Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Q1.

Four students and their teacher do an experiment to measure the speed of sound in air.

The teacher stands at a distance and fires a starting pistol into the air.
The students see the flash when the pistol is fired.
They measure the time from when they see the flash to when they hear the bang.

A student drew a diagram of the arrangement as shown in Figure 5.

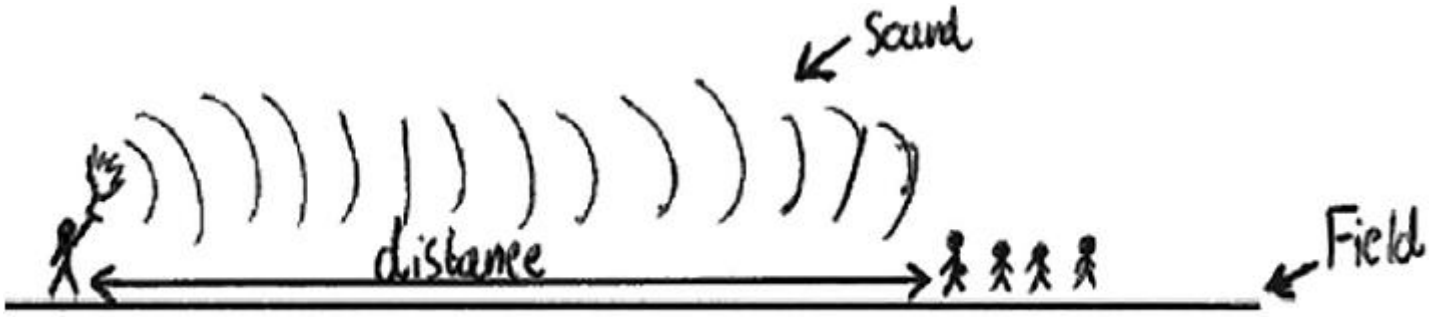


Figure 5

The students obtained a value of 240 m/s for the speed of sound.

The accepted value, in a science data book, is 343 m/s.

(i) Calculate the difference between the students' value and the accepted value as a percentage of the accepted value.

(2)

percentage difference = ... %

(ii) When the distance was 100 m, the students measured the following times:

0.43 s 0.35 s 0.50 s 0.38 s

Explain why their times vary so much.

(2)

.....

.....

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(iii) Explain **one** way the students might improve this experiment.

(2)

.....

.....

.....

.....

(Total for question = 6 marks)

Q2.

The distance between the Earth and the Sun is 1.50×10^{11} m.

Light takes 500 s to travel from the Sun to the Earth.

The wavelength of red light is 670 nm.

Calculate the frequency of red light, using only the data provided.

(4)

frequency = ... Hz

(Total for question = 4 marks)

Q3.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 6 shows two technicians, L and M, measuring the speed of sound in air.

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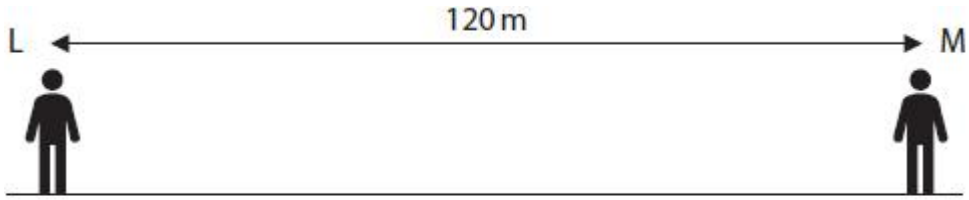


Figure 6

L fires a starting pistol.

M starts a stopwatch when first seeing the smoke from the starting pistol.

M stops the stopwatch when hearing the bang made by the starting pistol.

The distance between L and M is 120 m.

M's reaction time is 0.23 s.

The speed of sound in air is 330 m / s.

(i) Calculate M's reaction time as a percentage of the time sound takes to travel from L to M.

(3)

..... %

(ii) Which of these would improve the technicians' measurement of the speed of sound?

(1)

- ☒ **A** Use a firework 'banger' instead of the starting pistol.
- ☒ **B** Use a stop clock that measures time in minutes.
- ☒ **C** Increase the distance between **L** and **M**.
- ☒ **D** Decrease the distance between **L** and **M**.

(Total for question = 4 marks)

Q4.

A radio station transmits on 97.4 MHz.

To receive the waves an aerial needs a length equal to half the wavelength of the radio waves being transmitted.

Calculate the length of the aerial needed.

The speed of the radio waves is 3.00×10^8 m / s.

(3)

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length of aerial = ... m

(Total for question = 3 marks)

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