

Wave Behaviour

Q1.(2018)

D ✓

Q2.(2018)

C ✓

Q3.a(2018)

Distance between 2 points on a wave which are in phase
or identical / distance between the peaks /
distance between the troughs (is 6 m) ✓

1

2.1

ALLOW descriptions of peaks and troughs e.g. the
distance between the highest parts of the wave /
from maximum amplitude to maximum amplitude

ALLOW one (complete) cycle of a wave (is 6 m) /
the first wave starts at 0 m and ends at 6 m

ALLOW descriptions together with annotations on
the graph e.g. distance between points X and Y
with the X and Y correctly positioned on the graph

DO NOT ALLOW descriptions about the height or
amplitude of the wave e.g. from 3 to -3 it is 6 m

Q3.b(2018)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 3 (m/s) award 3 marks

$(v =) f \times \lambda$ **OR** speed = frequency $\times$ wavelength ✓

$(v =) 0.5 \times 6$ ✓

$(v =) 3 \text{ (m/s)}$ ✓

3

Q4.(2018)

Either any two from:

Count number of waves passing a point ✓

Measure time (for these waves) with a **stopwatch** ✓

(Use frequency =) number of waves ÷ time
or divide number of waves by time ✓

Repeat and take average values ✓

Or any two from:

Measure length of **n** waves with ruler ✓

Divide by **n** to get wavelength ✓

Measure time (for these waves) with a **stopwatch** ✓

Use speed = distance ÷ time ✓

Use frequency = speed ÷ wavelength ✓

Repeat and take average values ✓

2

2 × 2.2

ALLOW count or **measure** the number of waves
in a certain time ✓✓

DO NOT ALLOW frequency is measured using a
stopwatch

ALLOW measure the length of **one** wave with a
ruler

IGNORE measure how long the waves are

ALLOW measure the length of waves in a certain
amount of time with a stopwatch

ALLOW $v = d/t$

ALLOW use speed from part (b)

ALLOW $f = v/\lambda$

Q5.(2020)

A

Q6.(2020)

Ruler ✓

Stopwatch / stop clock ✓

2

2 × 1.2

DO NOT ALLOW metre stick
ALLOW timer

Q7.(2020)

Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.

Level 3 (5–6 marks)

Detailed description of wave properties.

AND

Calculation of wave speed **OR** period **OR** frequency with correct units.

AND

Identifies amplitude, and wavelength.

There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.

Level 2 (3–4 marks)

Description of some wave properties.

AND

Calculation of wave speed **OR** period **OR** frequency.

OR

Identifies amplitude and wavelength.

OR

Detailed description of wave properties.

AND

Identifies amplitude **OR** wavelength.

There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.

Level 1 (1–2 marks)

Description of some wave properties.

OR

Calculation of wave speed **OR** period **OR** frequency.

OR

Identifies amplitude **OR** wavelength.

There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.

0 marks

No response or no response worthy of credit.

6

2 × 1.1
4 × 2.2

AO1.1 – Demonstrates knowledge and understanding of wave properties

- Wavelength of wave = distance between 2 successive peaks / troughs / 2 points which are in phase.
- Frequency = number of waves passing a point per second.
- Amplitude = height of crest or depth of trough from centre/AW

AO2.2 – Applies knowledge and understanding of wave motion

- Realises the graphs depict the same wave, so the amplitude is the same in both.
- Identifies water as a transverse wave.
- Identifies amplitude as 3 cm.
- Identifies wavelength as 2 cm.
- Identifies period as 2 s.
- Calculates frequency as 1 wave per 2 s = 0.5 Hz.
- Calculates wave speed as
 $v = f\lambda = 0.5 \times 2 = 1 \text{ cm / s}$ **OR** 0.01 m / s

Q8.(2021)

A

Q9.a(2021)

(Frequency is) number of waves in a given time ✓

1

1.2

ALLOW e.g. waves per second

Q9.b(2021)

(Frequency =) 1 Hz ✓

Q9.c(2021)

Measure the distance across n waves with a ruler ✓
Divide distance by n ✓

2

2 × 3.3a

ALLOW any value equal to or greater than 2 for n

Q10.(2021)

Arrows indicating motion parallel to arrows in diagram ✓

E.g.



Q11.a(2021)

1000 000 / 10^6 / million ✓

1

2.1

ALLOW answers in the order of 10^6
e.g. ($3 \times 10^8 \div 330 =$) 9×10^5

Q11.b(2021)

FIRST CHECK THE ANSWER ON ANSWER LINE**If answer = 335 (m / s) award 3 marks**

3

1.2

2 × 2.1

(speed =) distance ÷ time ✓

(speed =) $1340 / 4$ ✓

(speed =) 335 (m / s) ✓

Allow $s = d \div t$

Q12.(2021)

Method 1 ✓

AND any one from:

- Distance can be measured accurately for method 1 /
ORA ✓
- Difficult to measure distance to lightning strike /
lightning occurs in different places ✓
- Times can be repeated and averaged for method 1 /
ORA ✓

Q13.(2022)

D ✓

Q14.(2022)

B ✓

Q15.(2022)

A ✓

Q16.a(2022)

Order (from top to bottom):

Lamp

Vibration generator

Tray of water

Pattern of waves ✓✓

2

2 × 1.2

All 4 correct ✓✓

2 or 3 correct ✓0

Q16.b(2022)

Any one from:

Speed of water waves has changed/decreased / AW ✓

Depth of water has changed/decreased / AW ✓

1

2.2

DO NOT ALLOW increase speed

DO NOT ALLOW increase depth

Q16.c(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE

If answer = 3 (no units) award 2 marks

(Amplitude of) A = 1.5 (cm) **OR** (Amplitude of) of B = 0.5 (cm) ✓

1.5 ÷ 0.5 = 3 ✓

2

2 × 2.2

IGNORE units

ALLOW 1 mark for seeing both 1.5 and 0.5

Q16.d(2022)

Any two from:

Higher frequency gives a shorter wavelength / OR A ✓

B has a higher frequency (than A) / OR A ✓

B has a smaller wavelength (than A) / OR A ✓

2

**3.1b
2.2**

A has a lower frequency

A has a longer wavelength

ALLOW B has twice the frequency and half the wavelength of A / OR A ✓✓

IGNORE references to amplitude

Q17.(2023)

B

Q18.(2023)

C

Q19.a(2023)

C
D
B ✓✓

2	2 × 1.1	All 3 correct = 2 marks 1/2 correct = 1 mark
----------	----------------	---

Q19.b(2023)

Longitudinal wave ✓

1	1.1	ALLOW any indication of the 2 nd box selected e.g., X or circling but ticking takes precedence DO NOT ALLOW more than one box ticked
----------	------------	---

Q20.a(2023)

Any three from:

(Method to) make a sound e.g., clap ✓

Measure distance to wall ✓

Tape measure / trundle wheel metre rule (to measure distance) ✓

Use of double distance/halving the time (measuring an echo) ✓

Use of speed = distance / time ✓

3	3 × 3.3a	DO NOT ALLOW throw item at wall to make a sound DO NOT ALLOW student making a second sound ALLOW place phone at measured distance IGNORE ruler ALLOW metre stick ALLOW speed = 2 x distance / time for 2 marks
----------	-----------------	---

Q20.b(2023)

Any one from:

(Acoustic timing) is more accurate / **ORA** ✓

(Acoustic measurement) does not involve a reaction time / **ORA** ✓

1	3.3b	ALLOW not prone to human error ALLOW automatically starts and stops
----------	-------------	--

Q20.c(2023)

First check the answer on answer line
If answer = 600 (Hz) award 3 marks

Rearrange Frequency = wave speed / wavelength ✓

(Frequency =) 330 / 0.55 ✓

(Frequency =) 600 (Hz) ✓

Q21.(2024)

B

Q22.(2024)

<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Detailed description of measurements AND control variables AND describes some precautions taken to obtain accurate and precise results</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) A description of measurement AND a controlled variable suggested AND describes a precaution taken to obtain accurate and precise results</p> <p>OR Detailed description of measurements AND a controlled variable or a precaution</p> <p>OR Describes some precautions taken to obtain accurate and precise results AND a controlled variable or a measurement</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p>	<p>6</p>	<p>2 × 2.2 2 × 3.3a 2 × 3.3b</p>	<p>AO2.2 - Apply knowledge and understanding of scientific enquiry, techniques and procedures to measure wave speed</p> <ul style="list-style-type: none"> Measures length of tray (with a ruler) Measures time taken for wave to travel across tray (with a stopwatch) Uses $s = d \div t$ to calculate wave speed <p>IGNORE Measurement of frequency/wavelength for this AO</p> <p>AO3.3a - Analyse information and ideas to develop experimental procedures to measure wave speed</p> <p>Control variables:</p> <ul style="list-style-type: none"> Depth/amount/mass of water Height tray lifted (to produce wave) <p>AO3.3b - Analyse information and ideas to improve experimental procedures to measure wave speed</p> <ul style="list-style-type: none"> Ensures no zero error using ruler Takes repeat readings of time and takes mean/checks for anomalies Video/computer method suggested to measure time (to eliminate reaction time errors) Stop water splashing out by not raising the tray too high
<p>Level 1 (1–2 marks)</p> <p>A description of a measurement OR A controlled variable suggested OR Describes a precaution taken to obtain accurate and precise results</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks No response or no response worthy of credit.</p>			