

The Big Questions -

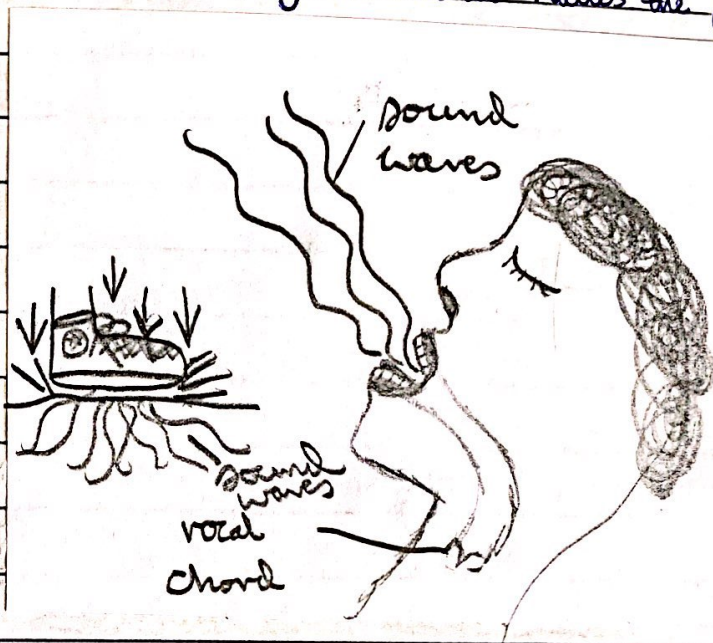
Some children are playing loudly in the street. How can my friend still hear them, even though her balcony door is closed?

How is the sound produced?

the sound is produced when the childrens vocal chords vibrate and their feet are hitting the ground when they run, this makes the particles around them vibrate as well.

How does it travel?

sound travels as a longitudinal wave when the sound is produced it makes particles vibrate, however these particles do not move permanently, sound travels fastest in solids as the particles are closest together.

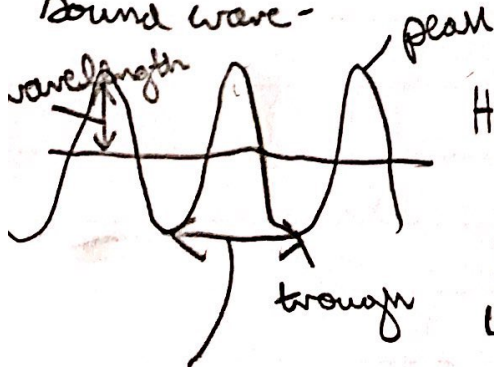


sound travels slowest in gases because the particles are further apart, in liquids it travels second fastest.

How does she pick up the sound?

When the waves reach her ears, they make her eardrums vibrate, this then moves down her auditory nerve as a electrical signal to her brain.

Sound wave -



Higher frequency = Higher pitch

Bigger wavelengths: louder sound

frequency  
medium pitch  
loud

high pitch  
quiet  
low pitch  
quiet

How can she block out the sound?

she could try putting up noise cancelling curtains and filling her room with soft objects, this is because soft things absorb sounds rather than reflecting them, creating an echo.

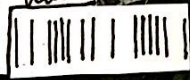
how is the sound produced?

Sound is produced through vibrations. Sound waves bounce off particles (e.g. solids). To create a louder sound, a good thing to avoid are soft objects like pillows and blankets. Soft objects dampen the sound. Sound is also louder when it travels through solids rather than liquids or gases.



how does sound travel?

longitudinal waves have vibrations which are parallel to the direction of the wave, as the wave bounces off its particles hit her glass window and sends the sound waves to her ear. The objects surrounding her could have been all/mostly solids.



object rates



air vibrates



ear drum vibrates



ear bones vibrate



hairs vibrate in the cochlea, sending a message to the brain.

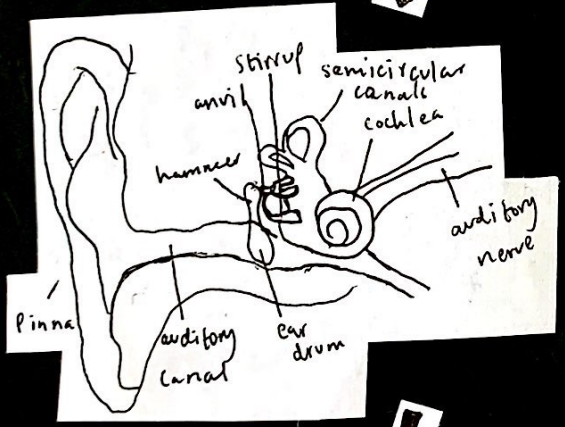
how does my friend detect it?

Sound waves make your eardrum vibrate. The lady could also detect it because her window is a solid and her curtains might be open. If her curtains were closed they would dampen the sound. And perhaps she was sitting quite close to her windows.

What should she do?



She could close her curtains to help absorb the sound, or she could move to another room with a closed door. She could also ask the children to move to a garden or a place that was a soft surface (e.g. grass) so the sound will be dampened.

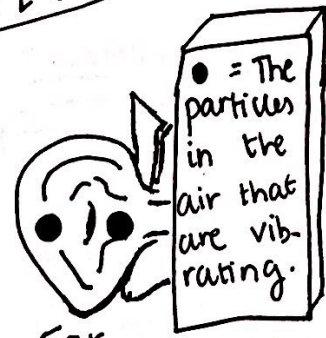
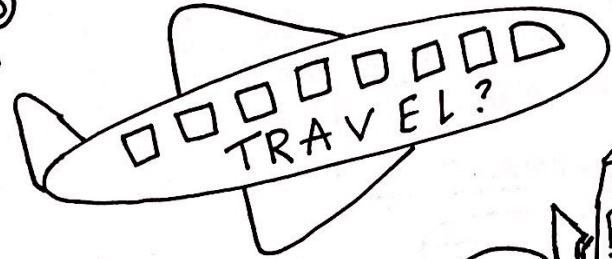


Her friend can hear the children on her street because the hard concrete allows the sound vibrations travel. Sound waves are collected by the ear lobe or pinna, this acts like a funnel to collect sound waves and bring them via the ear canal to the ear drum and cochlea. The auditory nerve sends signals to the brain.

By Dora

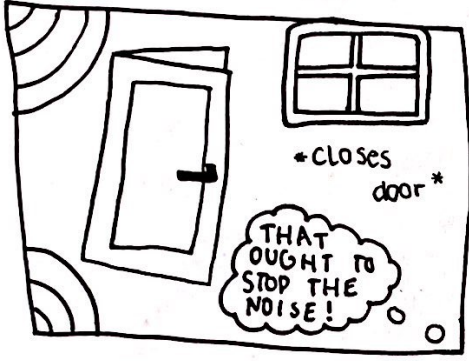
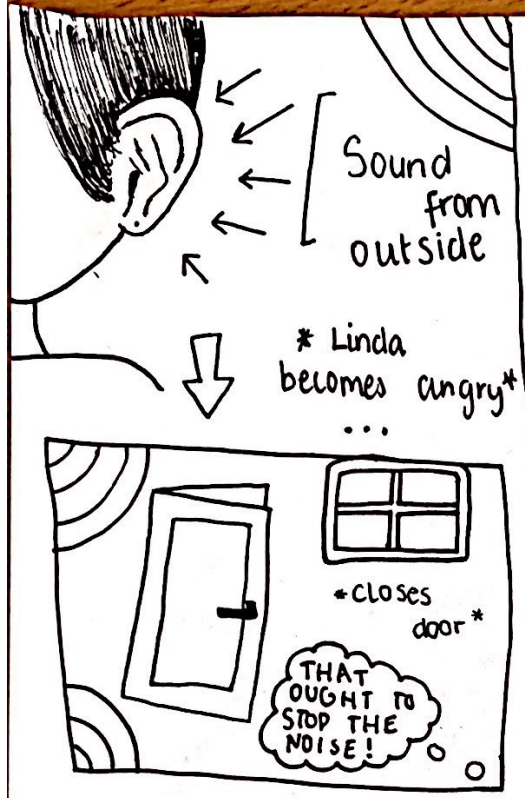
By Ramina

HOW - does - SOUND

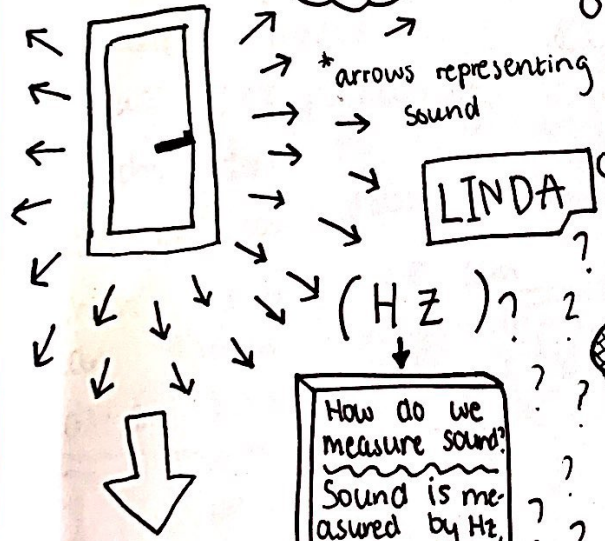


FUN FACT: THE HUMAN HEARING RANGE IS BETWEEN 20 to 20 THOUSAND HZ

Cochlea vibrates, sending a message to the brain.



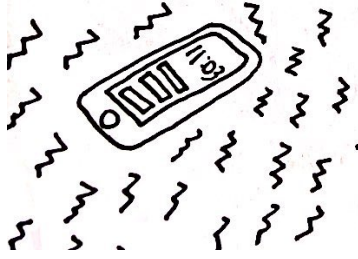
BUT I CLOSED THE DOOR?!



How do we measure sound? Sound is measured by Hz, the Symbol for Hertz.

WHY?

Sound waves are produced by vibrations, they detect noise & transfer energy.

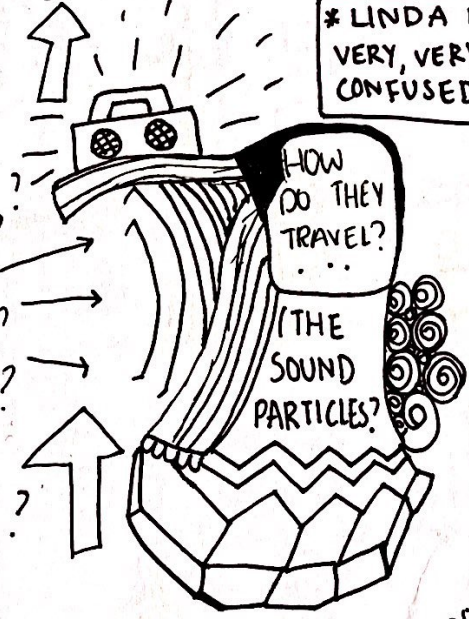


THE PHONE IS VIBRATING WHICH MEANS THE PARTICLES ARE BUMPING INTO EACH OTHER.

(ignore how bad my ear looks)

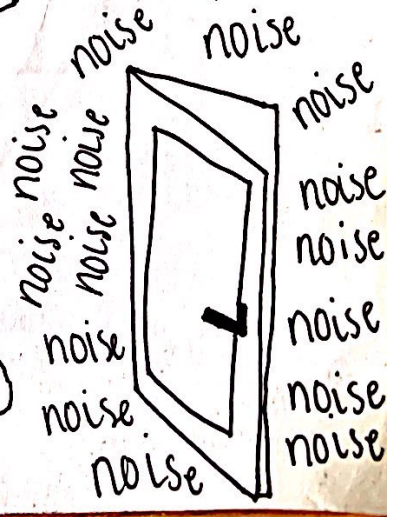
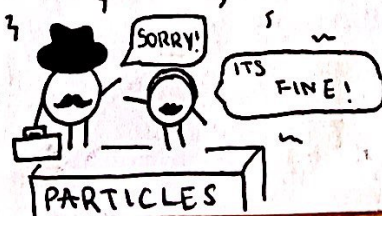
\* The ruler is vibrating currently -

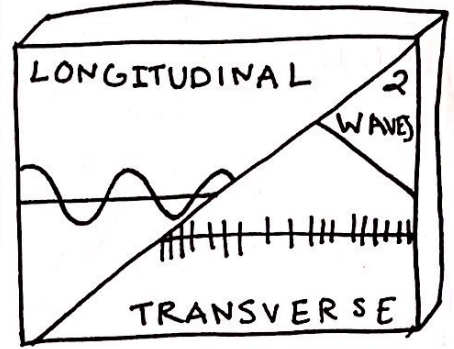
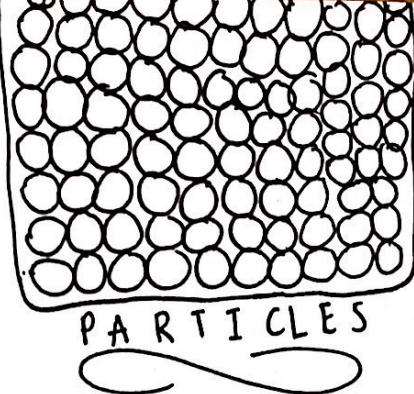
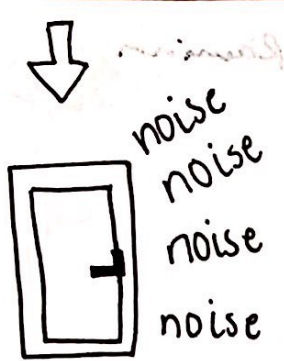
\* LINDA IS VERY, VERY CONFUSED\*



OK ... but why can I still hear noise with my door closed? ...

Vibrations are created by particles bumping into each other. Solids cant move, only vibrate.





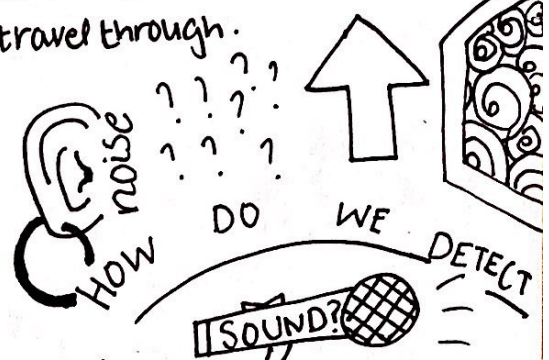
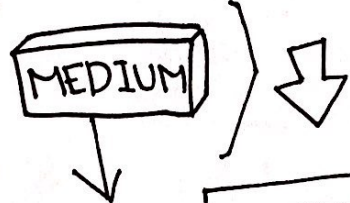
With the door closed, how come she can still hear some of the noise?????

The sound particles need a medium to travel through, so that they can vibrate. A door is a type of medium for the sound to travel through.

FUN FACT: A LOT OF OLDER PEOPLE'S EARS DRUMS DON'T VIBRATE AS WELL

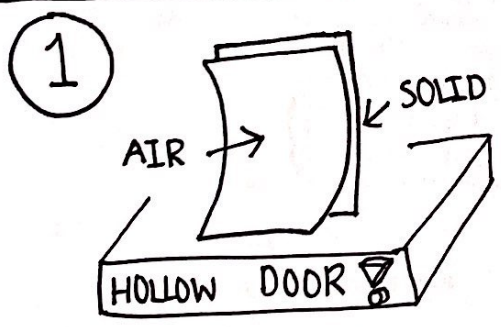


MEDIUM:  
• LIQUID  
• SOLID  
• GAS

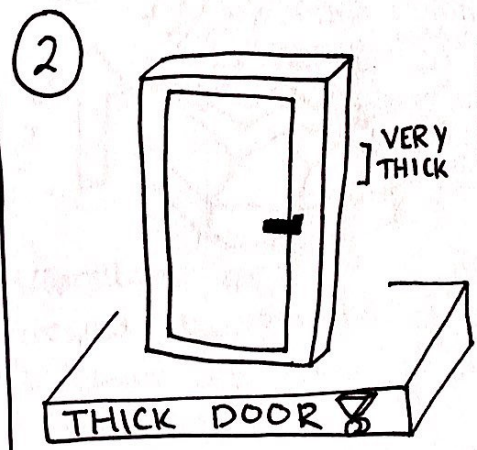


Sound travels through the particles in the door to get to our ears, which is why we can hear sounds through closed doors! 😊

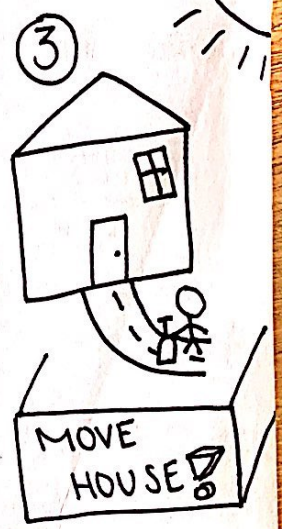
### SOLUTIONS!



1 If the inside of the door is hollow, it'll just have air inside so the particles have nowhere to travel & you can't hear noise!



2 If you have a thick door, there'd be many particles, so by the time the sound travels through the particles, 'use their energy'.



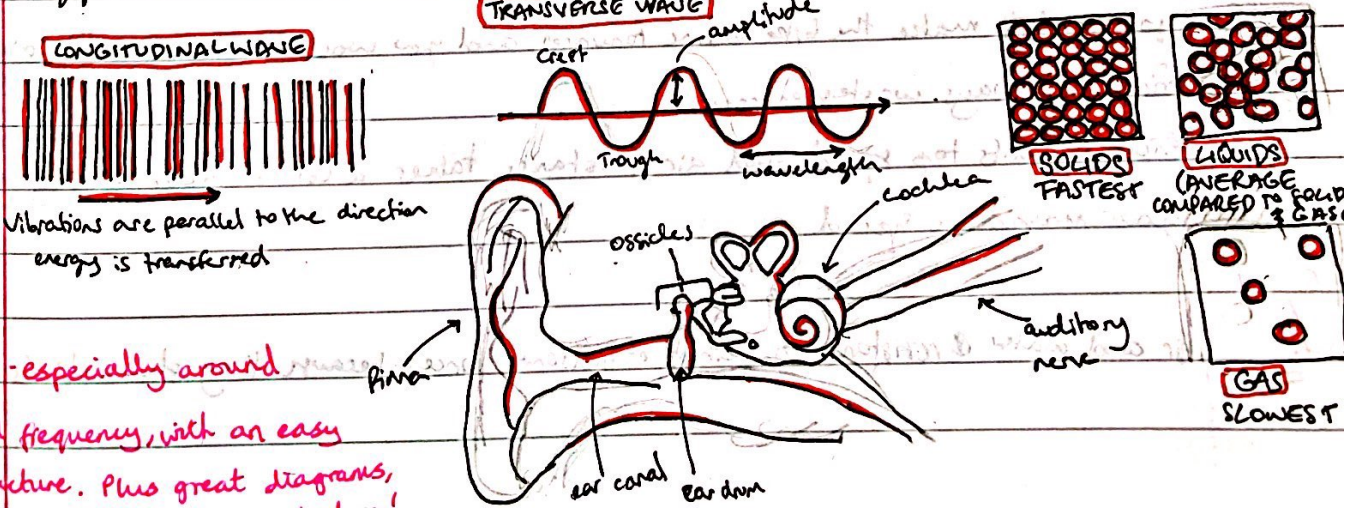
3 If you move house the kids won't be there to annoy you!

## By Sophia

### The Big Question

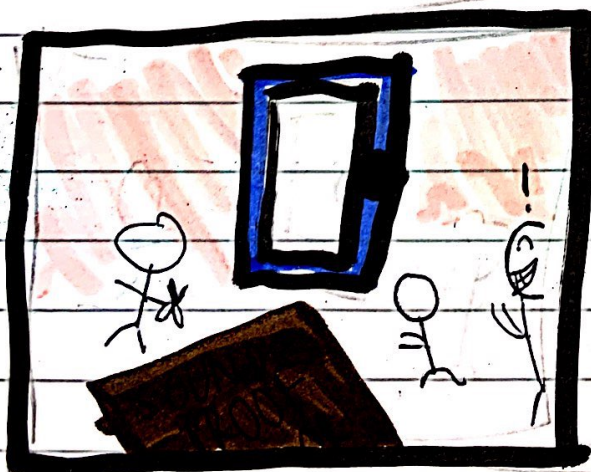
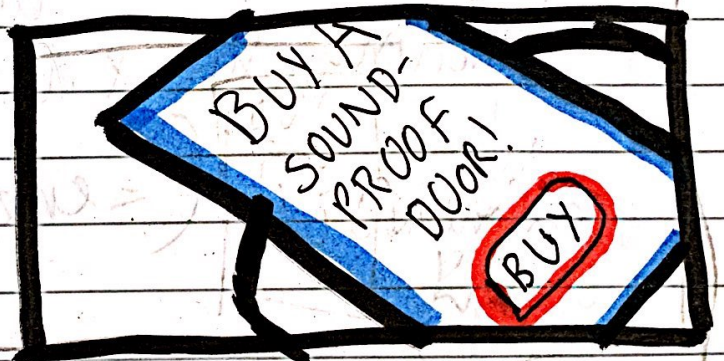
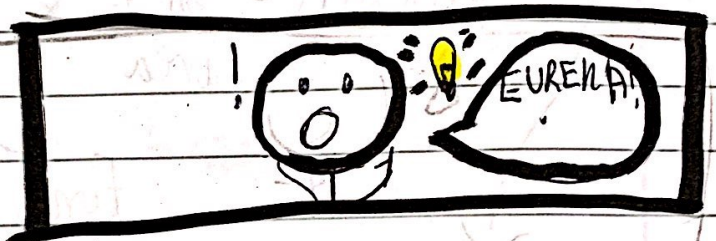
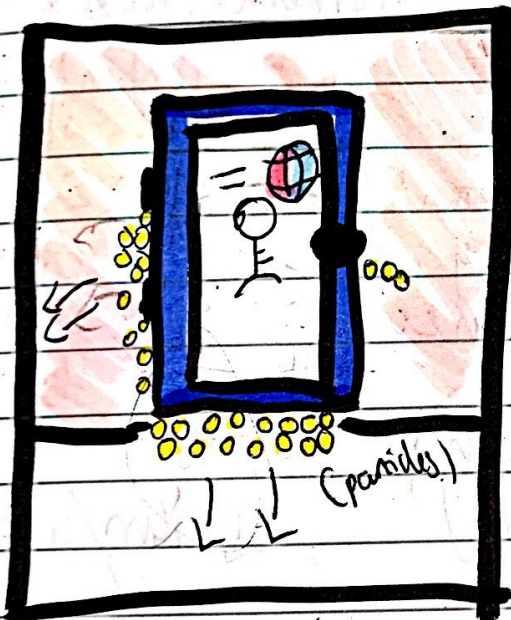
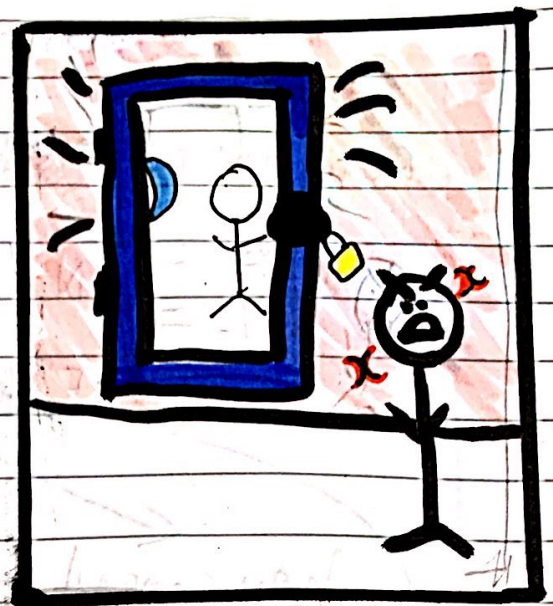
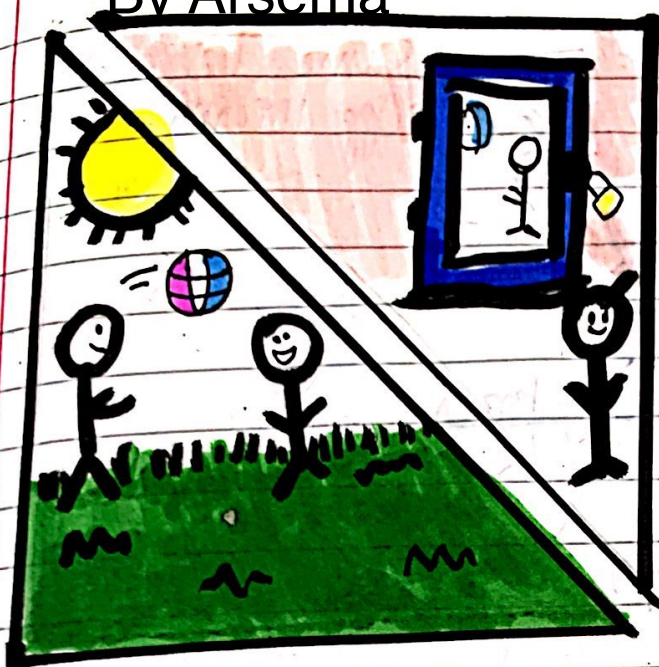
Sound is produced in the children's voicebox. They create sound waves (longitudinal waves) by air molecules vibrating through the air. The vibrations are parallel to the direction the energy is transferred in longitudinal waves unlike transverse waves where vibrations are parallel to the direction of energy transfer. Considering that Sarah can hear the children playing from her flat, we can presume that the sound waves that they are producing are at a high amplitude. The amplitude is the distance between the wave at its resting position and maximum height so the higher the amplitude, the louder the sound. Children also tend to have high pitched voices because the sound waves they are producing are at a higher frequency (measured in hertz). Frequency and pitch are proportional so the higher the frequency, the higher the pitch. For Sarah to hear the sound being produced by the children, the

vibrations need to reach her ear. The waves are collected by the pinna which has evolved to have a large surface area (thankfully) and travels through the ear canal. The sound wave makes the eardrum vibrate and these vibrations are passed through a collection of bones called the ossicles (mallet, hammer and anvil). It is worth noting that the eardrum moves more for louder sounds, less for quieter sounds, fast for high pitch sounds and slow for low pitch sounds. The vibrations will then travel to Sarah's cochlea where electrical signals are passed on through the auditory nerve and then sent to the brain where they are decoded and interpreted by Sarah as annoying children having fun! What would also create added annoyance would be a possible reverberation as the sound waves reflect off the concrete pavement and possibly off the walls of the building depending on its texture. Concrete can easily reflect sound because it is a hard, smooth surface. My advice for Sarah would be to add insulation to her flat and if she has large glass windows leading on to the balcony, insure they are double glazed. This would create an extra obstacle that the sound waves produced by the children would have to travel through. This would ultimately reduce the energy transfer in the waves until the sound wave is inaudible which I am sure would please Sarah. In gases like air for example sound travels the slowest because the particles are the furthest apart. In liquids neither very fast or slow because particles are not as far apart as in a gas but not as close as in a solid, so as expected sound travels fastest in solids because particles are closest together due to its rigid structure. However, double glazing does effectively cancel out noise because it is more dense. As you can imagine, materials that are more dense are harder for sound to travel through because particles are more sluggish and do not vibrate enough for the vibrations to be audible to humans.



ask detail - especially around  
 amplitude and frequency, with an easy  
 read structure. Plus great diagrams,

By Arsema



By Sienna

## The big question

Sound is produced by vibrations. ~~Vibe~~ A vibration is when something moves back and forth from the same rest positions. The sound waves transfer energy but they don't transfer matter. If a sound wave has a big amplitude it is loud. If a sound wave has a high frequency it is high in pitch. An echo is produced when a sound wave bounces off a flat, hard and smooth surface.

Sound waves are longitudinal meaning the particles and waves move in the same direction. Sound travels by particles vibrating which make the particles next to them vibrate. ~~Sound~~ <sup>It travels</sup> travels the quickest in solids because the particles are closest together and slowest in gases because the particles are far apart and random. Sound can not travel through a vacuum because there are no particles e.g. space.

Sound is detected by the waves being collected by the ear lobe or pinna. The sound travels along the ear canal and makes the eardrum vibrate. If the sound is high pitch it will vibrate quickly. The ossicles amplify the vibrations as they pass through. The cochlea turns the vibrations into electrical signals which are sent to the brain by the auditory nerve.

To quieten sound you could ~~have~~ <sup>use</sup> many soft surfaces because they will absorb the sound compared to flat, hard surfaces which produce echoes. Also by having different mediums (e.g. gas and a solid) it will reduce the sound. For example by having double glazed windows the sound waves will lose energy when they change from going through the window and air. Sound also travels slower in gases than solids which helps.



Sound is produced by Oscillations, when the children on the street talk, their vocal chords begin to vibrate which creates a sound wave, sound waves are longitudinal waves which means the vibrations are parallel to the direction of the energy transfer. If the children are speaking very loudly then the sound waves will have a higher amplitude and their voices are very high pitched the waves will have a high frequency.

The sound wave travels by the vibrations in the particles in the air which bounce against other particles to make them vibrate and allow the sound to travel, sound travels fastest in a solid as the particles are close together and hit other particles faster, it travels slower in a gas as the particles are far apart, sound wouldn't travel at all in a vacuum as there would be no particles in the air for the wave to travel across. The sound wave travels through the air and through the closed windows of the flat as the sound waves can travel through the particles in a solid, because the windows are closed it would be quieter because the sound waves lose energy when they change between mediums but it's still loud enough to hear.

You hear this because the sound waves are detected by your ear lobe as the shape helps you collect the sound more, the waves then travel along your ear canal and then make the ear drum vibrate (bigger vibrations for a louder sound and faster movements for a higher sound). The small bones in your ear (ossicles) then amplify the sounds so the cochlea can turn them into electrical signals to send to the brain.

If she wants to stop hearing the children she could replace her windows with double pane windows - this would dampen the sound because the sound waves lose energy when they travel through different mediums and because double paneled windows have 2 layers of glass with air in between the sound wave would lose more energy as the medium keeps changing making it quieter. She could also put curtains in front of her windows because softer things like curtains absorb sound instead of reflecting it like a hard wall and creating an echo.

# The big question

By Verity

Some children are playing in the street and Sarah can still hear them with her ~~her~~ balcony door closed how does it work?

~~Some~~ The children are making noise from their vocal cords. Your vocal cords are two slaps of skin that hit together as you speak (or make any noise from your mouth). As they hit together they make the particles in ~~the~~ the air vibrate and hit together which creates a (longitudinal) sound wave. The wave travels through the air by making particles vibrate and hit together. Once the wave makes it's way to Sarah's balcony door or window it will ~~make~~ <sup>make</sup> create the particles in the solid ~~and~~ vibrate so the sound ~~wave~~ <sup>wave</sup> continues.

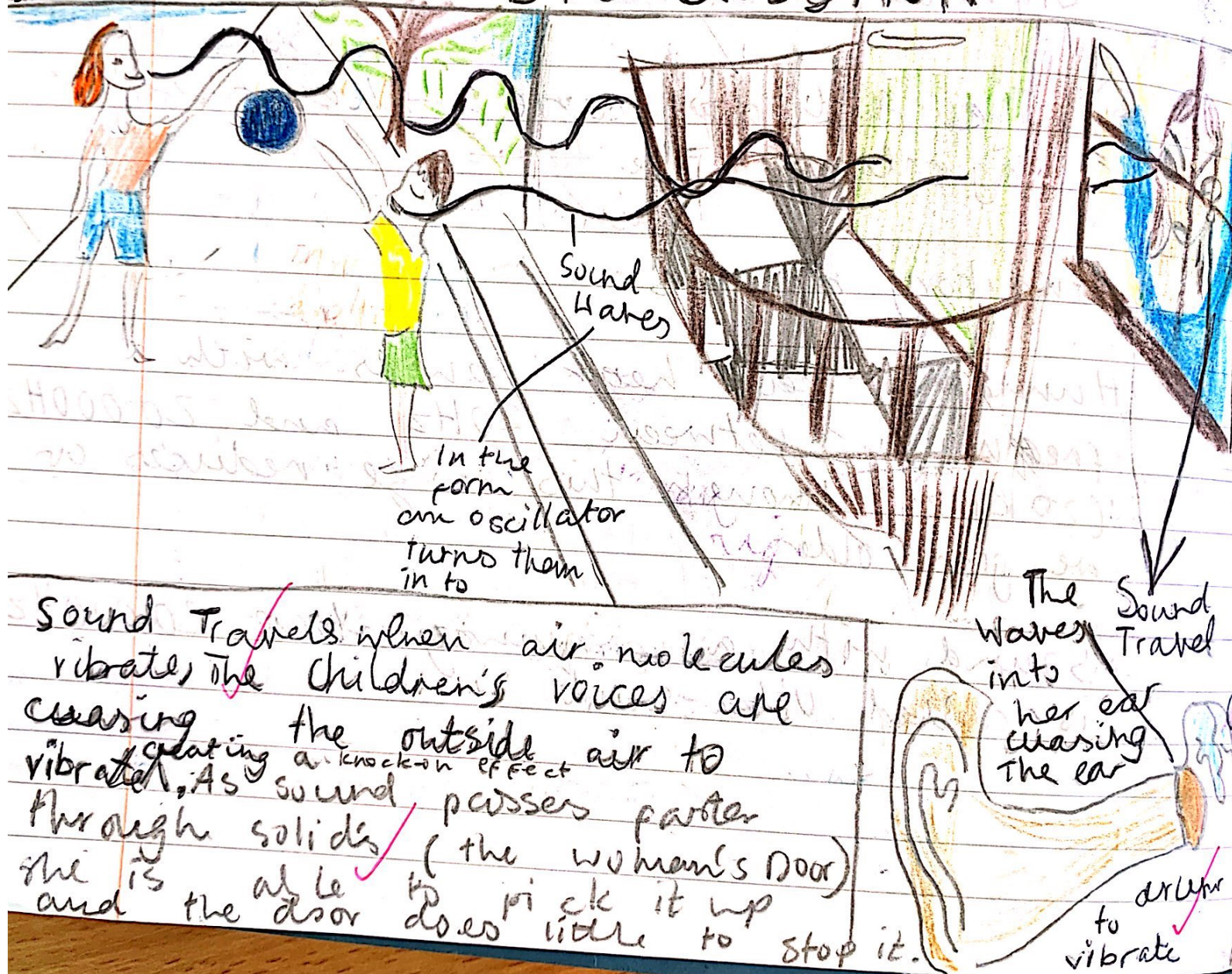
In a solid the particles are closer together than they are in a gas so the wave move quicker through solids. The wave will make it's way to her car. Her ear lobe (pinna) will detect it then the ear drum will vibrate = frequency

More or less depending on the amplitude <sup>(pitch)</sup> ~~and~~ and the frequency. Then the cochlea will ~~turn~~ turn the wave into electrical currents and will send it to the brain then ~~she~~ <sup>she will</sup> ~~can~~ hear it.

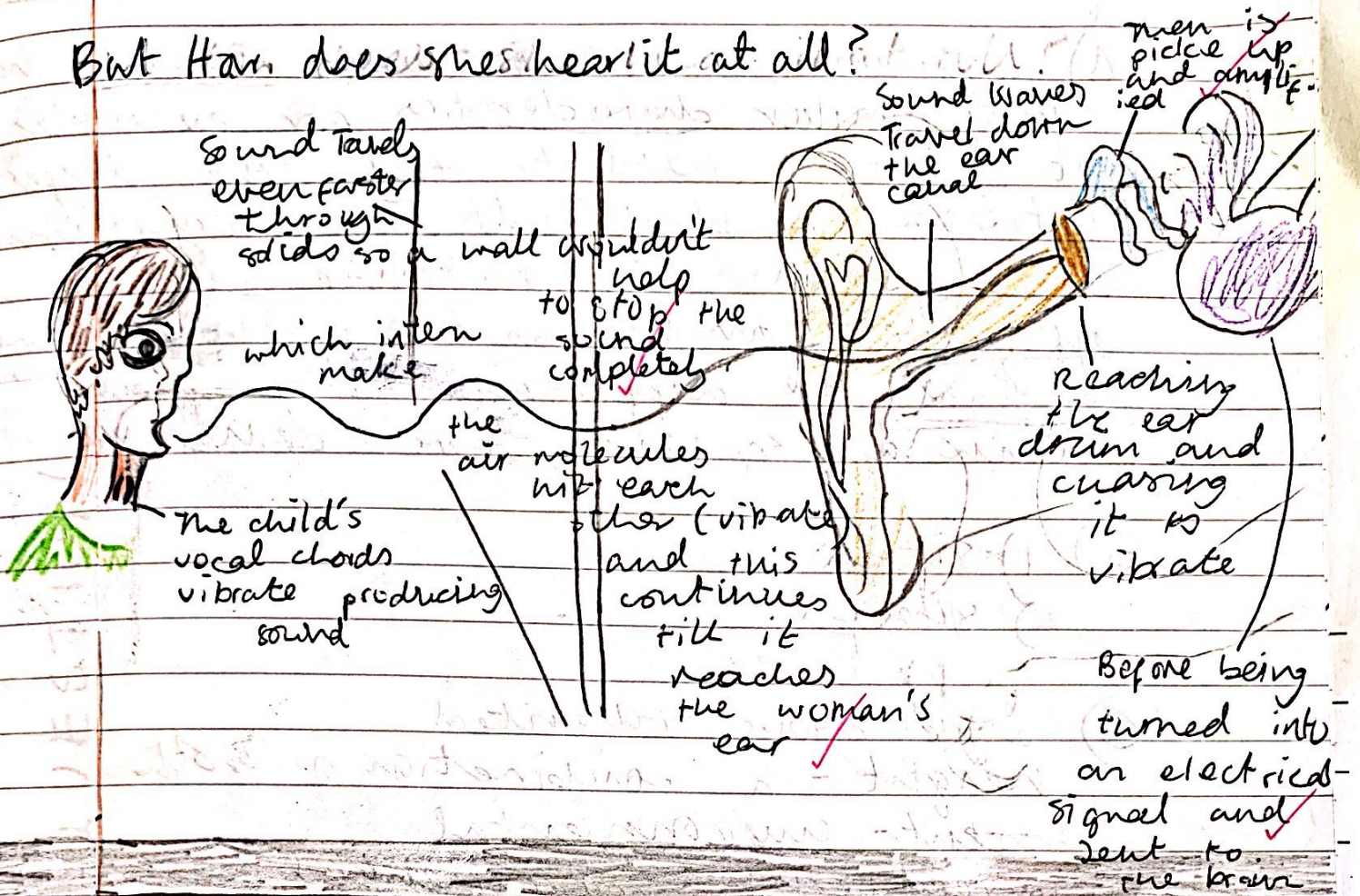
My advice to her to make her hear it less is to put more soft stuff on her ~~door~~ balcony or the doors and windows because soft stuff dampens the vibrators and so it will be less likely to travel into her house. Also a possibility is that she could move to space because there are no particles in space so she wouldn't be able to hear anything especially the children. I'm not sure she would want to live in space!

By Matilda

# The BIG QUESTION

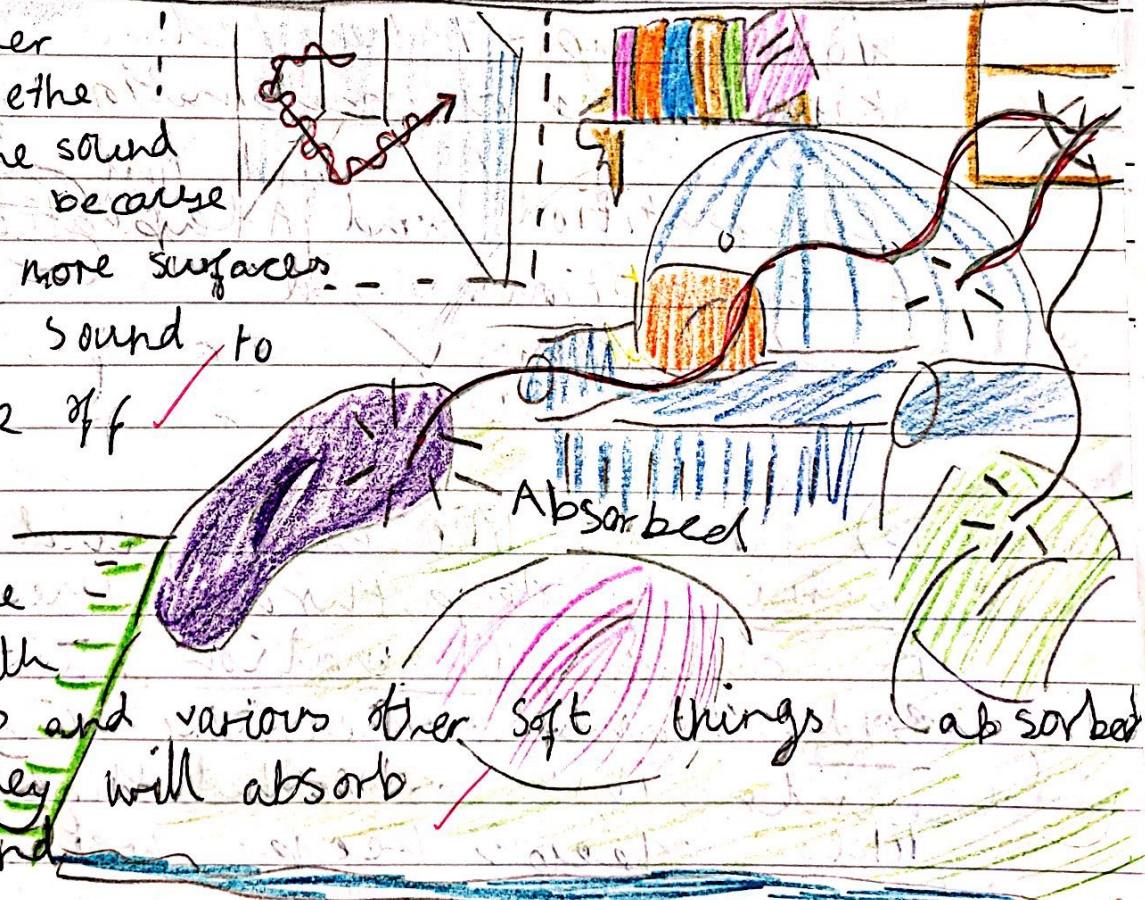


But Han does she hear it at all?



The Bane the house the louder the sound will be because there are more surfaces for the sound to bounce off

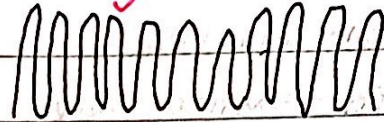
If she fills the room with cushions and various other soft things then they will absorb the sound



which is picked up and passed on as an electrical sign to the brain

How can her friend still hear them, even though the balcony doors are closed?

The sound is produced by the children's vocal chords vibrating. If they want to make a higher pitched, <sup>louder</sup> sound, they ~~ir~~ vocal chords vibrate faster and in a bigger movement. If drawn, the sound wave would look a bit like this:



The sound wave is drawn as a transverse wave even though it is longitudinal. This means that it travels through the air by particles knocking into one another, passing the wave along.

The friend detects it when the particles near her vibrate. She detects it when her pinna takes the wave in, through the ear canal and the ear drum vibrates. The vibrations are amplified by the ossicles (small bones in the ear) and the cochlea turns it into an electrical signal, which is taken in by the brain.

than in any other medium  
The friend might not hear it right away if she is far away because it takes longer for the sound to travel in a gas (air) because the particles are further away from each other.

To help her not to hear the children, she could put some <sup>not flat</sup> soft things like a curtain across her balcony as soft things absorb sound more.

Just closing the balcony doors would not help because even though there is a barrier, the balcony door would vibrate slightly, too. This would pass on the wave inside and so the particles inside would knock into each other, the wave moving along inside her home.