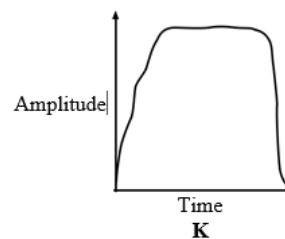
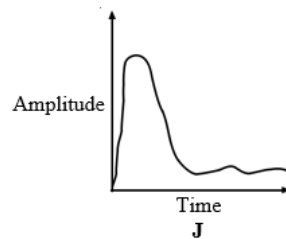
(a) Complete the sentence.

Sound waves are caused \_\_\_\_\_  
by \_\_\_\_\_

(1 mark)

(b) The graphs **J**, **K**, **L** and **M** represent the sound energy reflected from a surface. The graphs are all drawn to the same scale.

Which graph shows the greatest total sound energy output from the surface?



Graph \_\_\_\_\_

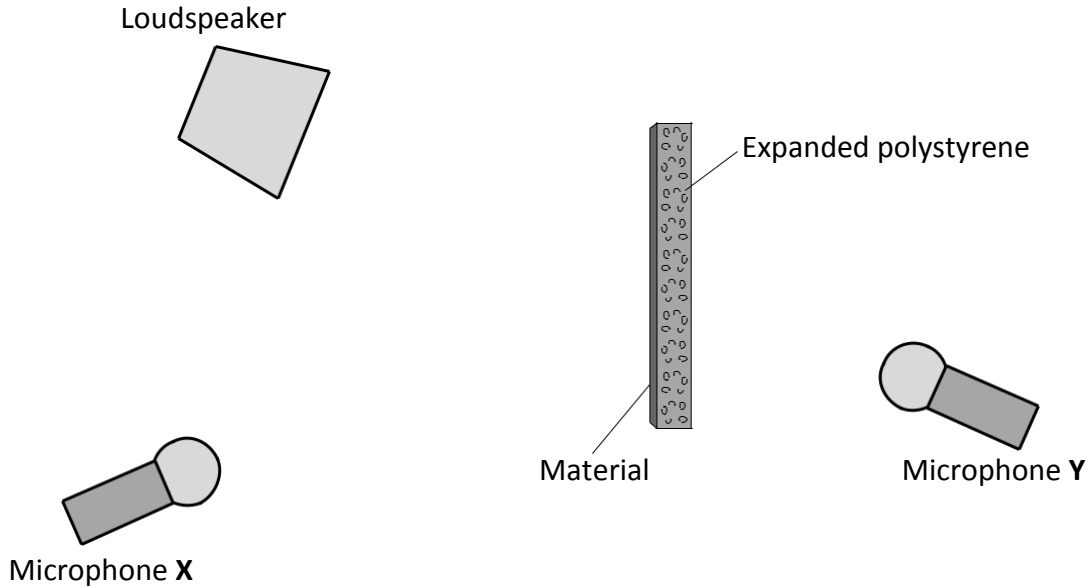
(1mark)

(c) The proportion of the sound energy which is reflected or transmitted depends on the material which receives the sound.

A student investigates different materials.

The diagram shows how a student sets up her equipment

(i) Using a pencil and ruler to draw on the diagram, show how microphone X receives reflected sound.



(1 marks)

ii) The student tests four materials. Each sheet of material is 1 mm thick. This has been glued onto a block of expanded polystyrene.

Why does the student use the same size of expanded polystyrene block and the same sound level for each test?

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(1 mark)

(iii) The table shows the readings for the sound level transmitted to microphone Y.

| Sound level from loudspeaker in arbitrary units | Surface material | Sound level transmitted to microphone Y in arbitrary units |
|---|------------------|--|
| 60  | paper            | 39   |
| 60  | plaster          | 18   |
| 60  | cloth            | 31   |
| 60  | wood             | 15   |

[A] Which surface material transmits the smallest proportion of the sound?

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(1 mark)

[B] What proportion is this?

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(1 mark)

(d) People living in a flat have very noisy neighbours who are always playing loud music.

Suggest one practical idea to reduce the amount of noise transmitted into the flat through the walls and explain how your idea will work.

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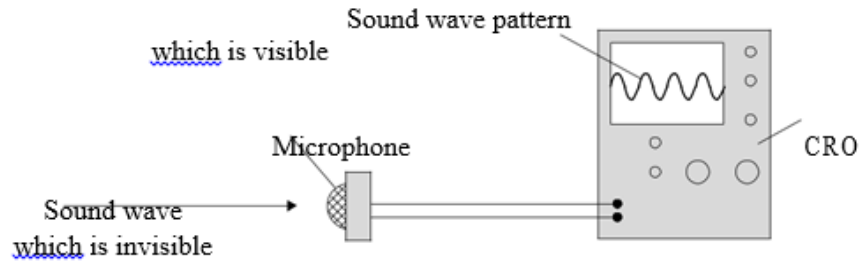
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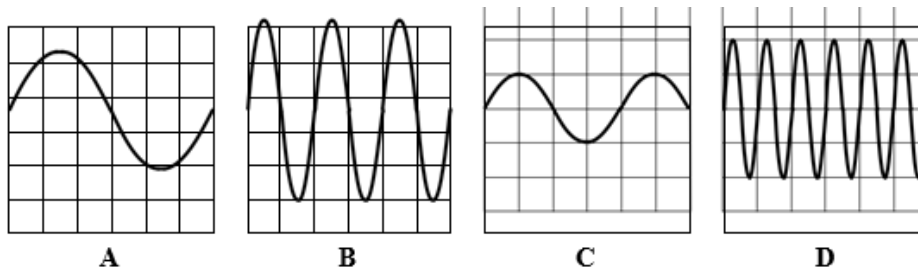
(2 marks)

**Q2.** A microphone and a cathode ray oscilloscope (CRO) can be used to show the pattern of a sound wave.



Four sound wave patterns, A, B, C and D, are shown.

They are all drawn to the same scale.



**(a)** Which one of the patterns has the smallest amplitude?

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**(b)** Which one of the patterns has the lowest frequency?

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(2 marks)

**Q3. (a)** The table gives information about the frequencies in the hearing ranges of six different mammals.

| Name of mammal | Frequencies in hearing range |
|----------------|------------------------------|
| Bat            | 20 Hz → 160 kHz              |
| Dog            | 20 Hz → 30 kHz               |
| Dolphin        | 40 Hz → 110 kHz              |
| Elephant       | 5 Hz → 10 kHz                |
| Human          | 20 Hz → 20 kHz               |
| Tiger          | 30 Hz → 50 kHz               |

**(a) (i)** Which mammal in the table can hear the highest frequency?

\_\_\_\_\_ (1 mark)

**(a)(ii)** Which mammal in the table, apart from humans, cannot hear ultrasound?

\_\_\_\_\_ (1 mark)

**(a) (iii)** Give one example of a frequency which an elephant can hear but which a tiger cannot hear. Include the unit in your answer.

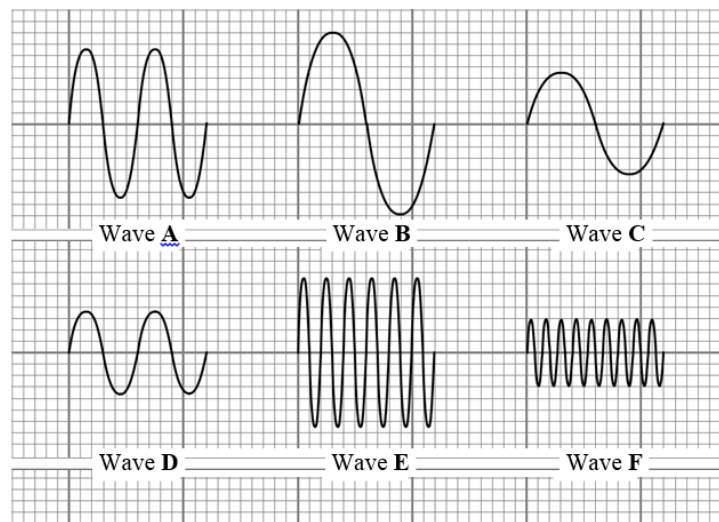
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Frequency \_\_\_\_\_

(1 mark)

**(b)** The diagrams show six sound waves, A, B, C, D, E and F, represented on an oscilloscope screen.

They are all drawn to the same scale.



(b) (i) Which one of the waves has the greatest amplitude?

Wave \_\_\_\_\_

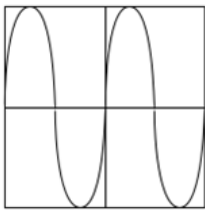
(1 mark)

(b)(ii) Which one of the waves has the highest frequency?

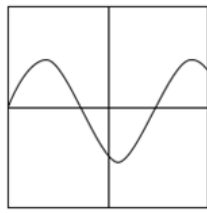
Wave \_\_\_\_\_

(1 mark)

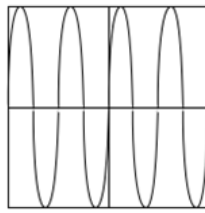
**Q4 (a)** A student uses a microphone to send different sounds to an oscilloscope. The diagrams show five traces, A, B, C, D and E, on the oscilloscope. All the traces are drawn to the same scale.



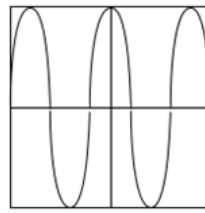
**A**



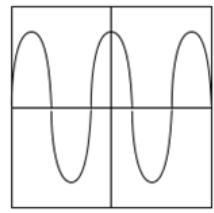
**B**



**C**



**D**



**E**

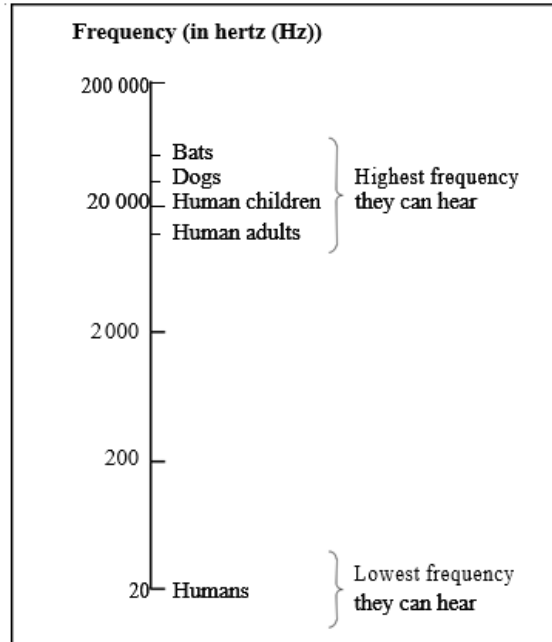
**(a) (i)** Which three diagrams show traces with the same amplitude?

Diagrams \_\_\_\_\_ and \_\_\_\_\_ (1 mark)

**(a) (ii)** Which two diagrams show traces with the same frequency?

Diagrams \_\_\_\_\_ and \_\_\_\_\_ (1 mark)

**(b)** The diagram shows the sound frequencies which some living things can hear.



(b) (i) What is the widest range of frequencies that a human child can hear?

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(1 mark)

(b) (ii) Why can some dog whistles be heard by dogs but not by humans?

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(1 mark)

**Total: 21 Marks**