

Human Biology 175 Lecture Notes: Special Senses

Section 1 Eye

A) Accessory Eye Structures

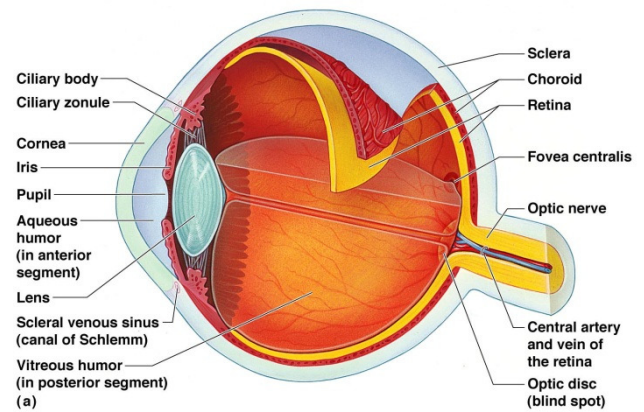
- 1) _____ Protects
- 2) _____
 - a) mucous membrane covers anterior sclera and inner eyelid
 - b) lubricate/rinse the surface
 - c) Conjunctivitis: inflammation of the conjunctiva
- 3) _____
 - a) structures that produce tears
 - b) _____ antimicrobial enzyme
 - c) Cleans/rinses/moistens
- 4) _____ Move eye in orbit—follow objects without moving head

B) Eyeball (1" sphere)

C)

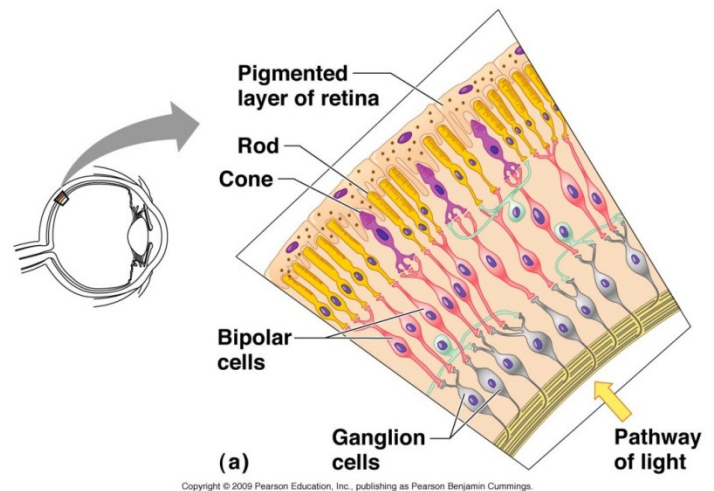
- 1) (outermost Layer) _____
 - a) _____ 'white ball'
dense fibrous connective tissue
 - b) _____ 'clear' fibrous
connective tissue
 - (1) Highly innervated → blink/tear
 - (2) Avascular → transplanted

- 2) (Middle Layer) _____
 - a) _____ Dark
 - (1) Vascular
 - (2) Function: _____
 - b) _____
 - (1) Smooth muscle
 - (2) Attached to the _____ by suspensory ligaments/ciliary zonules
 - (3) Contractions change shape of lens to _____
 - c) _____
 - (1) Crystallin protein (clear/transparent)
 - (2) Changes shape to bend the image/light onto the _____
 - (3) Divides sphere into two segments:
 - (a) Anterior segment: _____ Watery/nourishes/removes wastes
 - (b) Posterior segment: _____ Clear Gel—maintains eyeball shape



- d) _____
- (1) Doughnut of Smooth muscle
 - (a) _____
 1. pupil diameter increases
 2. _____ light enters
 - (b) _____
 1. pupil diameter decreases
 2. _____ light enters
 - (c) Controls amount of light entering eye
 - (2) Divides the anterior segment into two spaces
 - (a) Anterior chamber: between cornea and iris
 - (b) Posterior chamber: between iris and lens

- 3) (innermost layer) _____
- a) Ganglion cells (axons) form optic nerve
 - b) Exit eyeball → _____
(no photoreceptors present)
 - a) Bipolar cells
 - b) Photoreceptors
 - (1) _____
black/white vision (dim light)
 - (2) _____
color vision (bright light)
 - (3) _____
sharp vision/highest acuity



Section 2 Vision

A) Pathway of light

- 1) Cornea
- 2) Anterior chamber of the anterior segment
- 3) Pupil (iris)
- 4) Posterior chamber of the anterior segment
- 5) Lens
- 6) Vitreous humor of the posterior segment
- 7) Retina

B) Visual information pathway

- 1) _____
- 2) _____ information from each eye is transmitted to both cerebral hemisphere's for processing
- 3) _____ visual processing/overlap images from each eye

C) Sight

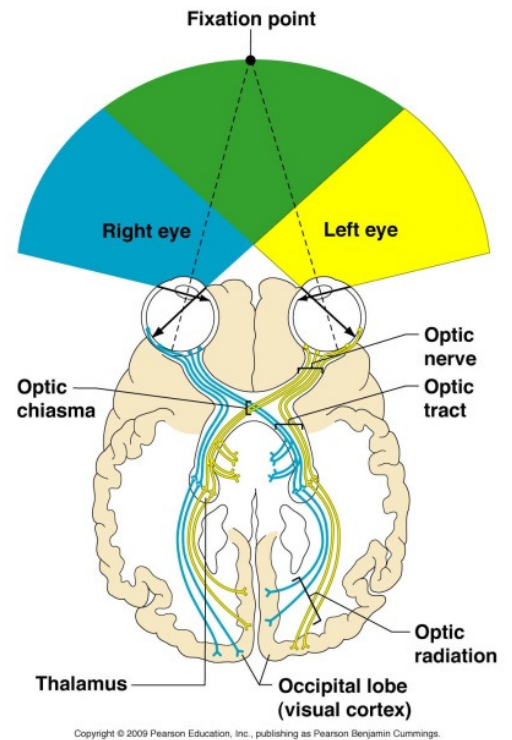
- 1) Normal vision: image is focused on the retina
- 2) Nearsighted: eyeball is elongated so image focused before the retina
- 3) Farsighted: eyeball is shortened so image focused passed the retina
- 4) Magnifyers: lens loses elasticity

D) _____

- 1) Duct to drain aqueous humor blocked
- 2) Aqueous humor made continuously
- 3) Increased pressure within eye can damage retina

E) _____

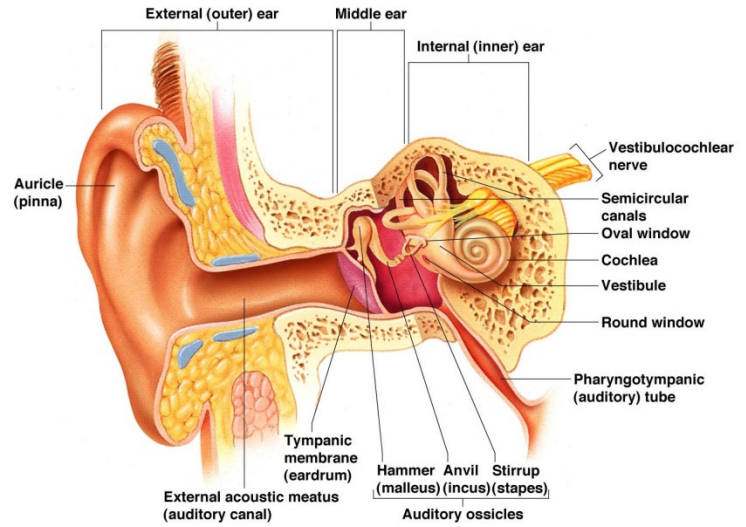
- 1) Lens is occluded/cloudy
- 2) Occurs with age/trauma
- 3) Remove/replace lens



Section 3 Ear

A) _____ (outer)

- 1) Structures:
 - a) auricle/pinna
 - b) External acoustic meatus (1" long) passes through the _____ bone
 - c) Lined with _____
Secrete cerumen (earwax) that traps particles
 - d) Filled with: _____
 - e) _____
- 2) Function: Direct sound toward the middle ear



B) Middle Ear or _____ within temporal bone

- 1) Structures:
 - a) _____
 - b) 3 ossicles: _____
pound against the oval window to transmit sound
 - c) Oval window
 - d) Round window
 - e) Filled with _____
 - f) _____ connects middle ear to nasopharynx (equalizes pressure)
 - (1) Connects middle ear to nasopharynx (equalizes pressure)
 - (2) Flat but opens during swallowing/yawning
- 2) Function: Amplify sound/Transmit to inner ear

C) _____ (inner cavity of the temporal bone)

- 1) Structures:
 - a) Maze/bony labyrinth of spaces
 - b) Semicircular canals: _____
 - c) Vestibule: _____
 - d) cochlea: _____
 - e) Filled with _____
 - f) _____: sensory receptors/stereocilia sway to generate an action potential
- 2) Function:
 - 1) Hearing
 - 2) equilibrium

Section 4 Hearing & Equilibrium

A) Hearing

1) Pathway of Sound

- auricle/pinna
- External acoustic meatus
- Tympanic membrane
- Ossicles
- Oval window
- Cochlea-- _____

- Hair cells with hairs/cilia in gel
- Fluid moves cilia in gel

2) _____ fluid movements cause stereocilia of hair cells to sway → (threshold) action potential

- Cochlear nerve → _____
- High pitches: nearest oval window
- Low pitches: furthest oval window
- Volume: dependent upon number of APs generated
- Tone: interpretation based on distribution of hair cells that are stimulated
- Sound from both ears → determine location

3) _____ sensory receptors stop responding to the same sounds/tones

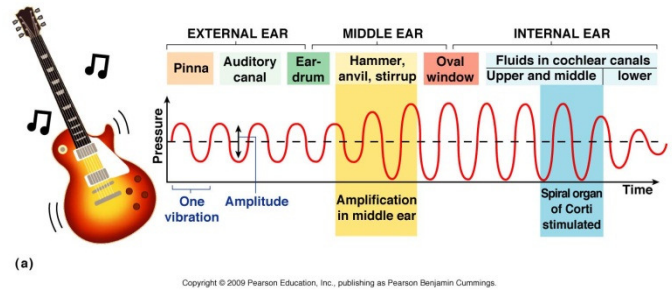
4) _____ hearing loss

- Cannot get fluid to move (wax buildup)
- Ossicles fused
- Ruptured eardrum
- Damage to organ of corti/cochlear nerve/auditory cortex
- Hearing aids turn up the sound
- Cochlear implant: device allows sound to stimulate cochlear nerve directly

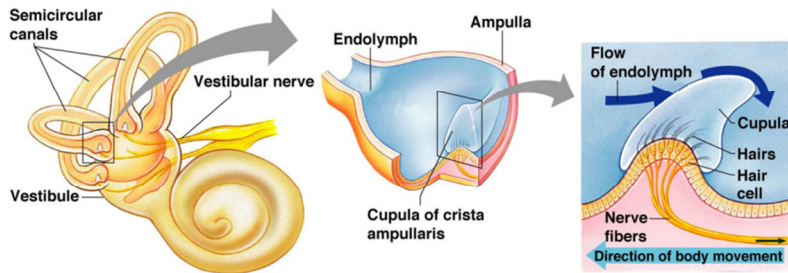
B) _____ sense based on movement of endolymph

1) Hair cells → vestibular nerve → _____

- _____ (sensory receptors) from muscles/tendons provide information about body position
- Work together to provide smooth/coordinated body movements

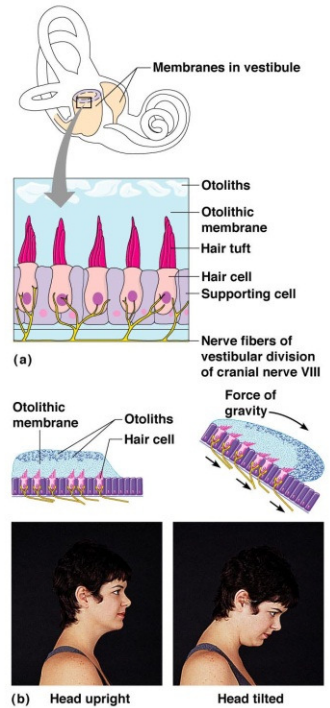


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- 2) Dynamic Equilibrium: _____
- 3 canals in 3 directions (anterior/superior/horizontal)
 - stereocilia of hair cells respond to moving endolymph
 - angular/rotational _____
 - Motion sickness: continuous fluid movements

- 2) Static Equilibrium: _____
- Otolithic membrane covers stereocilia of hair cells
 - Otoliths (calcium salts) stones within membrane roll/move with gravity/head movements
 - Pull on stereocilia → vestibular nerve
 - _____

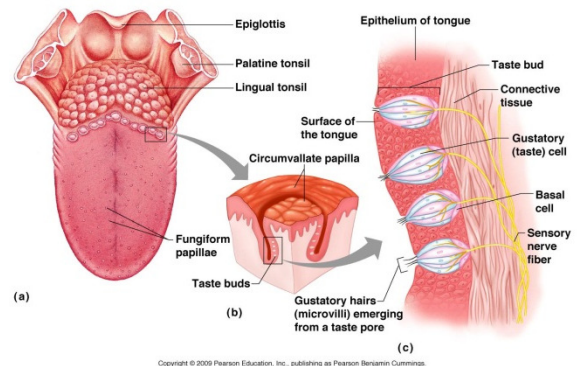


Section 5 Chemical Senses

A) Chemical senses of the tongue

1) Structures:

- _____ : macroscopic
- Covered with epithelial tissue
- Taste buds:
 - _____ chemoreceptor/sensory receptor
 - Basal cells--mitotic—replace gustatory cells every 7-10 days
 - Located on tongue, soft palate, superior pharynx and inner cheeks
 - Facial/glossopharyngeal nerve → cerebral cortex



2) 5 basic tastes:

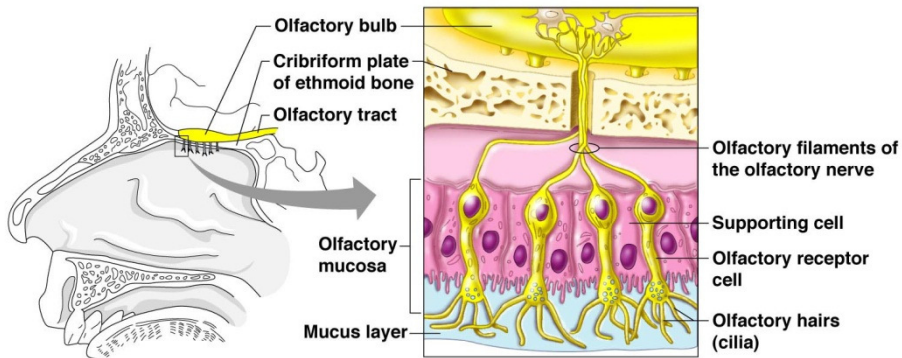
- Sweet: alcohol, saccharine, lead salts (paint), sugars
- Salts: metal ions (NaCl, K)
- Sour: acetic acid (vinegar)
- Bitter: caffeine, nicotine, quinine
- Umami: 'beef'/MSG (monosodium *glutamate*) flavor enhancer
- Most taste buds respond to >1 basic tastes/complement each other
- Tend to adapt quickly

B) Olfaction

1) Structures:

- 1) Nasal cavity
- 2) Lined with olfactory epithelium
- 3) _____: hair cells/chemoreceptors/sensory receptor sensitive to molecules dissolved in fluids of the mucosa
- 4) Axons pass through ethmoid bone and synapse with olfactory bulb then through limbic system (emotional link) to cerebral cortex

2) Function: Transmit information about smell to the cerebral cortex



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