

MR SULLY UNFOLDS PHYSICS ANSWERS

Wave properties and the wave equation

AQA 4.6.1.1–4.6.1.2 · RP8
Waves · Paper 2
Foundation & Higher · Required practical 8

Name _____ Class _____ Date _____

Waves transfer energy from one place to another without transferring matter.

KEY EQUATION

$$v = f\lambda$$

$$T = 1 \div f$$

v = wave speed (m/s)
f = frequency (Hz)
λ = wavelength (m)
T = period (s)

WORKED EXAMPLE

A wave has f = 50 Hz and λ = 0.4 m.
v = 50 × 0.4 = **20 m/s**

Section A · Recall

Grade 4–5

1 Describe the difference between transverse and longitudinal waves. Give an example of each. [4]

Transverse: oscillations perpendicular to the direction of energy transfer,

e.g. ripples on water, light.

Longitudinal: oscillations parallel to the direction of energy transfer,

e.g. sound waves in air.

2 Define amplitude and wavelength. [2]

Amplitude: maximum displacement of a point from its undisturbed position.

Wavelength: distance from a point on one wave to the equivalent point on the adjacent wave.

Section B · Calculate

Grade 5–6

3 Complete the table. [4]

Frequency (Hz)	Wavelength (m)	Speed (m/s)
10	2	**20**
500	**0.66**	330
4	0.25	1
2×10^8	1.5	**3×10^8**

4 A wave has a period of 0.02 s. Calculate its frequency. [2]

f = 1 ÷ 0.02 = 50 Hz

5 Explain what happens to the wavelength of a wave if its frequency doubles but its speed stays the same. [2]

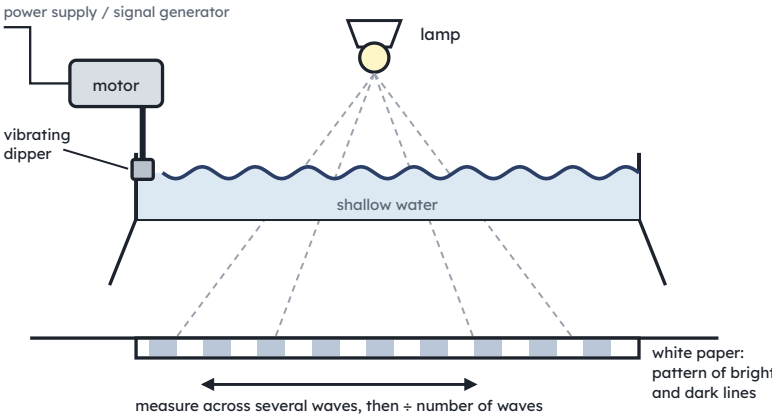
The wavelength halves,

because v = fλ and v is constant.

Section C · Required practical

Grade 6–7+

6 Describe how to measure the speed of water waves in a ripple tank. [4]



Use a lamp above the tank so the waves show on paper below.

Measure across several wavelengths with a ruler and divide to find one wavelength.

Count waves passing a point in 10 s; divide by 10 for frequency.

Calculate v = fλ; repeat and take a mean.

7 Waves in a solid: a string is attached to a vibration generator set to 40 Hz. A standing wave forms with 4 loops over 1.2 m. Calculate the wave speed. [3]

Each loop is half a wavelength: λ = 2 × (1.2 ÷ 4) = 0.6 m

v = fλ = 40 × 0.6 = 24 m/s

Exam-style question

AQA style

8 A student measures the speed of sound by standing 100 m from a large wall, clapping, and timing the echo.

a The echo takes 0.6 s to return. Calculate the speed of sound. [3]

Distance travelled = 2 × 100 = 200 m

v = 200 ÷ 0.6 = 333 m/s

b Suggest one reason why the student's value may be inaccurate, and one improvement. [2]

Human reaction time is large compared with 0.6 s.

Stand further away / time many claps in a row / use microphones and a data logger.

Total: _____ / 26

How confident am I?

	Not yet	Nearly	Got it
I can describe transverse and longitudinal waves	☐	☐	☐
I can use v = fλ and T = 1/f	☐	☐	☐
I can describe how to measure wave speed	☐	☐	☐