PART OF THE EXPERIENCE SIGHT
THE STORY OF VISION

mirage 3D

KOENIGFILMS

SEEING

A Photons Journey Across Space, Time and Mind

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Jobson Medical Information LLC

UNDERWRITTEN BY ZEISS

INTRODUCTION

- The digital planetarium program "SEEING!" follows a photon's creation and journey across the galaxy to a young stargazer's eye. The viewer follows the photon into the girl's eye, learning the structures of the eye and their functions, prior to taking a ride on the optic nerve. Dramatic fulldome imagery from around the globe featuring humanity, landscapes, skyscapes, wildlife and space will be used to create the story of the photons journey through the eye and its conversion to the electro-chemical impulse traveling the neuro pathways of the brain to create the image we see. Along the way the program examines how the eye works, how technology has enabled us to restore vision and prevent a variety of diseases that affect sight.

- Produced by Mirage3D and Koenig Films and funded through a generous grant by Zeiss this program will bring the story of sight and vision to planetariums around the globe. "Seeing!" was directed by Robin Sip, written by Emmy Award© winning writer Kris Koenig and narrated by Dr. Neil deGrasse Tyson, Director of the Hayden Planetarium at the Rose Center for Earth and Space in New York City.

- This program is aligned to the Next Generation Science Standards (NGSS) covering the following:
  - **MS-PS4-1: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.**
  - **MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.**
  - **MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.**

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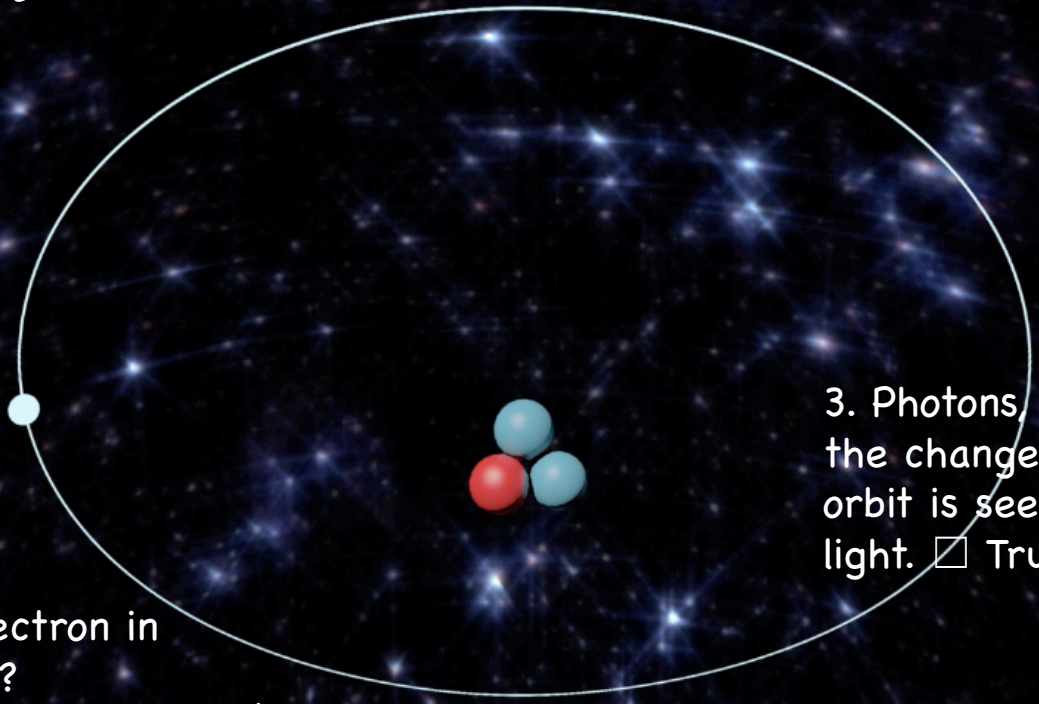
1. Hydrogen was formed as a result of the Big Bang.
☐ True ☐ False

2. The hydrogen atom is made up of 3 parts, a proton and two electrons. ☐ True ☐ False



3. Photons, released from the change of an electrons orbit is seen as colored light. ☐ True ☐ False

4. We see _____ from stars from the interaction of the electrons and energy of protons colliding.

5. Where is the electron in this picture?

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6. The speed of light is
   a. 100,000 km/sec
   b. 200,000 km/sec
   c. 300,000 km/sec
   d. 400,000 km/sec

7. What is the approximate speed of light in miles per second? (1 km = 0.62 miles)

8. How many years will the photon take to reach Earth for the star whose photon we followed from the nebula in Orion?
   a. 1300 years
   b. 560 years
   c. 75 years
   d. Uses Fedex and arrives tomorrow!

9. How did you know it was Saturn that the photon passed on its journey?

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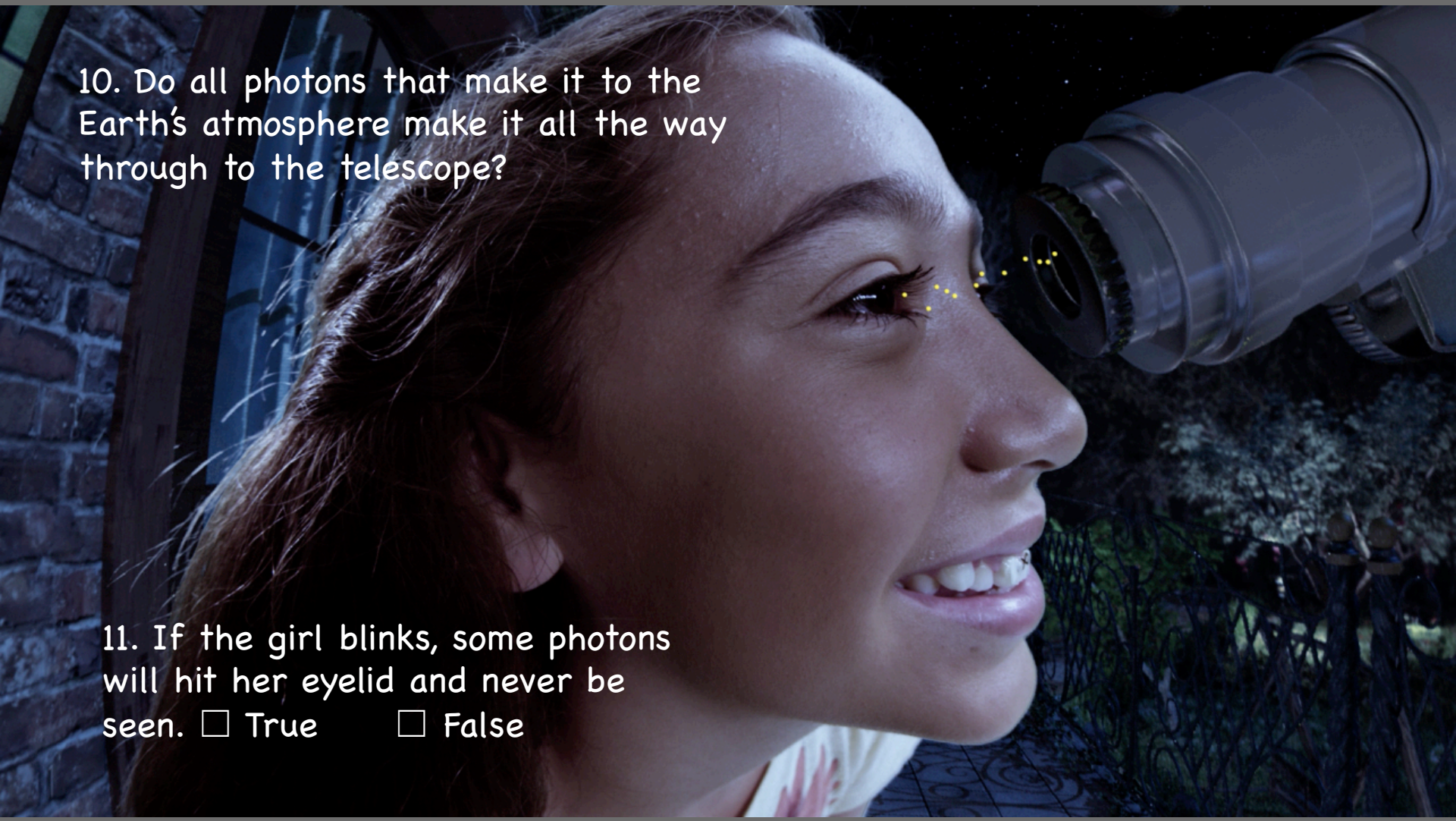

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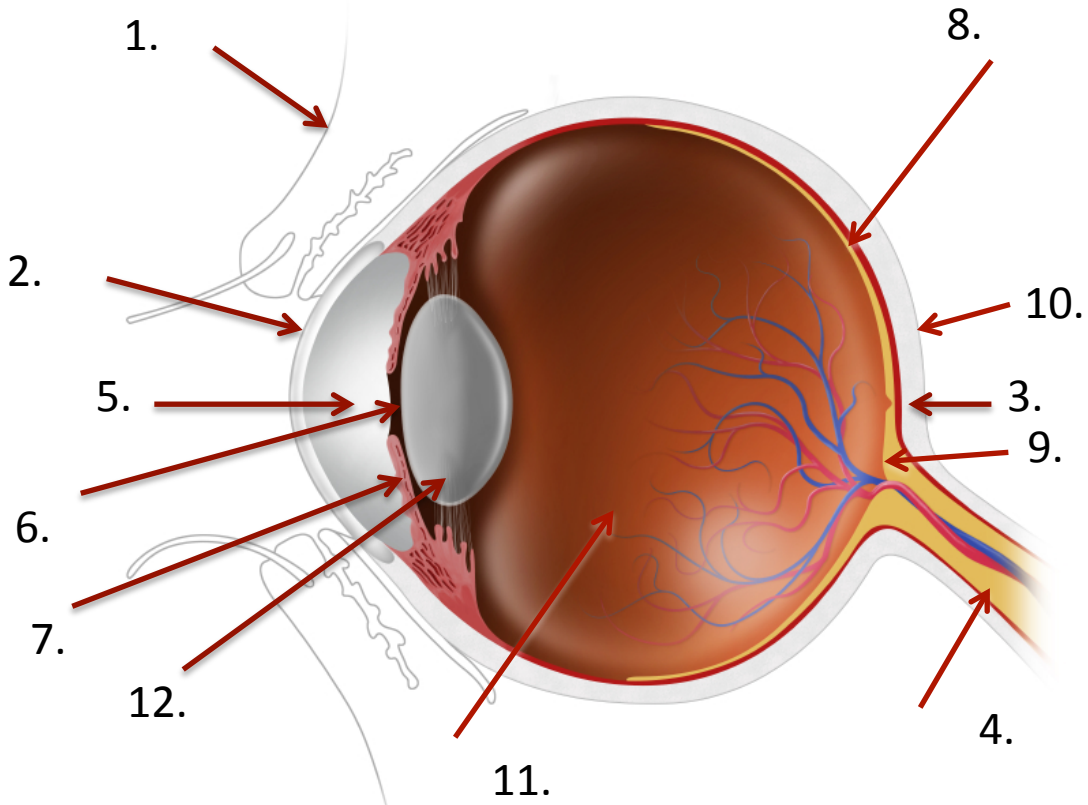
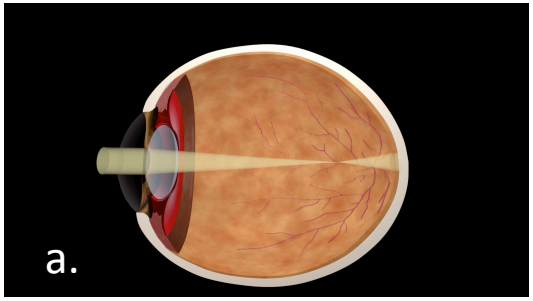


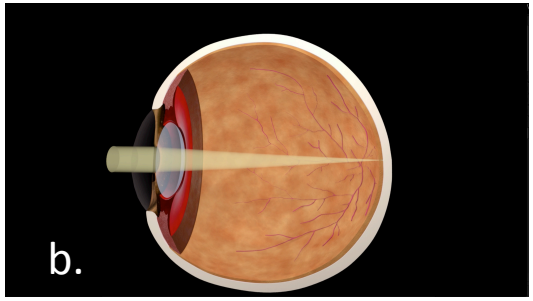
1._____ a. Retina
2._____ b. Iris
3._____ c. Lid
4._____ d. Sclera
5._____ e. Cornea
6._____ f. Fovea
7._____ g. Optic disc
8._____ h. Aqueous Humor
9._____ i. Pupil
10._____ j. Lens
11._____ k. Vitreous
12._____ l. Optic Nerve

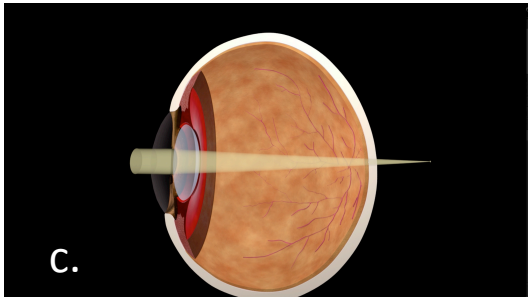
12. MATCHING – EYE ANATOMY

13. The iris adjusts to allow just the right amount of light into the eye to see.
    ☐ True ☐ False
14. The pupil is a hard black disc that blocks light from entering the eye.
    ☐ True ☐ False
15. The zonules and girdle of the lens help focus the light onto the back wall of the eye's retina ☐ True ☐ False
16. As we age, the difficulty warping the crystalline lens to see thing clearly up close is called a condition called
    a. Myopia
    b. Astigmatism
    c. Hyperopia
    d. Presbyopia
17. A lifetime exposure to ultraviolet (UV) light can cause a _____ in the lens of the eye.
    a. Pimple
    b. Cataract
    c. Zonule
    d. Stye
18. What is the final destination of the photon?
    a. Retina
    b. Cornea
    c. Lens
    d. Vitreous
19. The cells in the retina encode the photon's data, so that the optic nerve can interpret it ☐ True ☐ False
20. Where does the crystalline lens focus the light in the retina?
    a. Macula
    b. Dracula
    c. Vernacular
    d. Spectacular
21. All of the following are true except
    a. Most of the photo receptor cells are rods
    b. Rods are very sensitive to light
    c. Most of the photo receptor cells are cones
    d. Rods relay only white light at low resolution
22. This pothole in the macula is exactly where the lens focuses light. It's called the
    a. Macpotula
    b. Fovea
    c. Optic Nerve Head
    d. Main blood vessel
23. All are distinct cell layers in the retina except
    a. Ganglion layer
    b. Bipolar cell layer
    c. Crystalline lens, cell layer
    d. Rods and Cones

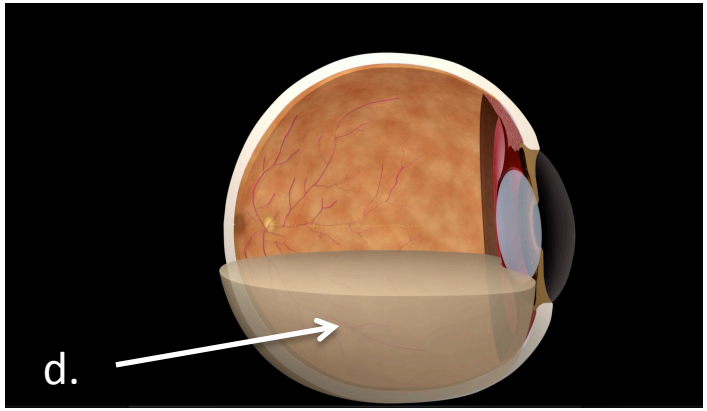
Eye Conditions

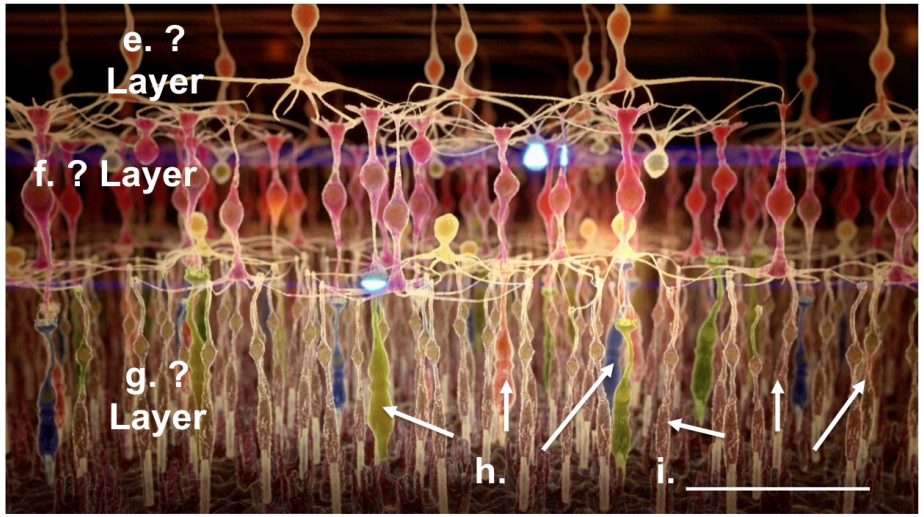






Eye Structures





24. LABEL EACH DIAGRAM

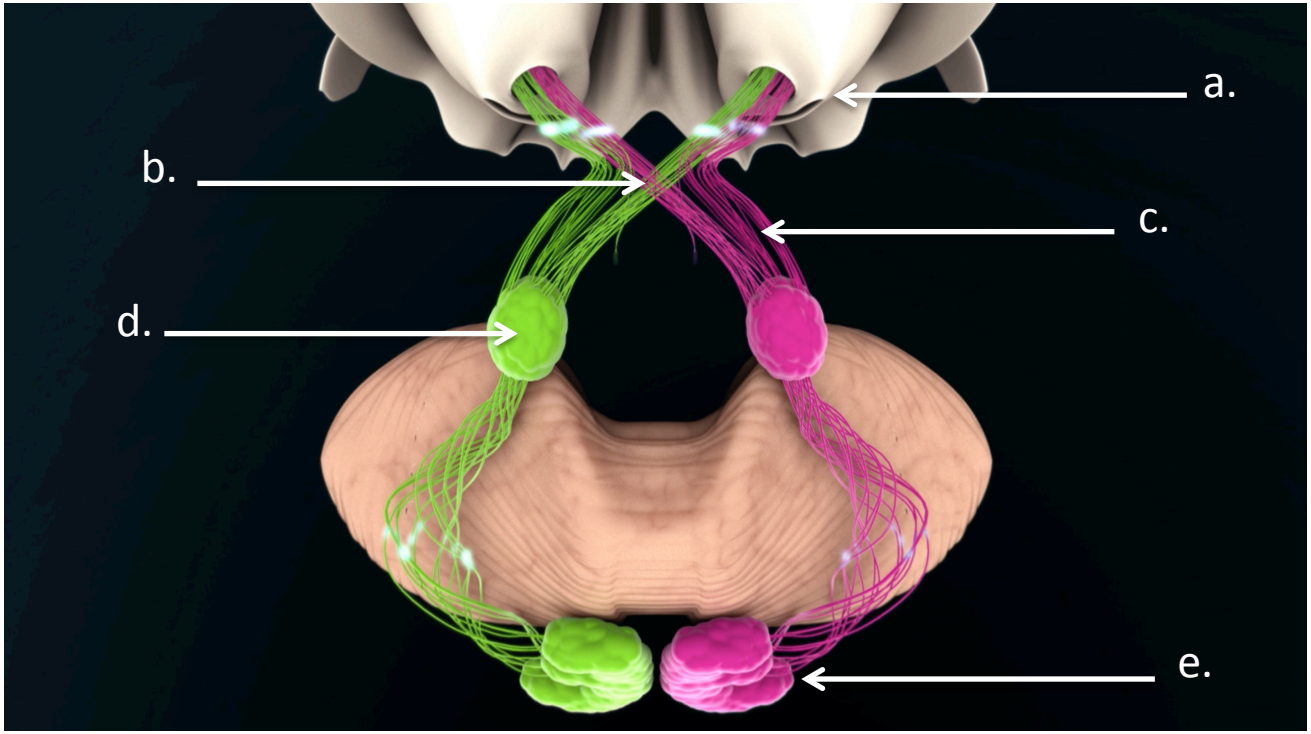
25. When the crystalline lens gets cloudy, it's called a _____.
26. Cones detect _____ when photons hit them.
27. Ganglion cells are connected directly to the _____ through fibers that run back to form the optic disc.
28. Why is the eye called "the window to the soul"?
29. Observing changes to the retina by Optometrists and Ophthalmologists can detect diseases like _____ long before other methods
30. If you are under 40 years old, how often should you have your eyes checked?
    a. Every year
    b. Every two years
    c. Only when you have a problem
    d. Not necessary
31. If over 40, have your eyes checked every_____.
32. Wear sunglasses outdoors to protect the retina and lens from
    a. Ultraviolet light
    b. Starlight
    c. Red light
    d. Moonglow
33. What vegetable was the girl in the film eating, as part of good nutrition? _____ Do you know why?
    – What can you research about orange and green vegetables for good eye and body health?
34. Rods are connected by Amacrine cells to form a scanner for _____ and _____.
35. Cone cells convert photons to electrical pulses sent to the _____ cells then to the _____ cells.
36. Splitting the R and L view of the retina at the optic chiasm allows our brain to see _____.
37. What two main sections of vision are separated in the optic radiations? _____ and _____ vision
38. The brain uses about _____% of its resources for vision?
39. Why should you stare out at the distance for 20 seconds about every 20 minutes when reading or using your smartphone or tablet? _____

_____

40. Why should you wear eye protection?_____

_____

41. Can you chart the path of a photon from a distant star to the image that you see, in your mind?



42. THE PATH TO THE BRAIN

Worksheet/Notes

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