

Tasks & Resources

<u>Activity</u>	<u>Resources Needed</u>
1. Hear the music	Tibetan bells or signal generator Plastic ruler/whirly tube/slinky
2. How do we hear sounds?	8 Decibel and 8 Sound pictures Ear diagram & 7 Ear labels "Parts of the ear" cards – (also supplied as info card)
3. Good & bad sounds	Recordings of sounds (Sound Matters PowerPoint) "Love it" and "Hate it" labels at either end of a room
4. What makes a noise dangerous?	"Have I damaged my hearing?" cards "How long is it safe to listen?" info card
5. What is hearing damage?	"Ear Ear" presentation (Sound Matters PowerPoint) Model ear Which Platform announcements Platform 1 -4 signs Destination cards Ear plugs to give out Ear plugs to look at
5a. Protect your hearing	Paper and pens Plasticine
6. Tell your friends & Presentations	Examples of public service announcements (PSAs) Recording equipment etc for groups to create their PSAs

Suggested Timetable


<u>Time</u>	<u>Length of task</u>	<u>Activity</u>
10am / 12.30	10 mins	1. Hear the music
10.10 / 12.40	15 mins	2. How do we hear sounds?
10.25 / 12.55	10 mins	3. Good & bad sounds
10.35 / 1.05	10 mins	4. What makes a noise dangerous?
10.45 / 1.15	30 mins	5. What is hearing damage?
11.15 / 1.45	10 min	Break
11.25 / 1.55	10 – 15 mins	5a. Protect your hearing (optional)
11.40 / 2.10 (11.25 / 1.55)	20 mins	6. Tell your friends
12.00 / 2.30 (11.45 / 2.25)	30 mins	Presentations
12.30 / 3.00 (12.15 / 2.45)	2h 15m or 2h 30m	Finish

How hearing works

Sound travels through the air as vibrations or small changes in air pressure. The pinna “catch” these sound waves and their shape helps the brain work out which direction the sound is coming from. The vibrations travel down the ear canal to the eardrum which moves back and forth. Having two ears helps us work out which direction the sound comes.


The eardrum vibrates a set of tiny bones called the ossicles. The cochlea is filled with fluid which is harder to move than air (imagine pushing your hand through water compared with air). The small pressure changes felt at the eardrum are not strong enough to move this fluid. The ossicles act like a lever to push on the fluid in the cochlea and make the vibrations stronger.

The vibrations travel along the basilar membrane in the cochlea. Along the basilar membrane are lots of tiny hair cells. The hair cells detect vibrations along the membrane and send an electrical signal through the auditory nerve to the brain. The brain can tell pitch by knowing which hair cells are vibrating where on membrane. Loud sounds cause more hair cells vibrate – this is how the brain works out loudness. The brain takes all of this information and tries to make sense of it. We understand what the ear does, but we know much less about how the brain interprets sound.



Hearing loss

There are many different causes of hearing loss. The following are the general categories into which hearing loss falls:

- Otosclerosis - a disease that causes bony growth on the ossicles and causes them to become immobile, this stops sound being transferred into the cochlea.
 - Meniere's disease - a problem involving fluid pressure within the cochlea. It causes spells of hearing loss, dizziness, and tinnitus. They are often associated with stress.
 - Drug induced - some medicines can damage the ear if they are used for a long time. They are called ototoxic.
 - Cancer in the ear - a common tumour in the ear is called vestibular schwannoma.
 - Serious injury to the ear – e.g. fractures of the temporal bone, puncture of the eardrum by foreign objects, sudden changes in air pressure, and very loud noises.
 - Presbycusis - hearing loss caused by natural aging. It begins after age 20 but is not noticed until the ages of 55 to 65. Makes understanding and hearing speech difficult.
 - Noise-induced hearing loss (NIHL) - due to a sudden, loud noise or exposure to loud noises for a long time. A dangerous sound is anything that is 85 dB or higher.
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Parts of the ear

The **Pinna** is the part of the ear you can see from the outside. It acts like a funnel and directs the sound into the **ear canal**. It also lets us know which direction a sound is coming from.

The **Eardrum** is also called the tympanic membrane. It is a thin, oval shaped layer of tissue that separates the ear canal from the middle ear. The ear drum vibrates when hit by sound waves and transfers these vibrations to the middle ear.

The **Eustachian tube** (pronounced you-stay-shun tube) connects the ear to the nose. It has two main jobs. It lets any extra fluid in the ear drain away from the ear and down the throat! It also tries to keep the pressure in the ear the same as the air pressure outside. This tube opens up to let air flow in or out when we swallow, chew or yawn – sometimes you can feel popping when the pressure changes.


The **ossicles** are made up of three small bones, the anvil, hammer and stirrup. These bones connect the eardrum to the inner ear. Vibration of the eardrum causes these bones to move and pass the vibrations into the inner ear.



Parts of the ear

The **cochlea** (pronounced cock-lee-a) receives the vibrations that have travelled from the eardrum and ossicle bones and change them into electrical impulses. The cochlea looks like a coiled up tube. Inside the cochlea there are lots of tiny hair cells, it is these hair cells that change the vibrations into electrical signals.

The **auditory nerve** carries the electrical signals from the cochlea to the brain. This allows us to hear sounds.



How long is it safe to listen?

This table shows you how long it is safe to listen to noises at different levels.

Decibels	Length of safe listening time (per day)
85	8 hours
88	4 hours
91	2 hours
94	1 hour
97	30 minutes
100	15 minutes
103	7.5 minutes
106	Less than 4 minutes
109	Less than 2 minutes
112	Less than 1 minute
115	About 30 seconds
140	Any exposure may cause damage
180	Noise at this level will damage your hearing

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5 – Which platform? script

This is a passenger announcement. Please keep your luggage with you at all times. Any unattended luggage will be removed by the British Transport Police and may be destroyed.

The train standing at platform 1 is the 10:45 to Edinburgh Waverley. This train will be calling at Derby, Sheffield, Wakefield Westgate, Leeds, York, Darlington, Durham, Newcastle, Alnmouth and Edinburgh. Due to arrive in Edinburgh at 14:38.

[Normal conditions]

The 10:47 to Bournemouth will be shortly arriving on platform 4. This train will be calling at Coventry, Leamington Spa, Banbury, Oxford, Reading, Basingstoke, Winchester, Southampton Central, Brockenhurst and due to arrive in to Bournemouth at 14:04.

[Represents hearing loss when the ear does not respond to higher frequencies sounds]

Please make sure you are travelling on the correct train for your ticket. If you have the incorrect ticket you may be charged the full single fare for your journey.

The next train arriving on platform 2 will be the delayed 9:56 to Manchester Piccadilly. This train



5 – Which platform? script

is running approximately 45 minutes late and will call at Wolverhampton, Stoke-on-Trent, Congleton, Macclesfield, Stockport and due to arrive in Manchester Piccadilly at 11:46.

[Recorded with whooshing noise to represent tinnitus]

Please note there is a platform change for the 10:52 to Nottingham. This train is now departing from Platform 3 and not Platform 1 as it says on the departure board. The 10:52 will now depart from Platform 3.

[Voice recorded more quietly in comparison to background noise. This is common when hearing loss is just in one ear.]

