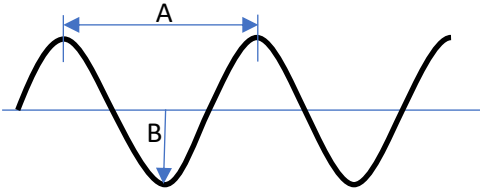# Properties of Waves

All answers to calculations should be to 2 significant figures.

1. Using the diagram below, answer the following questions.

1a. State what A and B represent

A Wavelength

B Amplitude

2. Define the following terms

Frequency – the number of waves that pass a fixed point each second.

Amplitude- the maximum displacement of a wave from the undisturbed position. The amplitude is a measure of the energy of the wave.

Wavelength- The distance from a point on a wave, to the same point on the next wave, measured in metres.

Period- the time taken for one complete wave

3. State the equation that links time period to frequency

$$\text{Time period, T} = \frac{1}{\text{frequency, f}}$$

4. Define the term wave speed

The distance the wave travels per second

5. State the equation that links wavelength, frequency and wave speed.

Wave speed = frequency x wavelength

6. Calculate the wave speed for a wave with a wavelength of 2m and frequency of 20Hz.

Wave speed = frequency x wavelength

Wave speed = 20Hz x 2m = 40m/s

7. Calculate the wavelength of a wave that has a speed of 45m/s and a frequency of 80kHz.

Wave speed = frequency x wavelength

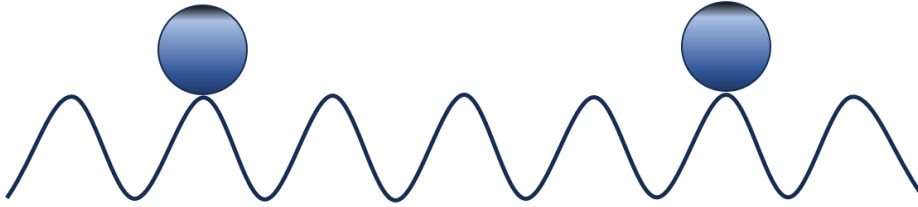$$\text{Wavelength} = \frac{\text{wave speed}}{\text{frequency}}$$

80kHz = 80000Hz

$$\text{Wavelength} = \frac{45}{80000}$$

Wavelength = 5.6 x 10^{-4}m

8. Using the diagram below answer the following questions

8a. The distance from the middle of beach ball on left to the middle of the beach ball on the right is 24m. Calculate the wavelength of the wave.

Between the 2 balls there are 4 waves, so if 24 m = 4 wavelengths, then 1 wavelength is 6m

8b. It takes the beach ball 3 seconds to travel from the position on the left, to the position on the right. Calculate the frequency of the waves.

$$\text{Wave speed} = \frac{\text{Distance travelled}}{\text{Time taken}}$$

$$\text{Wave speed} = \frac{24m}{3}$$

Wave speed = 8m/s

Wave speed = frequency x wavelength

$$\text{Frequency} = \frac{\text{wave speed}}{\text{wavelength}}$$

$$\text{Frequency} = \frac{8m/s}{6m}$$

Frequency = 1.3 Hz

8c. Using your answer to 8b, calculate the period for the wave.

$$\text{Time period}, T = \frac{1}{\text{frequency}, f}$$

$$\text{Time period}, T = \frac{1}{1.3}$$

Time period = 0.77 seconds

9. Write an experimental method to explain how to measure the speed of sound in air. Your method should include details of the steps to take, any measurements recorded along with any calculations.

Two people need to be a far distance apart, approx. 200-300m.

The first person needs to hold an object that will make a sound such as two cymbals.

The second person needs to have a stopwatch.

When the first person hits the cymbals together, the second person should start the stopwatch and stop the stopwatch when they hear the sound.

This will record the time taken for the sound wave to travel from the first person to the second person.

This method should be repeated 3 times and a mean calculated for the time taken.

Speed = distance/time