SCIENCE FOUNDATIONS

Frequency, wavelength, and period

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how you tell a low bass note from a high whistle, and how a radio station picks its spot on the dial, because every wave is described by how often it repeats and how long each repeat is. A musician tunes a guitar string by changing how fast it vibrates. A doctor uses ultrasound waves of a chosen frequency to see inside the body without surgery. Knowing frequency, wavelength, and period tells you how to describe any repeating wave, from sound to light to ocean swell.



Rule

Frequency, wavelength, and period: wave speed equals frequency times wavelength, v = f × wavelength.

Frequency is one divided by the period, $f = \frac{1}{T}$, so a higher frequency means a shorter period and, at fixed speed, a shorter wavelength.

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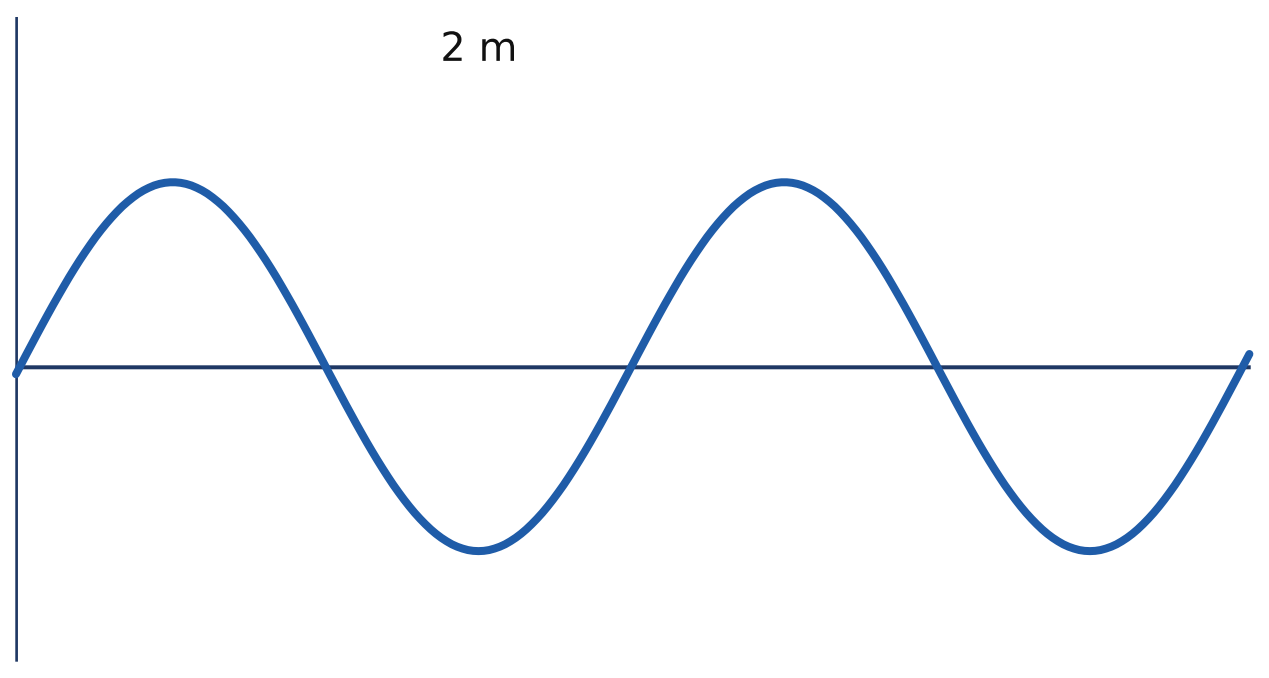
Worked examples

EXAMPLE 1

Q A wave has frequency 5 Hz and wavelength 2 m. Wave speed?



SOLUTION

Write the rule:

speed = frequency × wavelength

Substitute:

speed = 5 × 2 = 10 m/s

Write the answer with $\frac{m}{s}$.

The result is speed 10 m/s.

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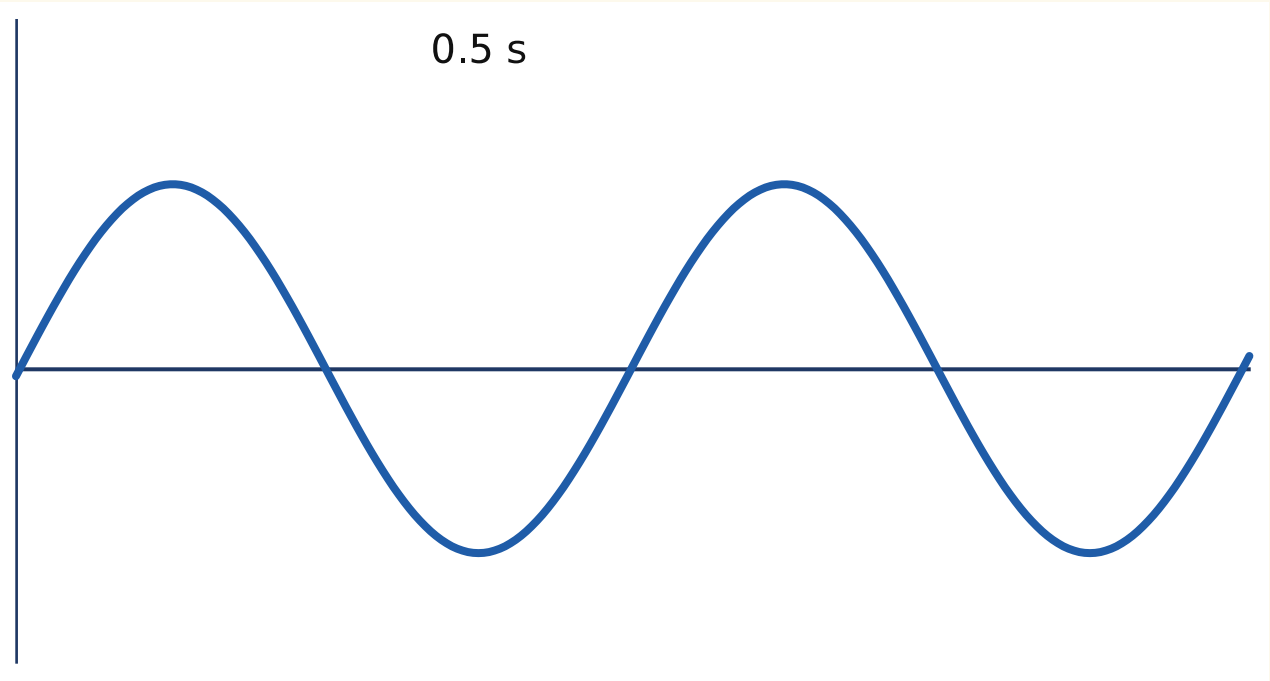
EXAMPLE 2

Q A wave has period 0.5 s. Frequency?



SOLUTION

Write the rule:

frequency = 1 ÷ period

Substitute:

frequency = 1 ÷ 0.5 = 2 Hz

Write the answer with Hz.

The result is frequency 2 Hz.

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Practice questions

1

Wave speed formula?

A Frequency times wavelength

B Frequency divided by wavelength

C Wavelength divided by frequency

D Frequency plus wavelength

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2

Frequency 4 Hz, wavelength 3 m: speed?

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Period 0.25 s: frequency?

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Frequency 10 Hz: period?

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Speed 20 m/s, wavelength 4 m: frequency?

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6 Speed 20 m/s, frequency 5 Hz: wavelength?

- A 4 m
- B 5 m
- C 2 m
- D 8 m

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7 Units of frequency?

- A Hertz
- B Metres
- C Seconds
- D Metres per second

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8 Higher frequency, fixed speed: wavelength?

- A Shorter
- B Longer
- C The same
- D Zero

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9 Period definition?

- A Time for one wave
- B Number of waves per second
- C Distance of one wave
- D Speed of one wave

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10

Frequency definition?

A Waves per second

B Seconds per wave

C Metres per wave

D Waves per minute

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ANSWER KEY

1. Frequency times wavelength

2. 12

3. 4

4. 0.1

5. 5

6. 4 m

7. Hertz

8. Shorter

9. Time for one wave

10. Waves per second

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