Sound Waves

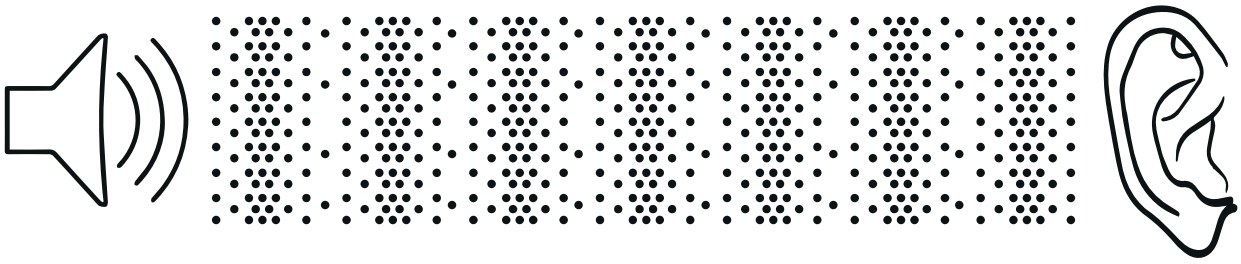
Sound is all around us. We can hear a bird in a tree, your Mum shouting upstairs, "Hurry up – we're late!" and we can listen to our favourite songs and music.

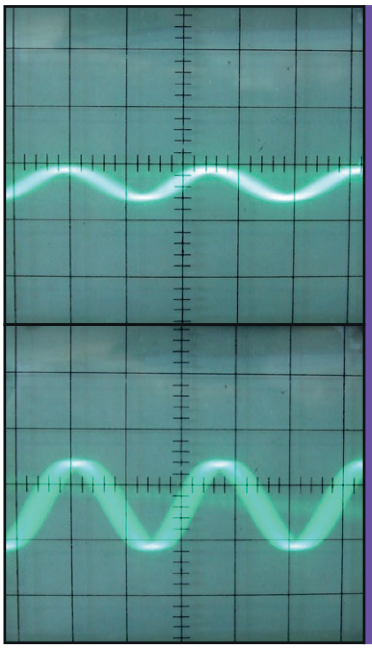
These are all different types of sounds but they have one thing in common… They all travel to your ear as sound waves.

Catching the Wave:

Sound waves are vibrations (little wobbles) that move the air, in the same way that the wind moves the water in the sea to make waves. 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 where the sound is made 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 which turn the vibrations into electric pulses that are sent to the brain.





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:

The pitch of a sound is how high or low it sounds. This depends on how quickly the source of the sound vibrates. This 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). The volume is 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 the sound will travel further just like your rounders ball. So to make a guitar string louder, but the same pitch, you 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 air?

6. Can bats hear higher pitched noises than humans?

7. How would you play a guitar string louder?

8. Why has the author put **(little wobbles)** in brackets next to the word 'vibrations' in the first sentence?

9. Sound needs air or other particles to move for it to work. In space there is a vacuum and no particles... do you think we can hear 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 air?

   340 m/s

6. Can bats hear higher pitched noises than humans?

   Yes

7. How would you play a guitar string louder?

   Pluck it with more force/harder

8. Why has the author put **(little wobbles)** in brackets next to the word 'vibrations' in the first sentence?

   To explain what vibrations mean in case the reader does not know

9. Sound needs air or other particles to move for it to work. In space there is a vacuum and no particles... do you think we can hear 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.**

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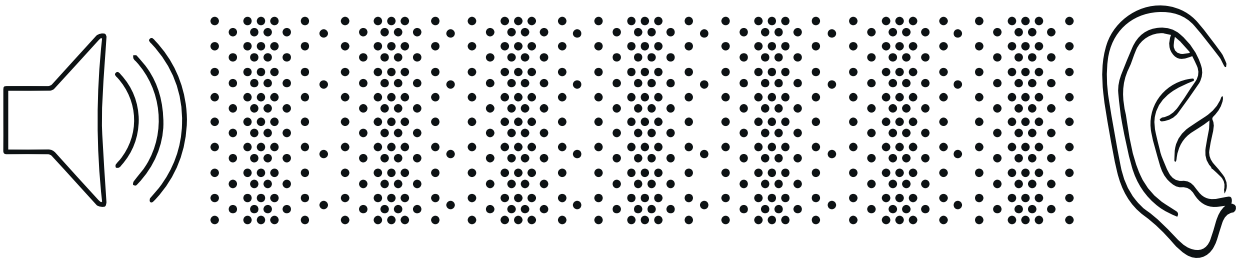
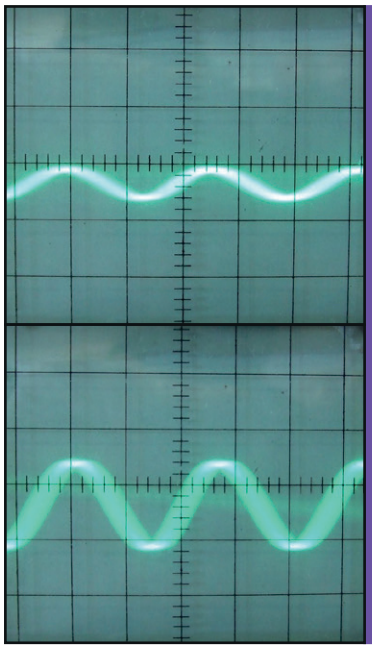
Different though all these things are, they have one thing in common… They all travel to your ear as sound waves.

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.





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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?

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   Decibels (dB)

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   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.

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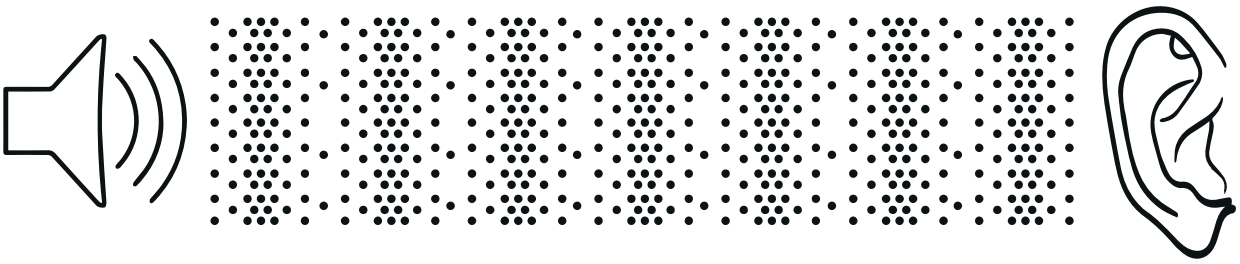
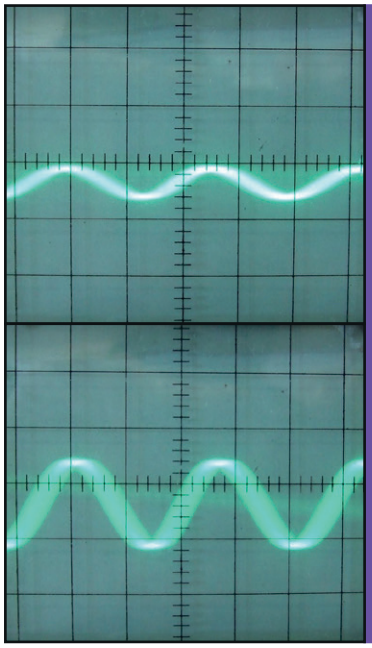
Catching the Wave:

Sound waves are vibrations that move particles in the air, similar to how the wind moves the sea to make the waves we can see. The waves travel towards your ear as the air particles move the adjacent particles – a bit like a slinky spring – until they reach your ear. How do the sound waves know how to get to your ear? Do they have a satnav? Well, the answer is, no, they don't. The sound waves travel in multiple directions from the source and your ear collects the ones that come in your direction. Once your ear has 'caught' the sound, it carries on vibrating the tiny bones inside your ear – called the stirrup, hammer and anvil – that then turns the vibrations into electric pulses that are sent to the brain for processing.





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5. Why do you think that sound travels faster in water? (Hint: think about the particles in a liquid and a gas)

6. In the fact file, what does the word 'audible' mean?

7. How would you make a guitar string have a lower frequency?

8. Why has the author used inverted commas around the word 'caught' in the Catching the Wave paragraph?

9. Why is there no sound in space?

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5. Why do you think that sound travels faster in water? (Hint: think about the particles in a liquid and a gas)

   The particles are closer together

6. In the fact file, what does the word 'audible' mean?

   Something you can hear/ loud enough to hear

7. How would you make a guitar string have a lower frequency?

   Lengthening or loosening the string (the opposite of the information given about raising the pitch)

8. Why has the author used inverted commas around the word 'caught' in the Catching the Wave paragraph?

   Because an ear does not actively 'catch' as we might catch a ball with our hands.

9. Why is there no sound in space?

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

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