BOYLE - COGS17 - Study Guide and HW 2-Part A Worksheet.

PID: _____ Name: (Last)_____ (First)_____ Date: ____

Answer	Definition	General Principle
	Conversion of stimulus energy to electrical potentials	All sensory systems use this physiological process
	Visual sensory pathway to V1	All sensory systems maintain the schema where the receptors feed into the primary afferents and second-order areas (or more) and then proceed to primary sensory cortex.
	Draw a detailed diagram of the phototransduction cascade. Include in your illustration the following: opsin, metarhodopsin-II, transducin with the alpha/beta/gamma subunits, GTP/GDP, retinal (both configurations), PDE, cGMP, 5-GMP, Na-cGMP channel, light waves.	Having an in-depth understanding of the phototransduction cascade will enable you to understand how sensory information is transduced. GPCR pathways are the majority of how the nervous system communicates. Understanding this classic system is critical to your neuroscience education.
	This central area within the macular region has the highest concentration of cones in the retina.	Macular degeneration is the leading cause of vision impairment in the over 60 population. It specifically targets the high acuity and color visual processing regions of the retina.
	List the Special senses. Compare special senses with general senses.	The distinction between Special and General sensation. The body processes and sends special sensation information to the CNS via special afferents while the general senses are distributed throughout the body and do not use a specialized organ.
	How does the primary afferent fiber transmit intensity of stimulus?	The CNS is limited by the binary nature (all or none) of action potentials.
	The process of mapping visual and auditory sensory information in the visual and auditory cortical areas.	Labeled line coding mechanism.
	Draw a detailed analysis of the circuitry in the outer plexiform layer of the retina.	This connectivity pattern is set up to enhance the contrast between strong and weak signals. The center-surround retinal ganglion cell activity is a good example of how the center receptive information is enhanced while at the same time the edge information is minimized.
	The connectivity pattern in which a 2nd order neuron receives a large number of receptor inputs.	Scotopic vision uses this type of circuit configuration to extend the sensory range.

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	The connectivity pattern that maximizes high fidelity and acuity information directly to V1.	The fovea has a 'private line" circuit configuration (also called midget circuit) and is key to being able to transmit highly detailed information direct to higher cortical centers.
	These bipolar cells depolarize when light is on. These bipolar cells are inhibited by glutamate and have a metabotropic glutamate receptor.	The retinal ganglion cells derive the on/off-center properties from the behavior associated with bipolar cells. A good example of illustrating how one transmitter (glutamate) can generate different post-synaptic responses which are dependent on the type of receptor and ionic permeability.
	These bipolar cells depolarize in the dark. Glutamate has an excitatory response on them and which is mediated by the AMPA ionotropic glutamate receptor.	
	This feature pathway is associated with color information and enables a high level of detail information. The signal is persistent.	Understanding how feature and form information is processed and mediated in the visual system leads to important insights for perception and clinical evaluations.
	This feature pathway is associated with motion detection. It processes information transiently and activated quickly. It does not process detailed or color information.	
	This midbrain structure receives bilateral retinal information. It mediates gaze and orienting information.	Retinal information that is not processed by the visual system. Important for fast reflex responses associated with visual information.
	These hypothalamic nuclei sit above the optic chiasm and receive blue light information to regulate the circadian rhythm and the release melatonin.	Retinal information that is not processed by the visual system. Provide important information regarding the environment and regulate the sleep-wake cycle.
	These midbrain nuclei drive the autonomic pupillary reflex via the CNIII (oculomotor nerve),	Retinal information that is not processed by the visual system. Clinically significant in terms of identifying drug overdose, brain stem, and optic nerve trauma.
	These fibers projecting from LGN to V1 carry information from the upper hemiretina (lower half of the visual field - so you can see puppies and kittens).	Frequently, head trauma to Area 17 (V1, striate cortex) can impair vision. Knowing what part of the visual field is affected is important for lesion localization. Draw in a diagram (using sagittal midsection) illustrating the following anatomical areas: calcarine fissure, cuneate gyrus and lingual gyrus.
	These fibers projecting from LGN to V1 carry information from the	

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	lower hemiretina (upper visual field -- so you can see the seagulls flying in the sky). These fibers also have the famous “Meyer Loop” - be sure to identify this specific loop.	
	Include in your diagram the following structures: (pigment epithelium, photoreceptors, horizontal cells, bipolar cells, amacrine cells, retinal ganglion cells (with optic nerve).	
	This diagram should include the following: nasal/temporal hemiretina projections, LGN (ipsi/contralateral) layer identification, LGN magno/parvo layers, Meyer’s Loop, upper and lower bank V1 connection. Also, identify the location of the superior colliculi, pretectal nuclei, and suprachiasmatic nuclei.	