

Study Guide for the first examination (Tuesday, 8 October 2002). Be able to answer the following questions and be familiar with the concepts involved in the answers.

1. Draw a typical psychometric function for detection relating percent detection to stimulus intensity. Be sure to label the axes. Indicate on the graph how the stimulus “threshold” is defined. What is the relationship between the “threshold” as a point on a psychometric function and threshold as a theoretical concept?
2. What are the three classical methods that Gustav Theodor Fechner developed to measure internal sensory thresholds?
3. What is a Receiver Operating Characteristic (ROC)? Describe the ROC predicted by the High Threshold Model and by Signal Detection Theory of detection. How do you compute sensitivity (d') and decision criterion (X_c) from the hit rate and the false alarm rate for the equal-variance dual-Gaussian, variable-criterion signal detection theory model?
4. Draw a diagram of the eye including the following structures: cornea, lens, pupil, iris, sclera, aqueous humor, vitreous humor, retina, optic disk and optic nerve.
5. Draw a diagram of the retina including the following parts: rods, cones, receptor outer segments, receptor inner segments, horizontal cells, bipolar cells, amacrine cells, ganglion cells and the optic nerve.
6. Draw a diagram of the major neural pathways from the retina to cerebral cortex.
7. Define the term “receptive field.” Describe the receptive fields of retinal ganglion cells. How do they differ from the receptive fields of cells in the primary visual cortex? Explain how Mach Bands or the illusory dots of the Hermann Grid are created.
8. Why do dark-adaptation curves and the Purkinje shift indicate that there are two receptor systems in our retina?
9. In terms of relative optical power (dioptries) what are the near point and far point? What happens to the eye in presbyopia? What happens to the far point in myopia and hyperopia?
10. Four important stimulus variables that affect the visibility of a target are contrast, size, exposure duration, and average level of illumination. What is Bloch’s Law?
11. Why do we need artificial illumination at the end of civil twilight in order to perform many visual tasks?
12. How does the sensitivity of the visual system differ for sine and square waves? Why? What information are high spatial frequencies primarily carrying? Low spatial frequencies?
13. How does an infant’s contrast sensitivity function compare with an adult’s? Draw them on the same graph, and discuss the meaning of the graph.