

Waves

1. Sound

CONCEPT 2

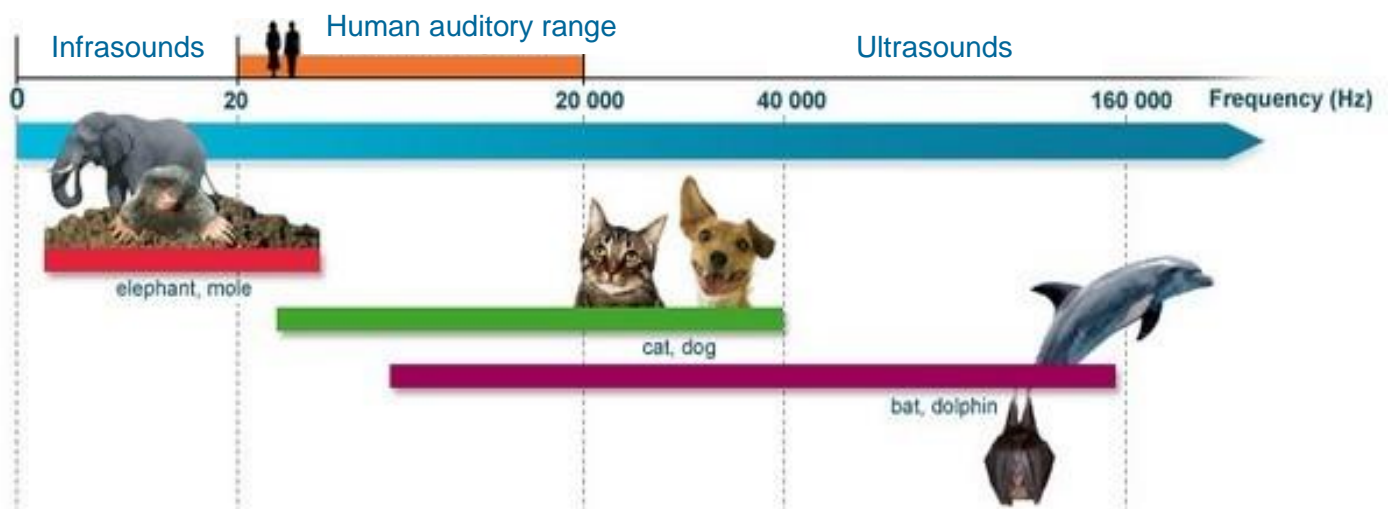
HEARING SOUNDS AND AUDITORY RANGES

NOTES

We know that sound is produced when something vibrates. We hear this vibration because air particles vibrate and energy is transferred into our ears. The number of vibrations each second determines how we hear this sound because the air particles will vibrate at the same rate.

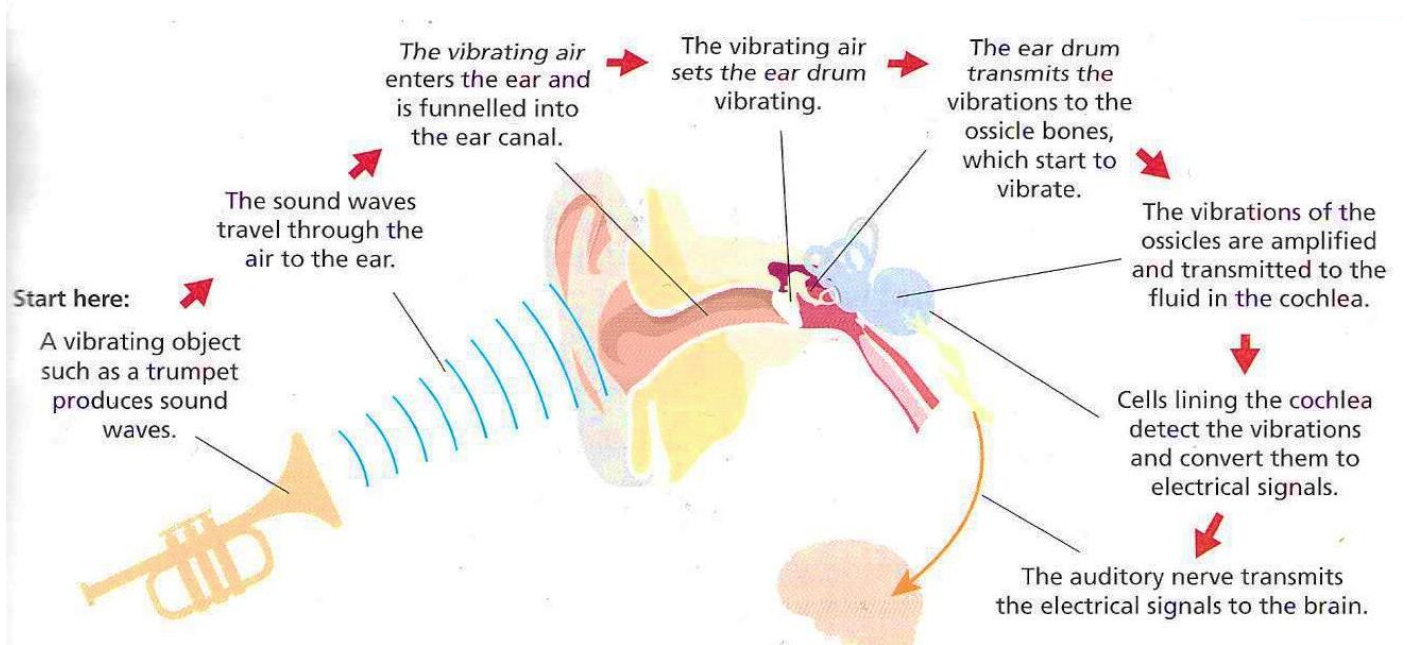
The rate of vibration (or number of vibrations each second) is called **frequency**. We measure frequency in hertz (Hz). When we hear sounds we also refer to frequency as the pitch. Low pitch (low frequency) sounds are deep bass notes. High pitch (high frequency) sounds are high squeaky treble notes.

Human ears have evolved to be able to hear sounds over an **auditory range** which is from 20 Hz to 20 000 Hz. Sounds lower than 20 Hz and sounds higher than 20 000 Hz cannot be heard.



Animals have different auditory ranges. Elephants have evolved to detecting low frequency vibrations from other elephants up to 6 km away. Bats use high frequency sounds for echolocation to help them navigate in dark caves

Humans hear sounds in the following way.



When we speak we actually hear our voice in two ways:

1. By air particles vibrating into our ears and vibrating our ear drum.
2. By the bones in our skull vibrating and vibrating the bones in our inner ear directly - called bone conduction.

This is often why we sound different when hear out voice on a recording. We are used to hearing both methods at the same time. Hearing a recording will only use method 1.

Bone conduction is a proposed method to help people with hearing problems.

The health of our ears may be affected by several factors. Some of

Causes of poor hearing or ear damage	Possible solutions
Ear canal can become blocked with wax.	Have the ear canal cleaned out.
Very loud sounds can rupture the ear drum.	Ear drum may heal itself over a long period of time.
Ear drum can be damaged by infection.	Use antibiotics to get rid of the infection.
Ossicles can become fused together.	An operation is needed.
Infections may occur in the middle ear.	Use antibiotics to get rid of the infection.
Hair cells and nerves in the cochlea may be damage by loud noises,	There is no cure.
In older people, nerve cells may deteriorate.	There is no cure