

جامعة ذي قار كلية التمريض

*Test of Hearing And Pure tone  
Audiometry*

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# *Objective*

- The usual primary purpose of pure-tone tests is to determine the type, degree, and configuration of hearing loss.
- To plot the frequency intensity recording and construct the audiograms.
- To interpret the audiograms

# Major Divisions of the Ear

**Peripheral Mechanism**

**Central Mechanism**

**Outer  
Ear**

**Middle  
Ear**

**Inner  
Ear**

**VIII  
Cranial  
Nerve**

**Brain**

## *Air conduction*

This test assesses sensitivity when the signal is transmitted through the outer, middle, and inner ear and then through the brain to the cortex. Testing may be performed using headphones, insert earphones.

## ***Bone conduction***

This technique assesses sensitivity when the signal is transmitted through the bones of the skull to the cochlea and then through the auditory pathways of the brain. This type of testing bypasses the outer and middle ear.

# *Masking*

Masking presents a constant noise to the non-test ear to prevent crossover from the test ear. The purpose of masking is to prevent the non-test ear from detecting the signal (line busy), so only the test ear can respond.

# *Pure tone*

A pure tone is a single frequency tone with no harmonic content (no overtones). This corresponds to a sine wave.

# *Audiogram*

The audiogram is a chart of hearing sensitivity with frequency charted on the X- axis and intensity on the Y- axis. Intensity is the level of sound power measured in decibels; loudness is the perceptual correlate of intensity.

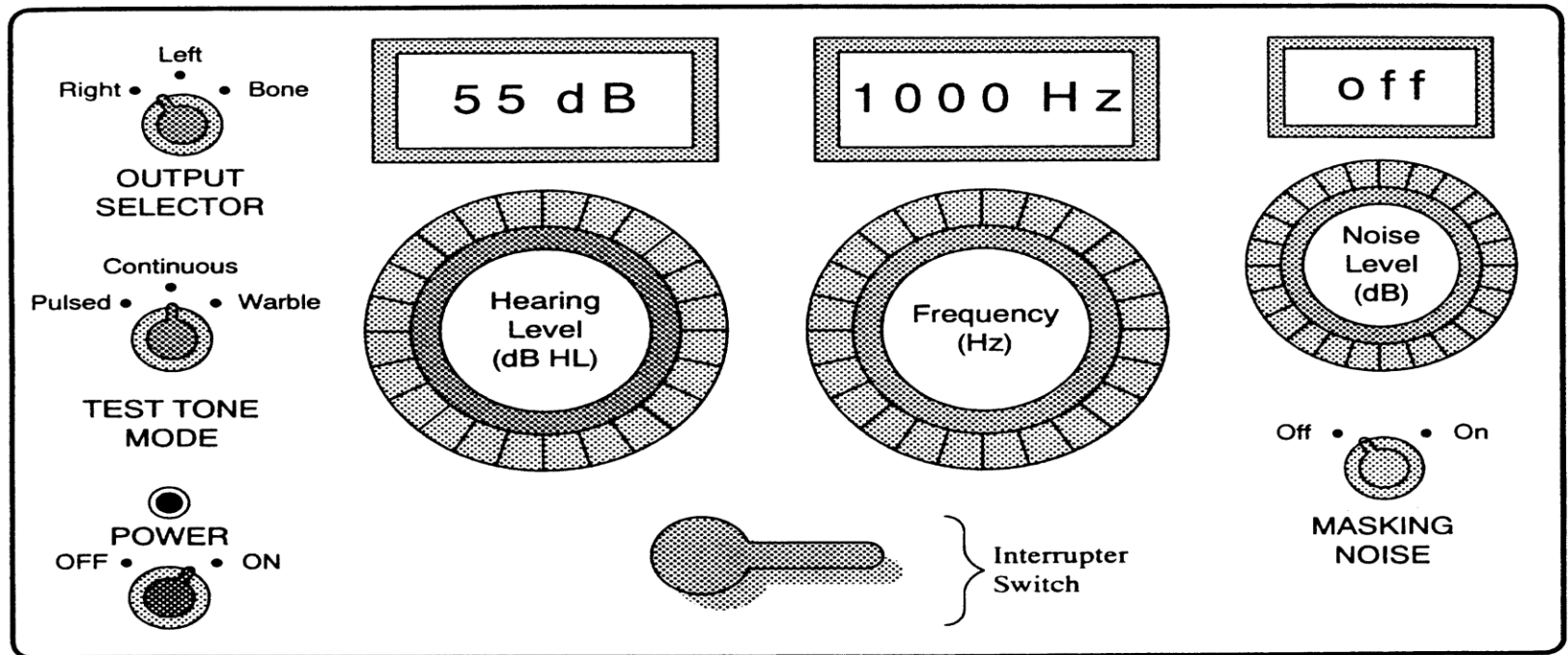


# Audiometer Components

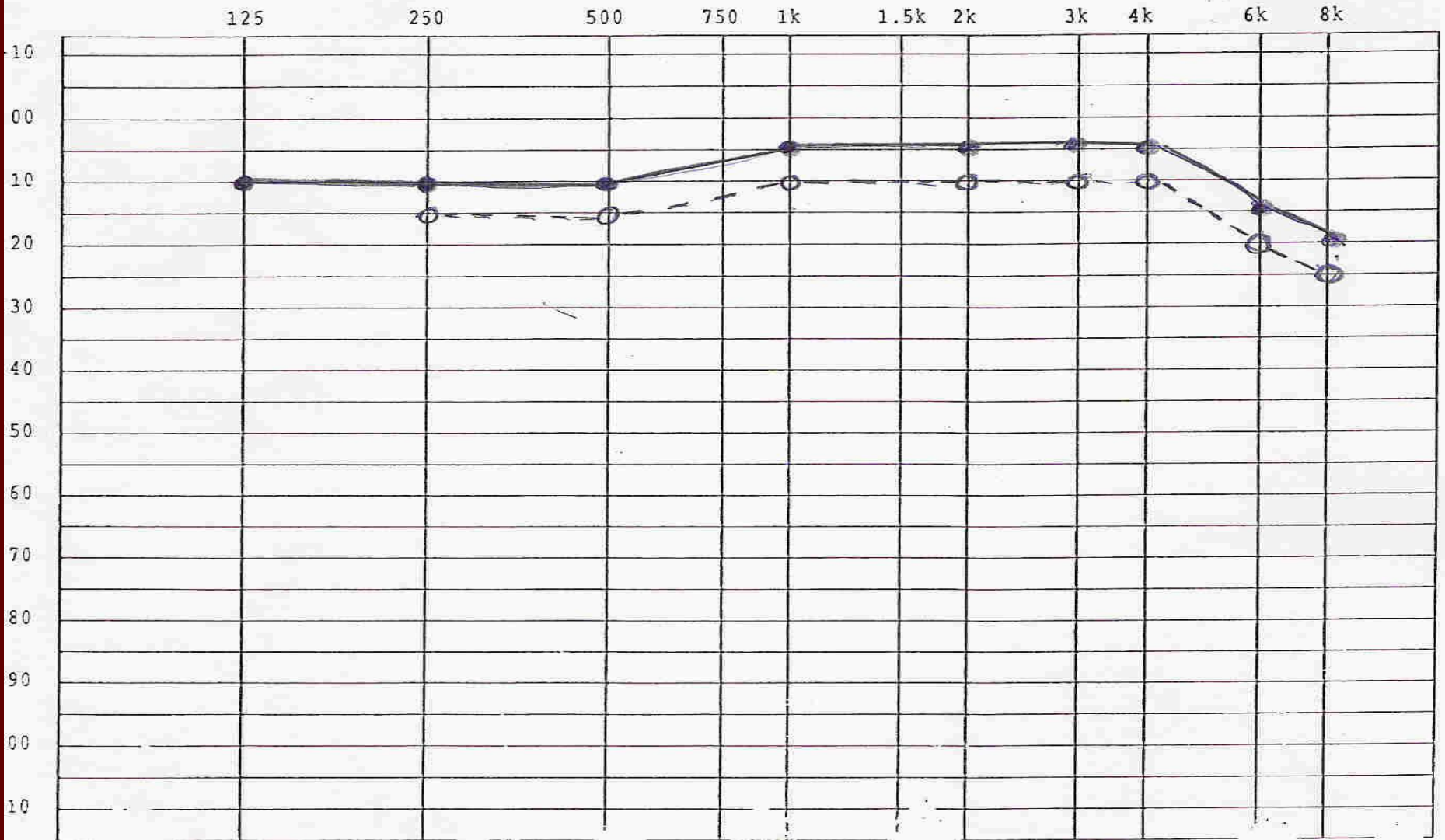
Attenuator (Hearing Level)  
Dial and Indicator

Frequency Dial  
and Indicator

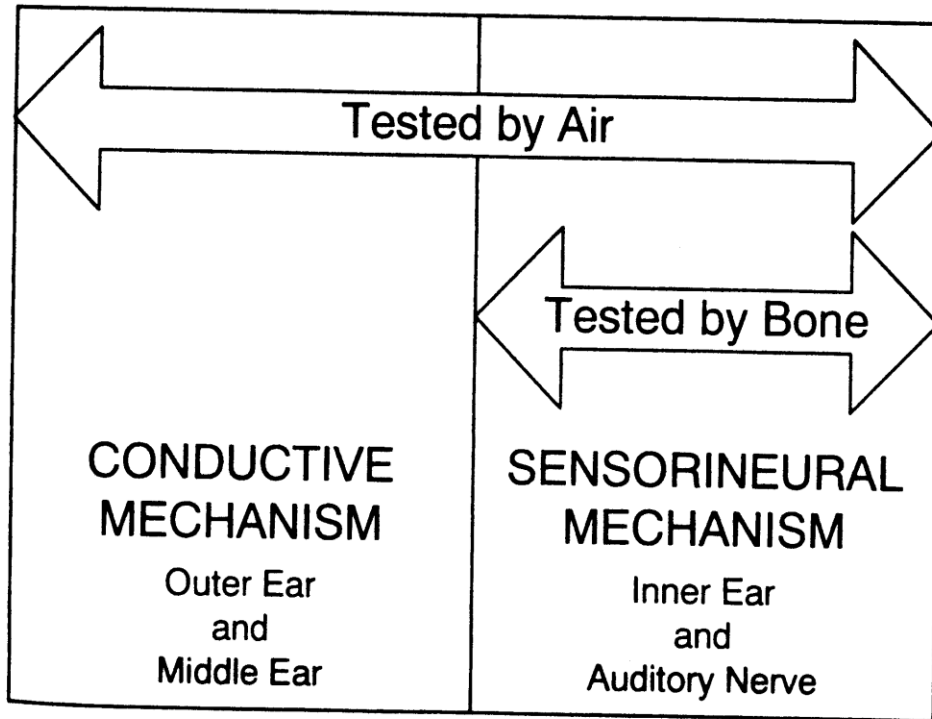
Masking  
Channel



# Audiogram



# Air Conduction vs Bone Conduction Testing



Air conduction tests the entire auditory system. Bone conduction bypasses the conductive mechanism, so it tests only the inner ear.

# Air vs. Bone Conduction

## ● A/C

- Via TDH-50P headphones
  - Placed on Pinna
- Checks the validity of entire ear system
- Tests that ipsilateral ear

## ● B/C

- Bone vibrator
  - Placed on Mastoid Process
- Tests the validity of only the inner ear
- Tests better cochlea

# Things to know about an Audiogram

- ❑ Lo to Hi Frequency (abscissa)
  - **125 Hertz to 8000 Hertz**
  - **Octave and half-octaves**
- ❑ Lo to Hi dB (ordinate)
  - **-10 dB HL to 120 dB HL**
- ❑ Each **20** dB is equal to one octave
- ❑ It is a Legal document

# The Legend

Legend	Right	Left
Air Conduction	O	X
•with masking	Δ	□
Bone Conduction	<	>
•with masking	[	]
No Response	↙	↘



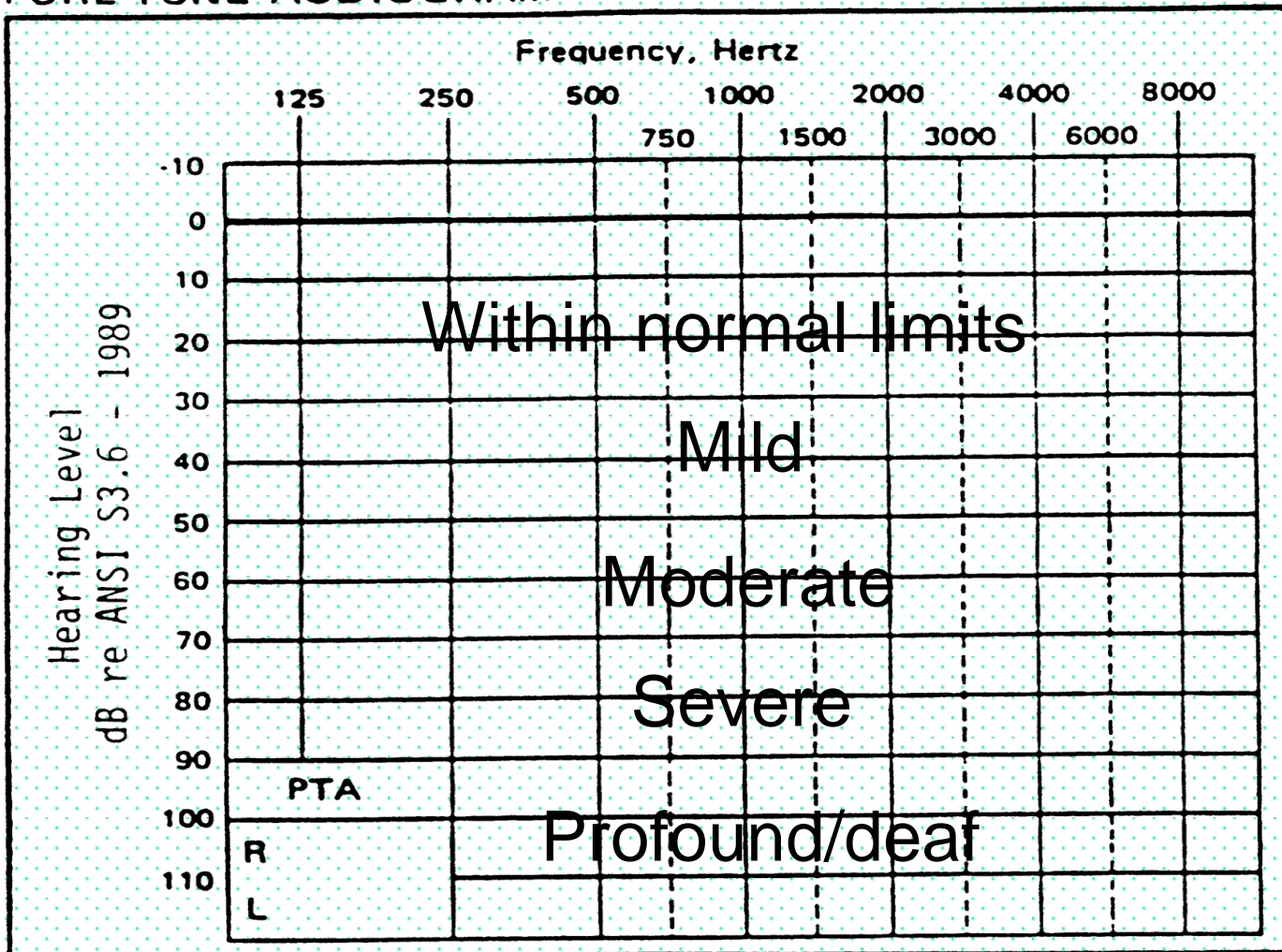
# Ranges of Hearing Loss

- Normal hearing (0-25 dB)
- Mild hearing loss (26-40 dB)
- Moderate hearing loss (41-55 dB)
- Moderate-severe hearing loss (56-70 dB)
- Severe hearing loss (71-90 dB)
- Profound hearing loss (>90 dB)

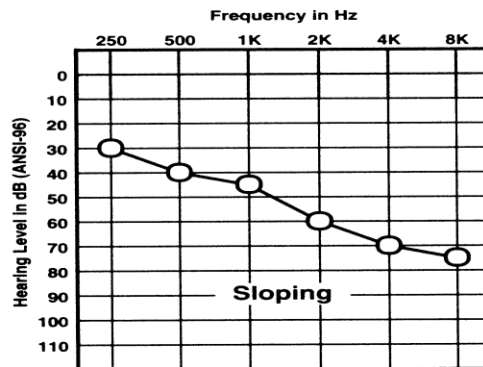
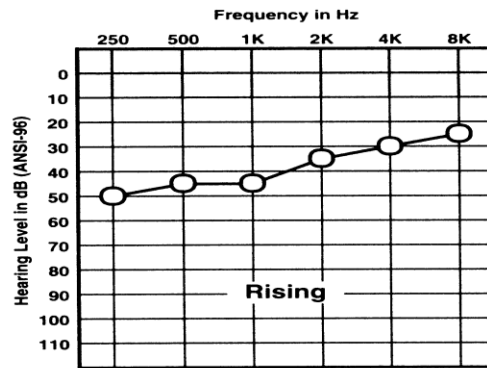
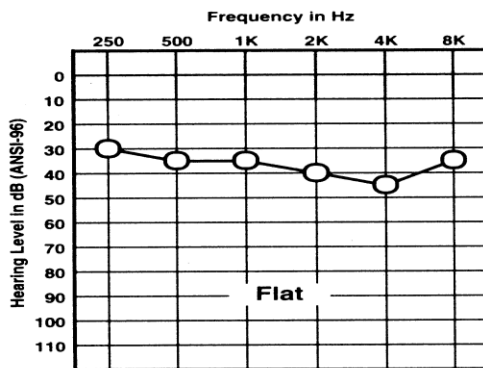


# What the Audiogram Says About the Impairment

PURE-TONE AUDIOGRAM



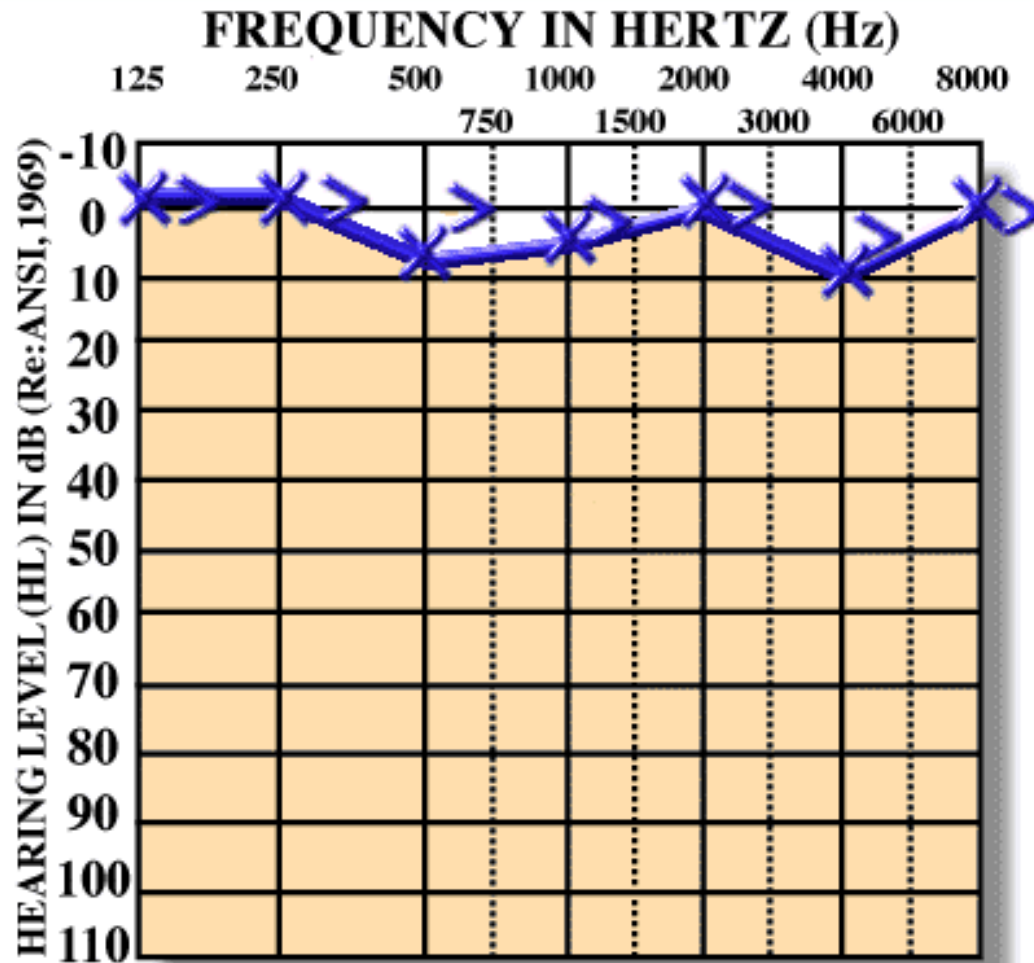
# What the Audiogram Says About the Impairment



The configuration of the hearing loss

- Flat
- Rising
- Sloping

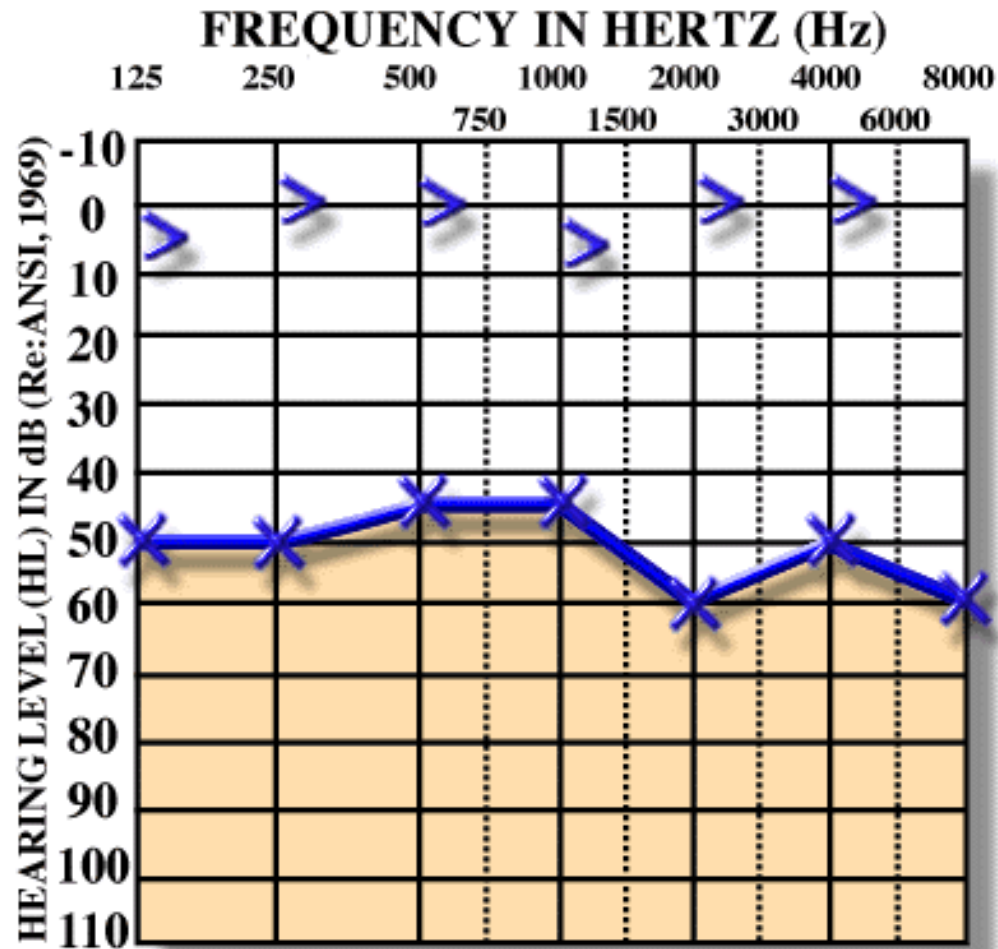
# Normal Hearing



# *TYPES OF HEARING LOSS*

- Conductive hearing loss
- Sensorineural hearing loss
- Mixed hearing loss

# Conductive Hearing Loss

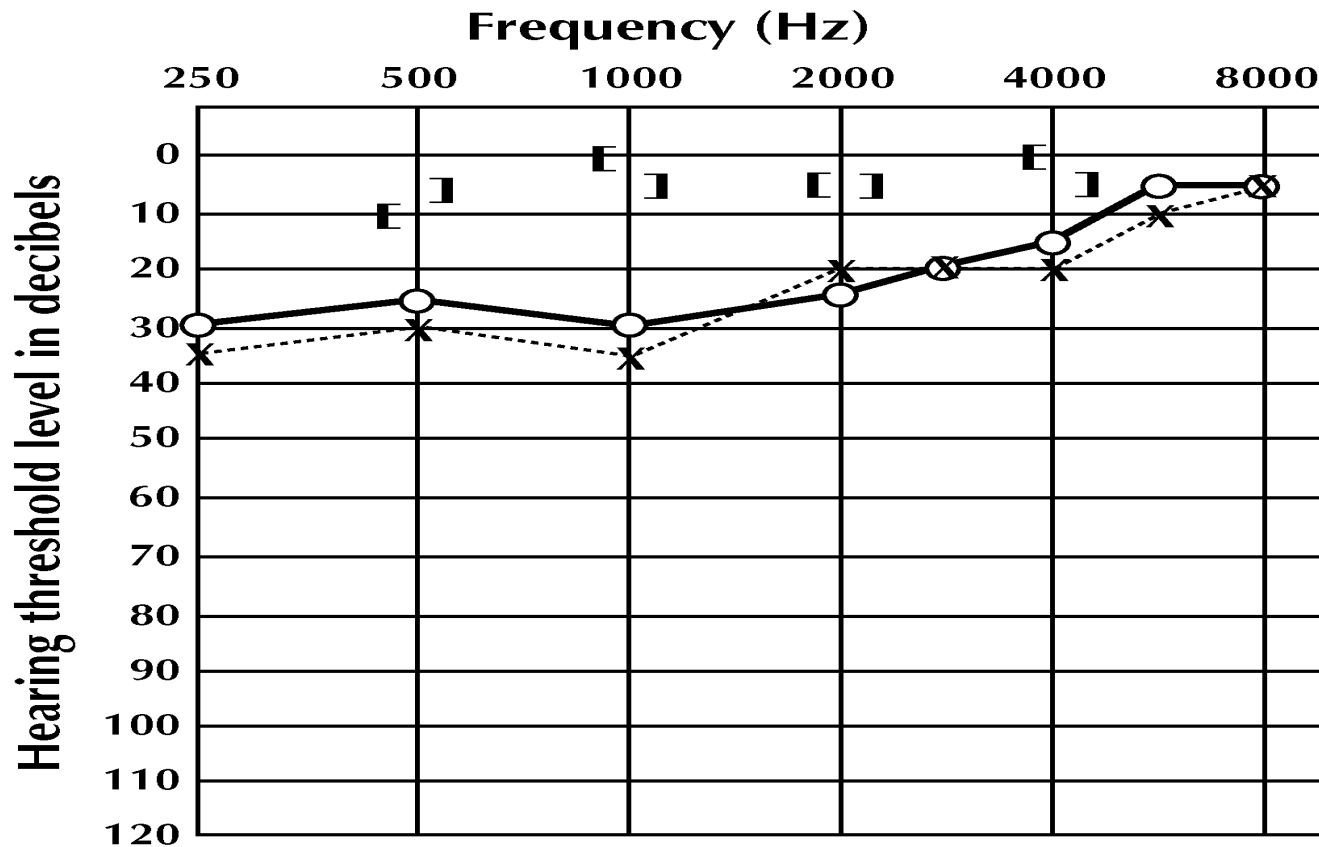




# *Conductive Hearing loss (deafness)*

- ❑ The abnormality reduces the effective intensity of the air-conducted signal reaching the cochlea, but it does not affect the bone-conducted signal that does not pass through the outer or middle ear.
- ❑ Examples of abnormalities include **perforated tympanic membranes**, **fluid in the middle ear system**, or scarring of the tympanic membrane. Pure-tone air-conduction thresholds are poorer than bone-conduction thresholds by more than 10 dB

# Conductive deafness

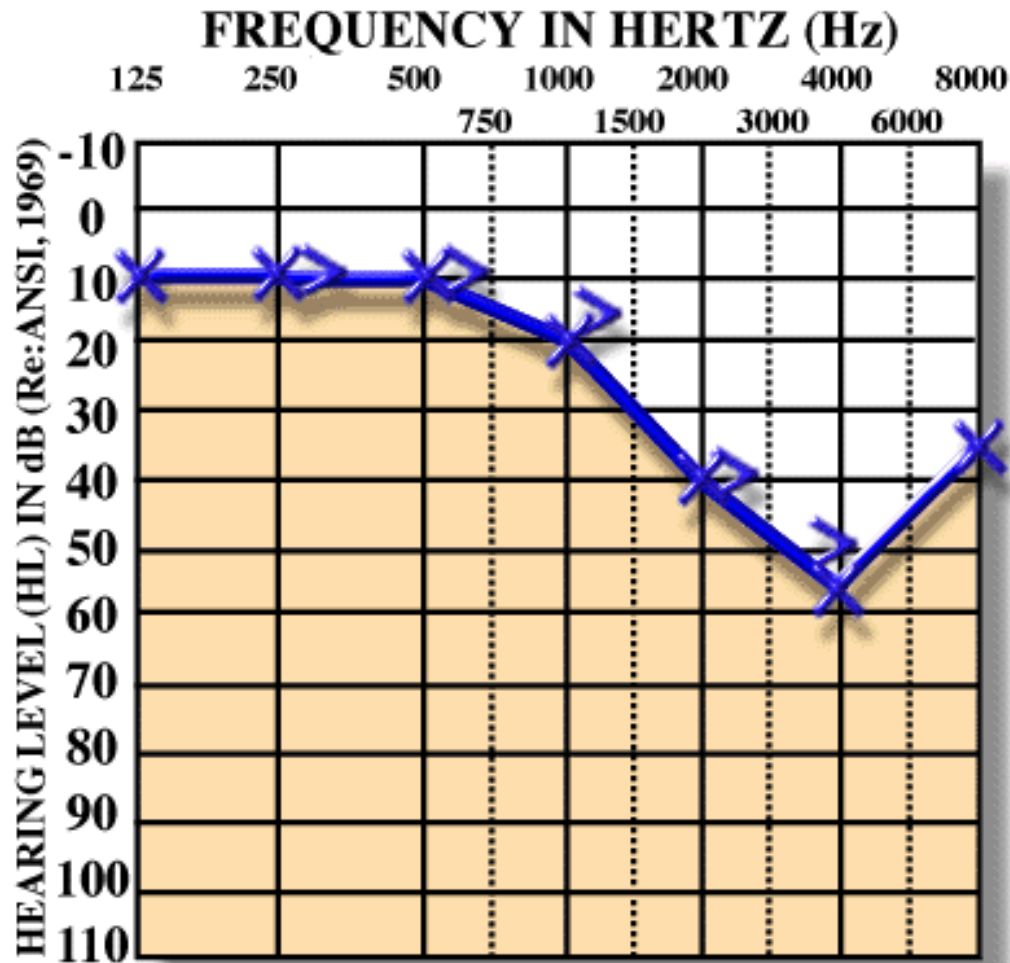


Audiogram Key		
	Right	Left
A/C Unmasked	○	×
A/C Masked	△	□
B/C Unmasked	<	>
B/C Masked	[	]
B/C Forehead Masked	┌	┐

## SPEECH TESTS

TESTS	R	L
<i>Sp. Reception Threshold (SRT)</i>	<b>30 dB</b>	<b>30 dB</b>
<i>Sp. Discrim. Scores</i>	<b>35 dB SL</b>	<b>98%</b>

# Sensorineural Hearing Loss

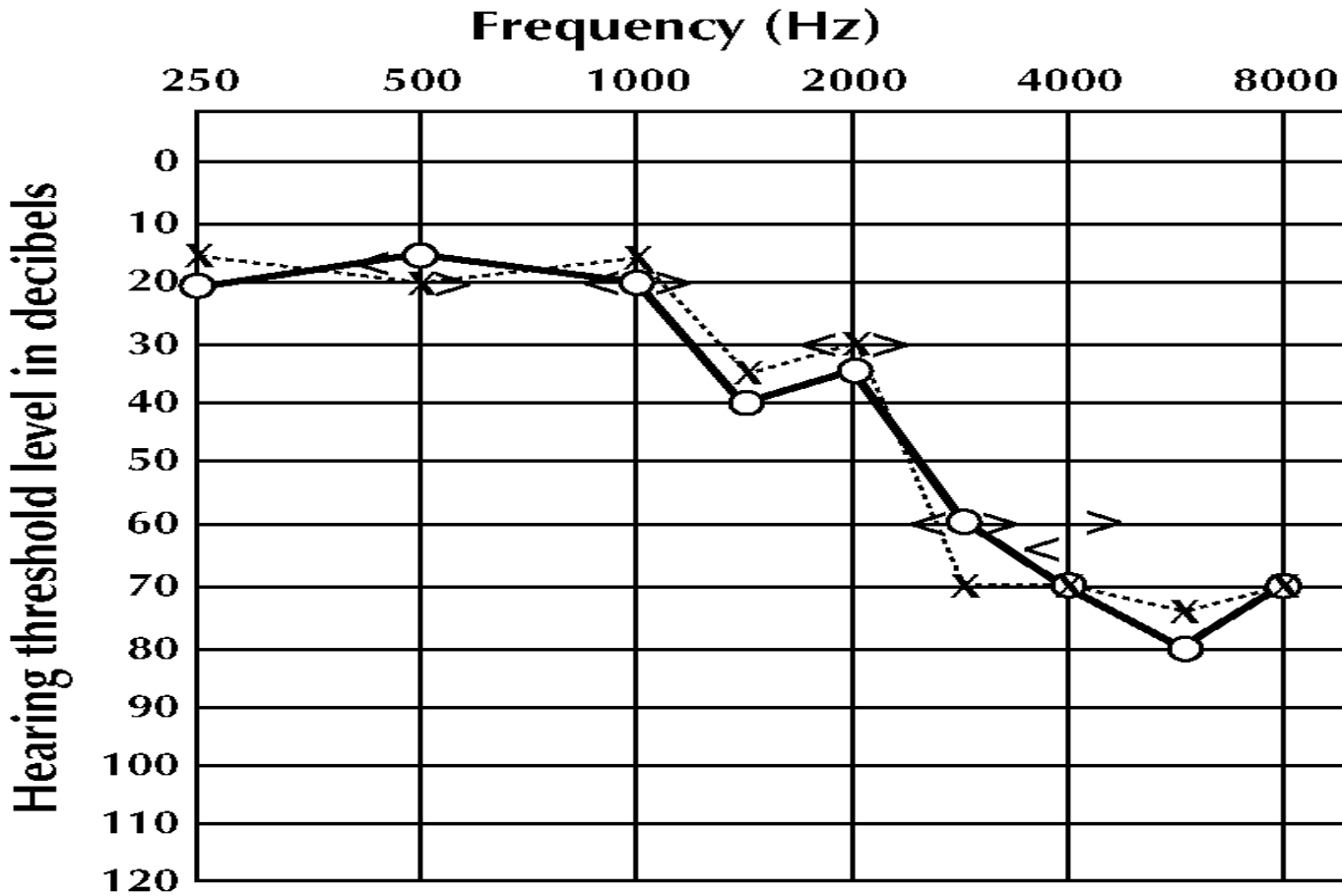




# *Sensorineural Hearing loss (deafness)*

□ This type of hearing loss is secondary to cochlear abnormality and/or abnormality of the auditory nerve or central auditory pathways. Because the outer ear and middle ear do not reduce the signal intensity of the air-conducted signal, both air- and bone-conducted signals are effective in stimulating the cochlea. Pure-tone air- and bone-conduction thresholds are within 10 dB

# Sensorineural

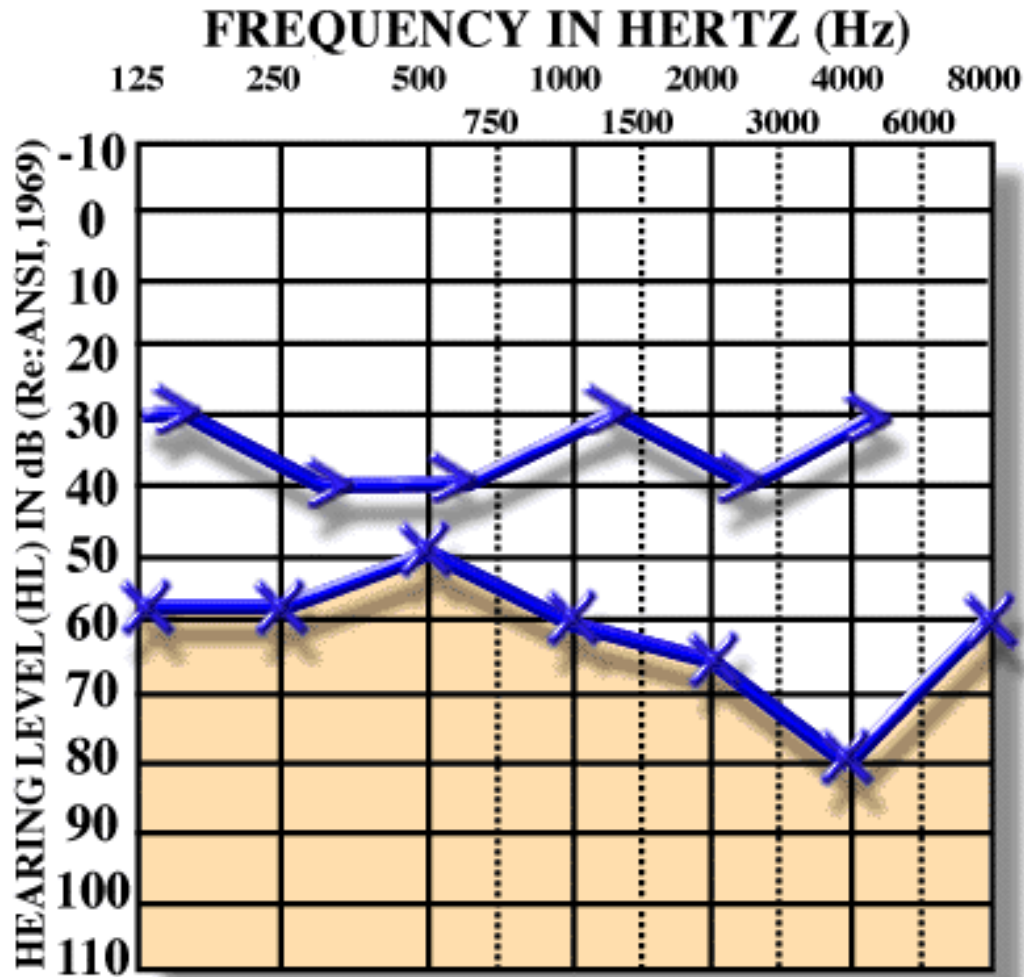


Audiogram Key		
	Right	Left
A/C Unmasked	○	×
A/C Masked	△	□
B/C Unmasked	<	>
B/C Masked	┌	┐
B/C Forehead Masked	└	┘

## SPEECH TESTS

TESTS	R	L
<i>Sp. Reception Threshold (SRT)</i>	25 dB	25 dB
<i>Sp. Discrim. Scores</i>	35 dB SL	72%
	72%	76%

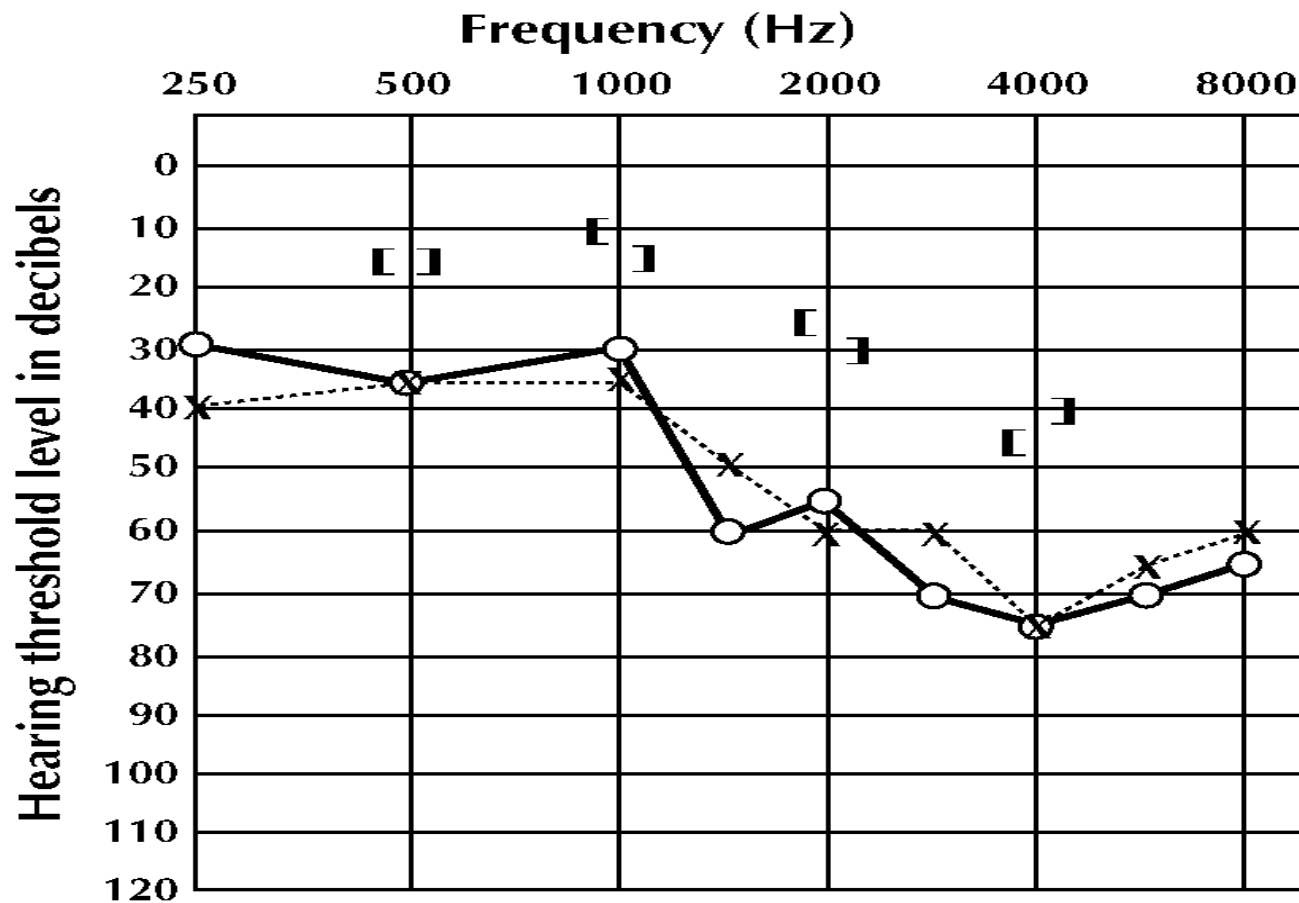
# Mixed Hearing Loss



## *Mixed Hearing loss*

□ This type of hearing loss has sensorineural and conductive components. Pure-tone air-conduction thresholds are poorer than bone-conduction thresholds by more than 10 dB, and bone-conduction thresholds are less than 25 dB

# Mixed Hearing Loss



Audiogram Key		
	Right	Left
A/C Unmasked	○	×
A/C Masked	△	□
B/C Unmasked	<	>
B/C Masked	⌈	⌋
B/C Forehead Masked	⌊	⌉

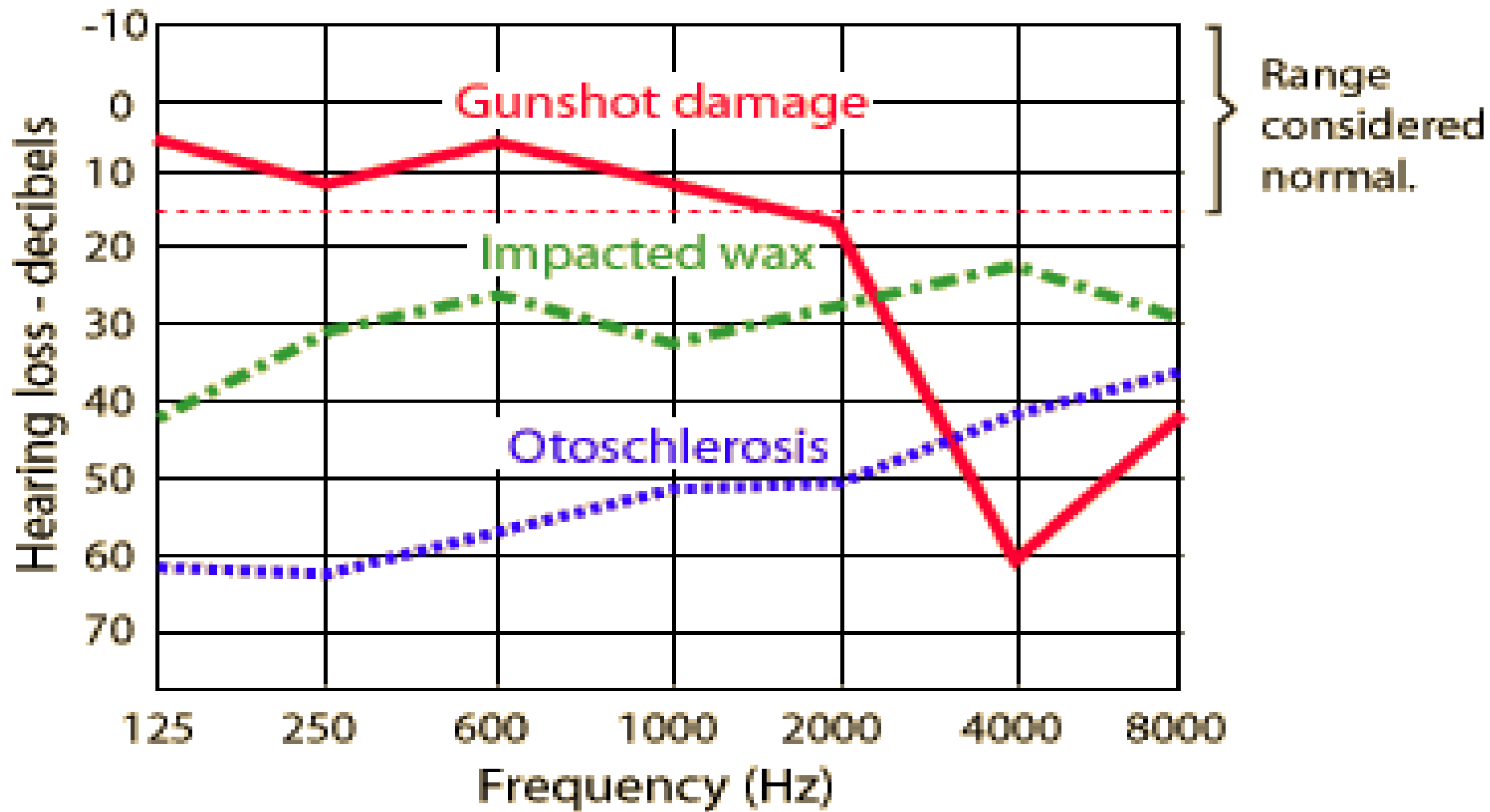
## SPEECH TESTS

TESTS	R	L
<i>Sp. Reception Threshold (SRT)</i>	40 dB	40 dB
<i>Sp. Discrim. Scores</i>	35 dB SL	84%

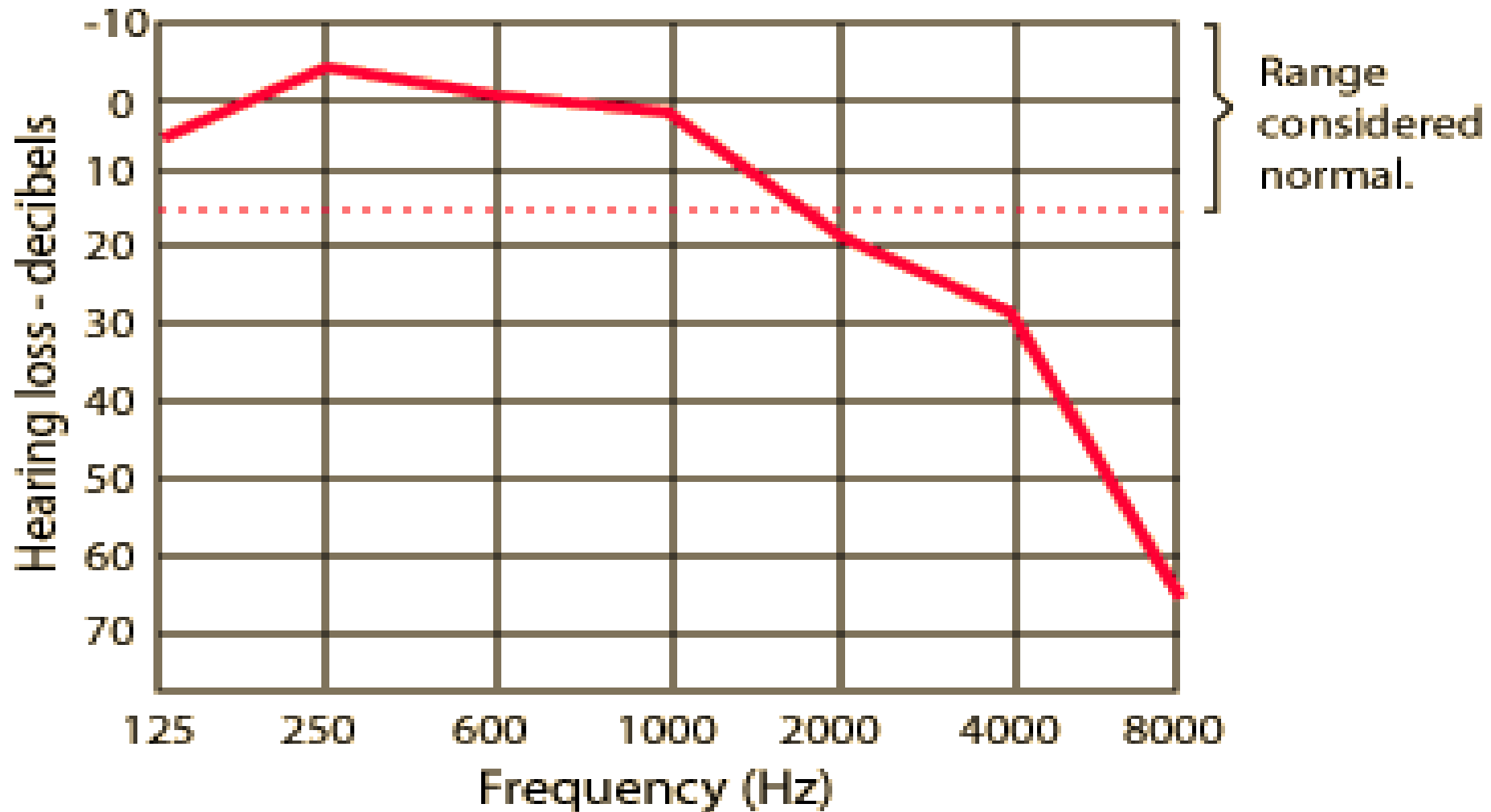


# *COMMON AUDITORY DISORDERS*

- Presbycusis** (age related hearing loss)
- Otitis media:** This condition is marked by fluid in the middle ear space usually secondary to an infection.
- Noise-induced hearing loss.**
- Otosclerosis:** The condition is caused by stapedial fixation in the oval window, stiffening the middle ear system.
- Ménière disease**



# Presbycusis

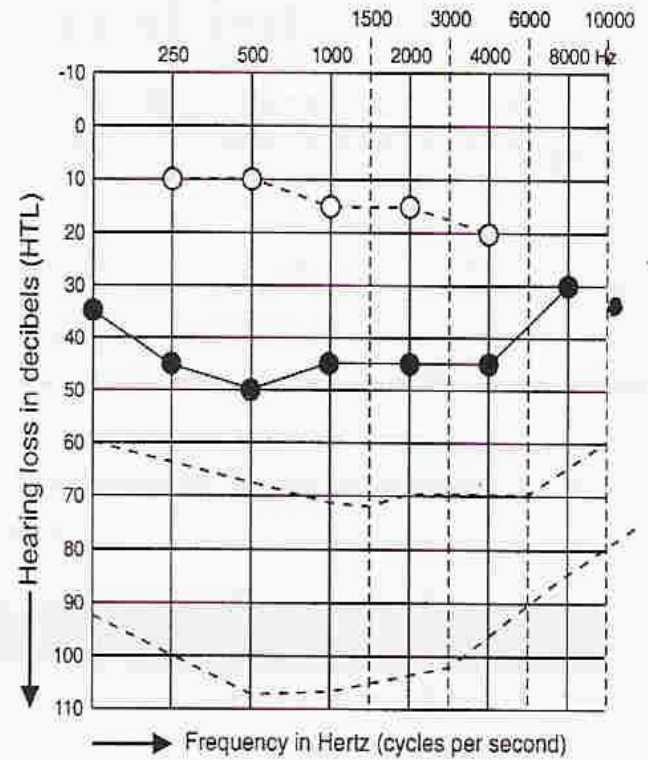




# Other “Hearing” Tests

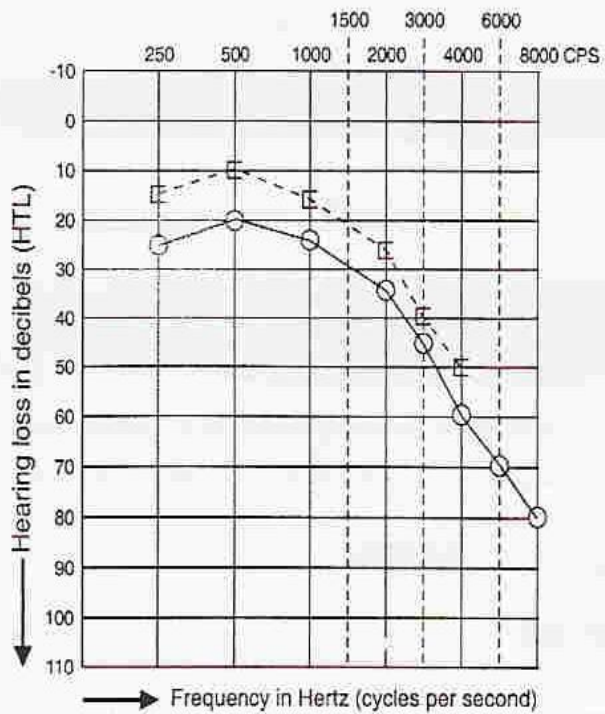
- Tympanometry
- Acoustic Reflexes
- Speech Audiometry
  - Speech Reception Threshold (SRT)
  - Speech Discrimination (SD)
- ABR
- ECOCHG (Electrocochleography)
- OAE

ABNORMAL AUDIOGRAM



- BONE CONDUCTION
- AIR CONDUCTION
- INTERPRETATION

Conductive deafness  
otosclerosis



□  
○

BONE CONDUCTION  
AIR CONDUCTION  
INTERPRETATION

*Presbycusis's  
old age hearing loss*

# What about Hearing Aids

- ❑ Minimal hearing loss
  - Probably no/little benefit
- ❑ Moderate hearing loss and usually sensorineural hearing loss are good candidates
- ❑ Profound hearing loss?
  - Could for environmental & safety reasons
  - Cochlear Implant



***THANK YOU***





***TUNING FORK TESTS***



# Rinne's Test

## Technique

- First: Bone Conduction
  - Vibrating Tuning Fork held on Mastoid process
  - Patient covers opposite ear with hand
  - Patient signals when sound ceases
  - Move the vibrating tuning fork over the ear canal
    - (Near, but not touching the ear)
- Next: Air Conduction
  - Patient indicates when the sound ceases
- **Normal: Air Conduction is better than Bone Conduction**
  - Air conduction usually persists twice as long as bone
  - Referred to as "positive test"
- **Abnormal: Bone conduction better than air conduction**
  - Suggests Conductive Hearing Loss.
  - Referred to as "negative test"











# Weber Test

Technique:

Tuning Fork placed at midline forehead

- **Normal: Sound radiates to both ears equally**
- **Abnormal: Sound lateralizes to one ear**
  - Ipsilateral Conductive Hearing Loss OR
  - Contralateral Sensorineural Hearing Loss.



