

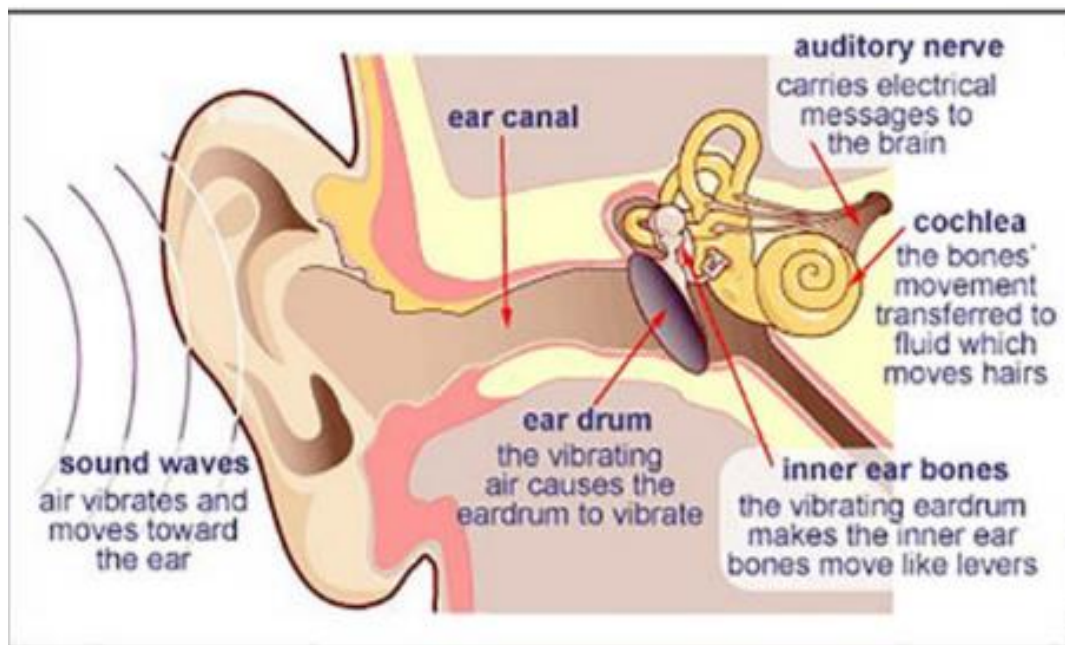
## The ear and how it works

The ear has two main functions.

1. It receives sound and converts it into signals that the brain can understand.
2. It helps us to balance.

The two functions are closely related.

### Diagram of the ear



The ear is the first part of the hearing system. The outside part of the ear (pinna) catches sound waves and directs them down the ear canal. The waves then cause the eardrum to vibrate.

These vibrations are passed across the middle ear by three tiny bones: the malleus, incus and stapes (sometimes known as the hammer, anvil and stirrup, known together as the ossicles). The bones increase the strength of the vibrations before they pass through the oval window into the cochlea.

The cochlea looks like a snail's shell. It's filled with fluid and contains thousands of tiny sound-sensitive cells. These cells are known as hair cells. The vibrations entering the cochlea cause the fluid and hair cells to move, much like the movement of seaweed on the seabed when waves pass over it.

As the hair cells move, they create a small electrical charge or signal. The auditory nerve carries these signals to the brain where they are understood as sound.

For an ear to work fully and pick up sound, all of these parts must work well.

## The main types of deafness

- **Sensorineural deafness**, or nerve deafness as it's sometimes called, is a hearing loss in the inner ear. This usually means that the cochlea isn't working effectively. Sensorineural deafness is permanent.
- **Conductive deafness** means that sound can't pass efficiently through the outer and middle ear into the inner ear. This is often caused by blockages such as wax in the outer ear, or fluid in the middle ear (glue ear). Glue ear is a very common condition, especially in pre-school children. Conductive deafness is usually temporary, but it can be permanent in some cases.

It's possible for children to have a combination of sensorineural and conductive deafness. This is known as **mixed deafness or a mixed loss**. One example of mixed deafness is when someone has an existing sensorineural deafness and then develops glue ear.

Deafness in one ear only is known as unilateral deafness, which can also be referred to as one-sided hearing loss or single-sided deafness (SSD).

Very few deaf children have no useful hearing. Most deaf children can hear some sounds at certain frequencies and loudness, and with the use of hearing aids or implants they are often able to hear more sounds. For children to develop spoken language, the best possible access to speech is required.

## How hearing loss is measured

The level of your child's deafness can be described in terms of their decibel (dB) hearing level, or by the terms 'mild', 'moderate', 'severe' or 'profound'.

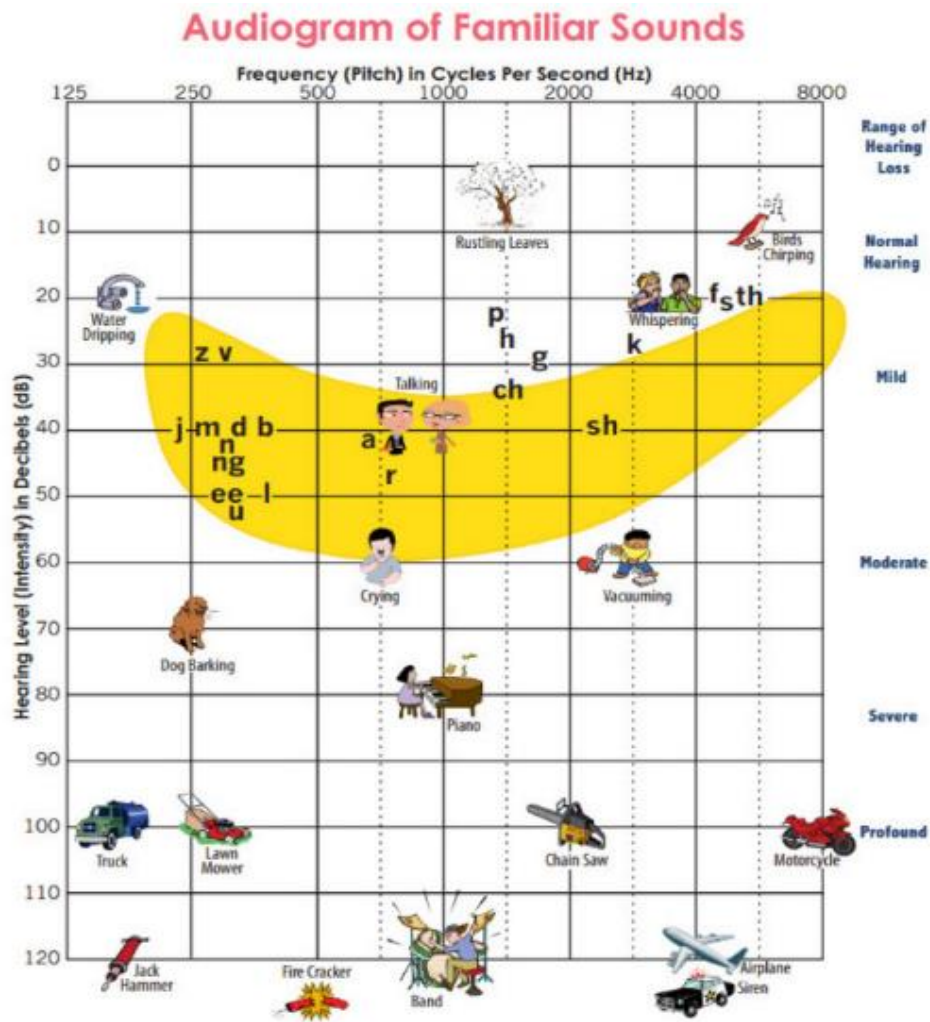
Based on British Society of Audiology definitions of hearing loss, this is the decibel hearing level range each of these terms refer to:

- mild (21–40 dB)
- moderate (41–70 dB)
- severe (71–95 dB)
- profound (95 dB).

Your child's audiologist will be able to give you more information about the level of your child's deafness. They will also be able to explain the sounds that your child can and can't hear. Your child's Teacher of the Deaf will also be able to support with understanding this information.

**Frequency:** All sounds are made up of different frequencies, measured in Hertz (Hz). The frequency of a sound affects the pitch that it's heard at. For example, the high notes on the right-hand side of a piano keyboard are examples of high-frequency sounds. If your child has a hearing test where the results are plotted on an audiogram, you'll see low to high frequencies marked along the top. An audiogram is a chart on which some of your child's hearing test results will be written. It shows you how loud a sound has to be, and at what frequency, before

your child can hear it. Sometimes separate charts will be used to show results for each ear. See example below:



It's possible to have the same level of deafness for all frequencies or to have different hearing levels at different frequencies. For example, your child may have more difficulty hearing higher frequency sounds.

Speech consists of vowels (a, e, i, o, u) and consonants (the remaining letters), that are made up of a range of frequencies.

Consonants communicate most of the information when a person speaks and they're also what make speech intelligible (able to be understood).

Consonants appear in the higher frequencies of an audiogram chart meaning that children need to be able to hear the full range of speech sounds at a quiet level to be able to understand speech.

Your audiologist will be able to explain your child's audiogram and give you information about the frequencies affected by your child's deafness.

(Information adapted from [NDCS.org.uk](http://NDCS.org.uk))