

How waves carry energy without matter

Grade 7 science (Year 8 · Class 7) · Lab answers

The sample speeds are close to 2.5 m/s whatever the size of the pulse. Use these model answers to check your analysis, and note that your own spring may give a different speed because the stretch changes it.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS4-1

Question 1 Mean times

Small: $(1.62 + 1.58 + 1.66) \div 3 = 4.86 \div 3 = 1.62$ s. Large: $(1.60 + 1.64 + 1.60) \div 3 = 4.84 \div 3 = 1.61$ s. **Small 1.62 s, large 1.61 s**

Question 2 Pulse speeds

Small: $v = 4.0 \div 1.62 = 2.47$ m/s. Large: $v = 4.0 \div 1.613 = 2.48$ m/s. **Both about 2.5 m/s**

Question 3 Effect of pulse size

The speeds differ by about 0.01 m/s, which is within the timing error, so the size of the pulse (amplitude) does not change the speed. **Amplitude does not affect speed.** The speed depends on the spring and how tight it is.

Question 4 Frequencies

Slow: $f = 14 \div 10 = 1.4$ Hz. Fast: $f = 20 \div 10 = 2.0$ Hz. **1.4 Hz and 2.0 Hz**

Question 5 Predicting wavelengths

Slow: $\lambda = 2.5 \div 1.4 = 1.79$ m (measured 1.8 m). Fast: $\lambda = 2.5 \div 2.0 = 1.25$ m (measured 1.2 m). **Predicted 1.8 m and 1.25 m, which agree with the measured values.**

Question 6 Another prediction

$\lambda = v \div f = 2.5 \div 2.5 = 1.0$ m. The speed stays the same, so a higher frequency gives a shorter wavelength.

Question 7 Timing error

Percentage uncertainty = $0.2 \div 1.62 \times 100 = 12$ %. **About 12 %.** Film the pulse with a phone and step through the frames, or use a longer distance.

Question 8 Improving the lab

Repeat each run five or more times and take the mean; keep the spring at the same stretch every time; use a longer marked distance; film the pulse for accurate timing. **More repeats and better timing.**