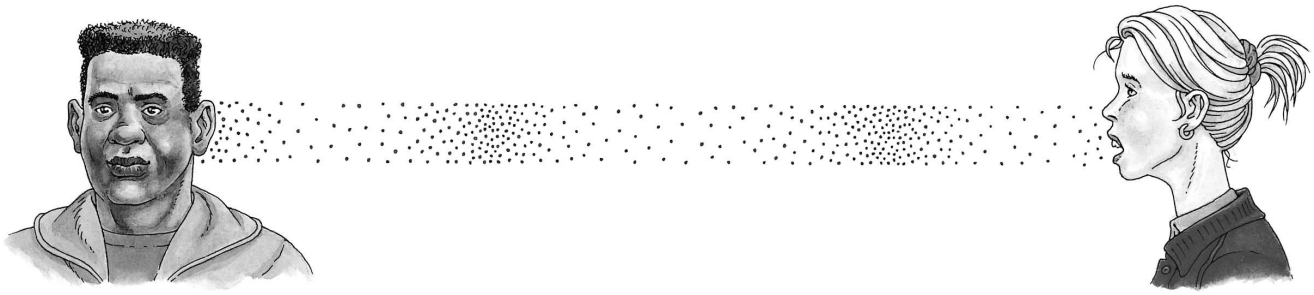
8L Summary Sheets

Sound and hearing

Sound vibrations and waves

Sound is a form of **energy**. Sounds are made when things **vibrate**. The vibrations are passed on by particles in solids, liquids or gases. Sound needs a substance to pass on the vibrations, so it can travel through solids, liquids and gases but not through a **vacuum**.



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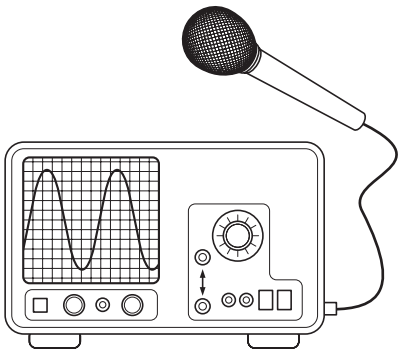
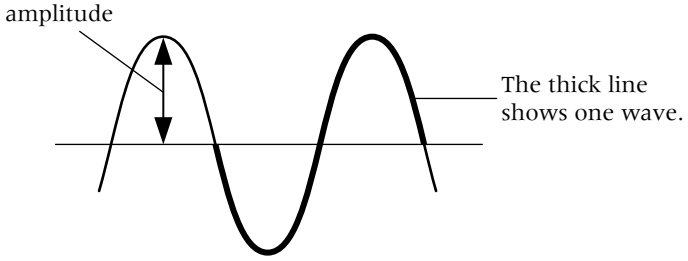
The speed of sound is faster through solids than liquids, and slowest through gases. This is because the particles are very close together in solids and so the energy is more likely to be passed from one particle to the next. The sound travels in all directions because the particles move in all directions unless something stops them.



Sound waves can be shown on an oscilloscope.

The **frequency** of a wave is the number of vibrations each second. The unit for frequency is **hertz** (**Hz**). If you listen to a sound with a frequency of 100 Hz, one hundred waves reach your ear every second. High **pitched** sounds have a high frequency, and low pitched sounds have a low frequency.

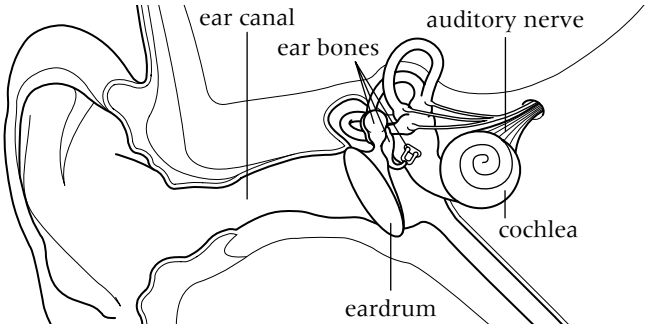
The distance between the waves is called the **wavelength**. It can be measured between any point on a wave and the same point of the next wave. It is often more convenient to measure it between the top of one wave and the next.



Half the height of the wave is called the **amplitude**. The **loudness** of a sound depends on the amplitude. Louder notes have more energy and the wave has a bigger amplitude.

Hearing and the ear

Sound waves travel through the air and into the ear. They cause the eardrum to vibrate. The vibrations are passed on to the **cochlea** in the **inner ear**, where they are changed to electrical signals called **impulses**. A **nerve** takes this message to the brain. When the message reaches the brain we hear the sound.



Sound can damage the ears if it is too loud or goes on for too long. Loud sounds can damage the eardrum or the cochlea. Unpleasant sound is often called **noise**.

We can measure how loud a sound is by using a **sound intensity meter**. This is an instrument which measures the loudness of a sound in **decibels** (**dB**). The **threshold of hearing** is the quietest sound we can hear and we say this is 0 dB.

Soft materials can **absorb** sound. Soft materials are used in **soundproofing** and for making ear protectors. Double glazed windows and soft materials like curtains help to reduce sound levels.

Sound and light

One major difference between **light** and **sound energy** is that light can travel through space (a vacuum) but sound cannot.

Light also travels much faster than sound. It is nearly a million times faster. Light travels at 300 million metres per second (or 300 000 km/s) and sound travels at about 330 metres per second.

Both light waves and sound waves can be reflected. We hear a reflected sound wave as an **echo**.

