

**Study Guide for the first examination (Monday, 13 March 2006).** Be able to answer the following questions and be familiar with the concepts involved in the answers.

1. Draw a “typical” **psychometric** function relating percent correct 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. Describe the classical psychophysical methods of Fechner: the method of adjustment, the method of limits and method of constant stimuli.
3. Define hit rate and false alarm rate. Describe the receiver operating characteristic (ROC) predicted by the High Threshold Model and by the Signal Detection Theory of detection. How do you compute sensitivity ( $d'$ ) from the hit rate and the false alarm rate for the equal-variance dual-Gaussian signal detection model? (Memorize the formula).
4. Draw a diagram of the eye including the following structures: cornea, lens, pupil, iris, sclera, aqueous humor, vitreous humor, choroid, retina, optic disk and optic nerve.
5. Be able to define the following optical properties of the eye: dioptres, optical power, relative optical power, accommodation, near point, far point, resting point, range of accommodation, emmetropia, myopia, and hyperopia. (Memorize the formula for computing relative optical power from viewing distance).
6. Define the term “receptive field.” Describe the receptive fields of retinal ganglion cells. How do ganglion cell receptive fields differ from those of cells in the primary visual cortex?
7. Offer an explanation of the Hermann Grid phenomenon based on ganglion cell receptive field characteristics.
8. What happens to contrast sensitivity and visual acuity as illuminance goes down? Why is it hard to read at night without artificial illumination?
9. If a person is injured in the upper left region of the primary visual cortex, what change in vision, if any, do you expect?
10. Draw a diagram of the major visual pathways from the eye to the thalamus, the cortex, and the midbrain. Include the optic nerve, optic chiasm, lateral geniculate nucleus, superior colliculus and the visual cortex.
11. Discuss the evidence that our color vision is based on three different types of cone receptors. What is the evidence supporting the existence of opponent process color mechanisms.

12. What are the major types of color defective vision and what are their causes? What kind of color experiences might a deuteranope have?
13. Assume that the following equations describe the reaction of the red-green and of the yellow-blue chromatic opponent processes. What would the color be of an object that caused the three cone types to absorb the following amount of light:  $L=5$ ,  $M=20$ ,  $S=5$ ?

$$(\text{red} - \text{green}) = 1.89 \cdot L - 2.79 \cdot M + 0.45 \cdot S$$

$$(\text{yellow} - \text{blue}) = 0.85 \cdot L + 0.22 \cdot M - 1.72 \cdot S$$

14. Name and illustrate three laws or principles of Gestalt organization.
15. When a person loses one eye, why is depth perception not lost?
16. What is retinal disparity? How much disparity do you need for normal stereoscopic acuity?
17. In stereoscopic vision, where must an object be located in relation to the Vieth-Müller circle to have zero retinal disparity?
18. Describe the “size/distance” (size constancy) hypothesis of certain visual illusions. Pick two such illusions and explain them in terms of this hypothesis.
19. How can you enhance the impression of depth in a photograph or representational painting while viewing it? Why?
20. What do the McCollough effect and the spiral aftereffect have in common? What implications does the later have for models of motion perception?
21. What perceptual experience do you have if you paralyze the eye muscles and then attempt to move them to the left? Offer an explanation in terms of Erich von Holst’s Reafference Principle.
22. What is change blindness? What does this phenomenon imply about our capacity to process visual information?