LIST OF ANIMALS AND ONLINE RESOURCES

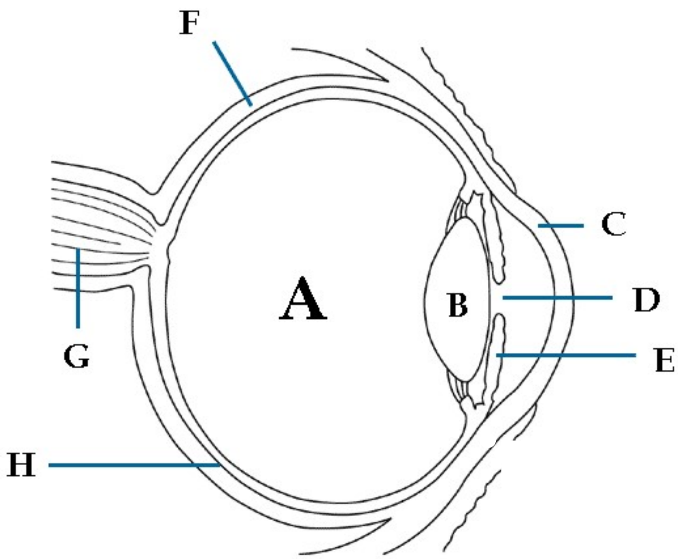
Animal	Resource
Tarsiers	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Trilobites	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Dragon flies	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Geckos	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Colossal Squid	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Reindeer	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Four-eyed Fish	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Gigantocypris	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Acanthodes bridgei	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Ostrich	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Cock-eyed Squid	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Chameleon	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Mantis Shrimp	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Camel	https://www.nhm.ac.uk/discover/amazing-eyes-vision-champions.html
Mudskipper	https://owlcation.com/stem/Mudskippers-Fish-That-Can-Live-on-Land
Cats	https://www.livescience.com/62513-photos-amazing-animal-eyes.html
Crabs	https://www.livescience.com/62513-photos-amazing-animal-eyes.html
Crocodiles	https://www.livescience.com/62513-photos-amazing-animal-eyes.html
Cuttlefish	https://www.livescience.com/62513-photos-amazing-animal-eyes.html
Goats	https://www.livescience.com/62513-photos-amazing-animal-eyes.html
Jumping Spider	https://www.livescience.com/62513-photos-amazing-animal-eyes.html
Giant Guitarfish	http://thescienceexplorer.com/nature/12-coolest-eyes-animal-kingdom
Ogre-Faced spider	http://thescienceexplorer.com/nature/12-coolest-eyes-animal-kingdom

LIST OF ANIMALS AND ONLINE RESOURCES

Spookfish	http://thescienceexplorer.com/nature/12-coolest-eyes-animal-kingdom
Okapi	https://www.saczoo.org/2022/06/eye-on-adaptations/
Frog	https://www.saczoo.org/2022/06/eye-on-adaptations/
Cheetah	https://www.saczoo.org/2022/06/eye-on-adaptations/
Goldfish	https://www.saczoo.org/2022/06/eye-on-adaptations/
Abyssinian Ground Hornbill	https://www.saczoo.org/2022/06/eye-on-adaptations/
Bald Eagle	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Harris Hawk	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Tawny owl	https://www.bioexplorer.net/animals-with-best-eyesight.html/
American Woodcock	https://www.bioexplorer.net/animals-with-best-eyesight.html/
European Robin	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Hummingbird	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Asin short-clawed otter	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Iguana	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Rattlesnake	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Sunburst diving beetle	https://www.bioexplorer.net/animals-with-best-eyesight.html/
Octopus	https://www.bioexplorer.net/animals-with-best-eyesight.html/

Human Eye | ____________ Eye

Label the following for both the human and animal eye: cornea, iris, lens, optic nerve, pupil, retina, sclera, vitreous humor



From Wikimedia Commons, the free media repository

Sketch and label your animal eye in the space below. Include additional structures that are not present in the human eye.

How does the size of the human eye compare to the size of the animal eye?

The human eye has 120 million rods and 6 million cones. Rods are activated by low levels of light and cones require more light, but allow us to see color. How does this effect our vision?

How many rods and cones exist in one eye of your animal? How does this effect its vision?

Human Eye

Human eyes are forward facing. Describe how forward eye placement benefits humans. In what ways can forward facing eyes be a detriment to humans?

Describe 3 ways our eyes are have adapted to meet the needs of humans.

____________ Eye

What direction do the eyes of your animal face? Describe how they benefit from their eye placement. In what ways could this eye placement be a detriment to your animal?

Describe 3 ways eyes have adapted to meet the needs of your selected animal.

Why do humans and most animals have 2 eyeballs?

Vision is an important sense that affects the ability of humans to thrive. Because vision has been so important to our survival, eyes evolved to include protective measures.

- Boney sockets in our skull provide impact protection
- Eyebrows protect eyes from bright light
- Eyelids project eyes from bright light and foreign objects.
- Eye lashes collect dust and debris to prevent it from entering the eyes
- Tears keep eyes moist

In what ways are the eyes of your animal protected?

Dear Caregivers of 4th-Grade Scientists:

We are writing to inform you of our next unit of study in science. Our 4th-grade scientists will be investigating the structures and functions of human and animal eyes. We are excited to have a local ophthalmologist visit and share her expertise. However, because this topic may evoke conversations around vision differences, we invite you to share your knowledge and experiences with your children to ensure everyone feels supported. The need for visual accommodations like glasses or contacts is how engineers have enhanced millions of people's vision. We ask that you please reach out to your child's teacher if you have any questions or concerns.

Sincerely,

Fourth Grade Science Teachers

P.S. We will be engineering a prototype to enhance human eyesight as a final project. We would appreciate donations of craft supplies or discarded cardboard items such as boxes or paper towel rolls.

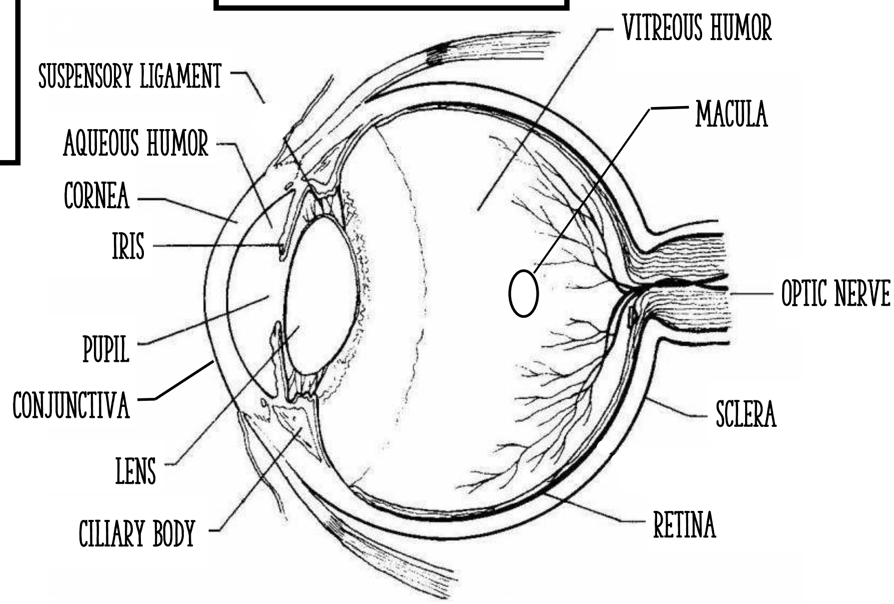
20/20

EYE STRUCTURE & FUNCTION: REFERENCE SHEET

SUPERHUMAN

VERONICA SEIDER, FROM GERMANY IS IDENTIFIED IN THE GUINNESS BOOK OR WORLD RECORDS FOR HAVING 20/2 VISION. HER VISUAL ACUITY WAS 20X BETTER THAN THE TYPICAL HUMAN. SHE COULD RECOGNIZE PEOPLE FROM A MILE AWAY.

COLOR ME:



WHAT IS VISON?

Human vison is a complex function involving image formation, reception by photoreceptors, transmission of sensory information to appropriate brain centers, and perception of image in the mind.

WORDS TO KNOW

⇒ **Visual Acuity**—the amount of detail the eye can distinguish.

⇒ **Astigmatism**—a condition that results from a defect in the curvature of the cornea or lens.

⇒ **Accommodation**—the changing of the shape of the lens that occurs when the typical eye is focused for close vision.

⇒ **Peripheral Vision**—allows you to see objects all around you without turning your head or moving your eyes. It helps you to sense motion and walk without crashing into things. It's what you use to see something out of the corner of your eye.

⇒ **Blind Spot**—an area on the retina called the optic disk where the nerve fibers leave the eye and enter the optic nerve.

⇒ **Dominant Eye**– in the same way you are right or left-handed, one of your eyes is used more than the other.

WHAT DO YOU THINK?

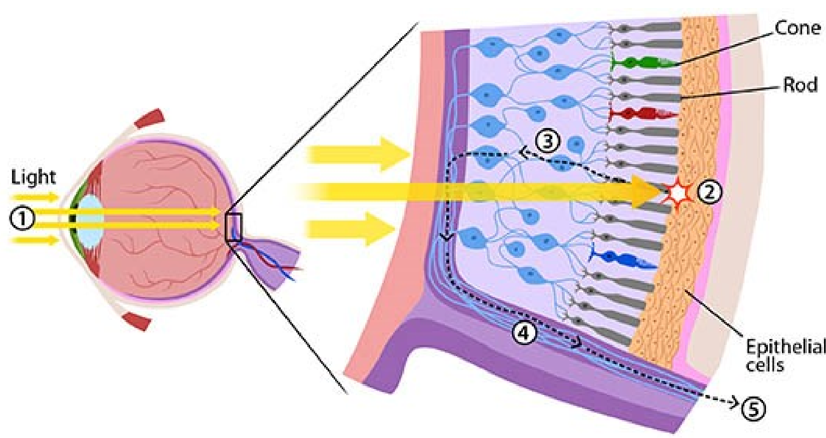
Is 20/20 the perfect human vision?

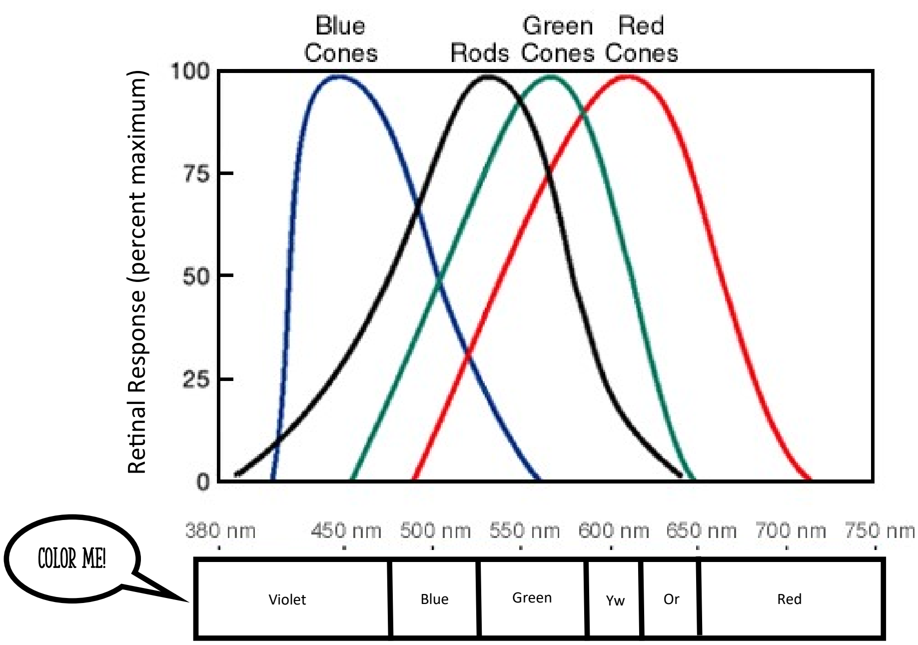
COLOR & LIGHT DETECTORS

RODS & CONES

Rods work at very low levels of light. We use these for night vision because only a few bits of light (photons) can activate a rod. Rods don't help with color vision, which is why at night, we see everything in a gray scale. The human eye has over 100 million rod cells.

Cones require a lot more light and they are used to see color. We have three types of cones: blue, green, and red. The human eye only has about 6 million cones.





Wavelength of Light (nm—nanometers)

The three types of cones are commonly labeled by the color at which they are most sensitive (**blue, green and red**) you might think other colors are not possible. But it is the overlap of the cones and how the brain integrates the signals sent from them that allows us to see millions of colors. For example, the color yellow results from green and red cones being stimulated while the blue cones have no stimulation.

WHAT DO YOU THINK?

Why would the proportion of rods and cones vary in different animal species?

Visual Variation Rubrics

Formative Assessment – Eye Model				
Human Eye Structures	No structures were present or labeled in the model.	Some structures were present and labeled, or all structures were present but not labeled.	Most structures were present and labeled.	All Structures were present and labeled
	0 Points	3 Points	6 Points	9 Points
Human Eye Functions	No functions were explained	Some functions of the structures were explained verbally or in written form.	Most functions could be explained verbally or in written form.	All functions could be explained verbally or in written form.
	0 Points	3 Points	6 Points	9 Points
Animal Eye Structure	No structures were present or labeled in the model.	Some structures were present and labeled, or all structures were present but not labeled.	Most structures were present and labeled.	All Structures were present and labeled
	0 Points	3 Points	6 Points	9 Points
Animal Eye Functions	No functions were explained	Some functions of the structures were explained verbally or in written form.	Most functions could be explained verbally or in written form.	All functions could be explained verbally or in written form.
	0 Points	3 Points	6 Points	9 Points
Human vs. Animal Eye structure comparison	Provided no graphic comparison of humans and animals eye structure.	Provided a graphic comparison of some structures of animal and human eyes.	Provided a graphic comparison of most structures of animal and human eyes.	Provided a graphic comparison of all structures of animal and human eyes.
	0 Points	3 Points	6 Points	9 Points
Human vs. Animal Eye structure comparison	Provided no graphic comparison of humans and animals eye function.	Provided a graphic comparison of some functions of animal and human eyes.	Provided a graphic comparison of most functions of animal and human eyes.	Provided a graphic comparison of all functions of animal and human eyes.
	0 Points	3 Points	6 Points	9 Points
Points Received				/54
Comments:				

Visual Variation Rubrics

Summative Assessment – Video Presentation				
Human Eye Model	Did not include the human eye model in the video presentation.	The model of the human eye was included in the video, but the student made no mention of it.	The model of the human eye was included in the video and was mentioned without specifics.	The model of the human eye was included in the video and some structures and functions were specifically mentioned.
	0 Points	3 Points	6 Points	9 Points
Animal Eye Model	Did not include the animal eye model in the video presentation.	The model of the animal eye was included in the video, but the student made no mention of it.	The model of the animal eye was included in the video and was mentioned without specifics.	The model of the animal eye was included in the video and some structures and functions were specifically mentioned.
	0 Points	3 Points	6 Points	9 Points
Human vs. Animal Eye Comparison	No structures or functions of the human and animal eye were compared during the video presentation.	The human and animal eye were briefly compared but no specific structures or functions were mentioned in the video.	Only the similarities OR differences between the human and animal eye was discussed in the video.	Both similarities and differences of the human and animal eyes were discussed in the video.
	0 Points	3 Points	6 Points	9 Points
Prototype	The prototype was not included in the video presentation.	The prototype was included in the video, but the student made no mention of it.	The prototype was included in the video and the student briefly mentioned how it can be used.	The prototype was included in the video and the student demonstrated how it can be used to enhance human vision.
	0 Points	3 Points	6 Points	9 Points
Engineering Design Process	There was no mention of the engineering design process in the video presentation.	The engineering design process was mentioned in the video but with only a few details.	The engineering design process was explained with some details.	The engineering design process was explained, and details were provided specific to the prototype that was developed.
	0 Points	3 Points	6 Points	9 Points
Video Productions	No video was produced.	The information in the video was unclear and the video was not engaging.	The information was clear but was not engaging.	Information was presented in an engaging and clear way.
	0 Points	3 Points	6 Points	9 Points
Points Received				/54
Comments:				