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Vision Science III - Ocular Motility & Binocular Vision

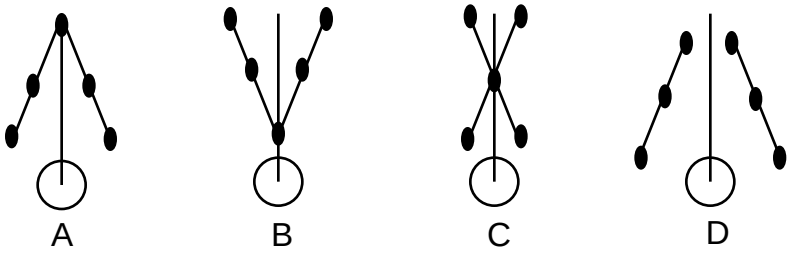
Binocular Vision Final Examination

Monday, May 7, 2001

1. Ultimately, all conscious perceptions of visual direction are ...
a. abathic
b. oculocentric
c. the same as local sign.
d. egocentric

2. When a patient bifoveally fixates a straight ahead object through base-up yoked prism, it appears to be lower than its true position. Based on what we learned about the binocular sense of visual direction, which of the following best explains this perception?
a. The prisms shift the retinal image to the superior retina, and its sense of visual direction is downward.
b. Prisms move the eyes downward. The retinal image fall on the inferior retina, so the image moves down.
c. Both eyes rotate downward to keep foveal fixation on the object. EOM data tells the brain that the object is lower.
d. Local sign says the object is down; proprioception says it's straight ahead. The combined perception is down.

3. Which of the following figures best describes what a patient should perceive if they bifoveally fixate and fuse the far bead on a Brock string that has three beads? The circle represents the cyclopean eye.



4. If a person has an exo fixation disparity, the intended fixation point will be imaged on the retina with ...
a. no disparity
b. crossed disparity
c. uncrossed disparity
d. Retinal correspondence

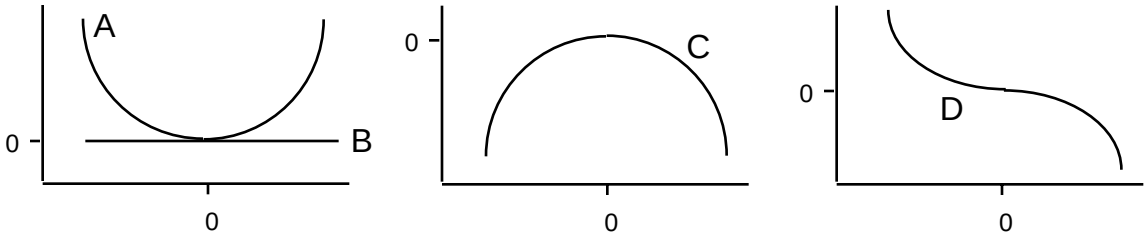
5. When shifting fixation from a distant object (A) on the right to a nearer object (B) on the left, OD and OS will ...
a. rotate as if following an object moving in a straight line from A to B.
b. perform a symmetric version until align with B's visual direction, then symmetrically converge on B.
c. start converging symmetrically, then add an integrated version/vergence and finish with a symmetric convergence.
d. perform a smoothly integrated version/vergence movement from A to B.

6. In shifting fixation to a near object, a normal healthy disparity vergence system will ...
a. converge both eyes until the fixation disparity is reduced to zero.
b. overconverge, then oscillate between under and overconvergence about the fixation point.
c. converge to within 20-40 arc minutes of perfect fixation, but leave this magnitude of residual error.
d. converge to within about 10 arc minutes of perfect fixation, but leave this magnitude of residual error.

7. A microbiologist complains that whenever he spends long hours using a binocular microscope he has headaches and eye strain, but he has no problems with extended reading. This might be due to ...
a. overconvergence caused by proximal convergence.
b. underconvergence caused by proximal convergence.
c. underaccommodation caused by proximal accommodation.
d. an uncorrected refractive error

8. Which of the following terms best describes the set of points in three-dimensional space that gives rise to zero disparity; that is, they stimulate corresponding points on the two retinas.
a. longitudinal horopter
b. point horopter
c. Vieth-Müller horopter
d. vertical disparity horopter

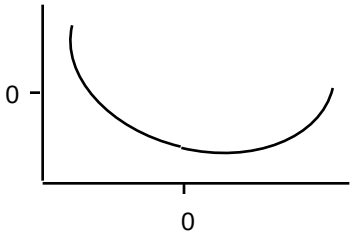
9. The following graphs, taken from an AFPP horopter experiment, plots disparity (y axis) as a function of eccentricity (x axis). Among them, which curve or line most closely matches the Vieth-Müller circle?



10. What is the main reason the Nonius method is considered the purest or truest horopter?
a. Because the rods will appear be aligned only when they are located on the true horopter.
b. Because it is an objective technique and requires no response from the subject.
c. Because it most closely approximates the Veith-Müller circle.
d. Because the vernier method minimizes the Hering-Hillebrand deviation.

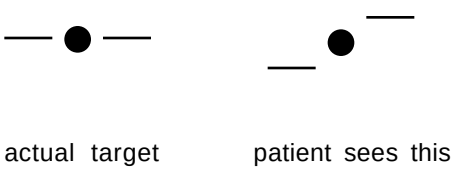
11. At the abathic distance, the AFPP horopter is ...
a. a vertical line passing through the fixation point.
b. concave toward the observer, but inside the Veith-Müller circle.
c. convex away from the observer.
d. coincident with the objective fronto-parallel plane.

12. Which of the following would NOT help account for the Hering-Hillebrand deviation in the plot shown to the right?
a. greater horizontal magnification before OD
b. fixation disparity
c. retinal disparity
d. nasal-temporal asymmetry in the retinal local signs



13. A vectographic target is designed with fixed (non-moveable) lines as shown by the figure to the right; OD sees the upper line, OS sees the lower line; both see and fuse the dot. Which of the following corresponds best with the figure?
a. Wesson card approach - exo fixation disparity
b. Sheedy disparometer approach - exo fixation disparity
c. Wesson card approach - eso fixation disparity
d. Sheedy disparometer approach - eso fixation disparity

14. If the card is rotated 90 degrees counter-clockwise, to test for a vertical fixation disparity, which of the following best describes the correct diagnosis for the appearance shown in the figure to the right? (Assume that the polarized glasses are worn the same way as for Question 13.)
a. OD hyper fixation disparity
b. OS hyper fixation disparity
c. dissociated vertical deviation (DVD)
d. OS hypertropia with OD suppression



15. If you use a Sheedy Disparometer, and the lines are oriented as shown to the right (OD sees right line) what is the diagnosis?
a. OD hyper fixation disparity
b. OS hyper fixation disparity
c. dissociated vertical deviation (DVD)
d. OD hypertropia with OS suppression

patient sees this actual target

16. Using a Sheedy Disparometer, the right eye sees the top line and the left sees the bottom. It is adjusted until the patient sees the lines perfectly aligned. They are, however, actually displaced such that the top line is 1.0 mm to the right relative to the bottom line. What kind and magnitude of fixation disparity does the patient have? Choose the closest answer.
a. About 4.2 arc minutes of eso fixation disparity
b. About 8.5 arc minutes of eso fixation disparity
c. About 4.2 arc minutes of exo fixation disparity
d. About 8.5 arc minutes of exo fixation disparity

17. On a plot of fixation disparity as a function of the power of base-in (left side of graph) or base-out (right side of graph) prisms, most normal subjects should, in theory, exhibit ...
a. an "L"-shaped curve with increasing exo fixation disparity with BO prism but a nearly constant level of fixation disparity with BI prism.
b. an "L"-shaped curve with increasing eso fixation disparity with BI prism but a nearly constant level of fixation disparity with BO prism.
c. a sigmoid function with increasing eso fixation disparity with BO prisms and exo fixation disparity with BI prisms.
d. a sigmoid function with increasing eso fixation disparity with BI prisms but increasing exo fixation disparity with BO prisms.

18. In a 5-year-old patient who is difficult to examine, you are able to measure a stereo acuity of 40 arc seconds using random dot stereograms. What does this tell you about the patient? They have ...
a. Only Worth grade 0 fusion, that is no fusion.
b. Only Worth grade 1 fusion.
c. Worth grade 2 as well as grade 1 fusion.
d. Worth grade 3, as well as grades 1 and 2 fusion.

19. In vision therapy clinic you are looking for Synoptophore slides designed to stimulate only Worth grade 2 fusion. Which of the following slide pairs would best serve this purpose?
a. One slide with a car and another with a garage.
b. Two identical slides showing a bird.
c. One slide showing a clown's face with a hat; the other showing the same face, with no hat, but a bow tie.
d. A pair of slides showing a clown's face, but the nose offset slightly to the right for OS and slightly to the left for OD.

20. When an amblyopic patient observes a pendulum swinging in a plane parallel to their face, they notice that it appears to be moving in an elliptical pattern such that it moves closer to them when moving from left to right and farther from them on the return swing. Seen from above the patient, the pendulum appears to move in a counter-clockwise orbit. This is an example of ...
a. Fechner's paradox
b. probability summation
c. the Pulfrich phenomenon
d. size constancy

21. Assume two normal healthy emmetropic eyes have similar monocular contrast sensitivity functions. How does an increasing amount of monocular blur affect binocular contrast sensitivity?
a. Binocular contrast sensitivity will be equal to the monocular contrast sensitivity for all levels of blur.
b. With enough blur, the binocular contrast sensitivity can decrease below the monocular level.
c. Binocular contrast sensitivity will always be about 1.4 times better than the monocular contrast sensitivity.
d. Binocular contrast sensitivity will be less than 1.4 times better, but never worse than the monocular contrast sensitivity, depending on the amount of blur.

22. When dichoptically viewing two uniform fields in a Synoptophore such that the luminance for OD is greater than the luminance for OS, the binocularly perceived brightness will probably be ...
a. the same as the dimmer (OS) light.
b. the same as the brighter (OD) light.
c. in between the brightnesses of the two lights.
d. brighter than either light alone.

23. After testing a monovision patient's sensory dominance at far and near, you decide to put the near correction on OS. Which of the following is consistent with this plan?
a. With the distance Rx in place, the left eye's distance visual acuity gets worse when a +1.50 add is placed over OS, rather than OD.
b. With the distance Rx in place, a directional dominance indicates that OS is dominant at far.
c. With the near Rx in place, the near binocular visual acuity is better when a -1.50 lens is placed over OS rather than OD.
d. With the distance Rx in place, the distance binocular visual acuity is better when a +1.50 lens is placed over OS rather than OD.

24. Which of the following does NOT contribute to our explanation of the moon illusion?
a. When objects move further away, they normally decrease in angular size.
b. The comparative size of trees, hills, etc., on the horizon make the moon appear larger.
c. The moon in the sky above (empty space) appears closer than the moon on the horizon.
d. Because of size constancy, objects of constant angular size appear to grow when their perceived distance increases.

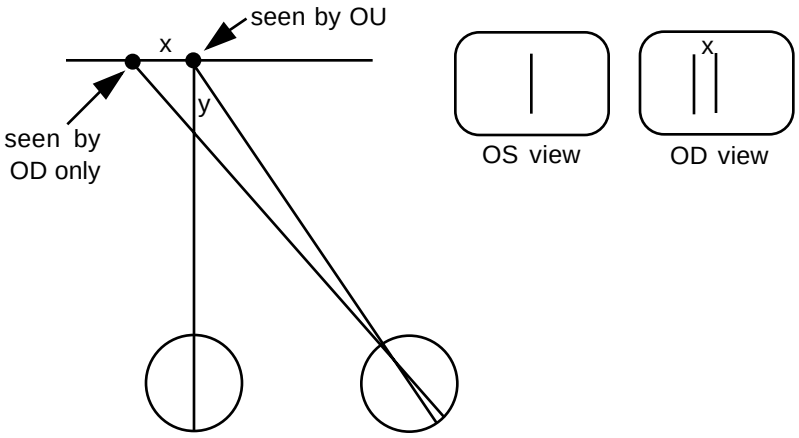
25. Which of the following clinical tests can provide you with the most information about the binocular development of a young pediatric patient?
a. random dot stereoacuity test
b. Worth Four-Dot test
c. binocular visual acuity
d. von Graffe phoria at far

26. Among the following lenses, which one is used for fundus biomicroscopy and provides the greatest amount of axial magnification? This would be particularly useful when evaluating the depth of the optic cup in a glaucoma patient.
a. 20 diopter lens
b. 60 diopter lens
c. 78 diopter lens
d. 90 diopter lens

27. It is possible to create a very simple stereogram by presenting a single vertical line target for one eye and two vertical lines for the other eye. This is an example of ...
a. Panum's limiting case.
b. the Pulfrich effect.
c. Bither's paradox.
d. a Worth grade 1 stereogram.

28. Assuming a PD of 64 mm and a stereoacuity threshold of 40 arc seconds, what is the maximum distance at which this person could perceive relative depth perception using stereopsis alone? Choose the closest answer.
a. 165 meters
b. 330 meters
c. 660 meters
d. 1320 meters

29. Refer to the figure below. Polarizers are used with a flat target that consists of two vectograph lines. OS sees only one line straight ahead, and OD fixates on the right line, but sees another one to the left. This creates a perception of two lines seen in stereoscopic depth—a fixated line and another located at a distance, y, closer to the observer. How much closer than the fixation target does the object appear to be, assuming a crossed retinal disparity of 20 arc seconds and a PD of 64 mm? That is, what is distance y in the figure? (Choose the closest answer.)
a. 0.02 mm
b. 0.04 mm
c. 0.24 mm
d. 0.48 mm



30. Continuing with the situation described in Question 29, how much must the second line, seen by OD, be offset to the left (distance x to the nearest 0.01 mm), to create a crossed disparity of 20 arc seconds?
a. 0.02 mm
b. 0.04 mm
c. 0.24 mm
d. 0.48 mm

31. Which of the following steps is LEAST useful for creating a random dot stereogram?
a. Begin with a repetitive pattern of some kind.
b. Draw a field of randomly scattered dots, to be seen by one eye.
c. Make a copy of the same pattern, to be seen by the second eye.
d. Cut out a portion of the second target and shift it slightly to one side.

32. Which of the following steps is NOT necessary for the creation of a set of free fusion stereo targets?
a. Create two identical background patterns, one to be seen by OD and the other to be seen by OS.
b. As an intermediate step, draw the same object over both backgrounds.
c. Create disparity by shifting the foreground objects (one for OD, one for OS) in opposite directions.
d. Shift the background for OD and OS by the same amount to the right or left

33. Under ideal laboratory conditions, what is the minimum stereoacuity threshold?
a. 2-10 arc seconds
b. 2-10 arc minutes
c. 6-10 arc minutes
d. 20-40 arc seconds

34. When looking at red/green stereoscope images of natural scenes, reversing the anaglyph glasses does not cause a noticeable depth reversal, as is seen with simple line figures. Why?
a. The reasons for this is unknown and is referred to as Fechner's paradox.
b. Monocular depth cues and stereoscopic disparity conflict, but, in this case, the monocular cues win out.
c. The stereoscopic disparities in natural scenes are so large that reversing the glasses does not change the actual disparity in the retinal images.
d. Chromostereopsis remains the same even if the glasses are reversed.

35. A strong sense of three-dimensional depth can be elicited in flat images because of movement in the image. This is referred to as ...
a. autokinesis.
b. biological motion.
c. motion capture.
d. the kinetic depth effect.

36. Luster and the appearance of a metallic sheen is created when presenting two similar images to each eye, if the black/white contours are opposite between the two images. Which of the following best explains the shiny appearance?
a. size constancy
b. Fechner's paradox
c. The opposite black/white contours mimic the difference between OD and OS images normally seen when viewing specular reflections.
d. Non-correlation of this kind creates conflicting oculocentric visual directions, which is perceived as a metallic sheen.

37. In heterochromatic flicker photometry, different colors are presented to the two eyes in rapid succession and the perceived color is a mix of the two true colors. This phenomenon is known as ...
a. color fusion.
b. color fission.
c. probability summation.
d. retinal rivalry.

38. What important principle was demonstrated by the random dot stereograms of Julez?
a. Objects located off the horopter stimulate disparate retinal points.
b. Monocular form perception always precedes stereopsis.
c. Monocular form perception is not required for stereopsis.
d. Two identical random dot patterns can stimulate stereopsis.

39. Using Bagolini lenses to test the relative depth of suppression, you find that OD is suppressed using a 1.0 ND filter, but OS is suppressed using a 2.0 ND filter. What does this tell us about this patient's visual system?
a. OD is more easily suppressed.
b. OS is more likely to perceive the Pulfrich effect than OD.
c. OD is probably the sensory dominant eye.
d. OS is amblyopic.

40. In a patient with a significantly different refractive correction before the two eyes, you may measure a different heterophoria in different directions of gaze. This is known as ...
a. antimetropia
b. anisophoria
c. anisocoria
d. Aniseikonia

41. Assume that a patient is wearing the following Rx: OD -2.00 sph; OS plano -2.00 x 090 . Which of the following best describes their perception of a rectangular wall in front of them?
a. The wall seems closer to OD and smaller on that side.
b. The wall seems closer to OS and larger on that side.
c. The wall seems closer to OD and larger on that side.
d. The wall seems closer to OS and smaller on that side.

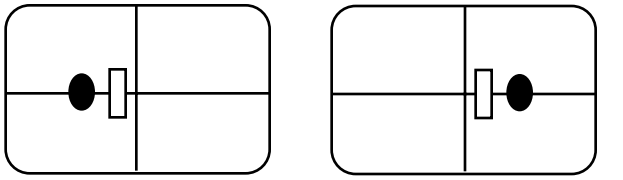
42. If the person in Question 41 looked into an Eikonometer, with all its setting in the zero position, what should he see?
a. The vertical lines and the cross should appear closer to OS.
b. The vertical lines and the cross should appear closer to OD.
c. The cross should appear closer to OS, but he vertical lines should appear unchanged (straight).
d. The cross should appear closer to OS, but the vertical lines should appear closer to OD.

43. Assume that a patient is wearing the following Rx: OD -2.00 -3.00 x 045; OS -2.00 -3.00 x 135. Which of the following best describes their perception of a rectangular wall in front of them?
a. The wall seems farther and larger at the top.
b. The wall seems farther and smaller at the top.
c. The wall seems closer and smaller at the top.
d. The wall seems closer and larger at the top.

44. If the person in Question 43 looked into an Eikonometer, with all its setting in the zero position, what should he see?
a. The cross should be narrower and tilted toward the person at the top.
b. The cross should be narrower and tilted toward the person at the bottom.
c. The cross should be wider and tilted toward the person at the top.
d. The cross should be wider and tilted toward the person at the bottom.

45. Which of the following is NOT consistent with Knapp's law?
a. Correct all aniseikonia patients with contact lenses as a first choice.
b. Correct an axial aniseikonias with spectacles.
c. Correct a refractive aniseikonias with contact lenses.
d. Correct a refractive aniseikonia with refractive surgery.

46. A laboratory monkey converges as if fixating on a point 60 cm away, while each eye is stimulated dichoptically, and you record from a neuron in the visual cortex. The right and left eye visual fields are shown below. The white rectangle shows the location of the neuron's receptive field in each eye's visual field; the black ovals are the blind spots; the intersection of the lines show the foveal fixation point. Which answer best describes the neuron? (1)



left eye receptive field right eye receptive field

a. The neuron is a monocular neuron since it is sensitive to a stimulus in either the right or left eye, but they are in non-corresponding locations.
b. The neuron is binocular, but when stimulated by identical objects in each receptive field, the animal should perceive diplopia since the receptive fields are located in non-corresponding retinal locations.
c.The neuron is binocular and specifically tuned to detect an object in space with a certain amount of crossed disparity.
d.The neuron is binocular and specifically tuned to detect an object in space with a certain amount of uncrossed disparity.

47. The critical period in humans ...
a. Extends from birth to 6-8 years of age.
b. Begins several months after birth and continues until age 3.
c. Begins several months after birth and continues until age 6-8.
d. Extends from about age 1 to 8.

48. Which of the following statements about the development of ocular alignment in NOT correct?
a. A three-month old infant will probably have unstable eye alignment.
b. An intermittent exotropia is more common that esotropia in new born infants.
c. Most infants develop stable ocular alignment by about 6 months of age.
d. It is important to surgically correct intermittent exotropia prior to age 3 months.

49. Which of the following statements about the development of stereopsis is NOT correct?
a. Stereoscopic depth perception is not well developed at birth.
b. The development of stereopsis follows a time course very similar to that for the development of visual acuity.
c. By about 6 months of age, the average infant should have a stereoacuity of about 60 arc seconds.
d. The development of normal ocular alignment is an important prerequisite for the development of stereopsis.

50. Which of the following ocular conditions would most likely account for the ocular dominance histogram shown to the right?
a. normal binocular development
b. monocular occlusion during most of the critical period
c. alternating exotropia during most of the critical period
d. binocular occlusion throughout the critical period

51. Which of the following kinds of developmental strabismus is most common at about age 1?
a. Infantile esotropia
b. Refractive esotropia
c. Intermittent exotropia
d. Constant infantile exotropia

52. Which way do infants with infantile esotropia tend to rotate their heads?
a. Toward the side with the strabismic eye
b. Toward the side with the dominant eye
c. Alternately toward the strabismic, then the dominant eye
d. Downward

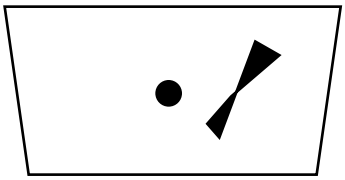
53. Which of the following would most likely be associated with an accommodative esotropia in a young patient with less than 2 diopters of hyperopia in that eye?
a. a similar angle of deviation at far and near
b. severe amblyopia
c. high astigmatism
d. an abnormally high AC/A ratio

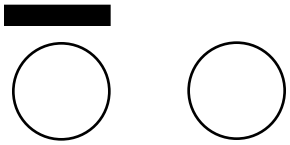
54. Which of the following best describes microstrabismus, also known as monofixation syndrome?
a. It must usually be corrected surgically.
b. It is a common cause of eye strain and headaches.
c. It is a small residual deviation following strabismus surgery.
d. These patients are incapable of central or peripheral binocular fusion.

55. Which of the following usually causes the most severe disruption to normal binocular development?
a. pattern deprivation
b. optical blur
c. strabismus
d. high astigmatism

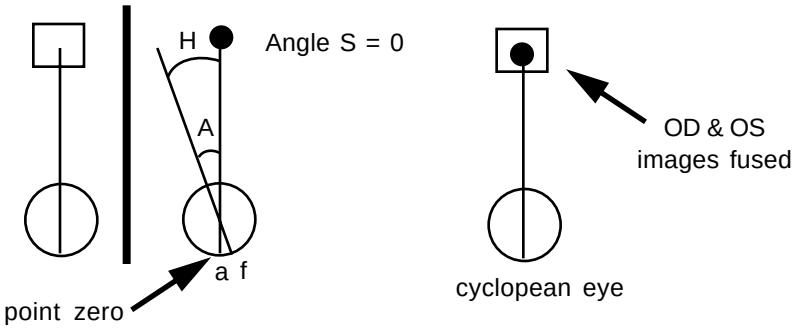
56. Which of the following is true about amblyopia in humans?
a. The magnocellular system is more severely affected by optical defocus than the parvo system.
b. Any strabismus should be surgically corrected before prescribing a refractive correction.
c. Treatment should include direct occlusion of the amblyopic eye to preserve superior vision in the dominant eye
d. A congenital cataract will cause severe irreversible amblyopia if not surgically removed by about 3 months of age.

57. If a patient attempts to fixate the center dot, but sees the Haidinger's Brushes to the right, as shown in the figure to the right, what condition do they have? The left eye is occluded.
a. nasal eccentric fixation in OD
b. temporal eccentric fixation in OD
c. nasal eccentric fixation in OS
d. anomalous correspondence





58. What kind of anomalous binocular condition is illustrated by the figure below? It shows that with dichoptic viewing the person fuses a box seen by OS with a dot seen by OD.



a. eccentric fixation
b. harmonious anomalous correspondence
c. unharmonious anomalous correspondence
d. paradoxical anomalous correspondence

BONUS POINTS. These can make up for points lost from other questions, but the total score cannot exceed 100%.

59. Sometimes, following an acquired EOM paresis, the patient may overestimate the direction of peripheral objects in some fields of gaze due to excessive proprioception to the paretic muscle. This is known as ...
a. the Gestalt effect.
b. past pointing
c. induced motion
d. Fechner's paradox

60. Which of the following best summarizes top-down processing of visual information according to the Gestalt theory?
a. The visual system analyzes image components and reassembles them in the brain before the image is perceived.
b. High and low spatial frequency components are processed in parallel up to the extrastriate level.
c. The brain interprets and organizes incoming visual data to best fit preconceived images.
d. Active processing of visual information does not begin until the primary visual cortex.

61. While stopped in traffic, you suddenly sense that your car is moving due to the movement of cars in the next lane, even though you are not actually moving. This is an example of ...
a. biological motion
b. the induced effect
c. autokinesis
d. self motion

62. A person with a movement agnosia probably would ...
a. not be able to perceive movement (motion blind).
b. have no chromostereopsis.
c. have anomalous extraocular movements.
d. tend to suppress peripherally, but fuse centrally.

63. In figure-ground processing, the visual system ...
a. rapidly shifts attention between the foreground and background.
b. tends to focus attention on an object and relegate everything else to the background.
c. efficiently minimizes the affect of background noise, there by improving the signal to noise ratio.
d. the magnocellular system can compensate for deficiencies in the parvocellular system.