**Chapter 12 Study Guide:**

* Know the parts of the ear that contribute to the vestibular system and how they work.
  + Otolith organs- mechanical structures that sense both linear acceleration and gravity.
    - Utricle- one of the two otolith organs. Saclike and contains utricular macula.
    - Saccule- Contains saccular macula.
  + Semicircular canals- the three toroidal tubes that sense angular motion.
  + otoconia-tiny calcium carbonate stones in the ear that provide inertial mass for the otolith organs enabling them to sense gravity and linear acceleration.
  + Maculae- specialized detectors of linear acceleration/gravity found in each otolith organ
* angular motion- the spatial orientation modality that senses motion resulting from rotation.
* linear motion- the spatial orientation modality that senses translation
* tilt- the spatial orientation modality that senses head inclination with respect to gravity.
* angular acceleration- rotations. Yaw=no pitch=yes, roll=sore neck of your head.
* linear acceleration- translations, car or train starting or stopping.
* Vection- illusory sense of self motion. Examples: IMAX movies, looking at a stream while standing on a bridge.
* motion sickness-results from a disagreement between the visual and vestibular signals. Vomiting is a good response to disagreement.
* Habituation- If we spin someone (rotation) at a constant speed they start to lose the perception of motion after about 30 seconds. When rotation stops the individual perceives rotation in the opposite direction. For example you will experience a “wavy” feel after you get off of a boat after spending a long period of time on the boat.
* Acceleration- is speed changing? Not how fast or slow.
* Velocity-the speed of something in a given direction.
* receptor potential- the change in voltage of sensory receptor cells, hair cells for the vestibular system, in response to stimulation.
* Mechanoreceptor- a sense organ or cell that responds to mechanical stimuli such as touch or sound.
* oscillatory-  the repetitive variation, typically in time, of some measure about a central value (often a point of equilibrium) or between two or more different states.
* sensory integration,
* Know the pathways used by the vestibular system
  + Vestibular information reaches the cortex via thalamocortical pathways
  + Areas of the cortex that receive projections from the vestibular system also project back to the vestibular nuclei which modulates low level vestibular processing in the brain stem.
  + There is a vestibular pathway that leads to the hippocampus through the vestibular cortex.
* Know the 3 different reflexes/responses used in vestibular response (they all start with “vestibulo-”) and what they do.
  + Vestibulo-ocular- linked ot eye movement system. Allowing quick real time adjustments for head movements.
  + Vestibule-autonomic- Responses to the autonomic nervous system: motion sickness. Responses adjust for blood pressure when you lie down or get up.
  + Vestibule-spinal-maintain balance while standing still or moving through the environment.
* Know how caloric stimulation works
  + When cold water ends the ear and the inner ear changes temperature it should cause fast, side to side movements called nystagmus. The eyes move away from the cold water and then slowly move back.
    - Cold opposite, warm same.
* How do cameras try to mimic the human vestibular system?
  + Modern camera’s move either lenses or sensor to compensate for vibration. Tuned for normal human motor tremor, and not ideal for other types of vibration (e.g. car or helicopter vibration). Similar to human system: combination of sensors and compensatory movements.