1 (a) When people speak, sounds are made by their vocal cords.

How do the vocal cords make a sound?

.....

1 mark

(b) The astronauts who landed on the Moon had to wear spacesuits.

The spacesuits were filled with air because there is a vacuum on the Moon.

(i) The astronauts had radios in their helmets.
Without the radios, they could not hear each other speaking.
Why does sound not travel on the Moon?

.....

.....

1 mark

(ii) If the radios broke, the astronauts could put their helmets together so that they touched. Then they could hear each other's voices.

Why could they hear each other's voices when their helmets were touching?

.....

.....

1 mark

The National Aeronautics and Space Administration (NASA) says that there is ice on some parts of the Moon.

(c) What does this tell you about temperatures on these parts of the Moon?

.....

1 mark

(d) The ice is mixed with rocks and dust. Astronauts who visit the Moon in the future may want to get water from this mixture.

(i) What **two** things must they do to get clear water from this mixture of ice, rocks and dust?

1. .....

.....

2. .....

.....

2 marks

(ii) After the astronauts have collected the mixture, they will need a supply of energy to get liquid water from it. Explain why.

.....

.....

1 mark

(iii) Suggest **one** energy resource which is naturally available on the Moon.

.....

1 mark

Maximum 8 marks

2 Thunder and lightning happen at the same time.

(a) We see the flash of lightning before we hear the thunder.
Give the reason for this.

.....

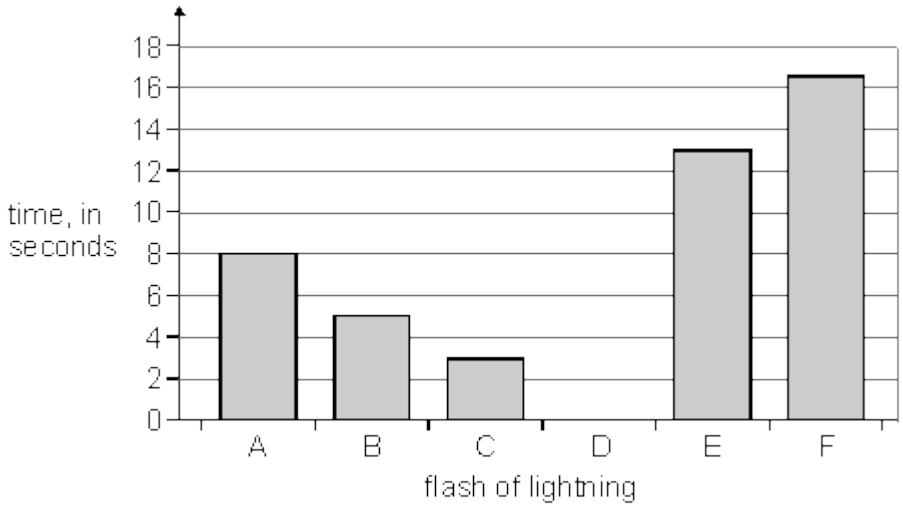
.....

1 mark

(b) Omar investigated the movement of a storm. He measured the time between seeing a flash of lightning and hearing the thunder.
He did this six times. Omar put his results in a table.

flash of lightning	time between seeing the lightning and hearing the thunder, in seconds
A	8.0
B	5.0
C	3.0
D	9.0
E	13.0
F	16.5

Omar drew a bar chart of his results as shown below.



(i) On the bar chart, draw a bar for flash D. Use a ruler.

1 mark

(ii) Which flash of lightning was closest to Omar?
Give the correct letter.

.....

1 mark

(iii) Describe how the distance between the storm and Omar changed as the storm moved between flash A and flash F.

.....

.....

1 mark

Maximum 4 marks

3 The table shows the speed at which sound travels through different materials.

material	physical state of the material	speed of sound in m/s
granite	solid	5400
nitrogen	gas	354
oil	liquid	1460
oxygen	gas	332
steel	solid	5980
water	liquid	1510

(a) Does sound travel fastest through solids or liquids or gases?

.....

1 mark

(b) Sound travels through air. Air is mostly nitrogen and oxygen.

Use the information in the table to suggest the speed of sound in a mixture of nitrogen and oxygen.

The speed of sound in this mixture is about ……

1 mark

(c) Tom and Zoe make a string telephone.
They use two empty tin cans joined by a piece of string.

Tom and Zoe are 5 m apart.
Tom talks quietly into one tin can, and Zoe holds the other tin can to her ear.
If they keep the string tight, the sound of Tom's voice travels along the string.

(i) How does the sound travel along the string to Zoe?

.....

.....

1 mark

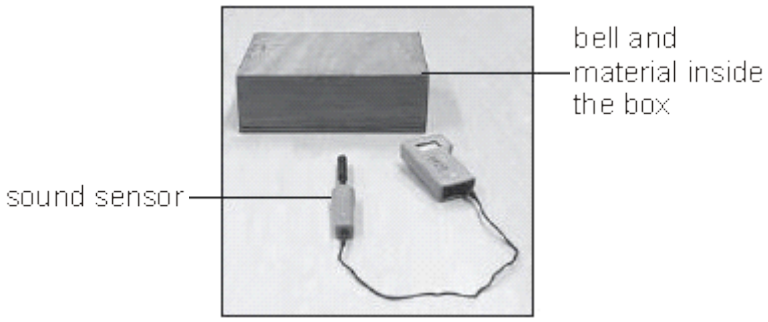
(ii) How does the tin can at Zoe's end make a sound?

.....

.....

1 mark
Maximum 4 marks

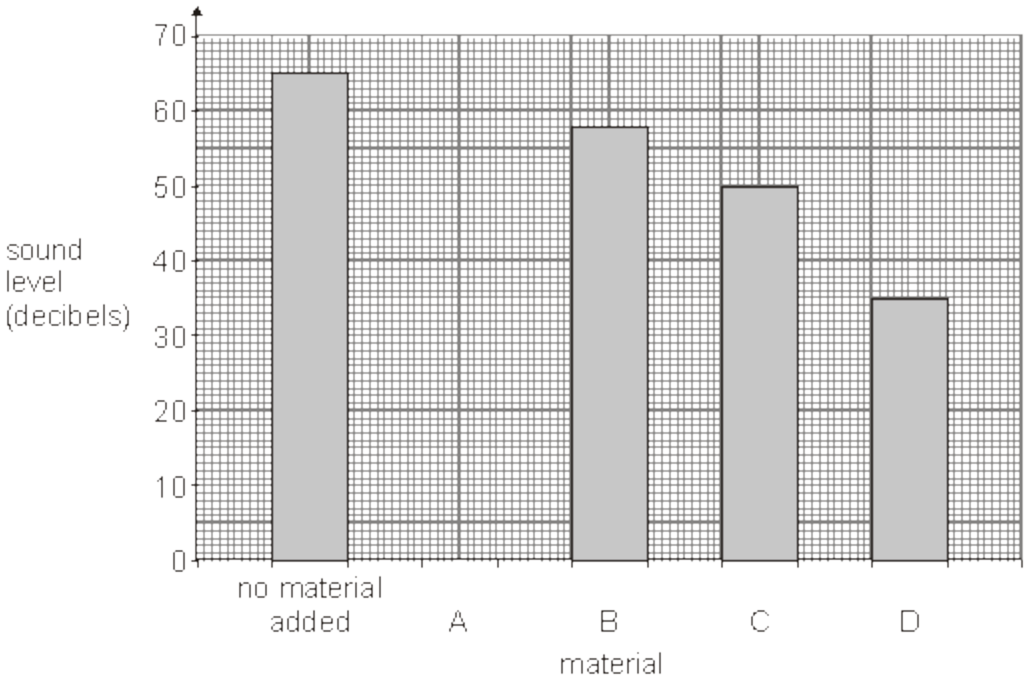
4 John investigated which material would be best for sound-proofing.
He put a bell inside a box.
He covered the bell with each material in turn.
He put a sound sensor outside the box to record the sound level.



He tested different materials and got the following results.

material	sound level (decibels)
no material added	65
A	40
B	58
C	50
D	35

(a) On the chart below, draw the bar for **material A.**



1 mark

(b) How many types of material did John test?

.....

1 mark

(c) Which material was best at stopping the sound going through?
Give the correct letter.

.....

1 mark

(d) Which **two** things should John have done to make his test fair?
Tick the **two** correct boxes.

Use the same box each time.	☐
Make sure a different person recorded the results each time.	☐
Use the same material each time.	☐
Keep the distance between the sound sensor and the bell the same each time.	☐
Test each material in a different room.	☐

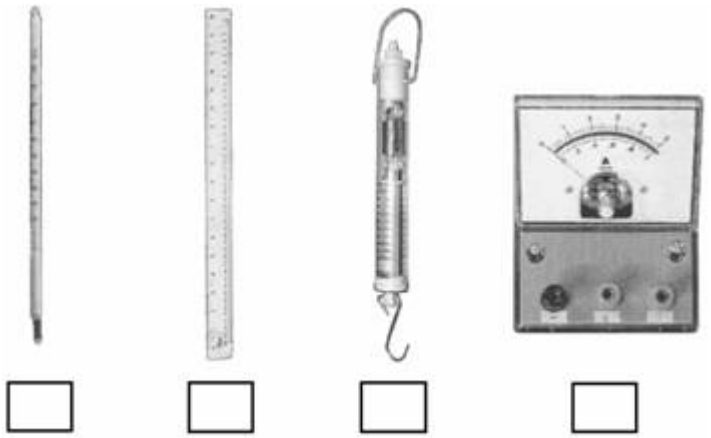
2 marks
maximum 5 marks

5 Lee blew across the top of paper tubes to make sounds.

He investigated how changing the length of a tube affects the pitch of the sound.

(a) What equipment could he use to measure the length of the tubes?

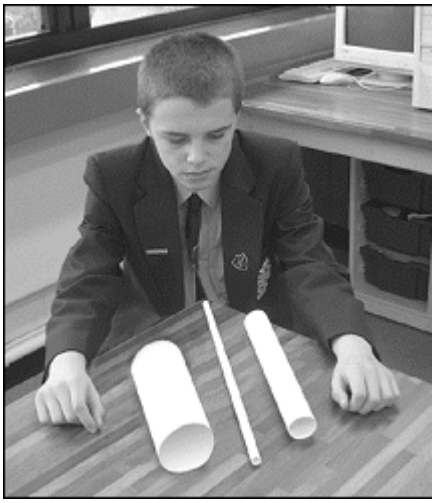
Tick the correct box.



☐ ☐ ☐ ☐

1 mark

(b) The photograph below shows the different lengths of tubes Lee used.



Suggest **one** way his test might **not** have been fair.

.....

.....

1 mark

(c) Lee made a prediction.

Which of these statements is a prediction?
Tick the correct box.

The tubes were made of paper.	☐
The pitch of the sound is how high or low it is.	☐
The longer tube will make a lower sound.	☐
The sound is caused by the vibration of air.	☐

1 mark

(d) Lee blew across the ends of 3 different lengths of tube and compared the pitch of the sound produced.

His results5 are shown below.

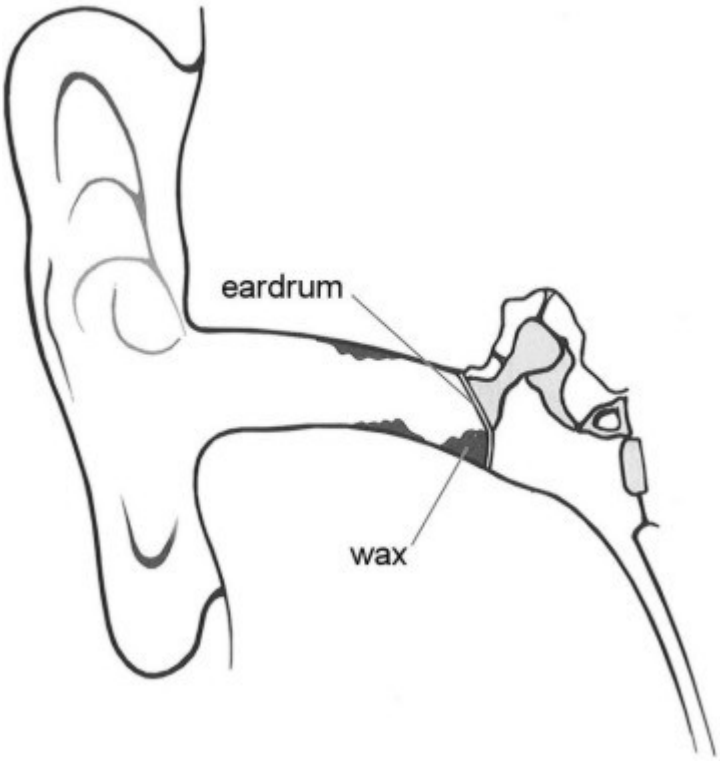
Length of the tube, in cm	*pitch of the sound*
5	*high*
25	*medium*
50	*low*

Which length of tube made the sound with the highest pitch?

..... cm

1 mark
Maximum 4 marks

6 The diagram below shows part of the human ear.



We can hear somebody speaking because sound waves enter our ears.

(a) (i) What do our eardrums do when sound waves reach them?

.....

1 mark

(ii) Sometimes a lot of wax is produced in the ear.
The wax rests against the eardrum, as shown above.

Give **one** reason why we **cannot** hear very well when our ears contain a lot of wax.

.....

.....

1 mark

(b) The table below shows the lowest and highest frequencies that five living things can hear.

living thing	**lowest frequency (Hz)**	**highest frequency (Hz)**
human	20	20 000
sparrow	300	20 000
dog	20	45 000
cat	20	64 000
rabbit	300	42 000

(i) Which **three** living things from the table **cannot** hear a frequency of 43 000 Hz?

..... and ..... and .....

1 mark

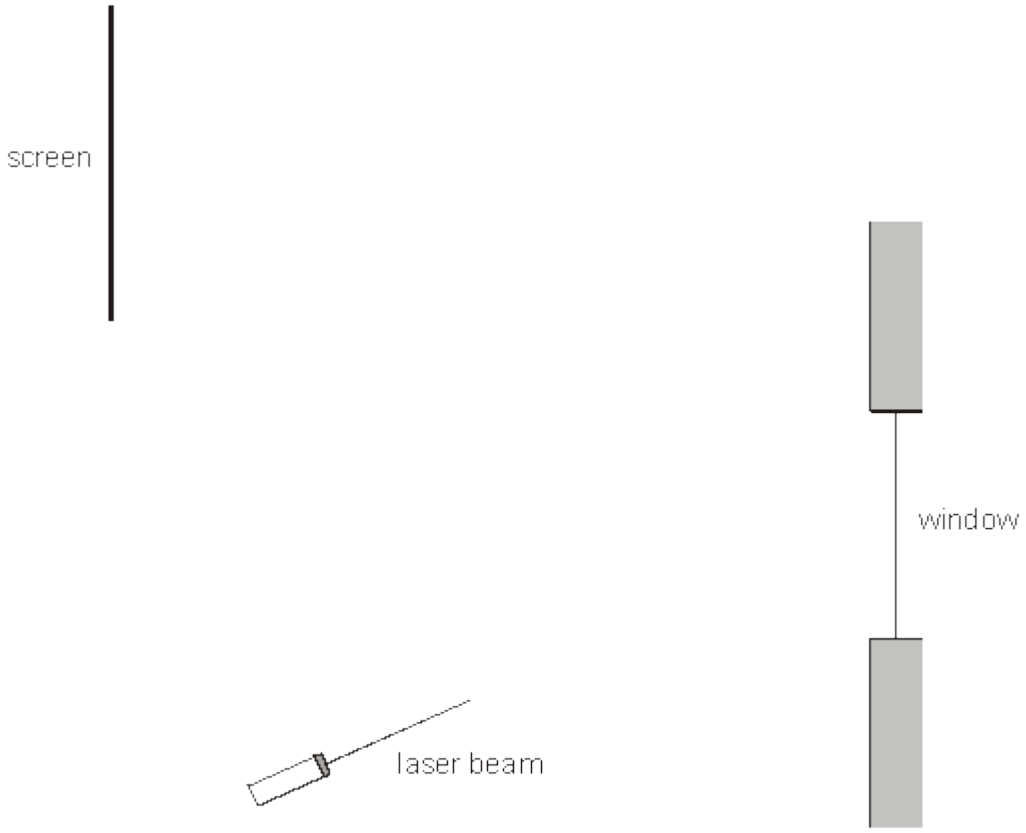
(ii) From the table, choose the living thing that can hear the biggest **range** of frequencies.

.....

1 mark

maximum 4 marks

7 (a) A teacher shines a laser beam onto a classroom window. It reflects off the window and onto a screen.



On the diagram above, continue the laser beam to show its path as it reflects off the window and onto the screen. Use a ruler.
Add arrows to show the direction of the laser beam.

2 marks

(b) (i) When a pupil plays her flute in the classroom the window vibrates.
Give the reason for this.

.....

.....

1 mark

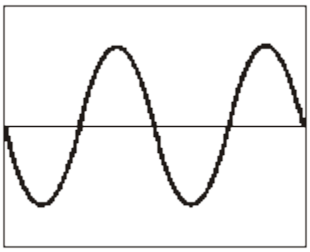
(ii) When the window vibrates, what happens to the laser beam that is reflected off the window?

.....

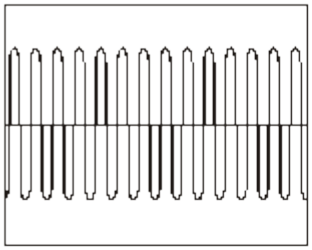
.....

1 mark

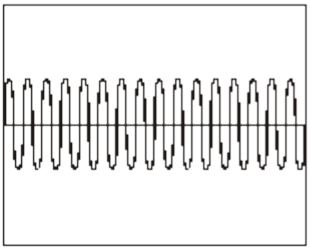
(c) The teacher places a microphone near the pupil as she plays her flute. The diagram below shows the pattern on an oscilloscope screen.



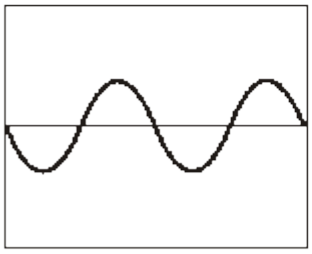
The pupil then plays her flute at a **higher pitch** and **more quietly**.
Which diagram below shows the pattern that would be seen on the oscilloscope?
Tick the correct box.



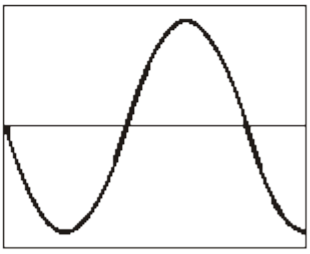
A ☐



B ☐



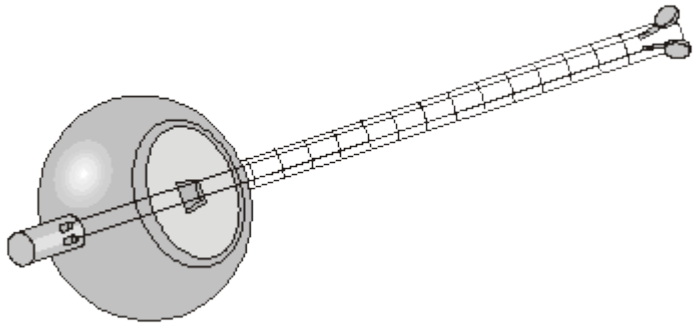
C ☐



D ☐

1 mark
maximum 5 marks

8 The dotar is a musical instrument with two strings.



(a) Aftal plays the dotar very quietly.

What must he do to the strings to make a louder sound?

.....

.....

1 mark

(b) Aftal makes the strings tighter so they vibrate more quickly.

How does this affect the sound produced by the strings?
Tick the correct box.

The sound has a lower pitch.	☐
The sound is louder.	☐
The sound has a higher pitch.	☐
The sound is quieter.	☐

1 mark

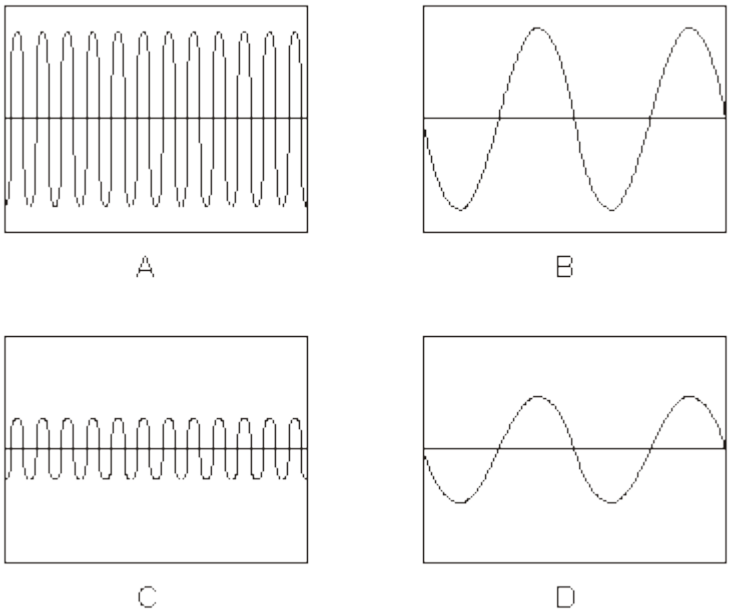
(c) One of the strings is thicker than the other, so it vibrates more slowly.

In what way is the sound made by the thicker string different from the sound made by the thinner string?

.....

1 mark

(d) Aftal played the dotar near a microphone connected to an oscilloscope.
The diagrams below show the patterns made by four sounds.



(i) How does the sound shown in trace A differ from the sound in trace B?

.....

.....

1 mark

(ii) How does the sound shown in trace A differ from the sound in trace C?

.....

.....

1 mark
maximum 5 marks

9 (a) (i) Air contains nitrogen.
In the box below draw **five** circles, ◯, to show the arrangement of particles in nitrogen gas.

1 mark

(ii) Zeena carries a personal emergency alarm.
It uses nitrogen gas to produce a very loud sound.

The nitrogen gas in the container is under much higher pressure than the nitrogen gas in the air.

How does the arrangement of nitrogen particles change when the gas is under higher pressure?

.....

.....

1 mark

(b) Use words from the boxes below to complete the sentence.

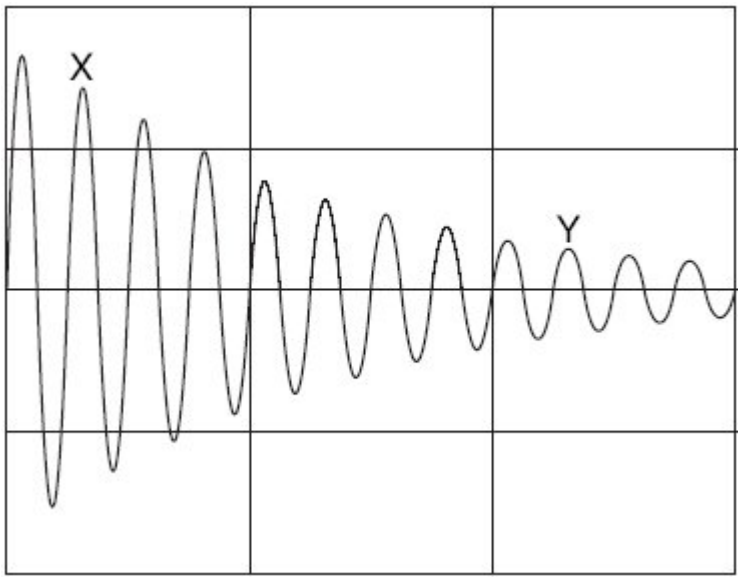
greater than	less than	the same as

The rate at which the nitrogen particles hit the inside of the container is ..... the rate at which nitrogen particles hit the outside of the container.

1 mark

(c) Zeena pushes the lid down and nitrogen gas escapes through the diaphragm. The diaphragm vibrates and produces a sound.

The pattern on the oscilloscope screen below represents the soundwave produced by the alarm.



(i) The loudness of the sound produced by the alarm decreases between X and Y.

How can you tell this from the graph?

.....

.....

1 mark

(ii) The pitch of the sound produced by the alarm stays the same between X and Y.

How can you tell this from the graph?

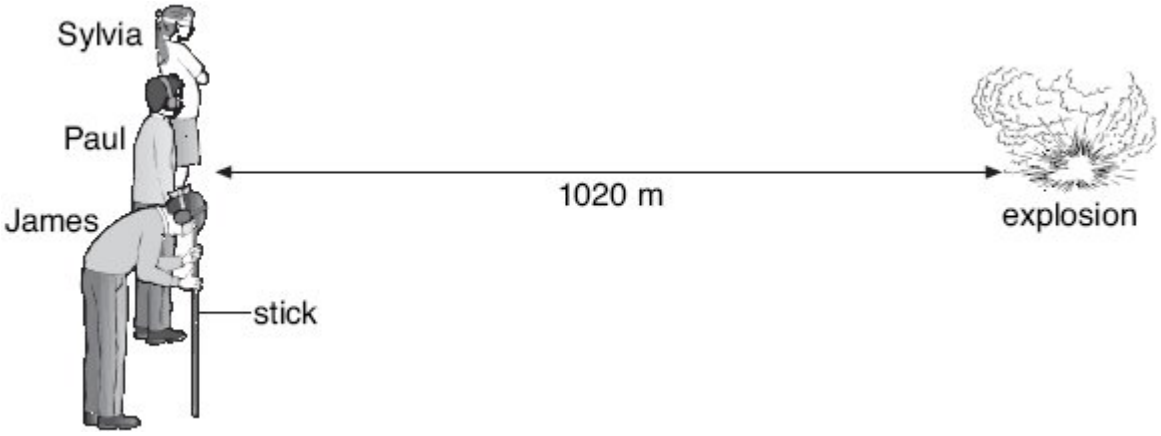
.....

.....

1 mark

maximum 5 marks

10 Three pupils took part in an investigation into the speed of sound.
All three pupils stood 1020 m from an explosion.



- Sylvia wore a blindfold.
- Paul wore ear defenders.
- James wore a blindfold **and** ear defenders. He rested his head on a wooden stick pushed into the ground so that he could feel vibrations.

The explosion produced sound and light at the same time.
The table shows the speed of sound in two different materials.

material	Speed of sound (m/s)
air	340
soil	3200

(a) Use all the information above to help you answer parts (i) and (ii) below.

(i) In which order would the pupils notice the explosion?

first .....

second .....

third .....

1 mark

(ii) From the information given, calculate the time it would take for the sound to travel through the air to Sylvia.

.....

..... **s**

1 mark

(b) Another pupil, Nasah, stood 2000 m away from the explosion.

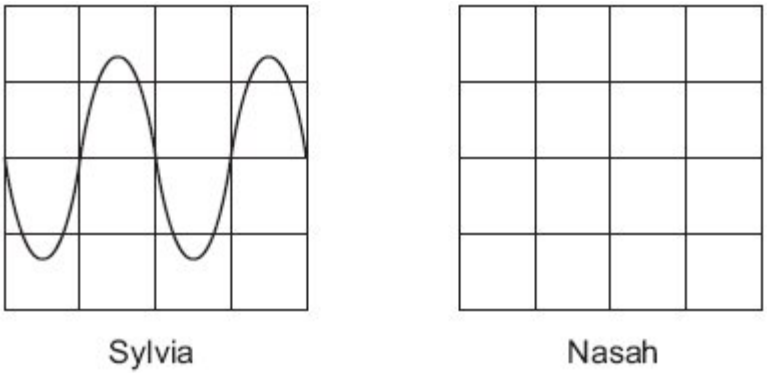
(i) The sound heard by Nasah was quieter than the sound heard by Sylvia.
The further sound travels the quieter it becomes.
Give the reason for this.

.....

.....

1 mark

(ii) The oscilloscope trace below represents the sound Sylvia heard.



The sound Nasah heard was quieter but the pitch was the same.

On the right-hand grid, draw the trace to show the pattern of the sound Nasah heard.

2 marks
maximum 5 marks