



**Distance Learning Program
Pig Eye Dissection
Middle School/ High School**

This guide is for middle and high school students participating in AIMS Pig Eye Dissections, which will be presented by an AIMS Anatomy Specialist. The primary focus is the anatomy, physiology and function of the structures of the eye. Eye diseases and disorders are also discussed. Students participating in this activity will have the opportunity to dissect and compare anatomical structures between the human eye and the pig eye. At the end of this document, you will find anatomical diagrams, vocabulary review, and pre/post tests for your students.

National Science Education (NSES) Content Standards for grades 9-12

- Content Standard:K-12 ***Unifying Concepts and Processes***: Systems order and organization; Evidence, models and explanation; Form and Function
- Content Standard F, ***Science in Personal and Social Perspectives***: Personal and community health
- Standard C, ***Life Science***: Matter, energy and organization of living systems
- Content Standard A ***Science as Inquiry***

National Science Education (NSES) Content Standards for grades 5-8

- Content Standard A ***Science as Inquiry***
- Content Standard C, ***Life Science***: Structure and function in living systems; Diversity and adaptations of organisms
- Content Standard F, ***Science in Personal and Social Perspectives***: Personal Health

Show Me Standards (Science and Health/Physical Education)

- ***Science*** 3. Characteristics and interactions of living organisms
- ***Health/Physical Education*** 1. Structures of, functions of and relationships among human body systems
- ***Health/Physical Education*** 2.Principles and practices of physical and mental health

- **Health/Physical Education 3.** Diseases and methods for prevention, treatment and control
- **Health/Physical Education 5.** Methods used to assess health, reduce risk factors and avoid high risk behaviors

Objectives:

The student will be able to:

1. locate and identify the major structures of the eye, including some of the muscles that move the eye;
2. explain the general function of the eye;
3. observe the internal and external structures of the eye;
4. reinforce their dissecting technique.
5. identify common conditions and disorders of the eyes and treatment

Lesson Objectives:

This lesson will:

1. allow students to observe and identify the major structures of the eye;
2. familiarize students with the actual structures of the eye;
3. provide students with useful information about the eye;
4. allow students to improve and reinforce their skills of observation and analysis.
5. students will learn about diseases and conditions of the eye and their treatment.

Related Websites:

Cow's Eye Dissection –Exploratorium - Index

http://www.exploratorium.com/learning_studio/cow_eye/index.html

Cow's Eye Dissection Directions

http://www.exploratorium.edu/learning_studio/cow_eye/coweys.pdf

Anatomy Vocabulary:

Anterior Chamber - The space in the eye that is behind the cornea and in front of the iris.

Aqueous humor - the thin, watery fluid that fills the space between the cornea and the iris (anterior chamber). It is continually produced by the ciliary body, the part of the eye that lies just behind the iris. This fluid nourishes the cornea and the lens and gives the front of the eye its form and shape.

Blind spot - The blind spot is the area on the retina without receptors that respond to light. Therefore an image that falls on this region will NOT be seen. It is in this region that the optic nerve exits the eye on its way to the brain.

Canal of Schlemm - a circular canal between the cornea and the iris that provides an exit for the aqueous humor from the eye into the bloodstream

Caruncle - a small, red portion of the corner of the eye that contains modified sebaceous and sweat glands.

Central Retinal Artery - The central retinal artery supplies blood to the retina as it branches into smaller segments upon leaving the optic disc.

Central retina vein - the vessel that carries blood away from the retina.

Choroid - the thin, blood-rich membrane that lies between the retina and the sclera; responsible for supplying blood to the retina.

Ciliary body - The thickened part of the vascular portion of the eye that lies between the iris and the choroids that produces the aqueous humor

Cones - Photoreceptor cells in the retina of the eye that function best in bright light and provide for color vision.

Conjunctiva - The conjunctiva is the thin, transparent tissue that covers the outer surface of the eye. It begins at the outer edge of the cornea, covering the visible part of the sclera, and lining the inside of the eyelids. It is nourished by tiny blood vessels that are nearly invisible to the naked eye.

Cornea - the clear, dome-shaped surface that covers the front of the eye.

Fovea centralis - In the eye, a tiny pit located in the macula of the retina that provides the clearest vision of all. The fovea contain only cones.

Iris the colored part of the eye. The iris is partly responsible for regulating the amount of light permitted to enter the eye.

Lens (Also called crystalline lens.) - transparent structure inside the eye that can change shape to allow precise focusing of light rays onto the retina.

Macula - the focusing portion of the eye that allows us to see fine details clearly. It contains mostly cones.

Optic Disc - The point inside the eye where the nerve that leads from the eye to the brain (optic nerve) leaves the eye (also called the *blind spot*)

Optic nerve - a bundle of nerve fibers that connect the retina with the brain. The optic nerve carries signals of light, dark, and colors to the area of the brain (the visual cortex), which assembles the signals into images (i.e., our vision).

Ora serrata - the serrated margin between the retina and the ciliary body.

Posterior chamber - the part of the eye behind the iris and in front of the lens.

Pupil - the opening in the middle of the iris through which light passes to the back of the eye.

Rods - Photoreceptor cells in the retina that are responsible for vision in dim light and for peripheral vision. They are more sensitive to light than cones, but do not provide either sharp images or color vision.

Superior rectus - the ocular muscle whose contraction primarily turns the eyeball upward, and secondarily rotates the top of the eye toward the nose (medially).

Inferior rectus - Ocular muscle that primarily rotates the eye downward, and secondarily rotates the top of eye away from the nose. (laterally)

Lateral rectus - Ocular muscle that moves the eye outward, away from the nose.

Medial rectus - Ocular muscle that moves the eye inward, toward the nose.

Superior oblique - Ocular muscle that depresses the eye and turns it laterally.

Inferior oblique Ocular muscle that elevates the eye and turns it laterally.

Suspensory ligament - A **ligament** that supports an organ or body part, especially a fibrous membrane that holds the lens of the eye in place.

Retina - the light-sensitive nerve layer that lines the back of the eye. The retina senses light and creates impulses that are sent through the optic nerve to the brain.

Sclera - the white visible portion of the eyeball. The muscles that move the eyeball are attached to the sclera.

Disorders/ Conditions of the Eye Vocabulary:

Astigmatism - Condition in which unequal curvatures in parts of the cornea or lens lead to blurred vision.

Cataract - A cataract is a clouding of the normally clear lens of the eye. It can be compared to a window that is frosted or yellowed.

Color Blindness - An inherited condition due to congenital lack of one or more of the cone types.

Conjunctivitis - Commonly known as pinkeye, conjunctivitis is an inflammation of the conjunctiva, the clear membrane that covers the white part of the eye and lines the inner surface of the eyelids

Glaucoma - A group of eye diseases that gradually steals sight without warning and often without symptoms. Vision loss is caused by loss of ganglion cells and damage to the optic nerve. It was once thought that high intraocular pressure (IOP) was the main cause of this optic nerve damage. Although IOP is clearly a risk factor, we now know that other factors must also be involved because even people with "normal" IOP can experience vision loss from glaucoma.

Hyperopia - Farsightedness or hyperopia, occurs when light entering the eye focuses behind the retina, instead of directly on it. This is caused by a cornea that is flatter, or an eye that is shorter, than a normal eye. Farsighted people usually have trouble seeing up close, but may also have difficulty seeing far away as well.

Myopia - Nearsightedness or myopia, occurs when light entering the eye focuses in front of the retina instead of directly on it. This is caused by a cornea that is steeper, or an eye that is longer, than a normal eye. Nearsighted people typically see well up close, but have difficulty seeing far away.

Presbyopia - is a vision condition in which the crystalline lens of your eye loses its flexibility, which makes it difficult for you to focus on close objects. Occurs as process of aging.

Retinal Detachment - Occurs when the retina's sensory and pigment layers separate. Because it can cause devastating damage to the vision if left untreated, retinal detachment is considered an ocular emergency that requires immediate medical attention and surgery. It is a problem that occurs most frequently in the middle-aged and elderly.

AIMS
Anatomy of the Human Eye
Pre/Post Test

1. The first structure of the eye that light passes through on its way to the retina is the _____.
2. This is the name of the gelatinous-like fluid that fills the space between the retina and the lens, and comprises 80% of the eye's volume. _____
3. This small area near the center of the retina has a high concentration of cones and is responsible for high acuity vision.
4. This tough outer covering of the eye is responsible for the "white of the eye". _____
5. The six muscles, which control movement of the eye, are the _____, _____, _____, _____, _____, _____.
6. These cells in the retina respond to bright light and are mainly responsible for the eye's color sensitivity. _____
7. This visual disorder occurs when light rays are focused at a point in front of the retina. _____. It is also known as _____.
8. The _____ conducts visual impulses from the retina to the brain.
9. This condition is a clouding of the eye's natural lens, which results from a clumping together of some proteins in the eye. _____
10. This colored circular muscle is responsible for human eye color and adjusts in size to regulate the amount of light entering the eye. _____
11. Which are more numerous in the human eye, rods or cones?

12. This is the term used to describe the automatic adjustment of the eye for seeing at different distances, affected mainly by changes in the shape of the eye. _____

Bonus: Are you interested in a career in medicine, as either a doctor, nurse, or some other member of the healthcare community? Y or N

AIMS
Anatomy of the Human Eye
Pre/Post Test
Answer Sheet

1. cornea
2. vitreous humor
3. macula
4. sclera
5. superior rectus, inferior rectus, lateral rectus, medial rectus,
superior oblique, inferior oblique
6. cones
7. myopia – nearsightedness
8. optic nerve
9. cataract
- 10.iris
11. rods
12. accommodation