

Combined Physics higher mock 2024

- 4 (a) The diagram in Figure 4 shows two students, P and Q, trying to measure the speed of sound in air.

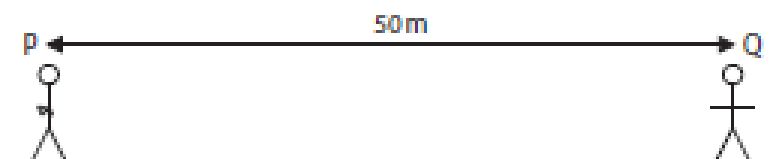


Figure 4

P will clap his hands together.

When Q sees P clap his hands, she will start a timer.

When Q hears the clap, she will stop the timer.

Explain **one** way the students could improve their method.

(2)

- (b) Figure 5 shows a long metal rod and a hammer.
 The rod is hit at one end by the hammer.
 This causes a sound wave to travel along the inside of the metal rod.

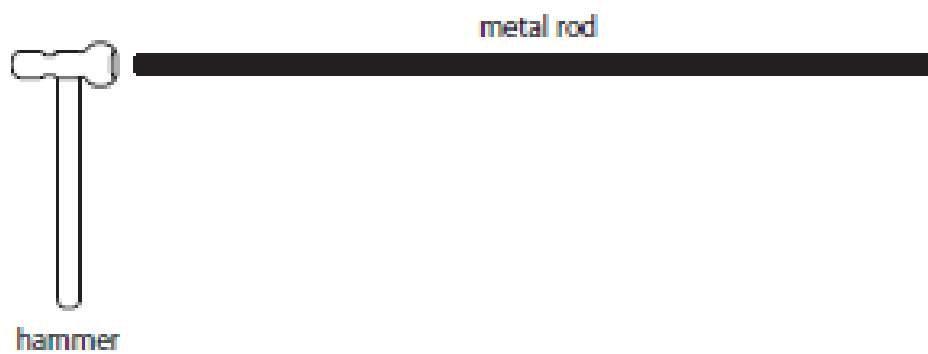


Figure 5

Describe how hitting the rod causes a sound wave to travel along the inside of the rod.

(2)

- (c) Sound travels slower in air than it does in water.

Figure 6 shows the direction of travel of a sound wave approaching a boundary between air and water.

The sound wave refracts at the boundary between air and water.

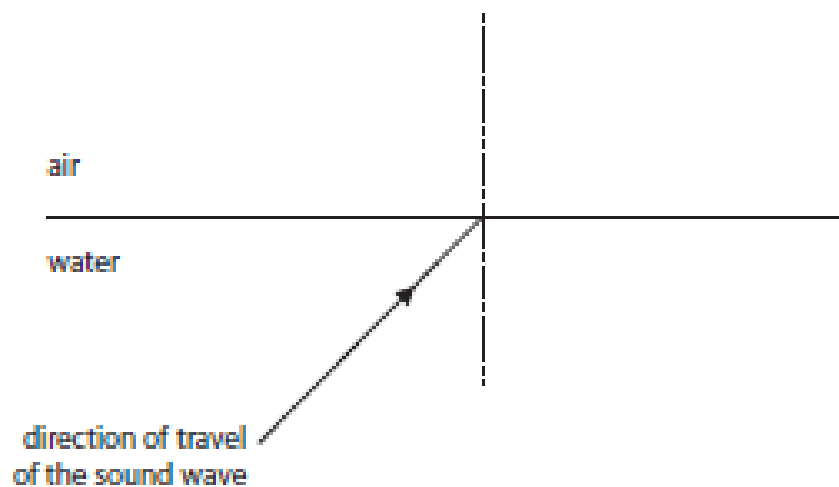


Figure 6

Complete the diagram in Figure 6 to show the direction the sound wave travels in the air.

(2)

(d) Sound travels slower in cold air than it does in warm air.

The equation relating the speed of sound in air to the density of the air is

$$\text{speed of sound} = \frac{K}{\sqrt{(\text{density})}} \quad \text{where } K \text{ is a constant.}$$

The table in Figure 7 gives some data about the speed of sound in air and the density of air.

	speed of sound in m/s	density of air in kg / m ³
in cold air	331	1.29
in warm air		1.16

Figure 7

Use the equation and the data in the table in Figure 7 to calculate the speed of sound in warm air.

Give your answer to an appropriate number of significant figures.

(3)

speed of sound in warm air = _____ m/s

(Total for Question 4 = 9 marks)