

# Hearing range

## Location

Ground floor, All About Us exhibition

## In a nutshell

How high and low can you hear? Our ears pick up a range of frequencies which changes as we age.

## What to do

Students wear headphones and play a range of steady frequencies to determine how high and low they can hear.

## Time Required

KS3 & KS4 3 minutes per student.

## What's happening?

Sounds are made from vibrations which travel through the air. The more vibrations per second, the higher the sound you hear. When you turn the dial on this exhibit, you are changing the number of vibrations per second or the frequency of the sound, measured in Hertz (Hz). Human ears can detect sound within the range of 20 to 20 000 Hz. When sound enters your ears the vibrations travel to your inner ear and the fluid-filled cochlea. The vibrations create waves through the fluid which are detected by thousands of tiny hair cells. The tiny V-shaped clusters of hairs in your ear detect the vibrations through the fluid. These are turned into electrical signals which are sent along the auditory nerve to your brain. The hairs which pick up high frequency sounds are more prone to damage as we age because they are at the bottom of the cochlea nearer the source of the sound. Your hearing range starts to narrow from about the age of 20, but most people don't notice any change to their hearing until their 60's when they might have trouble hearing some of the high frequency sounds in speech like 's', 'f' or 'sh'.



## Curriculum links

<b>KS3</b>	<b>Science - Sound waves</b> <ul style="list-style-type: none"><li>- frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound</li><li>- sound needs a medium to travel, the speed of sound in air, in water, in solids</li><li>- sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal</li><li>- auditory range of humans and animals</li></ul> <b>English - Reading</b> <ul style="list-style-type: none"><li>- learning new vocabulary, relating it explicitly to known vocabulary and understanding it with the help of context and dictionaries</li></ul> <b>Mathematics - Number</b> <ul style="list-style-type: none"><li>- understand and use place value for decimals, measures and integers of any size</li><li>- use standard units of mass, length, time, money and other measures, including with decimal quantities</li></ul> <b>Design &amp; Technology</b> <ul style="list-style-type: none"><li>- understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs]</li></ul>
<b>KS4</b>	<b>Science - Waves in air, fluids and solids</b> <ul style="list-style-type: none"><li>- describe wave motion in terms of amplitude, wavelength, frequency and period; define wavelength and frequency and describe and apply the relationship between these and the wave velocity</li><li>- describe how ripples on water surfaces are examples of transverse waves whilst sound waves in air are longitudinal waves, and how the speed of each may be measured; describe evidence that in both cases it is the wave and not the water or air itself that travels</li></ul> <b>Science - Waves at material interfaces: applications in exploring structures (single)</b> <ul style="list-style-type: none"><li>- describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids, and explain why such processes only work over a limited frequency range, and the relevance of this to human audition</li></ul> <b>Design and technology</b> <ul style="list-style-type: none"><li>- how electronic systems provide functionality to products and processes, including sensors and control devices to respond to a variety of inputs, and devices to produce a range of outputs</li></ul>

## Relates to:

Workshops & Theme Days	Shows	Trails	Other exhibits
<ul style="list-style-type: none"><li>• Choose Health (KS3 lower)</li></ul>	<ul style="list-style-type: none"><li>• Boggling Brains (KS3 &amp; KS4)</li><li>• How my body works (KS3)</li></ul>		<ul style="list-style-type: none"><li>• Surprising sounds</li><li>• Sound bite</li><li>• Vowel sounds</li></ul>

