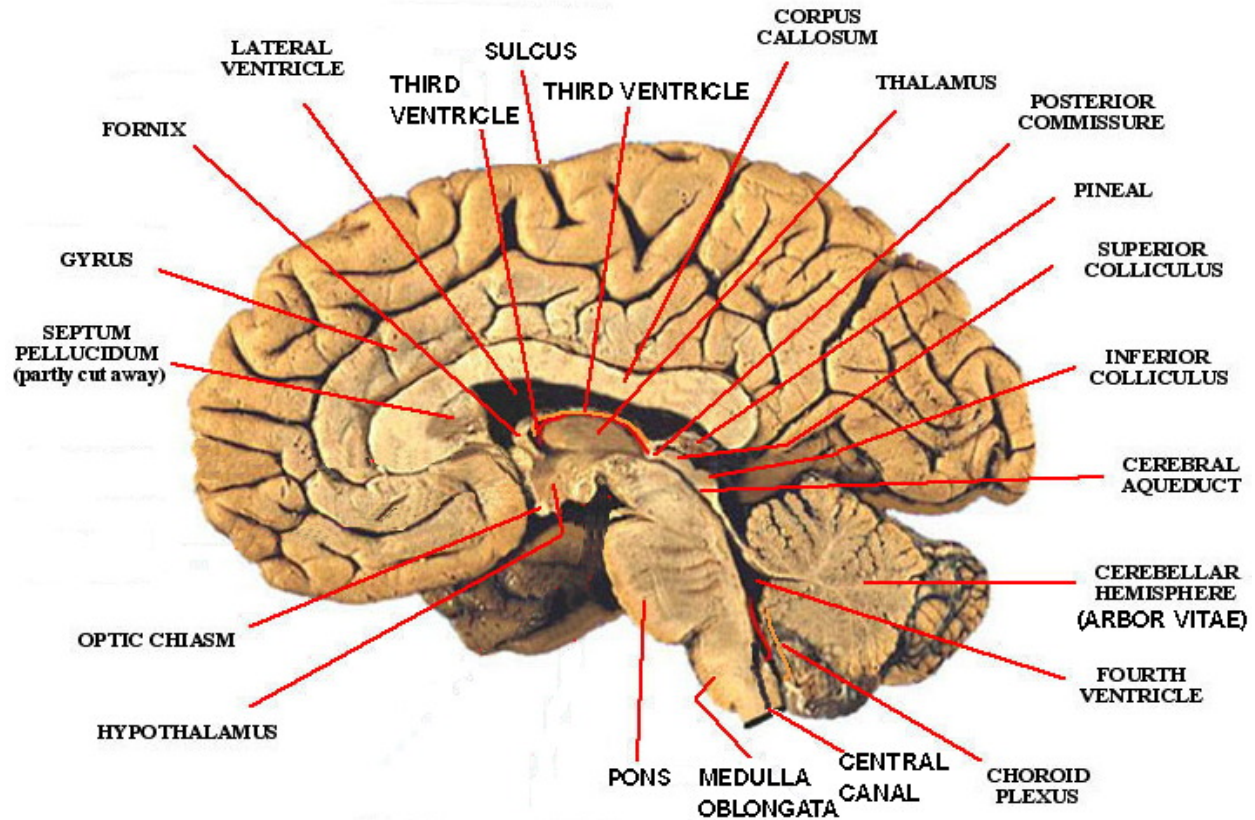


Biology 152 – Brain/Spinal Cord/Ear/Eye Objectives

Items will be identified on a sheep's brain dissection, human brain models, sagittal/coronal sections of human brains in plastic, ear and eye models, and an eye dissection. You will need to learn a **proper function** for each listed item for the practical.



BRAIN REGIONS – learn their names, position in the brain, and functions

Meninges – protective tissue layers around the brain and spinal cord

Dura mater	strong mother, collagenous layer with dural sinuses, protects brain and allows reabsorption of CSF into blood stream
Arachnoid membrane	arachnoid villi “pooch” into dural sinus to allow CSF loss to blood, holds CSF and allows circulation around brain/spine
Pia mater	weak mother, holds shape of brain and allows diffusion of nutrients and wastes between tissues and CSF

Cerebrum – two hemispheres where all conscious thought occurs

L/R Hemispheres	dual hard drives that control behavior and store all memory
Cerebral cortex	thin gray matter (nonmyelinated) layer that stores information
Frontal lobe	site of voluntary motor control, behavior, and intelligence
Parietal lobe	site of gustatory (taste) storage, special sense/navigation ability
Temporal lobe	site of olfactory and auditory memory storage
Occipital lobe	site of visual memory storage
Precentral gyrus	primary motor cortex router connecting frontal lobe to muscles
Postcentral gyrus	primary somatosensory router connecting senses to posterior brain regions

Central sulcus	low spot in cerebrum dividing all motor from all sensory areas
Gyri/sulci	ridges and folds in cerebrum/cerebellum that increase surface area
Corpus callosum	fast (100m/s) myelinated tract used to connect L/R cerebral hemispheres
Grey matter	slow (1m/s) nonmyelinated neurons used for decision making/memory
White matter	fast (100m/s) myelinated tracts used to connect brain regions

Forebrain Structures

Thalamus	central forebrain router for all sensory/motor impulses <i>except</i> olfactory
Hypothalamus	measures blood variables and generates cravings (for food, water, etc.)
Infundibulum	stalk of pituitary, connects hypothalamus to pituitary (for ADH/oxytocin)
Hypophysis (or pituitary gland)	" <i>Master Gland</i> " of the body, secretes GH, ACTH, LH, FSH, TSH, ADH, and oxytocin to control most of our physiology
Pineal Gland	posterior to thalamus, secretes melatonin to control sleep/wake cycles

Midbrain Structures

Corpora quadrigemina	Posterior area consisting of 2 <i>superior colliculi</i> (visual reflex actions) and 2 <i>inferior colliculi</i> (auditory reflex actions)
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Hindbrain Structures

Medulla oblongata	controls primitive repetitive autonomic activities (heart, lungs, GI, etc.)
Pons	connects medulla to cerebellum at 100 m/s, controls respiratory <i>depth</i>
Arbor vitae	branching "tree of life" connects brainstem to cerebellum at 100 m/s
Cerebellum	allows coordination of complex, repetitive, skilled fine-motor activities

CSF Creation And Flow

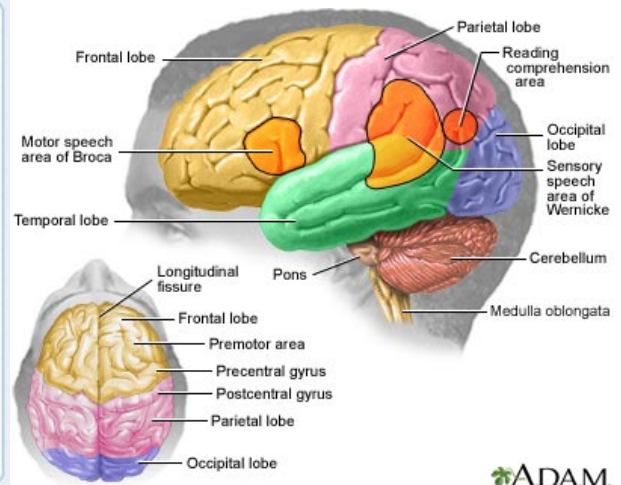
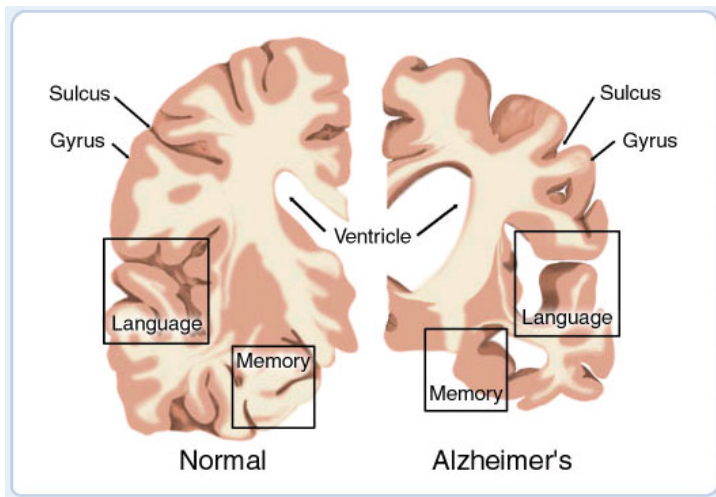
Lateral ventricles	feed nutrients to and remove wastes from the 2 cerebral hemispheres
Third ventricle	feeds nutrients to and remove wastes from the thalamus/hypothalamus
Cerebral Aqueduct	allows CSF to flow down from third to fourth ventricles
Fourth ventricle	feed nutrients to and remove wastes from the hindbrain structures
Central canal	feed nutrients to and remove wastes from the internal spine
Choroid plexus	gray/brown mass of blood vessels that filters the blood to create CSF

Optic Pathway

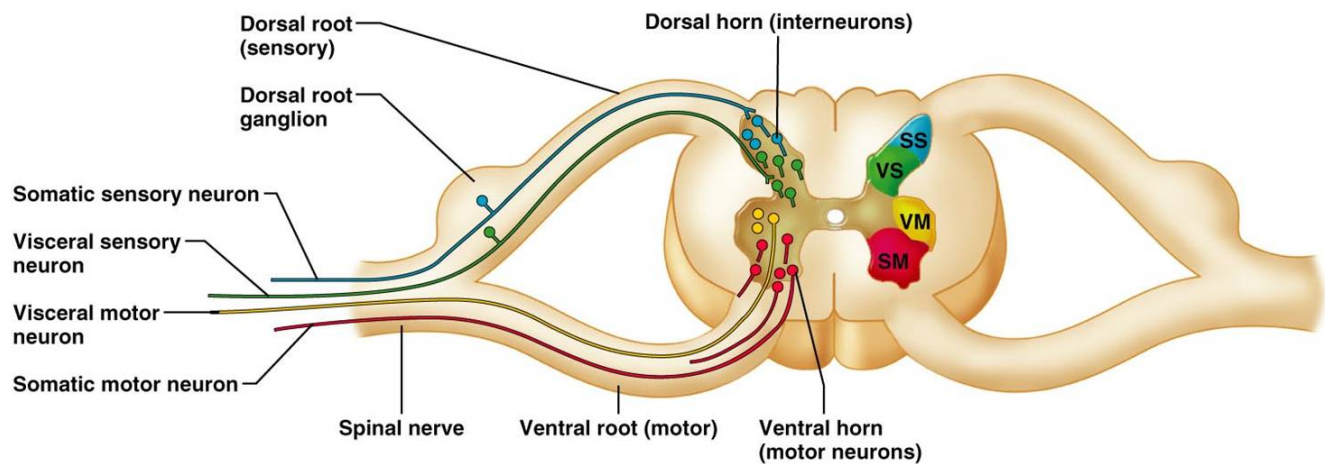
Optic nerve	connects retina from each eye to optic chiasma; monocular
Optic chiasma	fusion point that crosses optic information from each eye; stereoscopic
Optic tract	connects optic chiasma to occipital lobes; stereoscopic

Olfactory Pathway

Olfactory bulb	allows synapsis of olfactory nerves through cribriform plate of ethmoid
Olfactory tract	channels olfactory impulses at 100 m/s back to inferior temporal lobes



ADAM



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SPINAL CORD ANATOMY - learn their names, position in the spine, and functions

Specialized Structures

Central canal	feed nutrients to and remove wastes from the internal spine
Anterior root	mass of motor axons exiting spine at 100 m/s to muscles/glands
Posterior root	mass of sensory axons entering spine at 100 m/s from lower body
Posterior root ganglion	mass of sensory cell bodies (with nuclei) inside vertebrae (for protection)
Spinal nerve	mixed mass of sensory and motor neurons connecting spine to lower body
Gray commissure	slow 1 m/s connection between gray matter in L/R spine

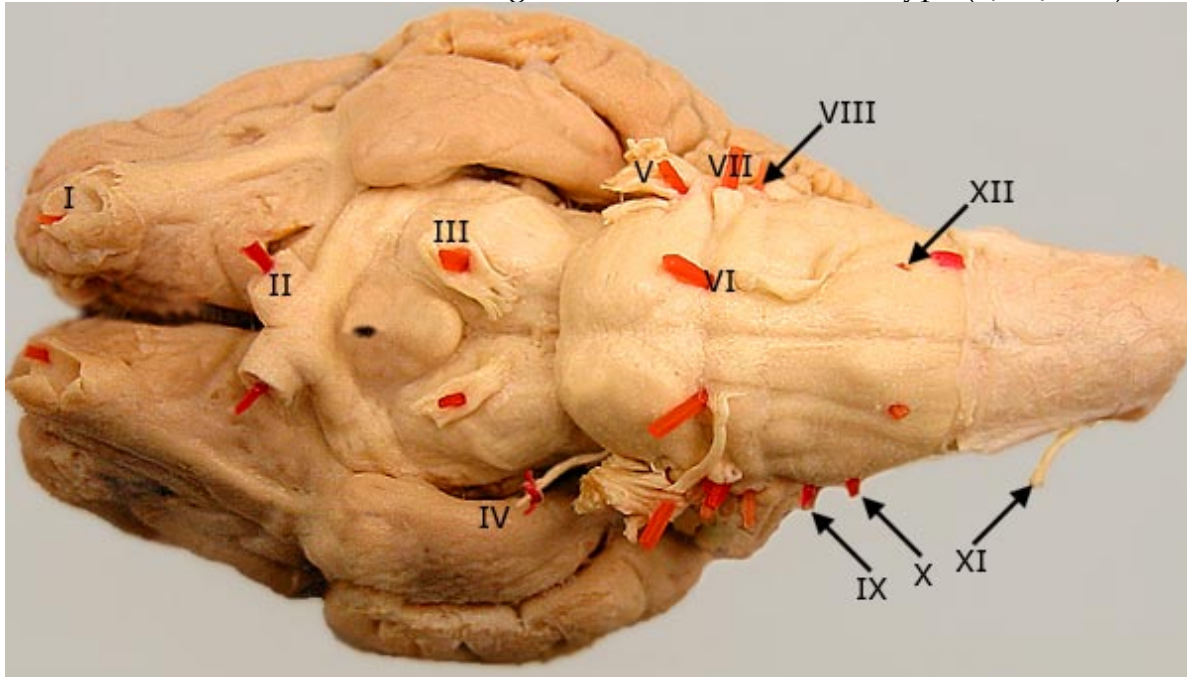
Gray Horns - slow, nonmyelinated "switches" allowing primitive decision making by the spine

Anterior gray horn	slow 1 m/s somatic area controlling voluntary skeletal muscles
Lateral gray horn	slow 1 m/s area controlling involuntary glands and smooth muscles
Posterior gray horn	slow 1 m/s sensory area responding to sensory input into spine

Spinal Funiculi - fast 100 m/s "elevators" connecting brain above to reflex arcs at various levels in spine

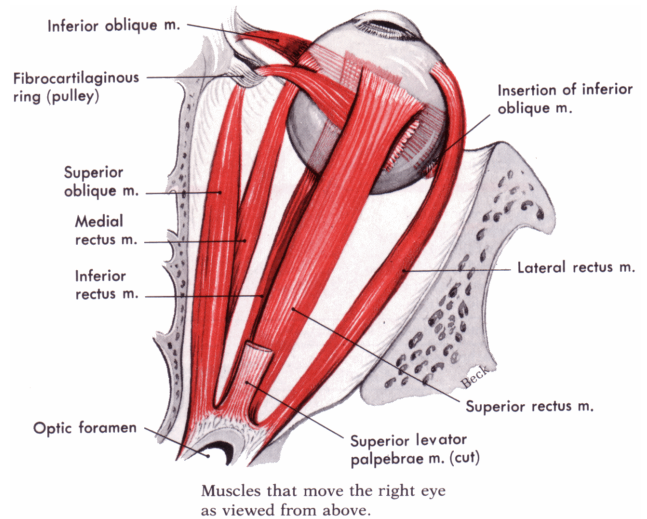
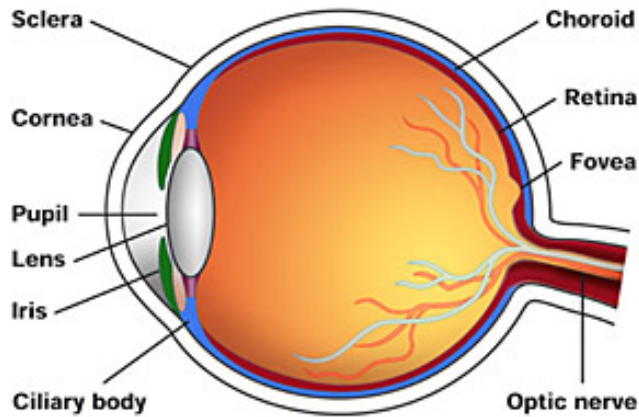
Anterior funiculus	fast 100 m/s descending pathway from brain to skeletal muscles
Lateral funiculus	fast 100 m/s descending pathway from brain to glands/smooth muscles
Posterior funiculus	fast 100 m/s ascending pathway for sensory input to reach thalamus

CRANIAL NERVES - learn their names, generalized functions, and type (S/M/Mix)



On Old Olympus' Towering Top, A Frisky Veterinarian Gave Valery A Hop

#	Name	Generalized Function	Type
1	Olfactory	Detects odors	<i>Sensory</i>
2	Optic	Detects light	<i>Sensory</i>
3	Oculomotor	Move eye medial, constrict pupil, focus eye up close	Motor
4	Trochlear	Move eye slightly for fine-focus	Motor
5	Trigeminal (3 branches)	<i>Ophthalmic Division</i> - sensations from upper face <i>Maxillary Division</i> - Sensation from mid-face and upper teeth <i>Mandibular Division</i> - Sensation from lower teeth and anterior tongue plus motor to muscles of mastication	Mixed
6	Abducens	Moves eye lateral	Motor
7	Facial (5 branches)	superficial motor/sensory to muscles of facial expression, taste sensation (sweet), 5 branches from forehead to neck	Mixed
8	Vestibulocochlear	Hearing (cochlea) and static/dynamic balance (vestibule)	<i>Sensory</i>
9	Glossopharyngeal	Pharyngeal sensation and control of muscles involved with swallowing action, parasympathetic control of parotid salivary glands	Mixed
10	Vagus	Widest distribution of all cranial nerves (passes into thorax and abdomen): sensory from larynx (cough reflex), motor to muscles of pharynx and larynx, parasympathetic to thoracic and abdominal viscera; involved in control of breathing rate, heart rate, and digestive motility (peristalsis)	Mixed
11	Accessory	Motor to sternocleidomastoid and trapezius muscles	Motor
12	Hypoglossal	Motor to muscles of tongue	Motor



EYE STRUCTURES – models and dissection; learn their names, position, and functions

Four refractory structures of the eye

Cornea	“window of the eye”; stratified squamous nonkeratinized skin layer; starts to bend (refract) light into pupil
Lens	Behind iris; refracts light onto retina; reverses object (upside-down, L/R)
Aqueous humor	nutrient-rich saline solution created by choroid; keeps eye shape normal
Vitreous humor	thickened jello-like solution created in posterior eye; holds retina in place

Two intrinsic muscles of the eye

Iris	pigmented circular muscle that constricts/dilates to control light entry
Ciliary body	black muscle behind iris that constricts on lens for up close vision; mushroom cap

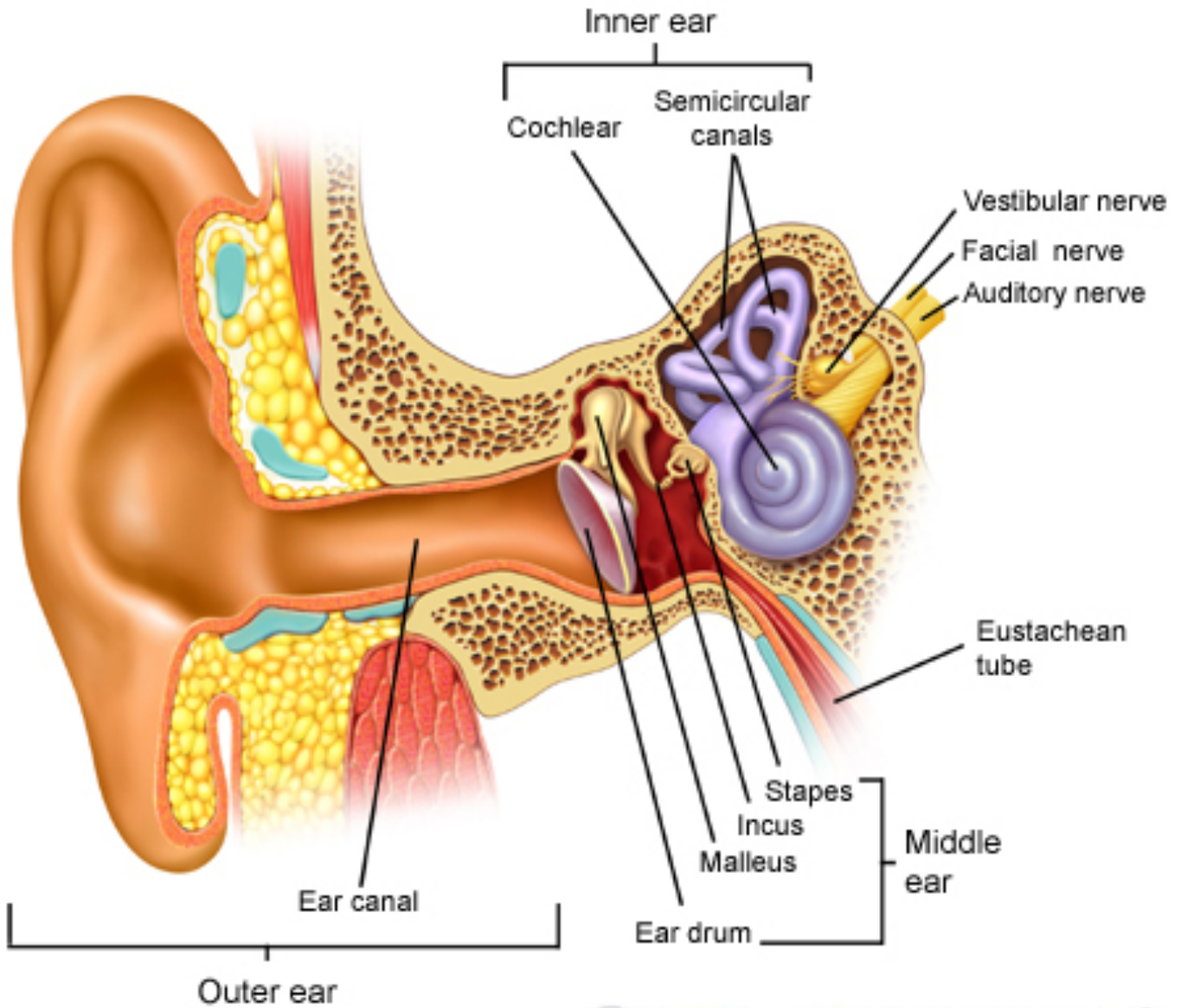
Three tunics of the eye

Sclera/Cornea	tough, collagenous sclera protects eye from punctures, allows attachment site for ocular muscles, and has blood vessels; cornea is clear window into eye
Choroid	black layer behind retina; absorbs light after viewing with retina; makes aqueous humor to provide nutrients for all internal eye structures
Retina	Thin layer of nervous sensory denrites; contains rods (for B/W vision) and cones (red/green/blue; color vision) to interpret visual information

Accessory structures of the eye

Lacrimal gland	creates tears to rinse the eye of debris and microbes
Lacrimal sac	reabsorbs tears and drains to nasal cavity
Superior rectus muscle	elevates eye upwards (innervated by oculomotor nerve)
Inferior rectus muscle	depresses eye downwards (innervated by oculomotor nerve)
Medial rectus muscle	adducts eye medially (innervated by oculomotor nerve)
Lateral rectus muscle	abducts eye laterally (innervated by abducens nerve)
Superior oblique muscle	medially rotates eye (innervated by trochlear nerve)
Inferior oblique muscle	laterally rotates eye (innervated by oculomotor nerve)

EAR STRUCTURES - models only; learn their names, position in the eye, and functions



External ear – designed to capture sound waves, amplify them, and transmit them to middle ear

Auricle (or pinna)	large radar dish made of elastic cartilage; amplifies captured sound waves
External auditory canal (or meatus)	transmits sound waves into temporal bone down to tympanic membrane
Tympanic membrane	keeps debris/microbes out of middle ear; transmits sound waves to MIS; sometimes intubated with children who suffer from chronic <i>otitis media</i>

Middle ear – contains ossicles (MIS); connects outer/inner ear; contains stapedius “fuse” for loud sounds

Malleus (MIS)	transmits sound from tympanic membrane to incus; allows “fuse” w/ tensor tympani muscle (to dampen loud sounds and chewing noise)
Incus (MIS)	transmits sound from malleus to stapes
Stapes (MIS)	transmits sound from incus to oval window, allows “fuse” w/ stapedius muscle (to dampen loud sounds and chewing noise)
Oval window	transmits sound from stapes into vestibule and then the cochlea
Eustachian tube	allows drainage of fluids from middle ear into throat; equalizes pressure

Inner ear – contains vestibule/semicircular canals for balance and cochlea for hearing

Cochlea	tightly curled structure containing <i>Organ of Corti</i> to interpret sound
Round window	tiny round membrane below vestibule that acts as “pressure release valve”
Vestibule	contains two static equilibrium receptors (utricle and saccule) that detect acceleration, deceleration, and head position in space, acts as steady cam when running and bouncing
Semicircular canals	Lie in three planes (X/Y/Z); allow interpretation of dynamic (or spinning) equilibrium using the superior (summersaults), posterior (cartwheels), and lateral (spinning chair) semicircular canals

On the practical itself, you will be given the following format. I will also provide a Cranial Nerve Chart with some of the items filled in:

Number	Structure (1pnt)	Proper Function (1pnt)
1		
2		
3		
4		