Sound Waves

What Sounds Can You Hear?

Sounds are all around us from the tweeting of a bird in a tree to your mum shouting upstairs, "Hurry up – we're late!" to the latest song from your favourite band. The sounds we hear can be very different but they all have one thing that is the same. They all travel to your ear as sound waves.

What Is a Sound Wave?

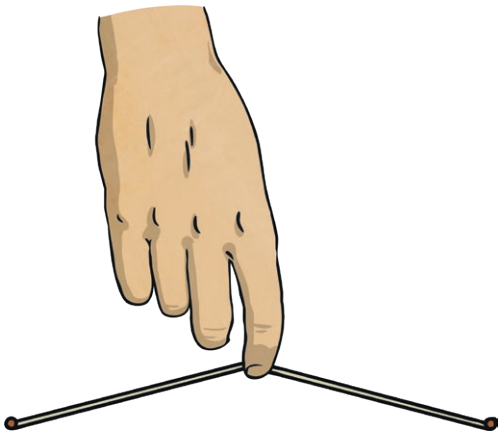
Sound waves are vibrations that move the air around us. The waves travel towards your ear by vibrating the air near to where the sound was made which then vibrates the next bit of air and so on until the wave arrives at your ear. Sound waves travel in lots of different directions from where the sound first started. Your ear 'catches' the bit that comes in your direction. Once your ear has 'caught' the sound, it carries on vibrating inside your ear all the way to your ear drum. These vibrations are then turned into an electric message that your brain reads and tells you what sound you have heard.

What Is Pitch?

Pitch can be high or low. A high pitch sound is like chalk screeching on a blackboard and a low pitch sound is like the rumble of thunder. The pitch of a sound tells us how fast the sound vibrated when it was first made. A low note will have a slow vibration and a lower frequency. A high note will have a fast vibration and a higher frequency. You can make a string on an instrument have a higher pitch by shortening the string or making it tighter.

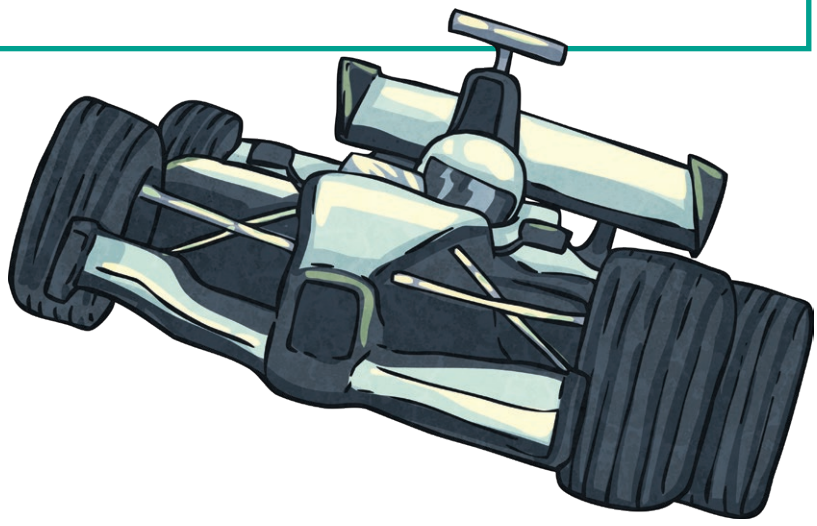
What Is Volume?

Volume is how loud a sound is, no matter the pitch of the note. It is measured in decibels (dB). Volume is the strength of the vibration the sound makes. A quiet sound has a gentle vibration and moves the air gently. A loud sound has lots of strength, moves the air with greater force and travels further. If we wanted to make the sound from a guitar string louder, but the same pitch, we would simply pluck it harder.



Did You Know?

- The volume of a jet engine is 150 dB.
- The loudest job in which to work is being a driver of a Formula One car which is 140 dB.
- The highest pitch a human can hear is 20 000 Hz.
- The highest pitch a bat can hear is 90 000 Hz.
- The smallest bone in your body is called the stapes/stirrup bone. It is found in your ear and measures 2.6-3.4mm.
- The speed of sound is 340 metres per second in air but 1484 metres per second in water.



Questions

1. What vibrates inside your ear to send signals into your body? Tick one.

   - ○ skin
   - ○ ear drum
   - ○ brain
   - ○ wax

2. What part of the body tells you what sound you have heard? Tick one.

   - ○ the brain
   - ○ the ear drum
   - ○ the ear canal
   - ○ the ear lobe

3. Which one of these is a high-pitched sound? Tick one.

   - ○ thunder
   - ○ a lion's roar
   - ○ chalk on a blackboard
   - ○ a jet engine

4. Number the events in order to show how a sound travels to the ear.

	The vibrations are then turned into an electric message.
	The sound is made.
	The ear 'catches' the sound.
	Sound waves move the air.
	You hear the sound.

5. What is the speed of sound in air?

_____

6. Fill in the missing words.

   A high note will have a _____ vibration and a _____ frequency.

7. Sum up what you have learnt about volume in two sentences or less.

Answers

1. What vibrates inside your ear to send signals into your body? Tick one.

   ○ skin
   ⊗ ear drum
   ○ brain
   ○ wax

2. What part of the body tells you what sound you have heard? Tick one.

   ⊗ the brain
   ○ the ear drum
   ○ the ear canal
   ○ the ear lobe

3. Which one of these is a high-pitched sound? Tick one.

   ○ thunder
   ○ a lion's roar
   ⊗ chalk on a blackboard
   ○ a jet engine

4. Number the events in order to show how a sound travels to the ear.

4	The vibrations are then turned into an electric message.
1	The sound is made.
3	The ear 'catches' the sound.
2	Sound waves move the air.
5	You hear the sound.

5. What is the speed of sound in air?

   The speed of sound in air is 340 metres per second.

6. Fill in the missing words.

   A high note will have a ***fast*** vibration and a **higher** frequency.

7. Sum up what you have learnt about volume in two sentences or less.
   Accept any answers which explain that volume is the strength of the wave and the stronger the wave, the louder the sound.

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!" to the latest song from your favourite band.

Although all of these sounds are very different, they all have one thing in common. Do you know what it is? They all travel to your ear as sound waves.

Sound Waves

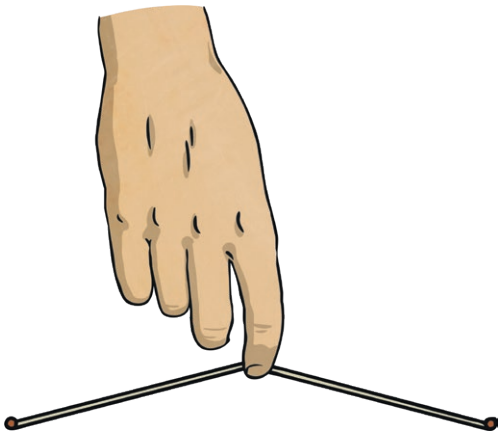
Sound waves are vibrations that move air molecules. The waves travel towards your ear by vibrating the molecules around them which then shake the neighbouring molecules and so on until they arrive at your ear. How do the sound waves know how to get to your ear? Well, the answer is they don't. The sound waves travel in many different directions from the source of the sound and your ear 'catches' the bit that travels towards you. Once your ear has 'caught' the sound, it carries on vibrating the ear drum and tiny bones inside your ear that then turn the vibrations into electrical pulses that are sent to the brain for them to be processed.

Pitch

Pitch is how fast the initial sound vibrates. It is called the frequency of sound and is measured in hertz (Hz). A dolphin's squeak will have a fast vibration and a higher frequency creating a higher-pitched note. A low note, like the rumble of thunder, will have a slow vibration and a lower frequency. To change the pitch on a string instrument, you could shorten the string or make it tighter to give a higher frequency, or loosen the string to give a lower frequency.

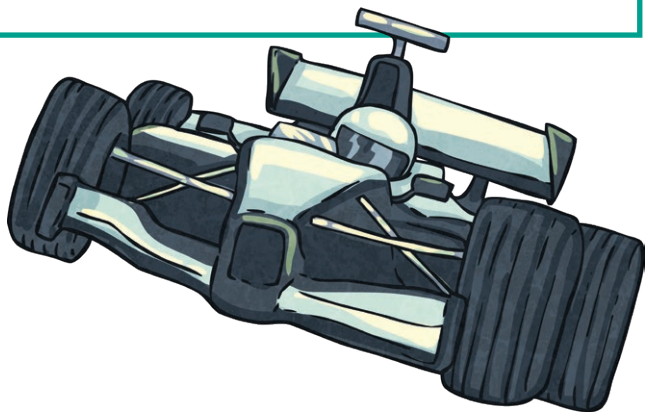
Volume

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 as being the strength of the vibration. If the sound is loud, it will have a strong vibration and the molecules in the air will be striking each other harder. This means the sound will be louder and will travel further. If the sound is quiet it will have a gentle vibration and the molecules won't be striking each other as hard or travelling as far. So, if we want to make a guitar string louder, but the same pitch, we simply pluck it with more force.



Did You Know?

- Volume of a jet engine: 150 dB
- Loudest job in which to work: driving a Formula One car which is 140 dB
- Highest pitch a human can hear: 20 000Hz
- Highest pitch a bat can hear: 90 000Hz
- Smallest bone in your body: the stapes/stirrup bone in your ear measuring 2.6-3.4mm
- Speed of sound: 340 metres per second in air but 1484 metres per second in water



Questions

1. What do sound waves make air molecules do? Tick one.

   - ○ disappear
   - ○ vibrate
   - ○ get bigger
   - ○ get smaller

2. How could you create a higher-pitched noise on a string instrument? Tick one.

   - ○ loosen the string
   - ○ pull the string with more force
   - ○ tighten the string
   - ○ pull the string gently

3. Match the endings to make full sentences.

Pitch is measured in	decibels.
Volume is measured in	150 dB.
The volume of jet engine is	hertz.

4. Number the events in order to show how a sound travels to the ear.

	The vibrations are then turned into an electric pulse.
	The sound is created.
	The ear 'catches' the sound.
	The sound wave vibrates the air molecules.
	The brain processes the electrical pulse.

5. Fill in the missing words.

   If the sound is _____, it will have a _____ vibration and the molecules in the air will be striking each other _____.

6. What happens if you pluck a guitar string with more force?

7. Explain what all sound waves have in common.

8. Thinking about noise levels, what safety kit would you need if you were a Formula One driver? Explain your answer.

Answers

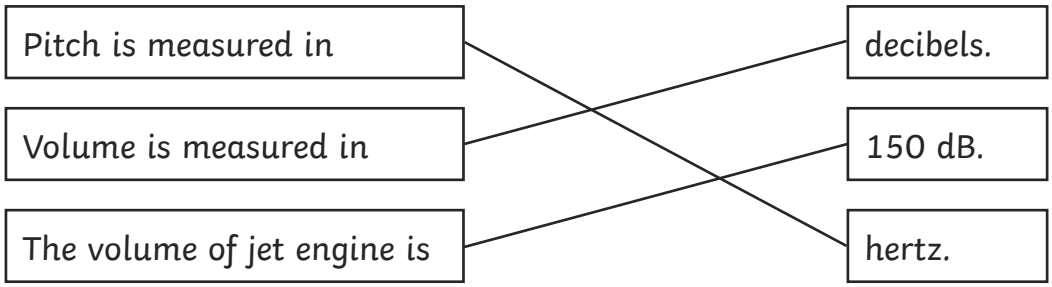
1. What do sound waves make air molecules do? Tick one.

   ○ disappear
   ⊗ vibrate
   ○ get bigger
   ○ get smaller

2. How could you create a higher-pitched noise on a string instrument? Tick one.

   ○ loosen the string
   ○ pull the string with more force
   ⊗ tighten the string
   ○ pull the string gently

3. Match the endings to make full sentences.



4. Number the events in order to show how a sound travels to the ear.

4	The vibrations are then turned into an electric pulse.
1	The sound is created.
3	The ear 'catches' the sound.
2	The sound wave vibrates the air molecules.
5	The brain processes the electrical pulse.

5. Fill in the missing words.

   If the sound is **loud**, it will have a **strong** vibration and the molecules in the air will be striking each other **harder**.

6. What happens if you pluck a guitar string with more force?
   Accept any answer which explains that the volume of the sound will be louder and the sound will travel further as the sound wave produced will have more strength.

7. Explain what all sound waves have in common.
   The one thing that all sound waves have in common is that they all travel to our ears as sound waves.

8. Thinking about noise levels, what safety kit would you need if you were a Formula One driver? Explain your answer.
   Accept any answers which explain that Formula One driving is a very noisy job and loud noises can do long-term damage to your ears. So, it would be advisable to wear some kind of ear defenders under their helmet, such as ear plugs.

Sound Waves

Sounds are a vital part of everyday life and they come from a variety of unique sources. Although these sounds can be extremely different from each other, they all have one thing in common. Do you know what it is? They all travel to your ear as sound waves.

Sound Waves

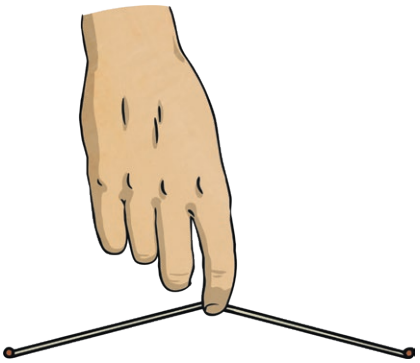
Sound waves are vibrations that vibrate air molecules. The waves travel towards your ear by vibrating the molecules around them which then shake their neighbouring molecules and so on until they arrive at your ear. How do the sound waves know how to get to your ear? Well, the answer is they don't. The sound waves travel in many different directions from the source of the sound and your ear 'catches' the bit that travels towards you. Once your ear has 'caught' the sound, it carries on vibrating the tiny hairs and bones inside your ear that then turn the vibrations into electrical pulses that are sent to the brain for them to be processed.

Pitch

Pitch is how fast the source of the sound vibrates. It is called the frequency of sound and is measured in hertz (Hz). The faster the vibration, the higher the frequency and the higher the pitch of the note. A fast vibration will create a high-pitched sound like a squeal. A low note, like the rumble of thunder, will have a slow vibration and a lower frequency. To change the pitch of a string instrument, the string could be tightened to produce higher-pitched sounds and loosened to produce lower-pitched notes.

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 as being the strength of the vibration caused by the sound. A loud sound will have a great deal of energy and will vibrate vigorously, producing a powerful sound wave. This means it will be louder and travel a further distance. A quieter sound will have less energy and not vibrate as much therefore creating a quieter sound that travels a shorter distance. Therefore, if we wanted to make a guitar string louder but maintain the same pitch, we would simply pluck it with more force.

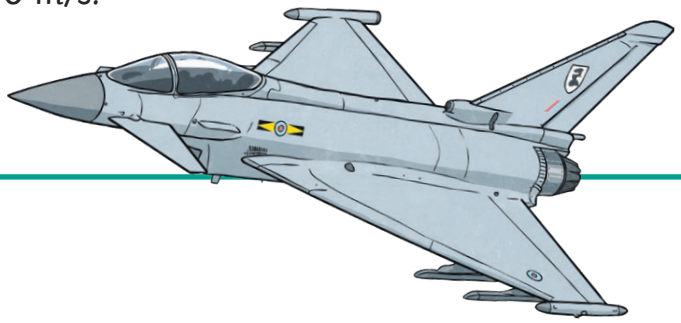


Numbers and Sound

The volume of a jet engine is 150 dB! The loudest job in which you could work would be driving a Formula One car. This is because the volume of one of these cars is 140 Db. The highest audible pitch that a human can hear is 20 000Hz whereas the highest audible pitch which a bat can hear is 90 000Hz. The stapes/stirrup bone in your ear is the smallest bone in your body, measuring just 2.6-3.4mm.

Did You Know?

- The speed of sound in air is 340 m/s.
- The speed of sound in water is 1484 m/s.



Questions

1. What is the volume of a jet engine? Tick one.

   ◯ 140 dB
   ◯ 145 dB
   ◯ 150 dB
   ◯ 155 dB

2. Number the events in order to show how a sound travels to the ear.

	The vibrations are then turned into an electric pulse.
	The sound is created.
	The ear 'catches' the sound.
	The sound wave vibrates the air molecules.
	The brain processes the electrical pulse.

3. Fill in the missing words.

   A _____ vibration will create a _____-pitched sound like a _____.

4. Why does a louder noise travel further?

   _____

5. Explain how you could produce a lower pitched note on a string instrument?

   _____

6. Why has the author used inverted commas around the word 'caught' in the Sound Waves paragraph?

   _____

   _____

7. Thinking about noise levels, would you like to be Formula One driver? Explain your answer.

8. Explain why you think the speed of sound in water is quicker than the speed of sound in air.

Answers

1. What is the volume of a jet engine? Tick one.

   ◯ 140 dB
   ◯ 145 dB
   ⊗ 150 dB
   ◯ 155 dB

2. Number the events in order to show how a sound travels to the ear.

4	The vibrations are then turned into an electric pulse.
1	The sound is created.
3	The ear 'catches' the sound.
2	The sound wave vibrates the air molecules.
5	The brain processes the electrical pulse.

3. Fill in the missing words.

   A ***fast*** vibration will create a **high**-pitched sound like a **squeal**.

4. Why does a louder noise travel further?
   Accept any answer which explains a louder noise produces a wave with more strength and energy which allows it to travel further.

5. Explain how you could produce a lower pitched note on a string instrument?
   Accept any answer which explains the string would need to be loosened to create a low-pitched note.

6. Why has the author used inverted commas around the word 'caught' in the Sound Waves paragraph?
   Accept any answer which explains that the author has used inverted commas to show that the ear does not actively catch the sound like we can catch a ball.

7. Thinking about noise levels, would you like to be Formula One driver? Explain your answer.
   Pupils' own responses, such as: I wouldn't like to be a Formula One driver as it is a noisy job and I'd be worried about damaging my hearing. Or, I would like to be a Formula One Driver but I would make sure I wore some earplugs to protect my ears from the noise levels.

8. Explain why you think the speed of sound in water is quicker than the speed of sound in air.
   Accept any answer which discusses that the particles are set closer together in liquid than in air so the sound can travel quicker.