

# Hearing Loss

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## Human Hearing

1. Frequency (Pitch) - the range of human hearing is between approximately 20 – 20,000 Hz. (Hertz = cycle per second). This corresponds to low (20) to high (20,000) pitches.

2. Intensity (Loudness) – in the intensity domain there is roughly 120 dB dynamic change.

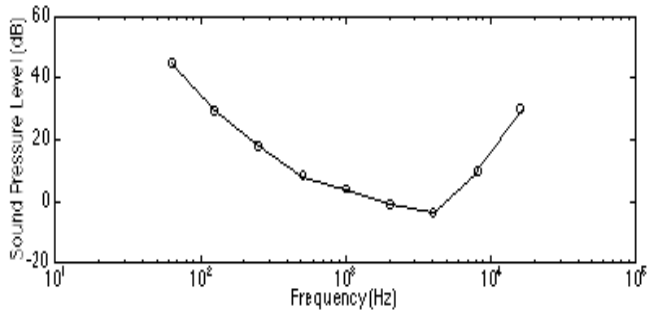


Figure 4. Human audiogram (Sivian & White, 1933).

(The higher the pressure level needed to be heard, the less sensitive we are to that frequency.)

## Causes of Hearing Loss

• **Problems in delivering the sound stimulus to the receptors** (something stuck in ear canal, middle ear infections)

• **Damage to the neurons or parts of the brain** (due to exposure to loud sounds or brain damage)

HEARING IMPAIRMENT is a deviation or change for the worse in either the structure or the functioning of the auditory system.

HEARING HANDICAP is the disadvantage that a hearing impairment causes in a person's ability to communicate or in the person's daily living.

## Levels of Hearing Loss

A. Profound hearing loss is the most extreme hearing loss. A profound hearing loss means that you may not hear loud speech or any speech at all. You are forced to rely on visual cues instead of hearing as your main method of communication.

B. Severe hearing loss leads to difficulty hearing in all situations. Speech may be heard only if the speaker is talking loudly or at close range. A severe hearing loss may sometimes cause you to miss up to 100% of the speech signal.

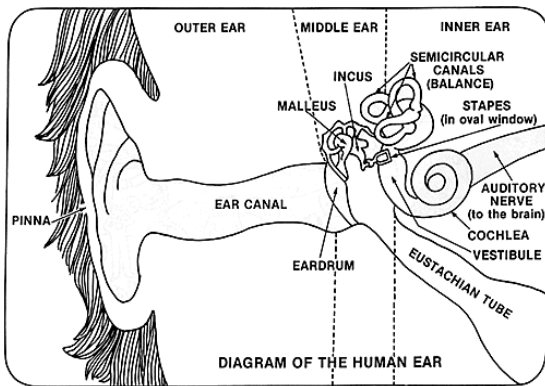
C. Moderate hearing loss may cause you to miss 50-75% of the speech signal. This means you would not have problems hearing at short distances and understanding people face-to-face, but you would have problems if distance or visual cues changed.

D. Mild hearing loss may cause you to miss 25-40% of the speech signal. Usually this results in problems with clarity since the brain is receiving some sounds but not all of the information. Symptoms of mild hearing loss include problems understanding someone farther away than a normal distance for conversation.

E. Unilateral hearing loss is hearing loss in one ear. Hearing in one ear is normal but the other ear is hearing-impaired. Symptoms of unilateral hearing loss may include difficulty locating the source of sounds, and problems hearing understanding speech in certain situations.

## Sections of the Ear

1. Outer Ear - includes the Pinna and Tympanic membrane (ear drum).
2. Middle ear - Ossicles (Malleus, Incus, and Stapes)
3. Inner ear - Cochlea (many structures, including the receptor neurons and nerve that send to the brain)



Eardrum - (tympanic membrane) a thin layer of skin at the end of the external ear canal

Auditory Ossicles - The three small bones in the middle ear, known as the hammer (malleus), anvil (incus) and stirrup (stapes) which are connected to one another. Together these ossicles are called the ossicular chain. Their purpose is to lead the sound striking the eardrum further into the inner ear

Oval Window - An opening in the bone between the air filled middle ear cavity and the fluid filled inner ear, and is covered by a thin membrane

Cochlea - Part of the inner ear that contains part of the hearing organs.

Semicircular Canals - Part of the organ of balance that is part of the inner ear

Eighth Nerve - Nerve that transmits messages from the inner ear to the brain.

Eustachian Tube - A tube connecting the middle ear cavity and the pharynx (back of the throat). It can be opened by coughing or swallowing, though it is normally closed. The occasional opening of the Eustachian tube is necessary to equalize the air in the middle ear cavity

## Other Parts of the Ear

Helix - The in-curve rim of the external ear

Antihelix - A landmark of the outer ear

Lobule - A landmark of the outer ear. The very bottom part of the outer ear

Crest of Helix - A landmark of the outer ear

External Auditory Meatus - or External Auditory Canal. The auditory canal is the channel through which the sounds are led from the ear outside to the middle ear.

## Ranges of Other Species

β Elephants: 15 to 10,000 Hz

β Dogs: 60 to 40,000 Hz

β Cats: 100 to 60,000 Hz

β Bats: 1,000 to 100,000 Hz

β Dolphins: 200 to 150,000 Hz