

Examination 2

(5/7/03)

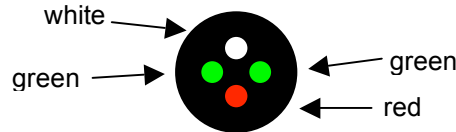
Maximum points: 57

- Which of the following viewing situations would most likely lead to binocular rivalry?
 - Complete constant suppression of one eye.
 - High-quality, correlated images on the two retinas
 - An empty bowl seen by one eye and a small fish seen by the other eye.
 - Vertical stripes seen by one eye and horizontal stripes seen by the other eye.
- Which of the following is most consistent with binocular confusion?
 - One image formed on the OD fovea and a different image formed on the OS fovea.
 - An image formed on the OD fovea and the same image formed on the OS fovea.
 - An image formed on the OD fovea and the same image on the OS peripheral retina.
 - Two different images formed on non-corresponding points on the two retinas.
- From the pair of image characteristics listed on each row below, circle the one that would most likely “win” in a case binocular rivalry. (7)

The OD image ...	The OS image ...
is bright.	is dark.
includes high spatial frequencies.	is missing high spatial frequencies.
has high contrast.	has low contrast.
is on the fovea.	is on the peripheral retina.
is stationary.	is moving slightly.
is on the nasal retina.	is on the corresponding temporal retina.
is a pattern.	is a uniform, empty field.

- When doing a Worth-4-dot test (see figure), with the red lens over OD and green lens over OS, the patient sees four dots. What is the diagnosis?

- Suppression OD
- Suppression OS
- Diplopia
- Binocular fusion



- A 32-year-old patient with a 25-prism diopter exotropia has a visual acuity of 20/20 in each eye. He might be capable of ...
 - Worth Grade 1 fusion but probably not Grades 2 or 3.
 - Worth Grade 1 and 2 fusion, but probably not Grade 3.
 - Worth Grades 1, 2 and 3 fusion.
 - Worth Grade 2 and 3 fusion, but not Grade 1.
- According to the lecture notes, which of the following corrections would most likely make a patient feel that he is taller than normal?
 - Base-in prism OU
 - Base-out prism OU
 - Base-right prism OU
 - Axis 90 magnification OD
- A patient has a 5-diopter difference between his OD and OS spectacle lens powers. He may or may not experience aniseikonia depending on other factors. Name at least three. (3)

optical magnification of the eyes
distribution of retinal local signs

neural processing
visual adaptation
interaction of the geometric and induced effects

8. When adding BO prism before OU, the near chart may appear to shrink. This is an example of the SILO effect. Explain in detail why a patient might see this illusion. (5)

- This is based on the principle of size constancy.
- BO prism causes the eyes to converge, as if the object were moving closer.
- Normally the retinal image of an object will increase as it moves closer.
- In this case, the retinal image size remains constant.
- Relative to the expected image size, the true image size is smaller. The object therefore appears to shrink.

9. When testing a patient with an eikonometer, the vertical lines appear tilted farther away on the right side, but the cross appears parallel to the fronto-parallel plane. The person has ...

- a. greater horizontal magnification in left eye.
- b. greater vertical magnification in the right eye.
- c. overall magnification in the right eye.
- d. overall magnification in the left eye.

10. When testing a patient with an eikonometer, the vertical lines appear tilted farther away on the right side, and the cross also appears tilted farther away on the right side. The person has ...

- a. greater vertical magnification in the left eye.
- b. greater horizontal magnification in right eye.
- c. overall magnification in the right eye.
- d. overall magnification in the left eye.

11. When testing a patient with an eikonometer, the vertical lines appear parallel to the fronto-parallel plane, and the cross appears tilted farther away on the right side. The person has ...

- a. greater vertical magnification in the left eye.
- b. greater horizontal magnification in right eye.
- c. overall magnification in the right eye.
- d. overall magnification in the left eye.

12. How will a wall in front of a patient appear if he has aniseikonia due to the following spectacle Rx?

OD -1.00 -2.00 x 180
OS -3.00 sphere

- a. trapezoid base left and the right side will appear farther away.
- b. trapezoid base right and the left side will appear farther away.
- c. trapezoid base right and the right side will appear farther away.
- d. trapezoid base left and the left side will appear farther away.

13. How will a wall in front of a patient appear if he has aniseikonia due to the following spectacle Rx?

OD -2.00 sphere
OS plano -2.00 x 090

- a. trapezoid base left and the right side will appear farther away.
- b. trapezoid base right and the left side will appear farther away.
- c. trapezoid base right and the right side will appear farther away.
- d. trapezoid base left and the left side will appear farther away.

14. How will a wall in front of a patient appear if he has aniseikonia due to the following spectacle Rx?
 OD -2.00 -3.00 x 045
 OS -2.00 -3.00 x 135

- a. trapezoid base up, top side closer
- b. trapezoid base up, bottom side closer
- c. trapezoid base down, bottom side closer
- d. trapezoid base down, top side closer

15. Neurons from LGN layers 3-6 synapse in which layer of the primary visual cortex?

- a. IVA
- b. IVB
- c. IVC α
- d. IVC β

16. Neurons from LGN layers 1 and 2 synapse in which layer of the primary visual cortex?

- a. IVA
- b. IVB
- c. IVC α
- d. IVC β

17. The first-order neuron in the visual cortex receives data from the LGN and passes the signal on to the second-order neuron. These second-order neurons may be found in any of the following except ...

- a. Either right or left ocular dominance column
- b. Thick or thin stripe or interstripe regions of V2.
- c. A hypercolumn
- d. Layer II or III.

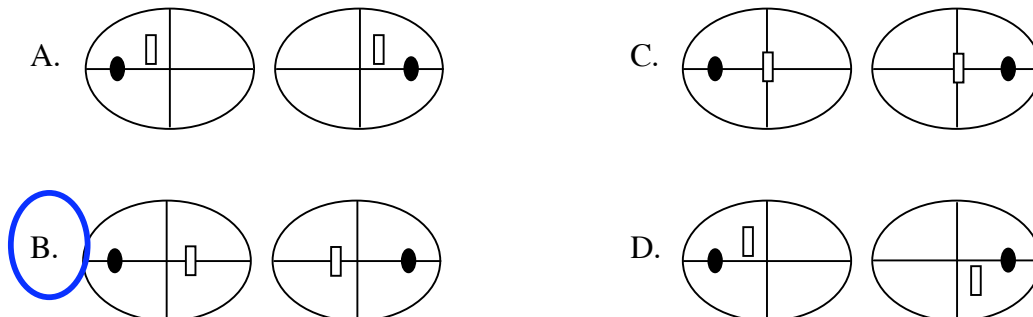
18. The first truly binocular neurons in the mature human visual system are located in ...

- a. the LGN.
- b. Layer IV or area V1.
- c. Layers II or III or area V1.
- d. Stripe or interstripe regions of V2.

19. Scientists have found certain neurons in the parvocellular part of the visual cortex, labeled TN (tuned-near) cells, which are most strongly stimulated by objects that are ...

- a. seen in crossed disparity
- b. seen by non-corresponding points
- c. that stimulate both foveas.
- d. located beyond the horopter.

20. Which of the following right/left receptive field plots most likely corresponds with the TN cell described above? In each, the black oval represents the blind spot and the white rectangle represents the location of the receptive field.



21. Which of the following is not consistent with a description of simple cells in the primary visual cortex?
- They probably receive input from LGN neurons with aligned, adjacent receptive fields.
 - They respond only if the stimulus is moving in a certain direction.
 - They respond better to lines or bars than to spots of light.
 - Their receptive fields include regions that show spatial antagonism.

22. Briefly explain how it's possible to have stereopsis on the midline, in spite of the segregation of right and left field data to opposite hemispheres. Answer with sentences, not just phrases. (2)

- Some ganglion cell axons from the temporal retina, near the midline cross at the chiasm, while some from the nasal retina don't cross. Therefore, post chiasmal fibers include some crossed and uncrossed fibers from either side of the retinal midline.
- Communication between the right and left visual cortices via the fibers that cross over through the corpus callosum.

23. Which of the following statements about the critical period is not correct?

- It does not begin at birth, but a few months after birth and continues for 6-8 years.
- During this time both retinas must receive good quality retinal images, if normal vision is to develop.
- During this time both retinas must receive correlated images, if normal vision is to develop.
- The critical period applies to binocular fusion, but not to monocular functions such as visual acuity.

24. Which of the following best describes the normal development of stereopsis?

- It precedes the development of normal ocular alignment.
- It rapidly develops from essentially no stereopsis to near adult level between about 3 to 5 months of age.
- It steadily improves throughout the critical period in parallel with visual acuity.
- Binocular input to the first-order cortical neurons must develop before stereopsis is possible.

25. Pioneering studies by Hubel and Wiesel showed that monocular deprivation in young cats causes ...

- large changes in the shape of receptive fields for the dominant eye.
- large changes in LGN ocular dominance.
- atrophy of neurons across right and left ocular dominance columns.
- large changes in cortical ocular dominance.

26. Animal studies of monocular deprivation showed that the most severe changes were seen after ...

- loss of high spatial frequency input
- deprivation of form information
- reduction in retinal illumination
- artificially induced strabismus

27. Surgically induced strabismus in young animals leads to which of the following effects in the primary visual cortex?

- a scarcity of group 4 cells and preponderance of cells in groups 1 and 7
- sensory blindness in the contralateral (non-strabismic) eye
- a preponderance of group 4 cells in Hubel and Wiesel's ocular dominance scheme
- an overall shift in ocular dominance to the ipsilateral (strabismic) eye

28. Surgically-induced strabismus in young monkeys during the critical period usually causes ...

- amblyopia in both exotropic and esotropic monkeys.
- anisometropia.
- alternating fixation in exotropic monkeys.
- monofixation syndrome.

29. Which of the following would not be normal for a one-year-old infant?
- Preference for a random-dot stereogram with 200 arc seconds, rather than a pair of random dot patterns with perfect correlation.
 - Symmetric smooth pursuits in both directions
 - Good alignment of the eyes vertically.
 - An intermittent exotropia.
30. Which of the following would probably be the most effective single treatment for a child with accommodative esotropia?
- strabismus surgery
 - spectacle correction for uncorrected hyperopia
 - direct occlusion
 - vision therapy
31. Because complete decorrelation causes such a significant disruption to the development of normal binocular vision ...
- strabismus is usually worse for binocular development than monocular blur.
 - monocular blur is usually worse for binocular development than strabismus.
 - both strabismus and monocular blur are worse than form deprivation.
 - optical blur usually affects the magnocellular neurons first.
32. Which of the following best describes eccentric fixation?
- The subjective and objective angles of strabismus are not equal.
 - The subjective and objective angles of strabismus are equal.
 - An eye monocularly fixates using some non-foveal retinal point.
 - A non-foveal point in one eye corresponds with the fovea in the other eye.
33. If a patient has an after-image optically imprinted on the OD fovea, and has a nasal eccentric fixation in OS, when OD is covered, he should see ...
- a line to the left of the fixation point.
 - a line to the right of the fixation point.
 - a line centered on the fixation point.
 - the fixation point decentered nasally with no line since OD is covered.
34. If a patient shows a 15-prism diopter esotropia by the cover test but is able to fuse, and subjectively shows no measurable strabismus he probably has ...
- suppression of one eye
 - alternating suppression
 - eccentric fixation
 - anomalous correspondence
35. A patient with a 20-prism diopter esotropia by the cover test is able to fuse, but subjectively seems to have a 10-prism-diopter strabismus. Which of the following conditions does this patient most likely have?
- eccentric fixation
 - alternating suppression
 - unharmonious anomalous correspondence
 - harmonious anomalous correspondence
36. Which of the following best summarizes top-down processing of visual information?
- The visual system interprets and organizes incoming data to fit into a preconceived image.
 - The visual system Fourier analyzes images and reassembles the spatial frequencies in the brain.
 - Active image processing doesn't begin until the second synapse in the primary visual cortex.
 - Preprocessing occurs in the magnocellular system, then it feeds its data into the parvocellular system.

37. After watching a faint, small point source in an otherwise unlit room, it may appear to move about. This is known as ...

- a. self-motion
- b. autokinesis
- c. the Pulfrich phenomenon
- d. kinetic depth effect

38. Which of the following best explains this effect?

- a. top-down processing
- b. delayed transmission velocity in one optic nerve
- c. Fechner's paradox
- d. shifts in the retinal image caused by involuntary eye movement

39. If a stationary dot is located in the center of a clearly visible frame, and the frame is moved slowly to the right, the dot will appear to ...

- a. move slowly to the left.
- b. move slowly to the right.
- c. move in an elliptical pattern.
- d. enlarge and move out.

40. The figure below shows a flattened map of the right primary visual cortex (calcarine fissure), similar to Fig. 23-6 in Adler's Physiology of the Eye. Assume that electrodes were placed at the five locations indicated by letters A, B, C, D, E. On the visual field plot, label the approximate location of the receptive fields that correspond to neurons stimulated at locations A-E. (5).

