

Vision Science III – Binocular Vision Module  
**Exam 1**

**PIN Number:** \_\_\_\_\_

1. 1 pt Assume both eyes are fixating a far object, while a near object is visible on the midline, straight ahead. Which of the following statements correctly describes this situation?
- The egocentric direction will agree with one of the eyes, but not both.
  - The OD and OS oculocentric visual directions agree, but differ from the egocentric direction.
  - The OD and OS oculocentric visual directions and the egocentric direction are all different.
  - The OD and OS oculocentric visual directions both agree with the egocentric direction.

2. 2 pt Briefly describe Fechner's paradox and mention what the person should see.

Fechner's paradox occurs when a light is dimmer when viewed binocularly with an ND filter over one eye than when viewed monocularly with no filter. It's a paradox because under binocular viewing the visual system actually receives more total light, yet the light appears dimmer. It indicates that the visual system averages the brightness between the two eyes.

3. 1 pt When testing far sensory dominance for a monovision contact lens fit, you find that the patient sees slightly better binocularly when the plus lens is placed over OS. Based on this alone, which eye is dominant at far, and which should probably have the near correction?

OD dominant at far. Put near Rx over OS

4. 1 pt If a person with glaucomatous damage to OS has a delay in the signal sent from OS to the brain, how would a pendulum swinging from left to right in his fronto-parallel plane appear to move?
- Away from the person, or in a clockwise elliptical path if seen from above.
  - In the opposite direction, that is, right to left in the fronto-parallel plane.
  - In a circle that contains the fixation point and nodal points of both eyes.
  - Closer to the person, or in a counter-clockwise elliptical path if seen from above.

5. 1 pt After the eyes have approximately converged on the near object, which of the following vergences completes the work by fine-tuning the alignment of the eyes?
- vergence adaptation
  - accommodative vergence
  - disparity vergence
  - proximal vergence

6. 2 pt Briefly define, and describe the "Vieth-Müller circle."

The theoretical horopter based on certain assumptions about the eyes. It is a circle that goes through the nodal points and the fixation point.

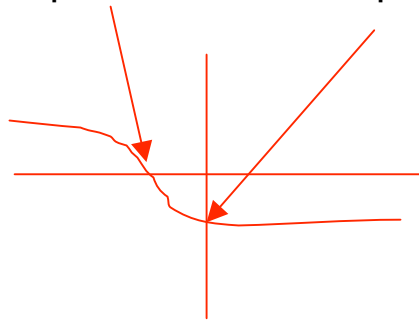
7. 2 pt Name 2 aspects of vision that are clearly better with binocular viewing versus monocular viewing.

Wider field of view and stereoscopic depth perception at near.

8. 1 pt When performing the cover test, the patient notices that the chart appears to jump vertically—as the paddle moves from OD to OS, the target appears to move down. When the cover moves from OS to OD, the target appears to move up. What kind of heterophoria is indicated?

OD hyper (BU) or OS hypo (BD)

9. 4 pt Draw and label a **Type IV** fixation disparity curve. Be sure to label the axes and note where the **associated phoria** and the **fixation disparity** are located on the graph.



10. 2pt Define the term, “horopter.”

The set of points in space that stimulate corresponding points in the two eyes; that is, points that have zero disparity in terms of oculocentric direction in the two eyes.

11. 1 pt What is fixation disparity?

A very small misalignment of the visual axes that occurs during binocular fixation.

12. 1 pt What is the most popular method used to measure the longitudinal horopter?

- a. Stereo threshold
- b. Nonius
- c. Nernst method
- d. Apparent fronto-parallel plane

13. 1 pt Which of the following are correctly matched?

- a. Crossed disparity/ crossed diplopia/ nearer than the fixation point
- b. Crossed disparity/ uncrossed diplopia/ nearer than the fixation point
- c. Crossed disparity/ crossed diplopia/ farther than the fixation point
- d. Crossed disparity/ uncrossed diplopia/ farther than the fixation point

14. 1 pt Which of the following best describes a situation in which a person would notice physiological diplopia?

- a. After an isolated right sixth nerve palsy, the patient notices diplopia on right gaze.
- b. A person bifoveally fixates the center rod of a Howard-Dolman apparatus, with all other rods located on the horopter.
- c. While focusing on the middle bead of a Brock string, a patient notices that the far bead appears double.
- d. A person with a large astigmatism notices diplopia when he does not wear his correction.

15. 2 pt Summarize why a small amount of fixation disparity is beneficial to the visual system.

A fixation disparity is necessary to stimulate the disparity vergence system, and leave it in play. If there were no fixation disparity, disparity vergence would turn off and the eyes would drift toward the phoria position until it turned on again. This would be unstable and inefficient.

16. 1 pt What is the difference between an associated and dissociated phoria?

An associated phoria is measured during fused conditions and is defined as the amount of prism that reduces the fixation disparity to zero. The dissociated phoria is the rest position of the eyes when fusion is interrupted.

17. 1 pt Describe or draw a figure to show what a pair of stereoscope slides should look like if they are designed to stimulate Worth Grade 1 and 2 fusion only.

Each slide would have a nearly identical image that could be fused, but each image would also have some feature unique to that slide as a check for suppression. There would be no disparity.

18. 2 pt What is the difference between egocentric and oculocentric localization?

Oculocentric – visual direction within each eye relative to the fovea, or fixation point.  
Egocentric – binocular visual direction computed from the combined input from both eyes.

19. 1 pt If binocular summation were due to probability summation alone, you would expect binocular sensitivity to be better than monocular sensitivity by factor of about ...

- a. 0.5
- b. 1.2
- c. 1.4
- d. 2.0

20. 2 pt Using a vectograph target, you determine the amount of prism necessary to align the vertical limbs of the cross-shaped target. You have measured the ...

- a. fixation disparity
- b. associated phoria
- c. dissociated phoria
- d. prism adaptation

21. 1 pt Which of the following is most closely associated with crossed disparity?

- a. left handedness but right eye dominant
- b. right handedness and right eye dominant
- c. an object whose retinal images are located temporal to the foveas
- d. an object located beyond the fixation point

22. 2 pt What is utricular discrimination?

The ability to tell which eye provided certain visual information after binocular fusion has occurred.

23. 1 pt Based on the research of Hofstetter, which of the following would be most suitable as a pass/fail criterion for assessing normal stereoacuity?

- a. 20 arc seconds
- b. 40 arc seconds
- c. 20 arc minutes
- d. 40 arc minutes

24. 1 pt Using Bagolini lenses to test the relative depth of suppression, you find that OS is suppressed using a 1.5 ND filter, but OD is suppressed using a 1.0 ND filter. What does this tell us about this patient's visual system?

- a. OS is more likely to perceive Fechner's paradox than OD.
- b. OS is more susceptible to suppression.
- c. OS is probably the sensory dominant eye.
- d. He is not capable of Worth grade 3 fusion.

25. 5 pts Please fill in the following table:

Worth degree	Maples degree	Sensory fusion	Description
0	0	none	Suppression, monocular vision
1	1	Simultaneous perception	Diplopia, confusion
2	2	Flat fusion	Superposition
	3	Flat fusion	Fusion maintained with BI or BO prism
3	4	stereopsis	Ultimate binocularity