

# Waves, sound and light

## Summary

### 1 Transverse pulses and waves

#### 1.1 Properties of transverse pulses and waves

- A pulse is a single disturbance in a medium. A single crest is a transverse pulse. A single trough is also a transverse pulse.
- In a transverse pulse or wave, the particles of the medium vibrate at  $90^\circ$  to the direction in which the pulse or wave moves.
- The amplitude of a pulse is the maximum displacement from the position of rest of a particle in the medium.
- A wave is made up of one pulse after another.
- The 'hump' in a transverse wave is called a crest.
- The 'hollow' in a transverse wave is called a trough.
- Continuous transverse waves are produced by continuous vibrations of the medium.
- A vibration is a regular to-and-fro movement (up-and-down or forwards-and-backwards).
- The rest position of a vibrating object (also called the equilibrium position) is the position that it would be in when not vibrating.
- One complete vibration (also called one oscillation) is one complete to-and-fro movement. It is the movement from the rest position to the furthest point in one direction, then to the furthest point in the opposite direction, then back to the rest position.
- One complete vibration (or one oscillation) of the end of a slinky spring will produce one wavelength in the spring.
- Particles in a medium are in phase if they are vibrating perfectly in step with one another.
- Particles in a medium that are not vibrating perfectly in step with one another are out of phase. Two particles are completely out of phase if they are moving oppositely, with one reaching the crest at the same instant that the other reaches the trough.

#### 1.2 Wavelength, frequency, amplitude, period, wave speed

- Wavelength ( $\lambda$ ) is the distance between two consecutive points that are in phase. For transverse waves, wavelength is the distance between two successive crests or two successive troughs. The unit is metres (m). If the wavelength is given in any other unit (for instance, mm or nm), it must be converted to metres when doing a calculation.
- Frequency ( $f$ ) is the number of wavelengths passing per second. It equals the frequency of the vibration making the waves. The unit is  $s^{-1}$  (per second).  $1 s^{-1}$  is called a hertz (Hz).
- The amplitude of a wave is the maximum distance that a point in a wave moves from its rest position. This equals the distance from the rest position to the top of a crest or to the bottom of a trough. The unit is metres (m).

# Physical Science Chapter 10 Sound Notes Section 1 The

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