# Worksheet: Wave Speed Calculations ($v = f\lambda$)

PhysicsSheets

Specification: GCSE Physics (AQA 4.6.1.2 / Edexcel SP4)

**Core Equation: Wave Speed**

$v = f \times \lambda$ where:

$v$ = Wave speed (**m/s**)

$f$ = Frequency (**Hz**)

$\lambda$ = Wavelength (**m**)

**Rearranged Forms:**

$f = \frac{v}{\lambda}$ $\lambda = \frac{v}{f}$

## Section A: Units, Conversions & Rearranging

1. Complete the table below by stating the correct SI unit and its symbol for each variable in the wave speed equation.

| Variable | SI Unit | Symbol |
|---|---|---|
| Wave speed ($v$) | _____ | _____ |
| Frequency ($f$) | _____ | _____ |
| Wavelength ($\lambda$) | _____ | _____ |

2. Rearrange the wave speed equation ($v = f \times \lambda$) to make $f$ and $\lambda$ the subject:

a) $f =$ _____

b) $\lambda =$ _____

3. Perform the following unit conversions. Show your working where appropriate.

a) Convert 25 cm to metres.

b) Convert 5 kHz to Hertz.

c) Convert 1.5 MHz to Hertz.

d) Convert 3.0 km/s to metres per second.

e) Convert 250 ms to seconds.

f) Convert 650 nm to metres (express in standard form).

## Section B: Practice Calculations

*Remember to show your working clearly, including the equation, substitution, and final answer with units.*

1. Calculate the missing values in the following scenarios:

a) A wave has a frequency of 20 Hz and a wavelength of 0.5 m. Calculate its wave speed.

b) A sound wave travels through a medium with a frequency of 500 Hz and a wavelength of 0.02 m. What is the speed of this sound wave?

c) A water wave travels at 1.2 m/s and has a wavelength of 0.8 m. Calculate its frequency.

d) A radio wave travels at $3.0 \times 10^8$ m/s and has a frequency of 150 kHz. Calculate its wavelength.

## Section C: Challenge Context & Practical Application

Figure 1 shows an experimental setup used by a student to measure the speed of sound in air. A signal generator produces sound waves, which are detected by two microphones connected to an oscilloscope.

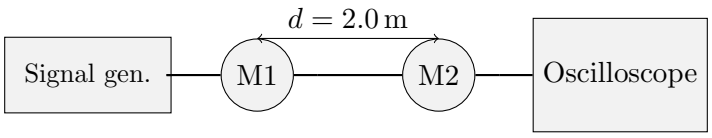


**Figure 1:** Setup for measuring the speed of sound

1. Answer the following questions based on the experiment in Figure 1:

a) The signal generator is set to a frequency of 440 Hz. The oscilloscope shows the sound wave reaching the second microphone 6.0 ms after the first. The microphones are placed 2.0 m apart. Calculate the wavelength of the sound wave. Show all your working, including any unit conversions, and give your answer to an appropriate number of significant figures.

b) Explain how the student could improve the accuracy of their measurement of the speed of sound in this experiment. Refer to specific changes in the experimental setup or procedure.