AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.6.1.1

Transverse and longitudinal waves

Past-paper questions

Tier	**Higher**
Question groups	**6**
Available paper years	**2018–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

6.6.1.1 Transverse and longitudinal waves

Question 01

June 2018 | 8464/P/2H | Original Q5

0 5 A car aerial receives radio waves from a radio transmitter.

Radio waves are transverse waves.

Sound waves are longitudinal waves.

0 5 . 1 Describe the difference between transverse waves and longitudinal waves.

[2 marks]

0 5 . 2 The radio waves have a frequency of 4.8×10^9 Hz

Wave speed of electromagnetic waves = 3.0×10^8 m/s

Calculate the wavelength of the radio waves.

Give your answer to 2 significant figures.

[3 marks]

Wavelength = _____ m

Question 5 continues on the next page

6.6.1.1 Transverse and longitudinal waves

Question 01 · continued

0 5 . 3 Describe how the radio waves reaching the car aerial produce signals in the electrical circuit of the car radio.

[3 marks]

8

6.6.1.1 Transverse and longitudinal waves

Question 02

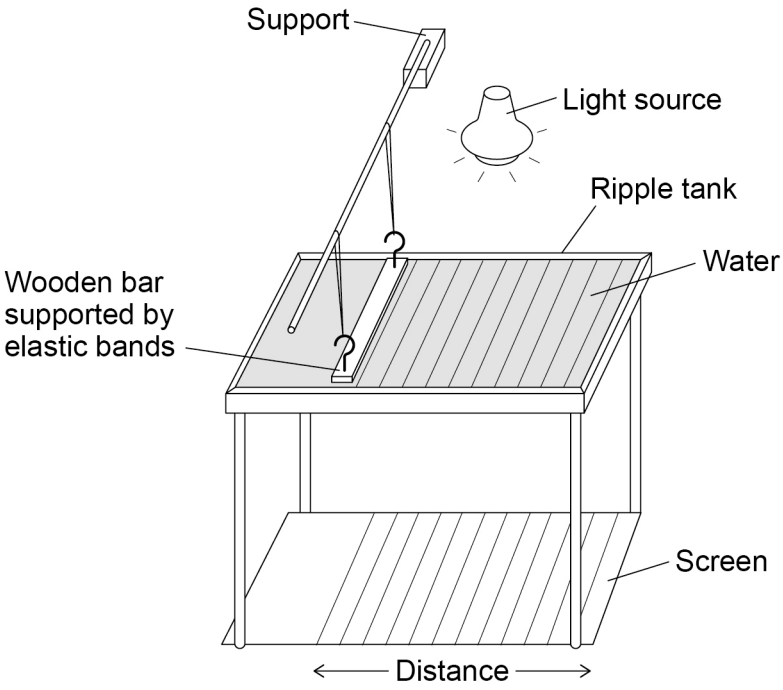
June 2019 | 8464/P/2H | Original Q2

0 2 **Figure 3** shows the equipment a teacher used to determine the speed of a water wave.

The equipment includes:

- a ripple tank filled with water
- a wooden bar that creates ripples on the surface of the water
- a light source which causes a shadow of the ripples on the screen.

Figure 3



0 2 . 1 Describe how equipment in **Figure 3** can be used to measure the wavelength, frequency and speed of a water wave.

[6 marks]

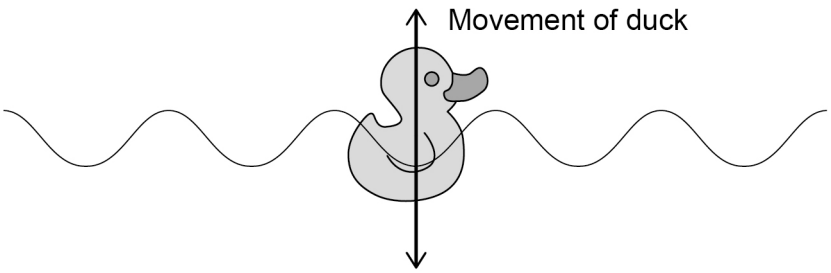
6.6.1.1 Transverse and longitudinal waves

Question 02 · continued

The teacher put a plastic duck in the ripple tank as shown in **Figure 4**.

The plastic duck moved up and down as the waves in the water passed.

Figure 4



0 2 . 2 How does the movement of the plastic duck in **Figure 4** demonstrate that water waves are transverse?

[1 mark]

Question 2 continues on the next page

6.6.1.1 Transverse and longitudinal waves

Question 02 · continued

0 2 . 3 The teacher measured the maximum height and the minimum height of the plastic duck above the screen as the wave passed.

The teacher repeated his measurements.

Table 2 shows the teacher's measurements.

Table 2

Maximum height in mm	509	513	511
Minimum height in mm	503	498	499

Calculate the mean amplitude of the water wave.

[3 marks]

Mean amplitude = _____ mm

10

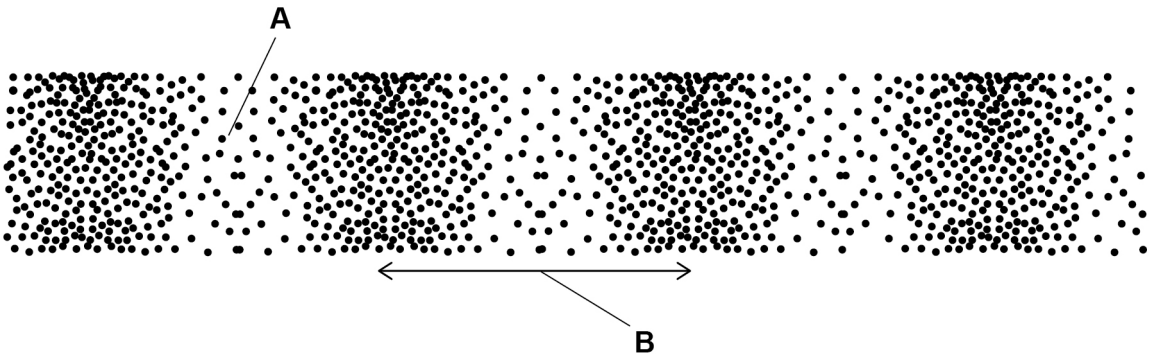
6.6.1.1 Transverse and longitudinal waves

Question 03

June 2022 | 8464/P/2H | Original Q1

0 1 **Figure 1** shows a longitudinal wave.

Figure 1



0 1 . 1 What do the labels **A** and **B** on **Figure 1** represent?

Choose answers from the box.

[2 marks]

amplitude	**frequency**	**rarefaction**	**reflection**	**wavelength**

A _____

B _____

6.6.1.1 Transverse and longitudinal waves

Question 03 · continued

0 1 . 2 The wave shown in **Figure 1** has a frequency of 4.0 kHz

Calculate the period of the wave.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

Period = _____ Unit _____

Question 1 continues on the next page

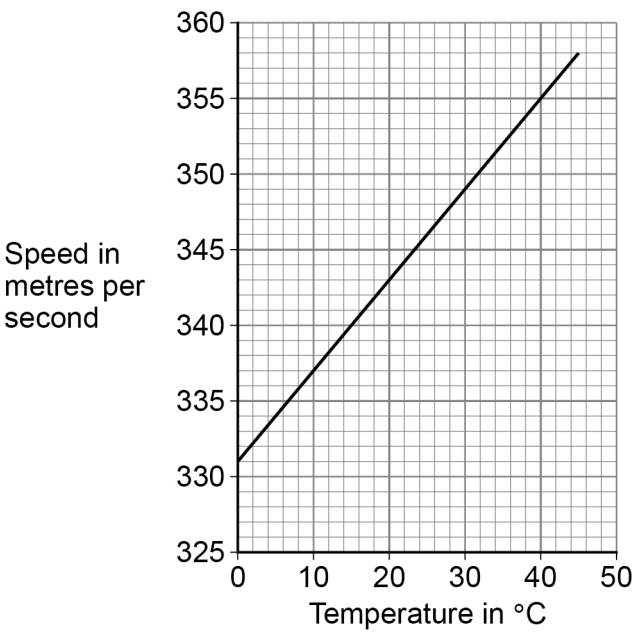
6.6.1.1 Transverse and longitudinal waves

Question 03 · continued

Sound waves are longitudinal.

Figure 2 shows how the speed of sound varies with the temperature of the air.

Figure 2



6.6.1.1 Transverse and longitudinal waves

Question 03 · continued

Use the Physics Equations Sheet to answer questions **01.3** and **01.4**.

0 1 . 3 Write down the equation that links frequency (f), wavelength (λ) and wave speed (v).

[1 mark]

0 1 . 4 A sound wave with a frequency of 300 Hz travels through the air.

The air has a temperature of 28.0 °C

Determine the wavelength of the sound wave.

Use **Figure 2**.

[4 marks]

Wavelength = _____ m

11

6.6.1.1 Transverse and longitudinal waves

Question 04

0 3 A teacher used a ripple tank to demonstrate water waves.

The teacher used a lamp to project a shadow of the water waves onto a screen below the ripple tank.

0 3 . 1 **Figure 4** represents the shadow of the water waves seen on the screen.

Figure 4



1.0 mm on **Figure 4** represents 5.0 mm on the screen.

Determine an **accurate** value for the wavelength of the waves on the screen.

Give your answer in mm.

Show how you work out your answer.

[3 marks]

Wavelength = _____ mm

The teacher adjusted the frequency of the waves produced in the ripple tank.

The teacher measured the wavelength five times.

Table 2 shows the results.

Table 2

Measurement	1	2	3	4	5	**Mean**
Wavelength in millimetres	96	99	97	**X**	97	97

0 3 . 2 Calculate value **X** in **Table 2**.

[2 marks]

X = _____ mm

0 3 . 3 The teacher states that the results are very precise.

Which of the following supports the statement made by the teacher?

[1 mark]

Tick (✓) one box.

- The mean value is very close to the true value. ☐
- The spread of values about the mean is very small. ☐
- The values are all given to the nearest millimetre. ☐
- The wavelength measurement was taken five times. ☐

6.6.1.1 Transverse and longitudinal waves

Question 04 · continued

0 3 . 4 Describe the difference between longitudinal waves and transverse waves.

[2 marks]

8

6.6.1.1 Transverse and longitudinal waves

Question 05

June 2024 | 8464/P/2H | Original Q3

0 3 Electromagnetic waves are grouped according to their wavelength and frequency.

Electromagnetic waves are transverse waves and can travel through a vacuum.

0 3 . 1 Give one **other** property that is the same for all types of electromagnetic wave.

[1 mark]

0 3 . 2 What is meant by 'transverse wave'?

[1 mark]

0 3 . 3 Which group of electromagnetic waves is used for satellite communications?

[1 mark]

0 3 . 4 Visible light is the only group of electromagnetic waves that the human eye can detect.

Which colour of visible light has the shortest wavelength?

[1 mark]

6.6.1.1 Transverse and longitudinal waves

Question 05 · continued

0 3 . 5 The three highest frequency groups of electromagnetic waves are hazardous.

Describe a risk linked to each group of high frequency electromagnetic wave.

[2 marks]

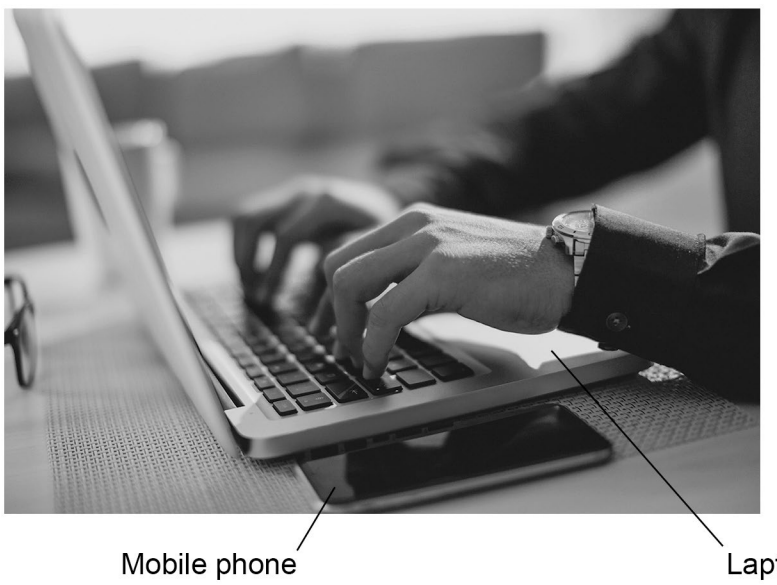
Question 3 continues on the next page

6.6.1.1 Transverse and longitudinal waves

Question 05 · continued

Figure 5 shows a person using a mobile phone to allow a laptop to access the Internet.

Figure 5



The electromagnetic waves emitted by the mobile phone send information to the laptop.

0 3 . 6 The electromagnetic waves emitted by the mobile phone have a period of 4.0×10^{-10} s.

Calculate the frequency of the waves.

Use the Physics Equations Sheet.

Give your answer in standard form.

[3 marks]

Frequency (in standard form) = _____ Hz

6.6.1.1 Transverse and longitudinal waves

Question 05 · continued

0 3 . 7 The electromagnetic waves are produced by oscillations in the transmitter of the mobile phone.

Explain how oscillations in the transmitter enable information to be transferred to the detector in the laptop.

[4 marks]

13

6.6.1.1 Transverse and longitudinal waves

Question 06

June 2025 | 8464/P/2H | Original Q3

0 3 A pair of sunglasses has lenses that absorb all ultraviolet and some visible light.

0 3 . 1 Ultraviolet and visible light are both transverse waves.

What is meant by 'transverse waves'?

[2 marks]

0 3 . 2 Ultraviolet can cause sunburn and eye damage.

Give **one** other risk to health from exposure to ultraviolet.

[1 mark]

0 3 . 3 Complete the sentence.

[1 mark]

Compared with the wavelength of visible light, the wavelength of ultraviolet is _____.

Question 3 continues on the next page

6.6.1.1 Transverse and longitudinal waves

Question 06 · continued

0 3 . 4 A wave of visible light has a frequency of 6.25×10^{14} Hz.

speed of light = 3.00×10^{8} m/s

Calculate the wavelength of this light.

Use the Physics Equations Sheet.

Give your answer in nanometres (nm).

[4 marks]

Wavelength = _____ nm

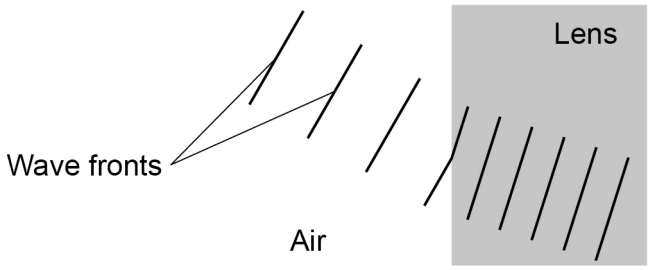
6.6.1.1 Transverse and longitudinal waves

Question 06 · continued

0 3 . 5 A ray of visible light incident on the lens in a pair of sunglasses is refracted.

Figure 3 shows a wave front diagram for visible light incident on the lens.

Figure 3



For each wave front, one end of the wave front enters the lens before the other end.

Explain why the light refracts as it enters the lens.

[2 marks]

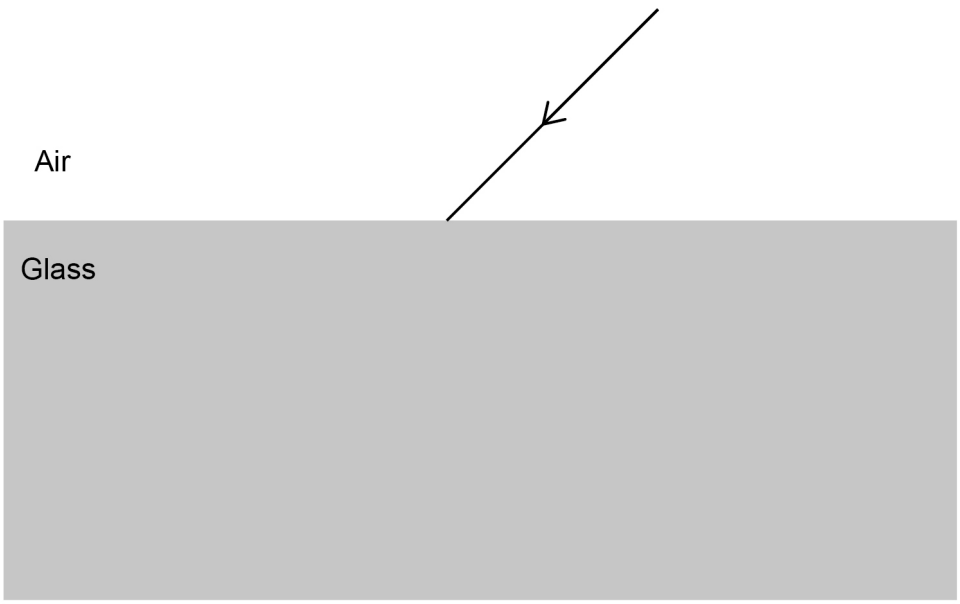
Question 3 continues on the next page

6.6.1.1 Transverse and longitudinal waves

0 3 . 6 **Figure 4** shows a ray of visible light incident on glass.

The angle of incidence is 45°.

Figure 4



The angle of refraction of the ray in the glass is 28°.

Complete the ray diagram in **Figure 4** to show the path of the ray in the glass.

You should:

- draw the normal line
- draw the refracted ray in the glass.

You do **not** need to draw the ray leaving the glass.

[2 marks]

12