

SLP Homework

1. Question: What should you be familiar with regarding the inner ear?
Answer: You should be familiar with the general anatomy of the inner ear.
2. Question: How is tonotopic tuning achieved by the basilar membrane?
Answer: Tonotopic tuning is achieved by the basilar membrane due to its varying stiffness along its length.
3. Question: What are the functional differences between outer and inner hair cells? Answer: Outer hair cells amplify sounds, while inner hair cells transmit sound information to the brain.
4. Question: What are the major landmarks of the temporal bone? Answer: The major landmarks of the temporal bone include the external auditory meatus, middle ear, and the mastoid process.
5. Question: What are the goals of audiologic evaluation? Answer: The goals of audiologic evaluation include determining the patient's hearing sensitivity, diagnosing the type of hearing loss, and determining the best course of treatment.
6. Question: What is the purpose and important questions of case history? Answer: The purpose of case history is to identify potential etiologies of a patient's hearing loss, and important questions include the patient's medical history, noise exposure, and medication use.
7. Question: What is the purpose of otoscopy and some examples of abnormal findings? Answer: Otoscopy is used to visualize the ear canal and tympanic membrane, and examples of abnormal findings include a ruptured tympanic membrane and the presence of cerumen.
8. Question: What does the audiogram represent and what do different symbols mean? Answer: The audiogram represents a patient's hearing sensitivity, with the X-axis representing frequency and the Y-axis representing intensity. Different symbols indicate different transducers used to obtain thresholds.
9. Question: Why do we plot thresholds in dB HL instead of dB SPL? Answer: We plot thresholds in dB HL because it represents the intensity level at which the stimulus is just barely audible for the average human listener.
10. Question: Why is the speech banana useful? Answer: The speech banana is useful because it shows the frequency and intensity range of speech sounds, which is important when assessing a patient's ability to understand speech.
11. Question: What is the difference between air conduction and bone conduction audiometry? Answer: Air conduction audiometry tests the entire auditory system, while bone conduction audiometry bypasses the outer

and middle ear and tests the inner ear directly. Each test provides different information about the type and location of hearing loss.

12. Question: What are the different types of hearing loss? Answer: The different types of hearing loss include conductive, sensorineural, and mixed.
13. Question: What is the procedure for obtaining hearing thresholds/the audiogram? Answer: The procedure involves presenting pure-tone stimuli at different frequencies and intensities to determine the softest level at which the patient can hear the sound.
14. Question: What are the “rules” for determining hearing loss type? Answer: The “rules” include the air-bone gap rule and the no bone conduction rule.
15. Question: How can hearing loss be characterized based on type, configuration, and severity? Answer: Hearing loss can be characterized as conductive, sensorineural, or mixed based on type, flat, sloping, or cookie-bite based on configuration, and mild to profound based on severity.
16. Question: How can the audiogram be interpreted? Answer: The audiogram can be interpreted by identifying the patient’s thresholds for different frequencies and intensities based on the symbols used in the audiogram.
17. Question: What is the concept of crossover, how and why does it occur, and why should we care about it? Answer: Crossover occurs when sound presented to one ear is detected by the other ear, which can result in inaccurate thresholds. It is important to care about it because it can affect masking decisions and diagnostic accuracy.
18. Question: What is the concept of interaural attenuation, what is IA for different transducers, and why is it important to keep these values in mind when performing audiometric testing? Answer: Interaural attenuation is the amount of sound energy lost when sound is presented to one ear and detected by the other ear, and it varies depending on the transducer used. It is important to keep these values in mind when performing testing to ensure accurate masking levels and diagnostic accuracy.
19. Question: What are the masking rules, what is the rationale for each rule, and how can you identify which rules apply in specific situations? Answer: The masking rules include the maximum permissible limits (MPLs) rule, the minimum masking level (MML) rule, and the plateau method. The rationale for each rule is to ensure accurate thresholds and avoid cross-hearing. The appropriate rule to use depends on the nature of the hearing loss and the patient’s thresholds.
20. Question: What is the plateau method and why do we use it as opposed to picking a single masking level for the non-test ear? Answer: The plateau method involves increasing the masking level in increments until the thresholds plateau, rather than selecting a single masking level for the non-test ear. We use it to ensure accurate thresholds and avoid

cross-hearing.¹ Question: What is undermasking? How do we know when undermasking is occurring? Answer: Undermasking occurs when the masking noise level is not sufficient to keep the non-test ear from responding to the stimuli, leading to a false impression of better hearing. We know when undermasking is occurring when the differences between the masked and unmasked thresholds are small, and there is a significant difference between the air and bone conduction thresholds in the test ear.

21. Question: What is the “plateau” actually telling us about which ear is participating? Why? Answer: The “plateau” indicates the point at which adding more masking noise no longer affects the test ear’s threshold. This means that the participating ear is the one with the better hearing ability since more masking noise is needed to prevent it from responding.
22. Question: What is overmasking? How do we know if overmasking is occurring? Answer: Overmasking occurs when the noise level in the non-test ear is too loud, which causes the test ear to overcompensate, leading to a false impression of poorer hearing. We know overmasking is occurring when the threshold of the test ear is higher with masking noise than the unmasked threshold.
23. Question: How can unmasked audiograms mislead clinicians about the type and severity of hearing loss? Think of the example of a unilaterally deaf patient from the Introduction to Masking presentation. Can you envision any other examples where the unmasked audiogram would be radically different from the masked audiogram? Answer: Unmasked audiograms can mislead clinicians because they do not account for the crossover of sound, leading to a false impression of better or worse hearing. For example, a patient with unilateral deafness may have a normal audiogram in the hearing ear, but their masked audiogram would show hearing loss due to the crossover of sound. Another example would be a patient with a significant air-bone gap who may have a better unmasked threshold than the actual masked threshold, leading to a false impression of better hearing.
24. Question: What are the types of speech audiometry tests, and what is the purpose of each test? Answer: The types of speech audiometry tests are Speech Recognition Threshold (SRT), Word Recognition Score (WRS), and Speech in Noise. The purpose of SRT is to determine the lowest level of hearing at which a patient can recognize and repeat back spoken words. The purpose of WRS is to determine a patient’s ability to identify individual words in a sentence or list presented at a comfortable listening level. The purpose of the Speech in Noise test is to determine a patient’s ability to identify individual words in the presence of background noise.
25. Question: What is the “cross-check” principle, and how does it apply to PTA and SRT? What could cause a lack of agreement between SRT and PTA? Answer: The “cross-check” principle is used to verify the accuracy

of hearing test results by comparing two different tests that evaluate different aspects of hearing. For example, comparing the Speech Recognition Threshold (SRT) and Pure Tone Audiometry (PTA) results can indicate the validity of the tests. A lack of agreement between SRT and PTA can occur due to inconsistencies in the results, such as issues with the audiometer, poor test instructions, or patient-related factors like lapses in attention, cognitive limitations, or fatigue.

26. Question: When is masking needed for speech audiometry, and how much masking is warranted? Answer: Masking is needed for speech audiometry when one ear has better hearing than the other, and the difference in hearing between the two ears causes the non-test ear to pick up some sound. The “rule of thumb” is to mask when there is a 15 dB difference between the air conduction thresholds of the ears, and a 10 dB difference between the bone conduction thresholds of the ears. The amount of masking noise warranted depends on the degree of the difference in hearing and the type of stimuli used.
27. Question: How do WRS performance-intensity functions look for different types of hearing loss, and why? Answer: WRS performance-intensity functions show the relationship between the intensity of the speech stimuli and the patient’s ability to correctly identify individual words. In individuals with conductive hearing loss, the function increases linearly with the increase in sound intensity. In individuals with sensory hearing loss, the function bends at the moderate-to-severe hearing loss range due to the reduced ability to use the intensity cues that are critical for word recognition.
28. Question: What is the concept of “rollover”? Answer: Rollover is a phenomenon where the Speech Intensity Level (SIL) required for patients to identify 50% of words decreases as the intensity of the speech signal increases. This occurs in individuals with sensorineural hearing loss and is an indication of the loss of dynamic range of hearing.
29. Question: How do speech-in-noise tests work, and what is the concept of “SNR loss”? Answer: Speech-in-noise tests are designed to evaluate a patient’s ability to understand speech in noisy listening environments. These tests present recorded speech sounds mixed with specific noise types at various intensity levels. The Signal-to-Noise Ratio (SNR) represents the strength of the voice signal relative to the strength of the noise signal. SNR loss is the reduction in the SNR at which a patient can recognize the speech stimuli in a noisy environment compared to that of normal hearing individuals.
30. Question: Where do otoacoustic emissions come from? Answer: Otoacoustic emissions (OAEs) come from the outer hair cells (OHCs) located in the cochlea. When the OHCs vibrate in response to sound, they generate a low-level acoustic signal that travels back through the middle ear and into

the ear canal, where it can be detected by a sensitive microphone.

31. Question: What are the two types of OAEs used clinically, and how do they differ in terms of stimulus and response? Answer: The two types of OAEs used clinically are Distortion Product Otoacoustic Emissions (DPOAEs) and Transient Evoked Otoacoustic Emissions (TEOAEs). DPOAEs utilize two or more tones to create a complex sound that stimulates the cochlea selectively. TEOAEs use a brief tone burst to stimulate the cochlea, generating a response that encompasses a broad range of frequencies.
32. Question: What does a DPgram show, and how is it used to determine if DPOAEs are normal or abnormal? Answer: A DPgram is a graphical representation of the amplitude of DPOAEs as a function of frequency. DPgrams are used to evaluate cochlear function and determine the presence of hearing loss. A flat or significantly reduced DPgram indicates underlying hearing loss, while a robust DPgram indicates normal hearing function.
33. Question: What are the clinical applications of OAEs, and what are the rationales for each application? For example, why are OAEs used heavily in pediatric clinics? Answer: The clinical applications of OAEs include screening for hearing loss, diagnosing hearing disorders, monitoring ototoxicity, and localized hearing loss. OAEs are used heavily in pediatric clinics due to their non-invasive nature, providing valuable information about hearing sensitivity in infants and young children, who may not complete traditional behavioral hearing tests.1. Question: What needs to be evaluated for the audiograms? Answer: The type, configuration, and severity of hearing loss, agreement between SRT and PTA, and what WRS scores indicate for each patient.
34. Question: What should you determine for each scenario when working through the following audiograms? Answer: Whether masking is needed, which thresholds need to be obtained with masking, and the initial masking level.
35. Question: What should you assume about the headphones or earphones used in the exercise for question 2? Answer: First, assume supra-aural headphones were used. Then repeat the exercise assuming insert earphones were used.