SLP Homework

1. Question: What should I be familiar with about 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 mechanical properties, which result in different regions of the cochlea responding to different sound frequencies.
3. Question: What are the functional differences between outer and inner hair cells? Answer: Outer hair cells amplify and fine-tune sound, while inner hair cells transduce sound into neural signals.
4. Question: What are the major landmarks of the temporal bone? Answer: The major landmarks of the temporal bone include the petrous portion, the mastoid process, and the external auditory meatus.
5. Question: What are the goals of audiologic evaluation? Answer: The goals of audiologic evaluation are to determine the presence, degree, and type of hearing loss, as well as any underlying pathology that may be contributing to the hearing loss.
6. Question: What is the purpose and what are the important questions of case history? Answer: The purpose of case history is to gather information about the patient's hearing health, medical history, and communication needs. Some important questions to ask during case history include the duration and onset of hearing loss, exposure to noise, and presence of any otologic symptoms.
7. Question: What is the purpose of otoscopy and what are some examples of abnormal findings? Answer: The purpose of otoscopy is to visualize the external auditory canal and tympanic membrane to assess for any abnormalities or pathology. Some examples of abnormal findings include perforations, effusions, and abnormal growths.
8. Question: What does each axis of the audiogram represent and what do different symbols mean? Answer: The vertical axis of the audiogram represents hearing threshold in decibels (dB), while the horizontal axis represents frequency in hertz (Hz). Different symbols represent different types of transducers and responses, such as unmasked air conduction and bone conduction thresholds, and "no response".
9. Question: Why do we plot thresholds in dB HL instead of dB SPL and what is the "origin" of the audiogram? Answer: We plot thresholds in dB HL (hearing level) instead of dB SPL (sound pressure level) because it accounts for individual differences in hearing sensitivity. The "origin" of the audiogram is 0 dB HL, which corresponds to the average threshold of a group of young, normal-hearing listeners.
10. Question: Why is the speech banana useful? Answer: The speech banana is useful because it represents the range of frequencies and intensities that

are important for speech understanding. It helps to illustrate how different types and degrees of hearing loss can affect speech perception.

11. Question: What is the difference between air conduction and bone conduction audiometry, what does each test accomplish and what information is revealed by comparing thresholds from each test? Answer: Air conduction audiometry measures the ability to hear pure tone stimuli presented through headphones or speakers, while bone conduction audiometry measures the ability to hear the same stimuli presented through a bone oscillator. Each test accomplishes different things and reveals different information about the type and degree of hearing loss. Comparing thresholds from each test can help to determine whether hearing loss is conductive, sensorineural, or mixed in nature.

12. Question: What are the different types of hearing loss: conductive, sensorineural, and mixed? Answer: Conductive hearing loss occurs when there is a problem conducting sound waves through the outer or middle ear, while sensorineural hearing loss occurs when there is damage to the inner ear or auditory nerve. Mixed hearing loss is a combination of both conductive and sensorineural hearing loss.

13. Question: What is the procedure for obtaining hearing thresholds/the audiogram? Answer: The procedure for obtaining hearing thresholds/the audiogram involves presenting pure tone stimuli of different frequencies and intensities to the patient, who indicates when they are able to hear the tone. Thresholds are recorded for each frequency and transducer type.

14. Question: What are the "rules" for determining hearing loss type? Answer: The "rules" for determining hearing loss type involve comparing air and bone conduction thresholds to determine if there is a conductive component to the hearing loss. If air and bone conduction thresholds are within normal limits but still exhibit hearing loss, this indicates a sensorineural component.

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 the type. Configuration refers to how hearing loss varies across frequencies, while severity refers to the degree of hearing sensitivity at each frequency.

16. Question: How can an audiogram be interpreted using the symbols that we have focused on up to this point in the class (unmasked air and bone conduction and "no response")? Answer: An audiogram can be interpreted by looking at the symbols for air and bone conduction thresholds at each frequency, and determining the type and degree of hearing loss based on the relationship between the two.

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 heard by the opposite ear. It occurs due to the phase differences between the sound waves reaching each ear. We should care about it because it can affect the results of audiometric testing and make it difficult to determine the true hearing thresholds of each ear.

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 refers to the degree to which sound presented to one ear is attenuated or reduced by the time it reaches the opposite ear. IA varies depending on the type of transducer used, and it is important to keep these values in mind when performing audiometric testing to ensure accurate threshold measurement.

19. Question: What are masking rules and what is the rationale for each rule? Be ready to identify which rules apply in specific situations. Answer: Masking rules are used during audiometric testing to ensure that the non-test ear is appropriately masked so that hearing thresholds can be accurately measured for the test ear. The rationale for each rule varies depending on the situation, but they generally involve selecting an appropriate masking noise level and adjusting it as needed to account for interaural attenuation and other factors.

20. Question: Why do we use the plateau method as opposed to picking a single masking level for the non-test ear, and how does it work? Answer: We use the plateau method to ensure that the non-test ear is appropriately masked at all test frequencies. It involves presenting a masking noise to the non-test ear at a level slightly above the initial masking level, and gradually increasing the level until thresholds in the test ear plateau or stop decreasing. This ensures that the non-test ear is sufficiently masked at all test frequencies.1. Question: What is undermasking? How do we know when undermasking is occurring? Answer: Undermasking is when the masking noise is not loud enough to fully mask the nontest ear, which could lead to a false impression of a better hearing threshold in the test ear. We know when undermasking is occurring when the threshold of the test ear improves when masking is introduced.

21. Question: What is the "plateau" actually telling us about which ear is participating? Why? Answer: The "plateau" is a term used to describe a point at which there is no further improvement in hearing threshold despite increasing the intensity of the sound presented to the test ear. The plateau indicates that the nontest ear is not participating in the test, as it is fully masked, and it can help determine the true hearing threshold of the test ear.

22. Question: What is overmasking? How do we know if overmasking is occurring? Answer: Overmasking is when the masking noise is too loud, which could lead to an underestimation of the hearing threshold in the

test ear. We know if overmasking is occurring if the threshold of the test ear worsens with increased masking in the nontest ear.

23. Question: How unmasked audiograms can 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 about the type and severity of hearing loss by not fully accounting for the contribution of the nontest ear to the patient's overall hearing sensitivity. For example, in the case of a unilaterally deaf patient, the unmasked audiogram would show normal hearing in the test ear despite the absence of hearing in the contralateral ear. Another example where the unmasked audiogram would be radically different from the masked audiogram could be in patients with asymmetrical hearing loss who may have better thresholds in one ear compared to the other, but the overall hearing sensitivity is worse due to the nontest ear's contribution.

24. Question: What are the types of speech audiometry tests, and what is the purpose of each test? Answer: There are several types of speech audiometry tests, including SRT, WRS, SDS, and Lombard test. The purpose of each test is to assess different aspects of the patient's speech perception abilities, such as speech recognition threshold, word recognition score, and speech discrimination abilities in 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 a method used to verify the accuracy of hearing test results by comparing different measures of the patient's hearing abilities. In the case of PTA and SRT, the principle would suggest that the audiologist should compare the results of both tests to ensure that there is agreement between them. A lack of agreement between SRT and PTA could be caused by factors such as a nonorganic hearing loss, test-retest variability, or incorrect administration of the test.

26. Question: When is masking needed for speech audiometry, and how much masking is warranted? (i.e., when is the "rule of thumb" masking level appropriate to use, and when is it not?) Answer: Masking is needed for speech audiometry when there is a significant difference in hearing threshold between the test and nontest ears. The amount of masking needed depends on the degree of hearing loss in the nontest ear and the intensity of the sound presented to the test ear. The "rule of thumb" masking level is appropriate to use when the difference in hearing threshold between the ears is greater than or equal to 40 dB, and the noise level needed to mask the nontest ear is 10 dB more than the threshold in the nontest ear. When the difference in hearing threshold is less than 40 dB or greater than 60 dB, the "rule of thumb" masking level may not be

appropriate or may need to be adjusted accordingly.

27. Question: How do WRS performance-intensity functions look for different types of hearing loss, and why? Answer: WRS performance-intensity functions look different for different types of hearing loss. In patients with conductive hearing loss, the WRS performance-intensity function has a shallow slope, indicating that the patient's speech recognition ability remains relatively stable over a wide range of presentation levels. In patients with sensorineural hearing loss, the WRS performance-intensity function has a steep slope, indicating that the patient's speech recognition ability deteriorates rapidly at lower presentation levels. The shape of the function helps identify the type and severity of hearing loss and can guide the selection of appropriate amplification or rehabilitation options.

28. Question: What is the concept of "rollover"? Answer: Rollover is a phenomenon in which a patient's speech recognition ability deteriorates at higher presentation levels, beyond a certain point. This deterioration is measured as a decrease in the difference between the percentage of words correctly identified between a low-level and high-level presentation.

29. Question: How do speech-in-noise tests work, and what is the concept of "SNR loss"? Answer: Speech-in-noise tests require the patient to repeat sentences or words presented with background noise. The tests determine the patient's ability to understand speech in noisy environments, which is an essential aspect of functional hearing ability. SNR loss is the difference between the signal-to-noise ratio (SNR) needed for the patient to achieve a certain level of speech recognition ability and the SNR needed for a normal-hearing individual to achieve the same level of speech recognition ability. The concept of SNR loss reflects the patient's difficulty in understanding speech in noisy environments, and it can guide the selection of appropriate amplification or rehabilitation options.

30. Question: Where do otoacoustic emissions come from? Answer: Otoacoustic emissions (OAEs) are sounds generated by the outer hair cells of the cochlea in response to an acoustic stimulus. These emissions can be detected by a microphone placed in the ear canal and are used to assess the function of the cochlea.

31. Question: What are the two types of OAEs used clinically, and how do they differ in terms of stimulus and response?

    a. DPOAEs
    b. TEOAEs Answer: The two types of OAEs used clinically are DPOAEs and TEOAEs. DPOAEs (distortion product otoacoustic emissions) are generated by the cochlea's non-linear response to two simultaneous pure-tone stimuli, while TEOAEs (transient-evoked otoacoustic emissions) are generated in response to a brief click or tone burst.

13. Question: What does a DPgram show, and how is it used to determine if

DPOAEs are normal/abnormal? Answer: A DPgram is a graph showing the amplitude of DPOAEs as a function of frequency. DPgrams are used to evaluate the function of the cochlea and the outer hair cells. DPgrams for normal hearing individuals are characterized by a visible DP-gram at multiple frequency bands, while individuals with hearing loss show a reduced or absent DP-gram at specific frequency regions.

14. Question: What are some clinical applications of OAEs, and what are the rationales for each application? For example, why are OAEs used heavily in pediatric clinics? Answer: Some clinical applications of OAEs include newborn hearing screening, monitoring of ototoxicity, and differential diagnosis of hearing disorders. OAEs are used heavily in pediatric clinics because they require no subjective response from the patient and can be used to screen for hearing loss in infants who cannot participate in traditional audiometry testing. OAEs are also useful in ototoxicity monitoring because they can detect early damage to the outer hair cells of the cochlea, which can guide the modification or discontinuation of ototoxic medications. OAEs can also provide additional diagnostic information in cases of ambiguous audiometry results.1. Question: What do you need to evaluate for the audiograms below? Answer: Type, configuration, and severity of hearing loss; agreement between SRT and PTA; and what WRS scores indicate for each patient.

15. Question: When working through the following audiograms, what needs to be determined? Answer: Whether masking is needed according to three rules.

16. Question: If masking is needed for the audiograms, what thresholds need to be obtained and what is the initial masking level? Answer: The audiogram scenario is not provided.