

Waves in Air-Fluids-Solids

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.6 Waves
Sub-Topic	Waves in Air-Fluids-Solids
Difficulty Level	Bronze Level
Booklet	Question Paper

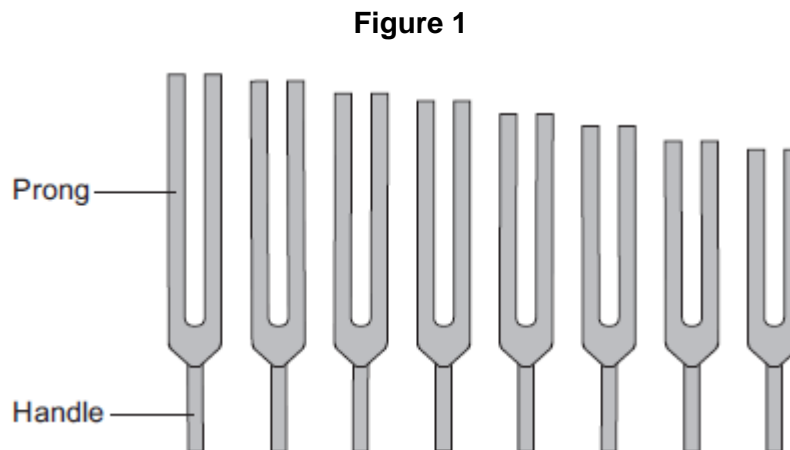
Time Allowed: 57 minutes

Score: /57

Percentage: /100

Grade Boundaries:

Q1.Figure 1 shows a set of tuning forks.



A tuning fork has a handle and two prongs. It is made from metal.

When the prongs are struck on a hard object, the tuning fork makes a sound wave with a single frequency. The frequency depends on the length of the prongs.

- (a) Use the correct answer from the box to complete each sentence.

direction	loudness	pitch	speed
------------------	-----------------	--------------	--------------

The frequency of a sound wave determines its

The amplitude of a sound wave determines its

(2)

- (b) Each tuning fork has its frequency engraved on it. A student measured the length of the prongs for each tuning fork.

Some of her data is shown in the table.

Frequency in hertz	Length of prongs in cm
320	9.5
384	8.7
480	7.8
512	7.5

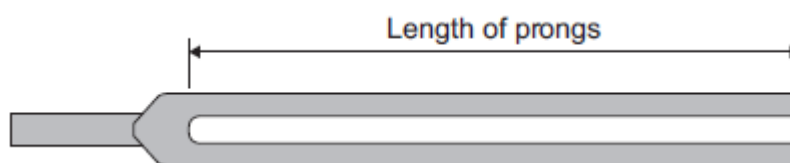
- (i) Describe the pattern shown in the table.

.....

(1)

- (ii) **Figure 2** shows a full-size drawing of a tuning fork.

Figure 2



Measure and record the length of the prongs.

Length of prongs = cm

(1)

Use the data in the table above to estimate the frequency of the tuning fork in **Figure 2**.

Explain your answer.

.....

Estimated frequency = Hz

(3)

- (c) Ultrasound waves are used in hospitals.

- (i) Use the correct answer from the box to complete the sentence.

electronic	hydraulic	radioactive
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Ultrasound waves can be produced by systems.

(1)

- (ii) The frequency of an ultrasound wave used in a hospital is 2×10^6 Hz.

It is **not** possible to produce ultrasound waves of this frequency using a tuning fork.

Explain why.

.....

.....

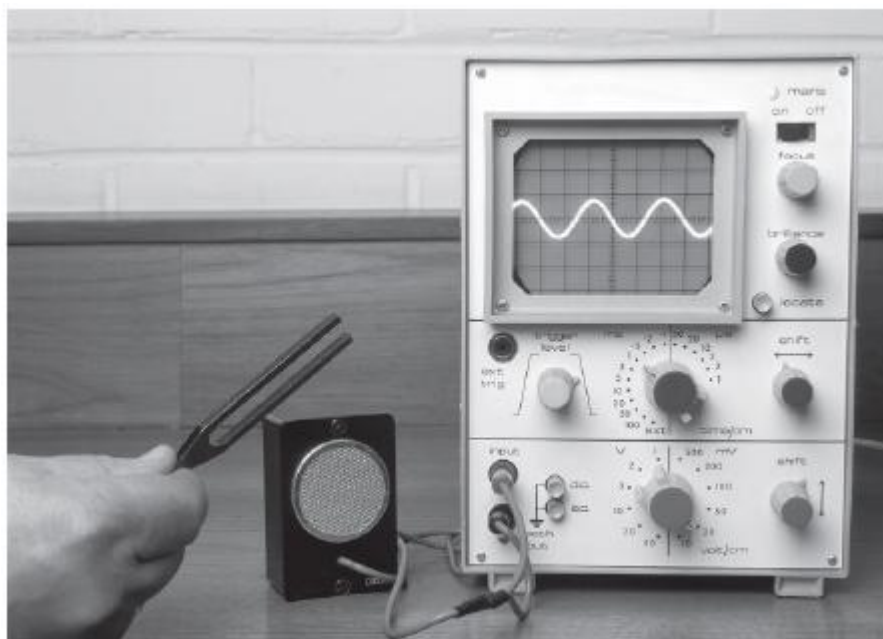
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(2)

- (d) **Figure 3** shows a tuning fork and a microphone. The microphone is connected to an oscilloscope.

Figure 3

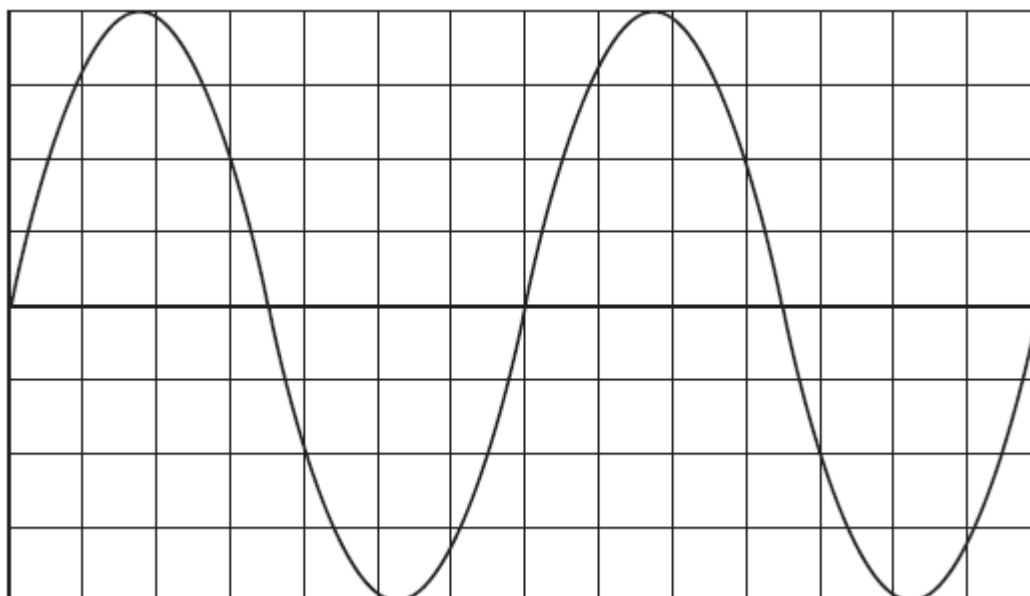


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When the tuning fork is struck and then placed in front of the microphone, a trace appears on the oscilloscope screen.

Figure 4 shows part of the trace on the screen.

Figure 4



Each horizontal division in **Figure 4** represents a time of 0.0005 s.

What is the frequency of the tuning fork?

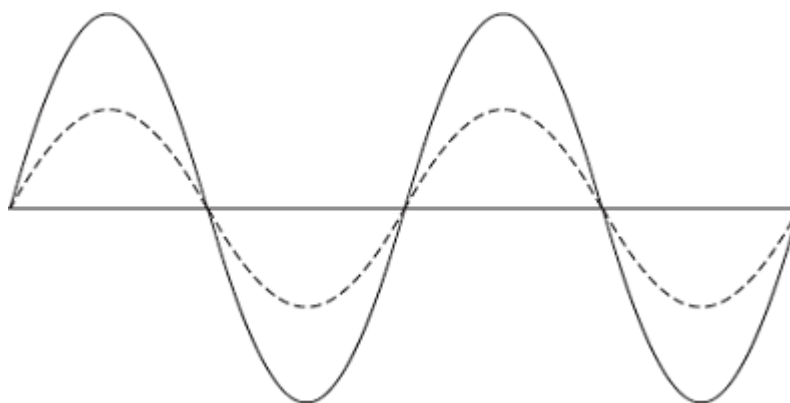
.....

Frequency = Hz

(3)
 (Total 13 marks)

Q2.(a) **Diagram 1** shows two waves.

Diagram 1



- (i) Name **one** wave quantity that is the same for the two waves.

.....

(1)

- (ii) Name **one** wave quantity that is different for the two waves.

.....

(1)

- (iii) The waves in **Diagram 1** are transverse.

Which **one** of the following types of wave is **not** a transverse wave?

Draw a ring around the correct answer.

gamma rays

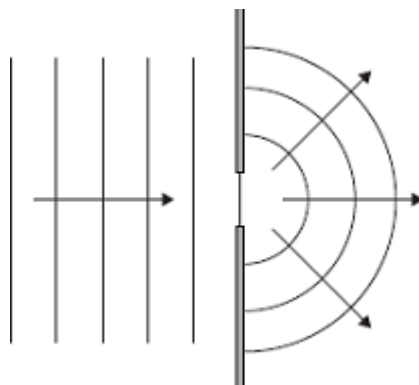
sound

visible light

(1)

- (b) **Diagram 2** shows water waves in a ripple tank moving towards and passing through a gap in a barrier.

Diagram 2



Every second, 8 waves pass through the gap in the barrier. The waves have a wavelength of 0.015 metres.

Calculate the speed of the water waves and give the unit.

.....

.....

.....

Speed =

(3)
(Total 6 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

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

.....

(1)

- (ii) Give **one** example of a frequency which an elephant can hear but which a tiger **cannot** hear.

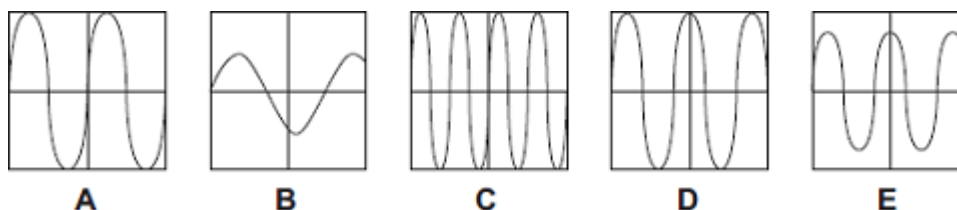
Include the unit in your answer.

Frequency

(1)

- (b) A sound wave can be represented as a trace on the screen of 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.



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

Diagrams , and

(1)

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

Diagrams and

(1)

- (c) There is no air in space.

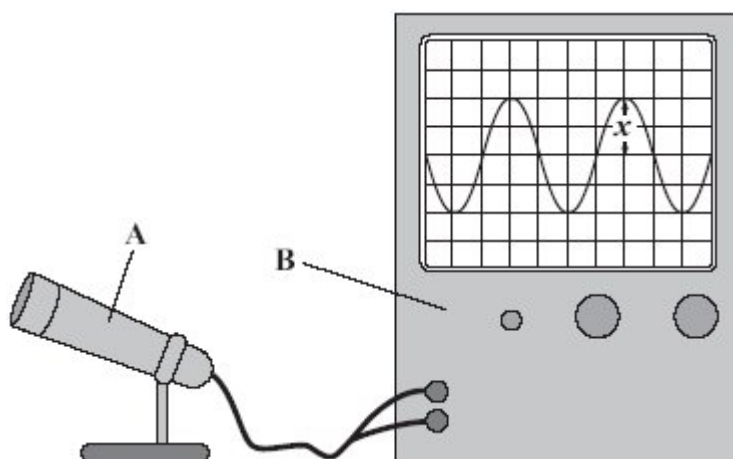
Astronauts in space cannot hear sounds from outside their spacesuits.

Explain this.

.....

(2)
(Total 6 marks)

- Q4.** (a) A student uses two pieces of equipment, **A** and **B**, to display a sound wave.



- (i) Use words from the box to complete the sentence.

a loudspeaker a microphone an oscilloscope a screen

A is and **B** is

(2)

- (ii) Use words from the box to complete the sentence.

the amplitude half the amplitude the frequency half the frequency

The distance **x** marked on the diagram measures of the sound wave.

(1)

- (iii) Complete the sentence.

The distance x becomes smaller. This is because the sound has

become

(1)

- (b) There is no air in space.

Astronauts in space cannot hear sounds from outside their spacesuits.

Explain this.

.....

.....

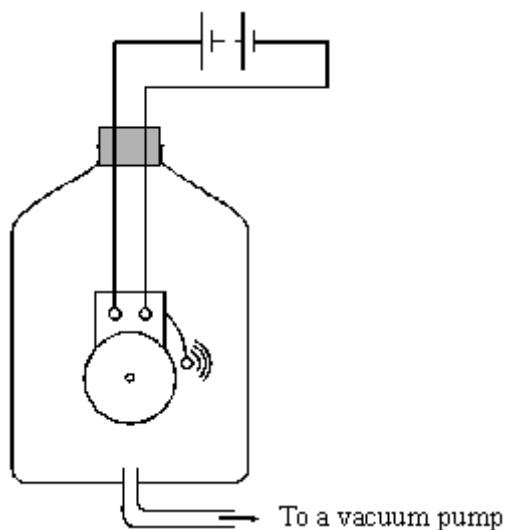
.....

.....

(2)

(Total 6 marks)

- Q5.** (a) The diagram shows an electric bell inside a glass jar. The bell can be heard ringing.



In the following sentences, cross out the **two** lines that are wrong in each box.

When all the air has been taken out of the glass jar, the ringing sound will

stop.
get louder.
get quieter.

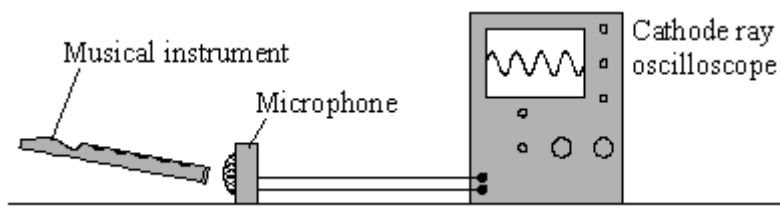
This is because sound

travels faster
travels slower
cannot travel

through a vacuum.

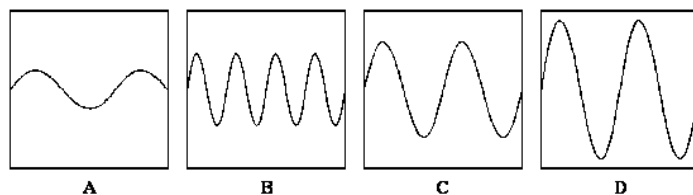
(2)

- (b) The microphone and cathode ray oscilloscope are used to show the sound wave pattern of a musical instrument.

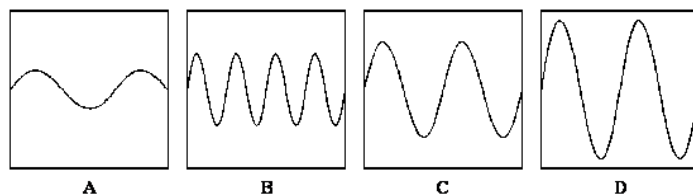


One of the following statements describes what a microphone does. Tick the box next to the correct statement.

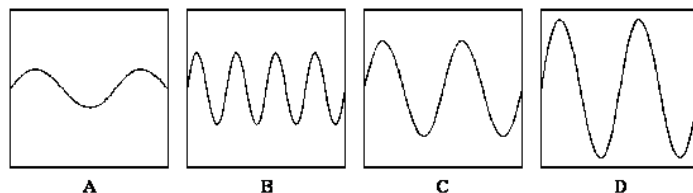
A microphone transfers sound energy to light energy.



A microphone transfers sound energy to electrical energy.

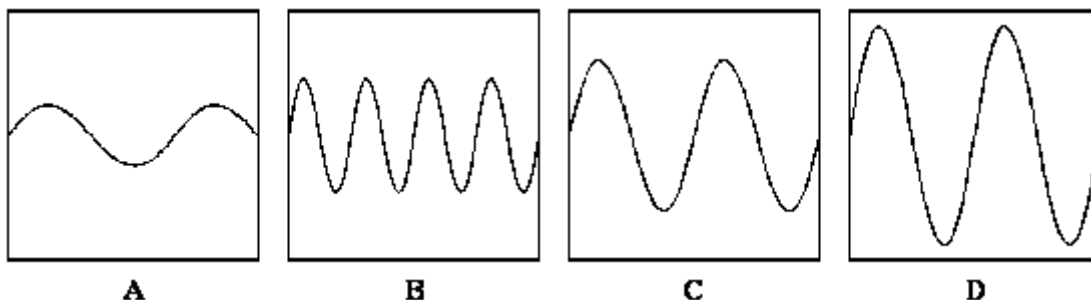


A microphone transfers electrical energy to sound energy.



(1)

- (c) Four different sound wave patterns are shown. They are all drawn to the same scale.



- (i) Which sound wave pattern has the highest pitch?

.....

Give a reason for your answer.

.....

(2)

- (ii) Which sound wave pattern is the loudest?

.....

Give a reason for your answer.

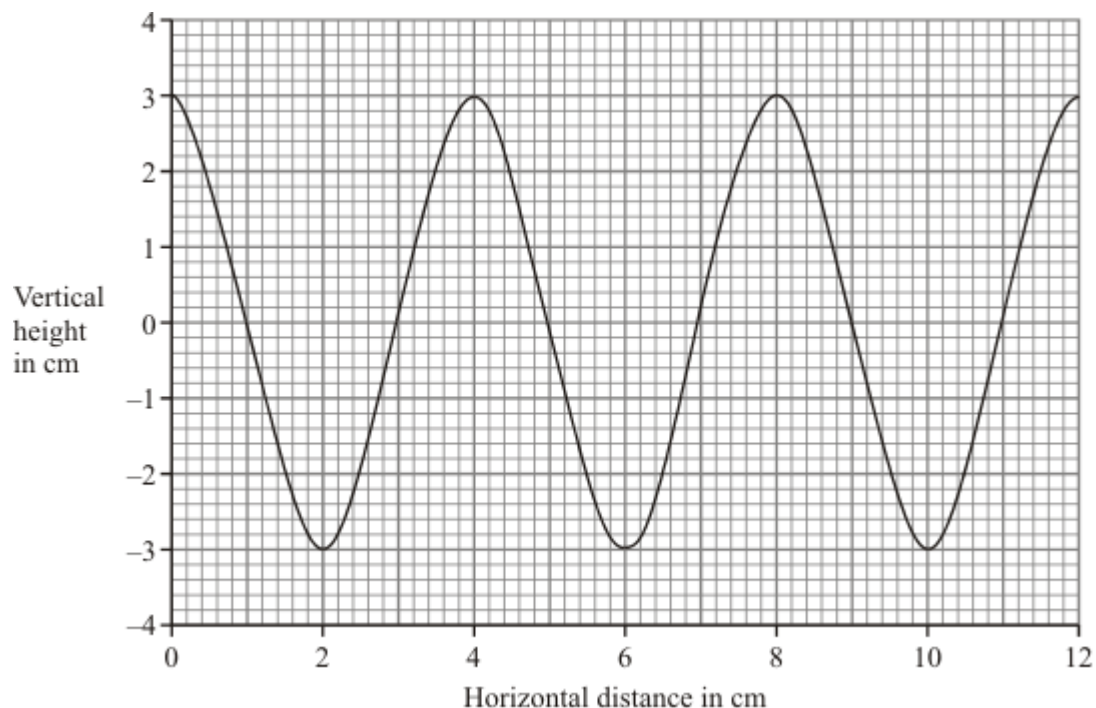
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.....

(2)

(Total 7 marks)

Q6. The diagram shows a water wave drawn to scale.



(a) What is the wavelength of this water wave? cm

(1)

(b) What is the amplitude? cm

(1)

(c) Twelve waves pass an observer in four seconds.

What is the frequency of the waves? Show clearly how you work out your answer and give the unit.

.....

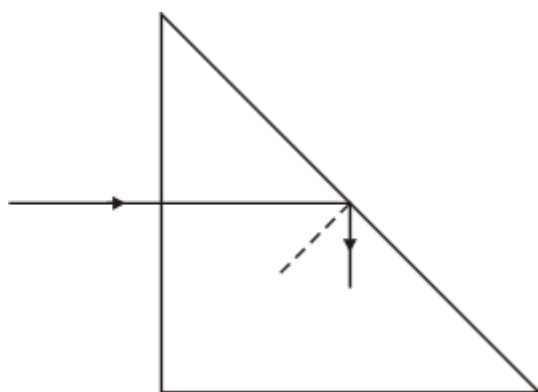
Frequency =

(3)

(Total 5 marks)

Q7. Glass prisms are used in many optical devices.

- (a) The diagram shows what happens to a ray of light as it travels through a glass prism.



To gain full marks for this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

Use the words in the box to help you to explain why the ray behaves in this way.

angle	critical	normal
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.....

.....

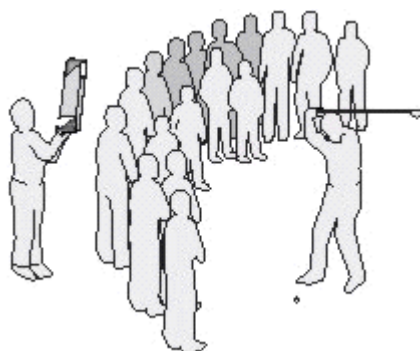
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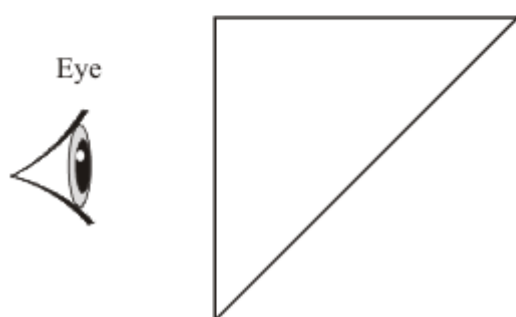
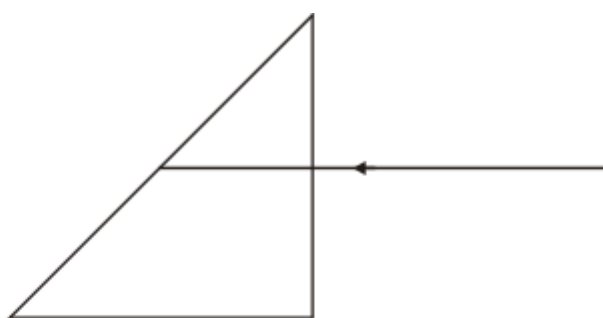
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(3)

- (b) Periscopes can be used to look over the heads of other people.



A periscope contains two glass prisms.
Complete the diagram to show the ray of light reaching the person's eye.



(3)
(Total 6 marks)

Q8. The table gives the frequencies of sound that different animals can hear.

Animal	Lowest frequency it can hear in Hz	Highest frequency it can hear in Hz
Human	64	23 000
Dog	67	45 000
Mouse	1 000	91 000
Rat	200	76 000
Cat	45	64 000
Tuna	50	1 100
Canary	250	8 000
Chicken	125	2 000

- (a) (i) Which animal can hear the lowest sound frequency?

.....

(1)

- (ii) Which animal can hear the smallest range of frequencies?

.....

(1)

- (b) (i) What is the name given to sound frequencies higher than those that humans can hear?

.....

(1)

- (ii) Give **one** industrial use of this type of sound.

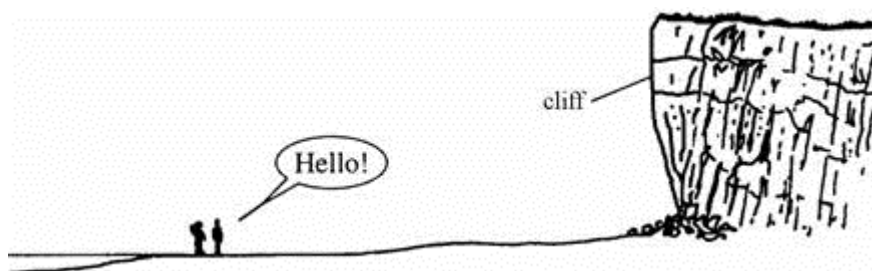
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(1)

(Total 4 marks)

Q9. Two friends are standing on a beach.

When they shout they can hear themselves a second later.



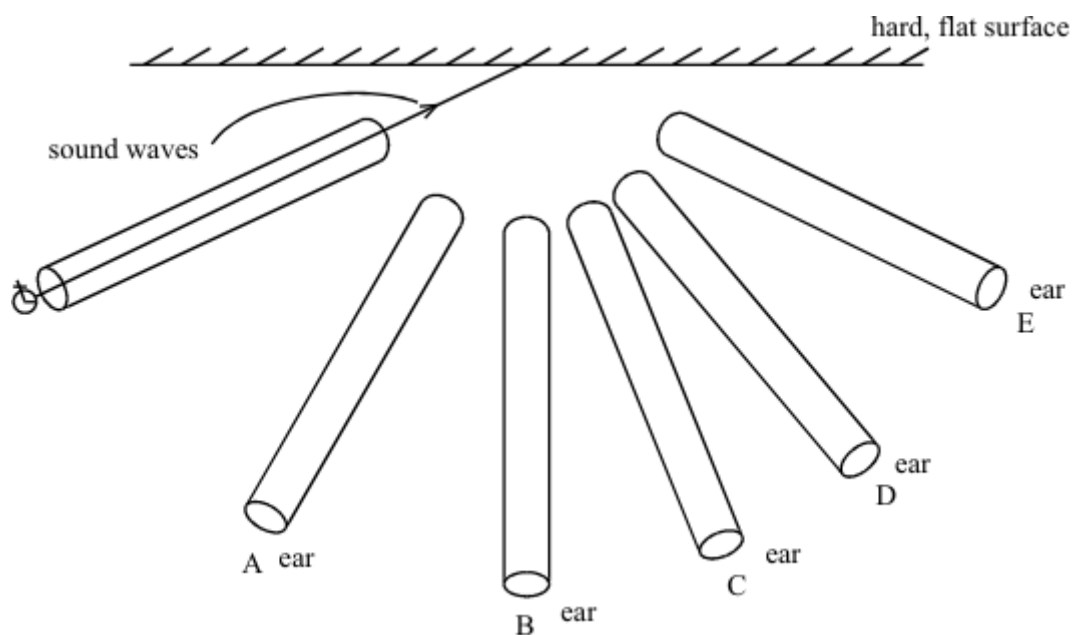
Explain, as fully as you can, why this happens.
(You may answer on the diagram if you want to.)

.....

.....

(Total 2 marks)

Q10. A hard, flat surface reflects sound just like a plane (flat) mirror reflects light.



You want to hear the reflection (echo) of the ticking watch through a tube.

Which is the best position to put the tube?

Choose from positions A-E on the diagram

(You may draw on the diagram if you want to.)

(Total 2 marks)