

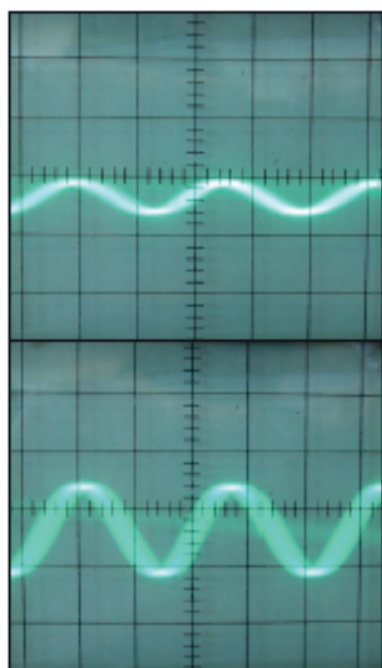
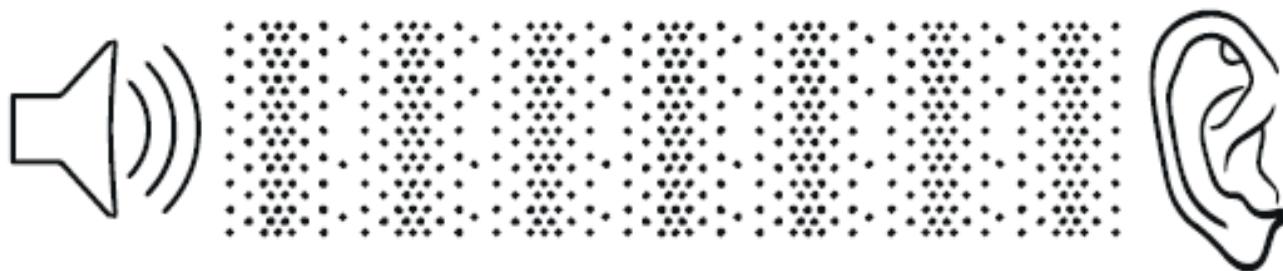
# Sound Waves

Sound is all around us from the tweeting of a bird in a tree to your Mum shouting upstairs, "Hurry up – we're late!" and the latest song from your favourite band.

Different though all these things are, they have one thing in common... They all travel to your ear as sound waves.

## Catching the Wave:

Sound waves are vibrations that move the air, in a similar way to how the wind might move the sea to make waves we can see. The waves travel towards your ear as the air particles move the next door particles until they arrive at your ear. How do the sound waves know how to get to your ear? Well, the answer is, they don't. The sound waves travel in lots of different directions from the source of the sound and your ear catches the bit that comes in your direction. Once your ear has 'caught' the sound, it carries on vibrating the tiny bones inside your ear that then turn the vibrations into electric pulses that are sent to the brain for them to be processed.



## Did you know?

**Volume of a jet engine: 150dB**

**Loudest place to work: Driving a Formula One car (140dB)**

**Highest audible pitch a human can hear: 20,000Hz**

**Highest audible pitch a bat can hear: 90,000 Hz**

**Smallest bone in your body: The stapes/stirrup bone in your ear measuring 2.6 - 3.4mm**

**Speed of sound: 340 m/s in air but 1484 m/s in water**

**Pitch:**

How fast the source of the sound vibrates is called the frequency of the sound and this is measured in hertz (Hz). The faster the vibration, the higher the frequency and the higher the pitch of the note. A low note will have a slow vibration and a lower frequency. You can make a string on an instrument have a higher frequency by shortening the string or making it tighter.

**Volume:**

Volume is how loud a sound is, no matter how high or low the pitch of the note. It is measured in decibels (dB). Think of volume being how hard the particles in the air are hitting each other, a bit like how hard you hit a rounders ball. Hit the particles hard and they will be louder and also the sound will travel further just like your rounders ball. So to make a guitar string louder, but the same pitch, you simply pluck it with more force.

# Questions About Sound Waves

1. What vibrates inside your ear to send the sound signals into your body?

---

---

2. What unit is pitch measured in?

---

---

3. What unit is volume measured in?

---

---

4. What is another name for the stirrup bone inside your ear?

---

---

5. What is the speed of sound in water?

---

---

6. Can bats hear higher pitched noises than humans?

---

---

7. How would you play a guitar string more quietly?

---

---

8. Why has the author used an exclamation mark in the first sentence?

---

---

9. Thinking about how sound travels through the air, can you think why there is no sound in space?

---

---

10. Thinking about noise levels, what safety kit does a Formula One driver need?

---

---

# Questions About Sound Waves

## Answers

1. What vibrates inside your ear to send the sound signals into your body?

**(Tiny) bones – more specifically the stirrup/stapes, hammer/malleus, anvil/incus)**

2. What unit is pitch measured in?

**Hertz (Hz)**

3. What unit is volume measured in?

**Decibels (dB)**

4. What is another name for the stirrup bone inside your ear?

**The stapes**

5. What is the speed of sound in water?

**1484 m/s**

6. Can bats hear higher pitched noises than humans?

**Yes**

7. How would you play a guitar string more quietly?

**Pluck it with LESS force/more gently**

8. Why has the author used an exclamation mark in the first sentence?

**To indicate shouting**

9. Thinking about how sound travels through the air, can you think why there is no sound in space?

**Discuss: space is a vacuum so there are no particles to move around to transfer vibrations so there is no sound.**

10. Thinking about noise levels, what safety kit does a Formula One driver need?

**Earplugs - They actually have custom made ones.**

**Discuss:**

- **What are the ramifications of long term exposure to loud noises?**
- **How loud do the children have their earphones? A safe rule of thumb to try is holding your earphones at arm's length. If you can still hear the music, it is too loud.**