

NAME Werner - KEY

SPHSC 461 Hearing Science
Spring Quarter 2011
Exam 2

Definitions (5 pt each)

1. two-tone suppression

The reduction in an auditory nerve fiber's response to a tone near ~~the~~^{its} best frequency when a second tone at certain frequencies/intensities is presented (ok re: sharpening neural amp. spectrum)

2. masking

The reduction in audibility of one sound caused by the presentation of another sound.

3. sensitivity-resolution trade-off

If a system increases its temporal integration time to increase sensitivity, it will lose temporal resolution. (temporal needs to be here)

4. sone scale

A scale of loudness based on magnitude estimation, ⁽²⁾ ⁽¹⁾
On the sone scale the loudness of a 1kHz tone at 40 dB SPL is 1 sone. ⁽¹⁾ A sound that is 2x as loud will be 2 sones etc. (ratio) ⁽¹⁾

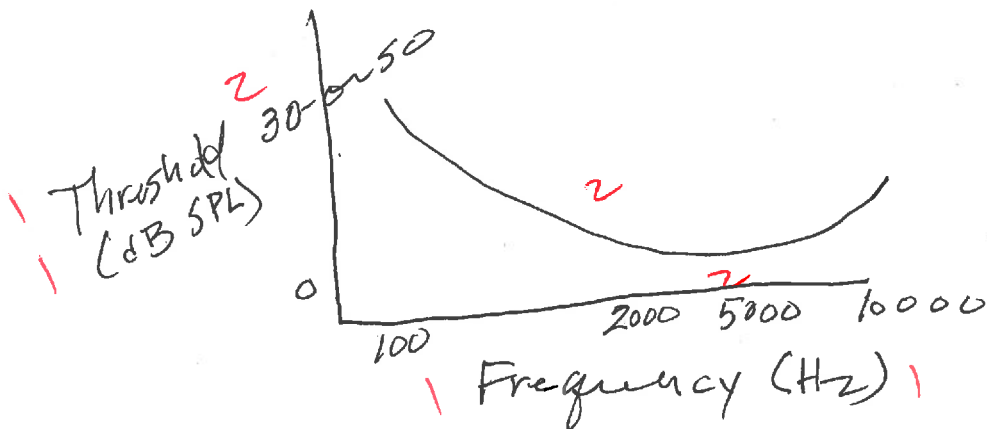
5. recruitment

An abnormally rapid growth of loudness

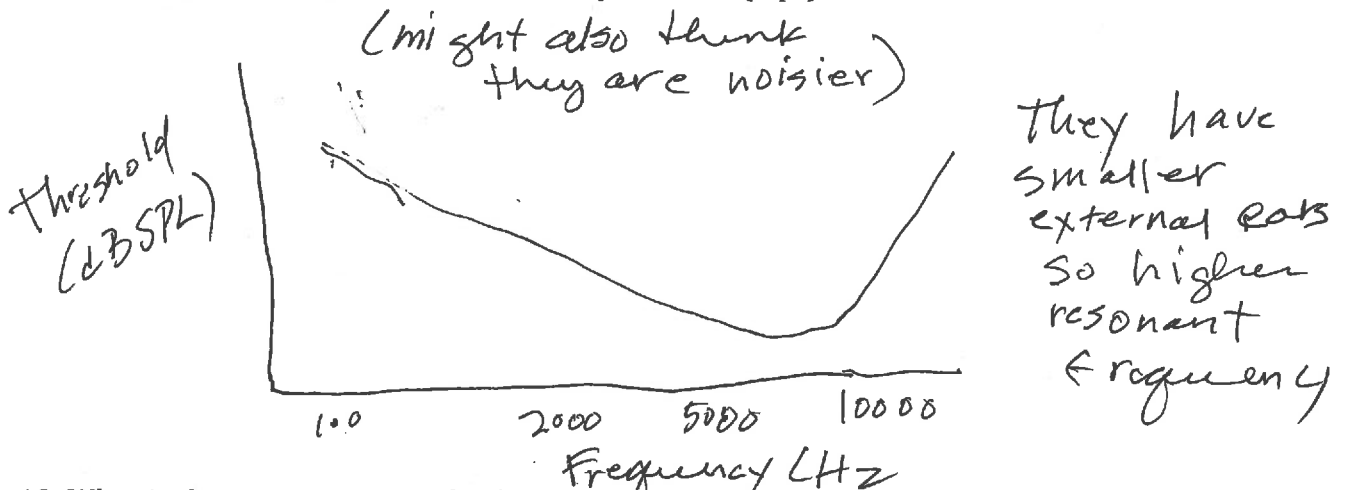
True or false? (2 pt each)

6. Loudness balance is a method for measuring loudness in which listeners adjust the level of one sound until its loudness matches that of another sound.
7. The auditory nerve response sometimes represents frequencies that were not present in the sounds transmitted to the ear.
8. If a person can distinguish a 20 dB click from a 21 dB click, then they can distinguish a 40 dB click from a 41 dB click.
9. A broadband noise can mask another sound if the other sound ends before the noise begins.
10. People can hear amplitude modulation very well for modulation rates lower than 50 Hz.

11. Sketch the human audibility curve. (10 pt)



12. Sketch what you might think the audibility curve of a 1-month-old baby would look like. Explain why you drew the curve you drew. (5 pt)

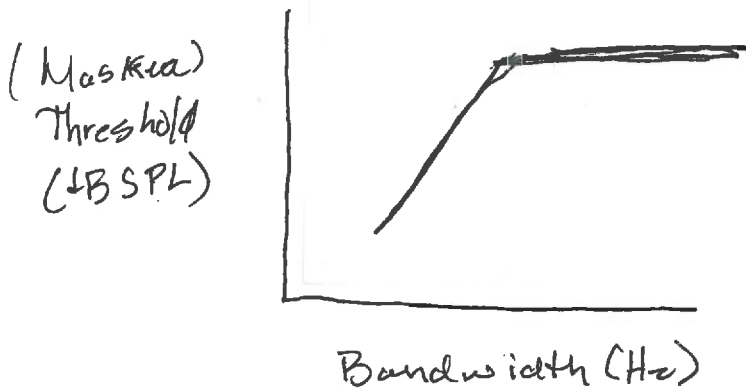


13. What is the near miss to Weber's Law? Why does it occur? (10 pt)

5 The near miss to Weber's Law refers to the fact that we do better at intensity discrimination at high intensities, for sounds like tones, than Weber's Law would predict.

5 At high intensities, if a sound has a narrow excitation pattern, the excitation pattern can spread along the basilar membrane, giving a listener additional information about intensity, besides firing rate.

14. Draw a graph showing the threshold for a tone masked by a noise band centered on the tone frequency, as a function of the noise bandwidth. (10 pt)



15. Suppose a listener had a hearing loss that was caused by loss of outer hair cells. Would performance on the following tasks be affected? Why? (3 pt each)

a. detection of a tone in noise

Yes, because OHC control auditory filter width, so without them get broader filters + more noise passes through the filter with the tone.

b. intensity discrimination of broadband noise

No. It could affect spread of neural excitation, but that isn't important for bbn.

c. loudness growth

Yes. OHC response is compressive, leading to compressive growth of loudness, if OHC gone, ^{recruitment} loudness growth wouldn't be compressive.

d. forward masking

No, because forward masking is determined by temporal factors not controlled by OHC.

e. temporal integration

No, because temporal integration is determined by temporal factors not controlled by OHC.

16. Describe two ways in which the auditory nerve's representation of the time waveform of sound is limited. (10 pt)

Fine structure not represented above 5000 Hz.
 Waveform is broken down into $\frac{1}{3}$ octave bands.
 Only positive parts represented. (Half wave rectification) distorted (2.5)

phase locking doesn't occur over 5000 Hz - Adaptation?

17. Do you think that a psychophysical tuning curve measured using forward masking would look like a psychophysical tuning curve measured using simultaneous masking? Why or why not? (5 pt)

Yes. Simultaneous + forward masking occur for different reasons, but a tone or noise band will affect the same nerve fibers (swamping or adaptation), and masked threshold will change in same way as masker frequency is changed.