Midterm I Study Guide

Midterm I will cover the material from the first six lectures (1/6-1/22), the first four chapters of the textbook and the following sections of the supplemental reading Learning How to See (available on the course calendar, entry 1/22):
- Adaptation to disturbed images
- Recovery from blindness
- What do babies see?

The exam will be a mixture of multiple choice, fill-in-the-blank, and short answer questions. You will not be able to use any external sources of information during the exam (e.g., books or notes). You need to bring a scantron form (X-101864-PAR-L) and a #2 pencil. Some sample questions are posted on the course calendar. A good way to study for the exam is to answer the Test Yourself questions in the course textbook (e.g., pg 90). Some of the short answer questions will be taken directly from or be very similar to the Test Yourself questions.

The lists of important concepts, phenomena, and methods below should guide your studying:

**Concepts & Phenomena**

You should be able to explain, to give examples of, and/or to apply the following:
- Marr’s levels of analysis
- Top down vs. bottom up processing
- Absolute threshold
- Difference threshold
- Weber’s law (Weber fraction)
- Steven’s power law (response compression, response expansion, linear response)
- Reaction time
- Accommodation
- Transduction
- Dark adaptation
- Photopic (cone based) vision
- Scotopic (rod based) vision
- Receptive field
- Different types of receptive fields (e.g., center-surround, end-stopped)
- Convergence (effects on rod system sensitivity and acuity)
- Lateral inhibition
- Specificity coding
- Distributed coding
- Experience dependent plasticity
- Cross-modal plasticity
- Critical period
- Double dissociations
- Hermann grid
Mach bands
White’s illusion
Simultaneous contrast

Brain and Eye
You should be label these terms on diagrams, to explain what they are, and to explain the functions they serve:
Axon
Dendrite
Synapse
Neurotransmitter
Action potential
Refractory period
Synaptic potentials
Retina
Cornea
Lens
Fovea
Peripheral retina
Optic nerve
Blind spot
Rod photoreceptors
Cone photoreceptors
Visual pigment molecules
Visual pigment regeneration
Horizontal cells
Bipolar cells
Amacrine cells
Ganglion cells
M-cells
P-cells
Lateral geniculate nucleus (LGN)
Cortical area V1 (a.k.a. striate cortex)
Cortical magnification factor
Simple cells (and why they might be a good way of representing visual information)
Complex cells
Orientation columns
Retinotopic organization
Ocular dominance columns
Cortical area IT
Fusiform face area (FFA)
Parahippocampal place area (PPA)
Extrastriate body area (EBA)
Dorsal/ventral visual pathways (and their proposed functions)
Streams
Maps
Columns
Flow of visual information from the eye

Psychophysical/Behavioral Methods
You should know how to implement these methods, what questions they can be used to answer, how they compare to alternative methods, and how to apply them to novel situations:
Description (the phenomenological method)
Recognition
Method of limits
Method of adjustment
Method of constant Stimuli
Magnitude estimation
Visual search
Selective adaptation
Selective rearing
Sensory deprivation
Gaze tracking
Imitation
Visual cliff
Binocular rivalry

Physiological Methods
You should know how to implement these methods (at a very general level), what they measure, what level of brain activity (e.g., streams, maps, columns, single cells) they are useful for studying, how they compare to alternative methods, and how to apply them to novel situations:
Single cell recording
Receptive field mapping
Optical imaging
Positron emission tomography (PET)
Functional magnetic resonance imaging (fMRI)
Transcranial magnetic stimulation (TMS)
Lesioning (ablation)
Computational modeling
Sample Short Answer Questions

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