

**The Visual System  
Exam 1  
Spring**

**Please be sure to put your name and ID# on each page.  
(The pages will be separated for grading.)**

**Name: \_\_\_\_\_**

**ID#:**

Answer **only 10** of the 12 questions on this exam.

**I pledge on my honor that I have not and will not give or  
receive aid on this examination.**

**SIGNATURE: \_\_\_\_\_**

- ! Each question is worth 10 points.
- ! Plan to spend a maximum of 5 minutes on any one question.
- ! Please watch the time.
- ! *Best wishes!*

(Bonds)

1. What is acuity? Describe five factors that might limit visual acuity, and how acuity depends on each.

(Bonds)

2. Linear systems analysis attempts to predict system performance for any condition on the basis of simple measurements. In the case of the optical quality of the eye, (1) what property of the eye was measured by Campbell & Gubisch (1966)? (2) How does this describe the general optical performance of the eye? (3) Describe any assumptions required to validate the study.

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(Bonds)

3. Why is the relationship between anatomical structure and system function complicated? Give examples.

(Bonds)

4. Why are the morphological differences between alpha and beta (M and P) type ganglion cells relative, as opposed to absolute? What properties of these cells change as one goes across the retina? How is this reflected in visual performance?

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(Casagrande)

5. The retina sends axons to many areas of the brain. Name three brain areas that receive input directly from the retina. What are the proposed functions of three these areas in vision?

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(Lappin)

6. A commonly used performance measure in psychophysical experiments is called a “threshold”? What does this term mean? Briefly describe the experimental procedure for measuring a threshold.

(Lappin)

7. What is the fundamental law of additive color mixture? What theoretical conclusion did Helmholtz draw from this law? Briefly describe one additional important piece of evidence that supports Helmholtz’s theory.

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(Lappin)

8. An alternative to the Young-Helmholtz theory of color vision is known as “opponent-process” theory. Briefly describe two types of psychophysical evidence that point to this theory. What is the principal physiological evidence for opponent-process theory? Briefly explain why contemporary scientists generally believe that the Young-Helmholtz theory and the opponent-process theory are both correct.

(Lappin)

9. What is “color constancy”? Why is this challenging to both the Young-Helmholtz and the opponent-process theories? In addition to the wavelengths reflected from an object, perceived object colors evidently involve information about how these wavelengths are spatially distributed. Explain, or give examples.

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(Penn)

10. What ocular condition(s) is(are) treated by pan-retinal photocoagulation (PRP)? Briefly describe the procedure. How does PRP exert its influence? What is the disadvantage of PRP therapy?

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(Royal)

11. Before light can be detected by the retina, it must first pass through a number of different cell layers. Name every retinal cell layer light must pass through on its way to being detected by photoreceptors. If you were involved in a car accident and lost all of the ganglion cells carrying information from only the macula, how would this impact your vision?

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(Sonsino)

12. Describe how the anatomy of the nerve fiber layer of the retina contributes to the clinical measure of visual fields.