Exam 1 Review Sheet (Chapters 1-5)

Chapter 1:

1.1 Sensation & Perception: Welcome to Our World

1.1.1 Explain the difference between sensation and perception. Know factors influence perception.
***May need to describe demos in class demonstrating factors that influence perception.**

1.1.2 Outline the different conceptual approaches to studying sensation and perception including thresholds, signal detection theory, sensory neuroscience, and neuroimaging.

1.2 Thresholds and the Dawn of Psychophysics

1.2.1 Explain Weber's law, Fechner's law, at a conceptual level.

1.2.2 Describe what is meant by threshold, how obtained; describe two-point threshold, and cross-modality matching (see text for latter).

1.2.3 Describe signal detection theory at a general level, including the concepts of sensitivity and criterion.

1.3 Sensory Neuroscience and the Biology of Perception

1.3.1 Explain the doctrine of specific nerve energies (see textbook)

1.3.2 List the lobes of the brain and what senses are processed in each one.

1.3.4 Describe the different neuroimaging techniques covered in the chapter: EEG, ERP, MEG, MRI, fMRI, and PET.

Chapter 2: Know all demos done during class and significance of these demos.

2.1 A Little Light Physics

2.1.1 Summarize the relationship between visible light and the rest of the electromagnetic spectrum.

2.1.2 Describe the various ways that light can be affected as it journeys from the sun to the eye.

2.2 Eyes That Capture Light

2.2.1 Identify the parts of the eye and their function in vision. Know how rods and cones are concentrated in the retina. Know role of context in filling in blindspot.

2.2.2 Describe the various defects in the eye that can cause impaired vision.

2.3 Dark and Light Adaptation

2.3.1 Explain the two major strategies the eye uses to adapt to dark and light environments.

2.3.2 Explain the concept of a receptive field.

* Know why pirates likely wore an eye patch

2.4 Retinal Information Processing

2.4.1 Describe how photoreceptors capture light and transduce it into neural firing.

2.4.2 Know the names of the different cells in the retina; know the function of rods, cones, and ganglion cells.

2.4.3 Describe the receptive field characteristics of retinal ganglion cells. Know what types of light stimuli would lead to maximum, minimum firing of these cells based on the receptive field characteristics.

Other: Know what is meant by photopic, scotopic, and mesopic. Know characteristics of cones and rods, receptive field sizes, light sensitivity, etc.

Chapter 3:

3.1 Visual Acuity: Oh Say, Can You See?

3.1.1 Explain the concepts of spatial frequency and contrast and how they differ from each other

3.1.2 Explain how visual angle relates to both the size of an object and its distance from the observer.

3.1.4 Describe Fourier analysis at a conceptual level

3.2 Retinal Ganglion Cells and Stripes

3.2.1 Explain how a retinal ganglion cell's response to a sine wave grating depends on the grating's spatial frequency.
3.2.2 Explain how a retinal ganglion cell's response to a sine wave grating depends on the grating's phase.

3.3 The Lateral Geniculate Nucleus
3.3.1 Identify the parts of the lateral geniculate nucleus, including the different types of cells and the information they carry.
3.3.2 Describe how locations in the visual field are mapped onto the different layers of the lateral geniculate nucleus.

3.4 The Striate Cortex
3.4.1 Describe the major anatomical features of striate cortex, including its location and connection to other areas in the visual processing pathway.
3.4.2 Explain the concept of cortical magnification.
3.4.3 Define the concept of visual crowding.

3.5 Receptive Fields in Striate Cortex
3.5.1 Describe the receptive field properties of striate cortex cells.
3.5.2 Describe the concept of orientation tuning in striate cortex cells.
3.5.3 Compare and contrast the receptive field properties of simple and complex cells in striate cortex.
3.5.4 Predict the responses of simple and complex striate cortex cells to various stimuli.

3.6 Columns and Hypercolumns
3.6.1 Describe the organization of orientation selective neurons into columns in striate cortex.
3.6.2 Explain the receptive field properties of hypercolumns in striate cortex.
3.6.3 Describe CO blobs or "blobs" in striate cortex.

3.7 Selective Adaptation: The Psychologist's Electrode
3.7.1 Describe the selective adaptation procedure.
3.7.2 Predict the tilt aftereffect that would be experienced after adapting to an oriented grating.
3.7.3 Describe the concept of spatial frequency channels in human vision.

3.8 The Development of Vision
3.8.1 Explain the concept of a critical period in visual development.
3.8.2 Describe how visual acuity and contrast sensitivity develop in early life.

Chapter 4:
4.1 From Simple Lines and Edges to Properties of Objects
4.1.1 Describe some of the ways that extrastriate cortex differs from striate cortex.
4.1.2 Explain the concept of border ownership.

4.2 *What* and *Where* Pathways
4.2.1 Compare and contrast information processing in the dorsal and ventral pathways.
4.2.2 Define visual agnosia.
4.2.3 Explain the concepts of feed-forward processing and reverse-hierarchy theory at a conceptual level.

4.3 The Problems of Perceiving and Recognizing Objects
4.3.1 Explain some ways in which object recognition is a challenge for the visual system.
4.3.2 Define mid-level (or middle) vision.

4.4 Mid-Level Vision

4.4.1 Describe the overarching philosophy of Gestalt psychology and recognize the Gestalt grouping principles that cause elements in a display to be perceived as grouped together.
4.4.2 Give examples of accidental viewpoints in perception.
4.4.3 Define figure-ground assignment and the principles used to accomplish it.
4.4.4 Explain some of the methods the visual system uses to deal with occlusion.

4.5 Object Recognition
4.5.1 Describe the receptive field properties of neurons in the brain that process objects and faces.
4.5.2 Explain the subtraction and decoding methods of brain imaging at a conceptual level.
4.5.3 Know the various object recognition models, including the Pandemonium, template, structural description, and deep neural network models (just in general)
4.5.5 Explain why faces are a special case of object recognition (!!)

Chapter 5:
5.1 Basic Principles of Color Perception
5.1.1 Describe the three steps to color perception: detection, discrimination, and appearance.

5.2 Step 1: Color Detection
5.2.1 Name the three types of cones that contribute to color vision.
5.2.2 Describe the spectral sensitivities of the three types of cones.

5.3 Step 2: Color Discrimination
5.3.1 Explain the principle of univariance and the related concept of metamers.
5.3.2 Describe the Young-Helmholtz trichromatic theory of color vision.
5.3.3 Define additive and subtractive color mixing and describe their differences.
5.3.4 Outline the four different ways that cone outputs are pitted against each other in cone opponent cells.

5.4 Step 3: Color Appearance
5.4.1 Describe the various ways that the three-dimensional color space is represented and indexed.
5.4.2 Describe opponent color theory

5.5 Individual Differences in Color Perception
5.5.2 Describe the various forms of anomalous color vision.
5.5.3 Explain the concept of synesthesia.

5.6 From the Color of Lights to a World of Color
5.6.1 Explain how the perception of color can be influenced by context.
5.6.2 Predict which color a negative afterimage will be depending on the color of the adapting stimulus.
5.6.3 Describe the concept of color constancy and how it is achieved by the visual system.

5.7 What Is Color Vision Good For?
5.7.1 Describe some of the ways that color vision is useful for humans and animals.