External Anatomy of the Human Ear:
- Auricle or Pinna
- Helix
- Antihelix
- Lobule
- Tragus
- Antitragus
- Concha
- Triangular fossa
- External Acoustic Meatus
- Tympanic membrane

Anatomy of the Middle ear or Tympanic Cavity:
- Auditory ossicles (Malleus, Incus, Stapes)
- Muscles of the Tympanic cavity (Tensor tympani, Stapedius)
- Eustachian tube

Anatomy of the Inner Ear, Auditory apparatus, Cochlea
- Bony labyrinth
  - Oval window
  - Scala vestibule
  - Perilymph
  - Round window
  - Scala tympani

- Membranous labyrinth
  - Cochlear duct
  - Endolymph
  - Vestibular membrane

- Organ of corti
  - Basilar membrane
  - Tectorial membrane
  - Outer hair cells
  - Inner hair cells

Anatomy of the Inner Ear, Equilibrium apparatus:
- Bony labyrinth
  - Perilymph
- Membranous labyrinth
  - Endolymph

Dynamic equilibrium:
- Semicircular canals (Anterior, Posterior, and Lateral)
  - Ampulla
  - Crista (Crista ampullaris)
  - cupula
- Hair cells

Static equilibrium:
- Macula and Utricle, Macula
  - Otoliths
  - Otolithic membrane
  - hair cells
Surface anatomy of the tongue
Tip or apex  Margin  Dorsum
Filiform papillae  Fungiform papillae  Foliate papillae
Vallate papillae (circumvallate)

Histology of the Cochlea:

1. Review Slide (38): Make sure you can identify the following structures:
   Bony labyrinth
   Scala vestibule  Perilymph  Round window
   Scala tympani
   Membranous labyrinth
   Cochlear duct  Endolymph  Vestibular membrane
   Organ of corti
   Basilar membrane  Tectorial membrane  Outer hair cells
   Inner hair cells

Physiological Aspects of Hearing:

Properties of Sound:
Pitch: Subjective perception of different sound frequencies
Frequency: Cycles (number of waves) per second, measured in Hertz (Hz). The frequency range in which most people hear is between 20 Hz and 20,000 Hz. The most sensitive range is between 1,000 Hz and 4,000 Hz. The normal speech range is 125 Hz to 8,000 Hz.
Loudness: Subjective evaluation of the amplitude, usually measured in decibels (dB)
Amplitude: The height, amount of energy, of sound waves.

Conduction impairment (deafness): refers to a blockage of sound waves as they are conducted through the external and middle ear to the sensory apparatus in the Cochlea. The structures of the external and middle ear form a conduction pathway which includes the Tympanic Membrane, Malleus, Incus, Stapes, and Oval window. If any of these structures do not vibrate normally, sound waves would not be amplified and the membrane covering the oval window would not vibrate sufficiently, result in impaired hearing.

Nerve impairment (deafness): Is caused by the damage to the nerve pathway between the internal cochlea on up to the acoustic areas of the brain located in the auditory cortex of the temporal lobe. Nerve deafness can be inherited or acquired through nerve damage. The most common cause is damage to the hair cells of the organ of corti.
Hearing tests:

The Rinne test: This test enables you to differentiate between nerve deafness and conduction deafness.

1. Have the subject plug one ear with a cotton ball. The experimenter should strike the tuning against the palm of their hand to start the tuning fork vibrating. Immediately hold the tuning fork about 10 cm (1 inch = 2.5 cm) from the subject's unplugged ear. The instant the subject can no longer hear the vibrations, the experimenter should place the base (handle) of the tuning fork against the subject's Mastoid Process on the same side. Conduction deafness may be present if the subject is not able to hear the tuning fork sound again.

2. Repeat the procedure with the other ear.

3. Did you get the same results with both ears?

4. Why is the Rinne test a logical test for conduction rather than nerve deafness?

The Weber Test: This test can be used to determine relative conduction and nerve deafness.

1. Have the subject sit quietly. The experimenter should vibrate the tuning fork and place the base (handle) on the mid-line of the forehead at the hair line.

2. If the vibration sound is heard equally in both ears, your hearing is the same in both ears.

3. If nerve damage is present, you will not hear the sound as well in the affected ear.

4. If conduction deafness is present, the sound will be louder in the weaker ear. Why would this be so?