AQA GCSE Physics | 8463

SPECIFICATION POINT 4.6.1.1

Transverse and longitudinal waves

Past-paper questions

Tier	**Higher**
Question groups	**5**
Available paper years	**2006–2023**

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.

4.6.1.1 Transverse and longitudinal waves

Question 01

June 2006 | 3451 | Original Q2 | Legacy

2 (a) The diagram shows water waves made by a wave machine in a swimming pool.



In 10 seconds 5 complete waves go past a person standing in the pool.

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

Show how you work out your answer.

.....

Frequency = ...

(2 marks)

(b) Water waves are transverse waves.

Give **one** other example of a transverse wave.

.....

(1 mark)

(c) How is a transverse wave different from a longitudinal wave? You may draw a diagram to help you with your answer.

.....

.....

.....

.....

(2 marks)

4.6.1.1 Transverse and longitudinal waves

Question 01 · continued

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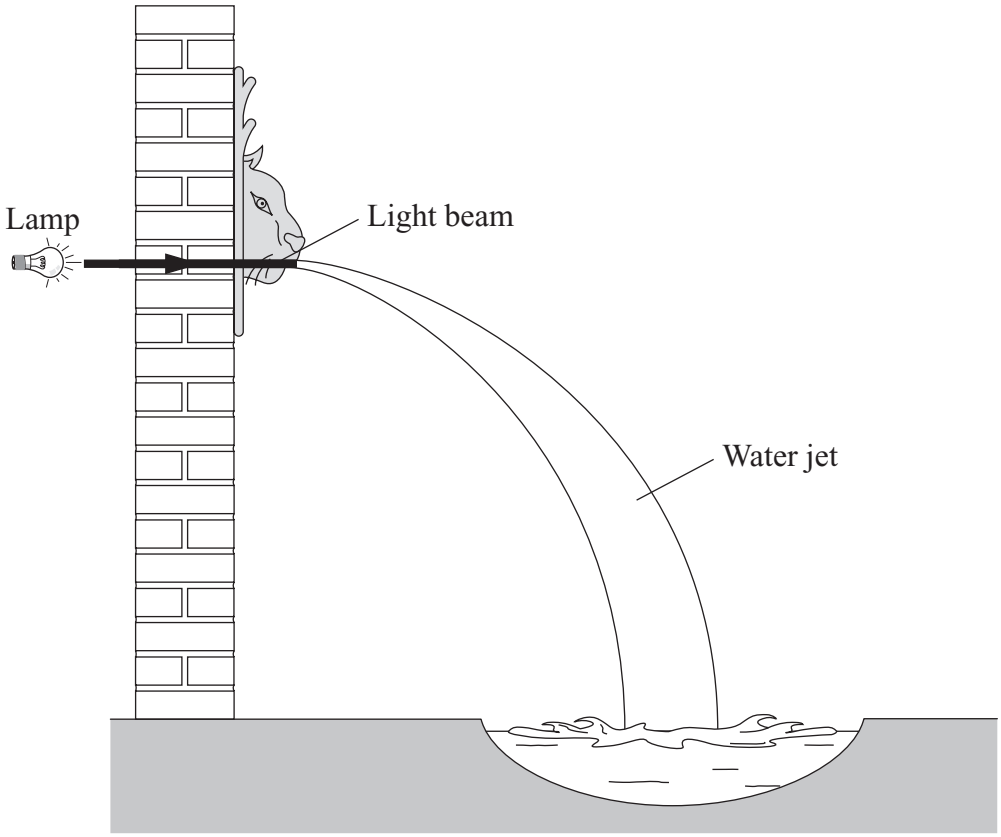
(d) The diagram shows a garden fountain. The fountain features a light beam that is totally internally reflected by the water jet.



(i) Draw the path of the light beam through the water jet. *(1 mark)*

(ii) Complete the following sentence by crossing out the **two** lines in the box that are wrong.

For light to be totally internally reflected the angle between the light ray and the normal must be

smaller than
equal to
bigger than

the critical angle.

(1 mark)

7

4.6.1.1 Transverse and longitudinal waves

Question 02

June 2006 | 3462 | Original Q2 | Legacy

2 (a) The diagram shows water waves made by a wave machine in a swimming pool.



In 10 seconds 5 complete waves go past a person standing in the pool.

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

Show how you work out your answer.

.....

Frequency = ...

(2 marks)

(b) Water waves are transverse waves.

Give **one** other example of a transverse wave.

.....

(1 mark)

(c) How is a transverse wave different from a longitudinal wave? You may draw a diagram to help you with your answer.

.....

.....

.....

.....

(2 marks)

4.6.1.1 Transverse and longitudinal waves

Question 02 · continued

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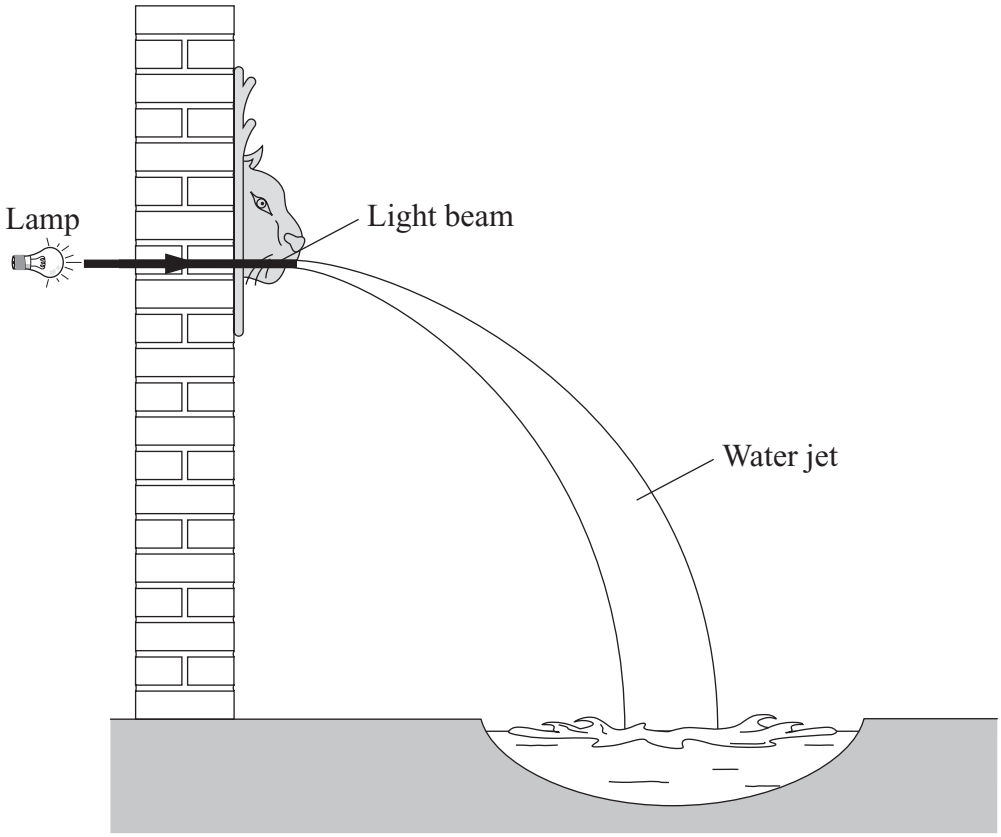
(d) The diagram shows a garden fountain. The fountain features a light beam that is totally internally reflected by the water jet.



(i) Draw the path of the light beam through the water jet. *(1 mark)*

(ii) Complete the following sentence by crossing out the **two** lines in the box that are wrong.

For light to be totally internally reflected the angle between the light ray and the normal must be

smaller than
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bigger than

the critical angle.

(1 mark)

7

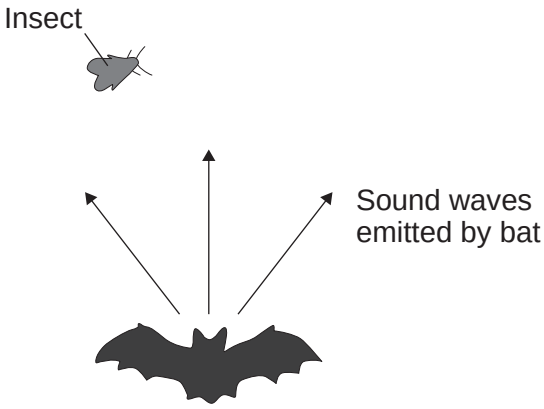
4.6.1.1 Transverse and longitudinal waves

Question 03

June 2016 | PH1HP | Original Q1 | Legacy

1 Bats use the reflection of high pitched sound waves to determine the position of objects. **Figure 1** shows a bat and an insect flying in front of the bat.

Figure 1



1 (a) What determines the pitch of a sound wave?

[1 mark]

Tick (✓) **one** box.

	Tick (✓)
amplitude	
frequency	
speed	

1 (b) State the name given to reflected sound waves.

[1 mark]

_____

4.6.1.1 Transverse and longitudinal waves

Question 03 · continued

1 (c) The bat emits sound waves with a range of wavelengths.

Some of the sound waves will be diffracted by the insect.

Complete the following sentences to explain why.

[2 marks]

Diffraction is caused by the sound waves _____ as they pass the insect.

The most diffraction happens when the wavelength of the sound wave is

_____ the size of the insect.

1 (d) The bat emits a sound wave with a frequency of 25.0 kHz and a wavelength of 0.0136 metres.

Calculate the speed of this sound wave.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

_____

Speed = _____ m/s

1 (e) Sound waves are longitudinal. Describe a longitudinal sound wave.

[2 marks]

_____

_____

_____

_____

8

4.6.1.1 Transverse and longitudinal waves

Question 04

November 2021 | 8463/2H | Original Q5

0 5 Ultraviolet is a type of electromagnetic wave.

0 5 . 1 Give **one** use of ultraviolet.

[1 mark]

_____

0 5 . 2 An ultraviolet wave has a wavelength of 300 nanometres.

Which of the following is equal to 300 nanometres?

[1 mark]

Tick (✓) **one** box.

3×10^{7} m ☐

3×10^{-7} m ☐

3×10^{9} m ☐

3×10^{-9} m ☐

0 5 . 3 The speed of ultraviolet waves is 3×10^{8} m/s.

Calculate the frequency of the ultraviolet wave.

Use your answer to Question **05.2**

[3 marks]

_____

_____

_____

_____

_____

Frequency = _____ Hz

4.6.1.1 Transverse and longitudinal waves

0 5 . 4 **Table 1** gives the wavelength of an ultraviolet wave and three other electromagnetic waves.

Table 1

	Ultraviolet	Wave E	Wave F	Wave G
Wavelength in nanometres	300	0.1	600	100 000

Draw **one** line from each wave to the name of the wave.

[1 mark]

Wave	Name
Wave E	Infrared
Wave F	Visible light
Wave G	X-rays

0 5 . 5 Electromagnetic waves are transverse.

Some other types of wave are longitudinal.

Describe the difference between transverse and longitudinal waves.

[2 marks]

8

4.6.1.1 Transverse and longitudinal waves

Question 05

June 2023 | 8463/2H | Original Q1

0 1 Infrared waves are transverse waves.

0 1 . 1 Complete the sentence.

[1 mark]

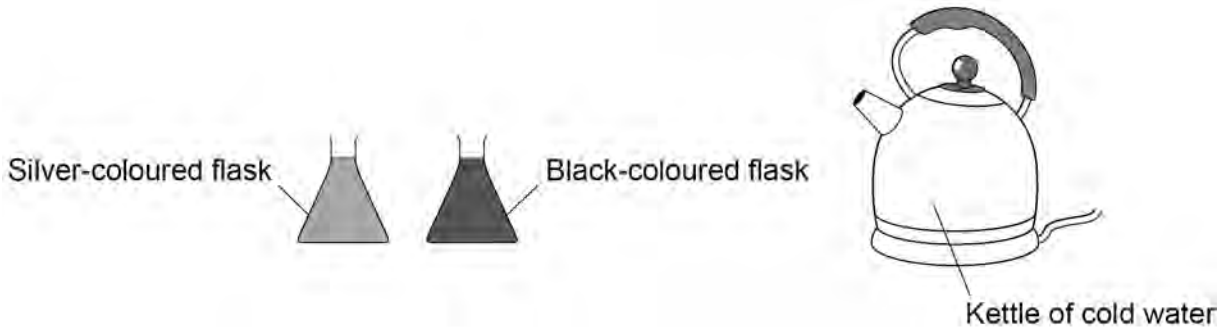
In a transverse wave, the direction of oscillation is _____

to the direction of energy transfer by the wave.

A student investigated how the colour of a surface affects the rate at which the surface emits infrared radiation.

Figure 1 shows some of the equipment used.

Figure 1



4.6.1.1 Transverse and longitudinal waves

Question 05 · continued

0 1 . 2 The student wrote the following hypothesis:

‘The black-coloured flask will emit more infrared radiation than the silver-coloured flask during 10 minutes of cooling.’

Describe a method to test this hypothesis.

[6 marks]

Question 1 continues on the next page

4.6.1.1 Transverse and longitudinal waves

Question 05 · continued

0 1 . 3 When will the flasks emit infrared radiation at the greatest rate?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

During the 1st minute ☐

During the 5th minute ☐

During the 9th minute ☐

Reason _____

_____

Question 05 · continued

Another student investigated the absorption of infrared radiation by different surface colours.

The student filled four hollow metal cubes with cold water.

Each cube was the same size but had a different surface colour.

The cubes were then placed the same distance from an infrared heater.

After 10 minutes, the student measured the temperature increase of the water inside each cube.

0 1 . 4 What was the dependent variable in this investigation?

[1 mark]

0 1 . 5 **Table 1** shows the results.

Table 1

Surface colour of the cube	Temperature increase after 10 minutes in °C
Matt white	3.0
Shiny white	2.0
Matt black	6.5
Shiny black	4.0

Give **two** conclusions that can be made from the results in **Table 1**.

[2 marks]

1

2

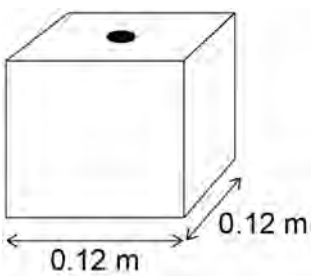
4.6.1.1 Transverse and longitudinal waves

Question 05 · continued

Figure 2 shows one of the cubes. The cube is filled with water.

The weight of the water exerts a pressure on the bottom of the cube.

Figure 2



Use the Physics Equations Sheet to answer questions **01.6** and **01.7**.

0 1 . 6 Which equation correctly links area, force and pressure?

[1 mark]

Tick (✓) **one** box.

pressure = force × area^2 ☐

pressure = force × area ☐

pressure = $\frac{\text{force}}{\text{area}}$ ☐

pressure = $\frac{\text{area}}{\text{force}}$ ☐

4.6.1.1 Transverse and longitudinal waves

Question 05 · continued

0 1 . 7 The water pressure at the bottom of the cube is 1500 Pa.

Calculate the force of the water on the bottom of the cube.

[4 marks]

Force = _____ N

17

Turn over for the next question