



11.5 How we hear

How does the ear hear?

1. Sound waves are collected by the ear lobe or *pinna*.

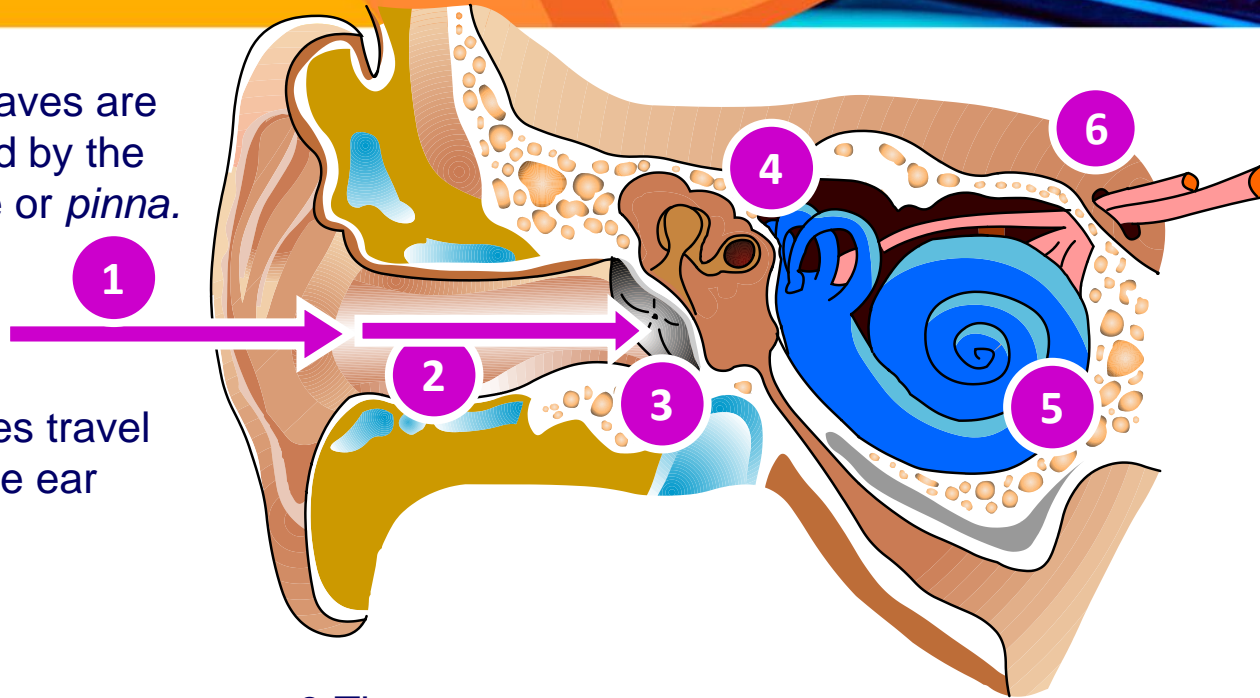
2. The waves travel along the ear canal.

3. The waves make the ear drum vibrate.

4. The small bones (ossicles) amplify the vibrations.

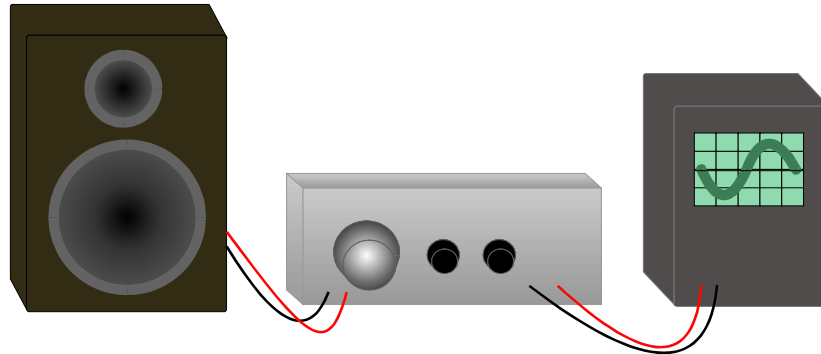
6. The auditory nerve takes the signals to the brain.

5. The cochlea turns these into electrical signals.



Hearing range

Set the volume and increase the frequency of the signal provided by the signal generator.



Humans can only hear sounds of certain frequencies.
The range of frequencies a person can hear is called their **hearing range**.

Hearing range

- Most people can hear sounds with frequencies as low as **20 Hz**. Young people (aged under 20) can usually hear sounds of up to about **20000Hz**.



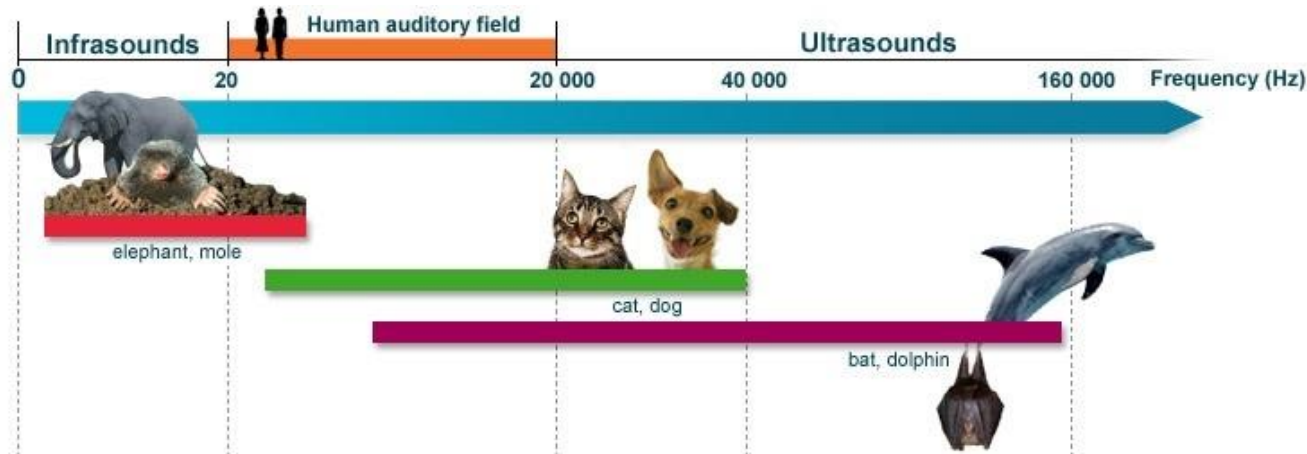
Hearing range

- As people get older, their hearing deteriorates. By the time day are 50, they may not hear sounds above 15000Hz.



Hearing range

- Sounds above 20000Hz are beyond the range of human hearing. Such sounds are known as **ultrasound**. Many animals can hear ultrasound

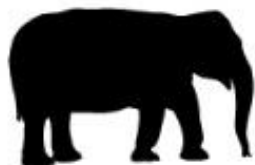


Ultrasound and infrasound



Sound waves with a frequency *too low* for the human ear to hear are called **infrasound**.

INFRA SOUND



Animals such as whales, elephants and hippopotamus use infrasound to communicate over distances.



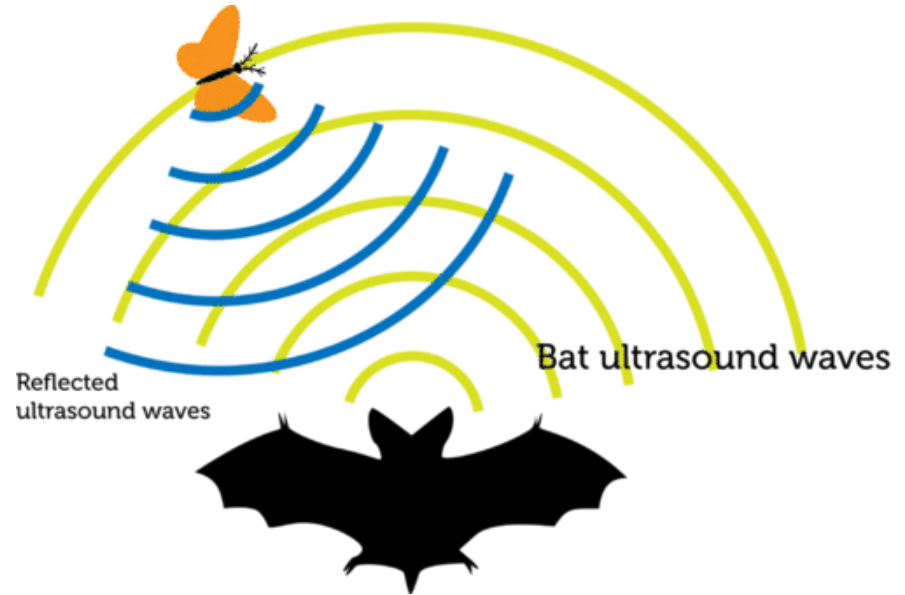
Sound waves with a frequency *too high* for the human ear are called **ultrasound**

ULTRA SOUND

Animals such as dogs, bats, birds and insects can hear ultrasound.

Ultrasound and infrasound

- Bats use ultrasound to find their way around. They emit high-pitched squeaks and listen to the reflected waves.



Noise and its effects

A noise is any unwanted sound.

- Loud sounds can damage our ears. Listening to music through headphones can be harmful if you have the volume turned up too high
- Often there are laws to protect workers who work in noisy places. They should wear ear protectors so that they do not become deaf



Noise and its effects



List three ways of reducing the effects of loud noise.

1. ear protectors

2. double glazing

3. putting noisy machinery in insulated rooms



Summary

- Our ears convert sound waves into nerve signals to the brain.
- Young people can usually hear sounds whose frequencies lie between 20Hz and 20000Hz.
- Loud sounds can damage our hearing.

