

Eye-Opening Anatomy: A Clearer View of the Visual System

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Objectives

- Dissect a preserved cow eye.
- Learn eye anatomy while relating structure and function.
- Discuss common eye disorders.



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Building Toward 3-Dimensional Learning

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and using models ▪ Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.	**LS1.A: Structure and function** ▪ Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.	**Structure and function** ▪ The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.

Explore Next Generation Dissections

1. NGSS Lead States, Next Generation Science Standards: For States, By States *(Washington, DC: The National Academies Press, 2013), retrieved from www.nextgenscience.org or ngss.nsta.org*

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Cow Eye Dissection



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Carolina's Perfect Solution® Specimens

Quality

- Superior preservation
- Superior tissue color and texture

Safety

- No dangerous off-gassing
- No formalin odor

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Dissection Preparation Tips

- **Organize your dissection area:**
  - Take out your dissection tray
  - Put blue absorbent pad under the dissection tray
  - Lay out your instruments
    - Scissors
    - Scalpel
- **Use appropriate personal protective equipment:**
  Apron, gloves, safety goggles



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Safety Requirements

- **Personal protective equipment**
  Apron, gloves, safety goggles
- **Dissection tools**
  Be diligent with sharp tools



Safety Tip
If you are not using an instrument, set it down.

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Opening the Bag

1. At the anterior of the specimen, locate an area where there is excess plastic.
2. Force any fluid out of the area to prevent spills.
3. Cut a small hole in the excess plastic. This will allow the fluid to drain to the bottom of the bag.
4. Continue to cut around the anterior of the specimen until you can easily remove the specimen from the bag.
5. Keep the bag upright until we collect the fluid and the bag.



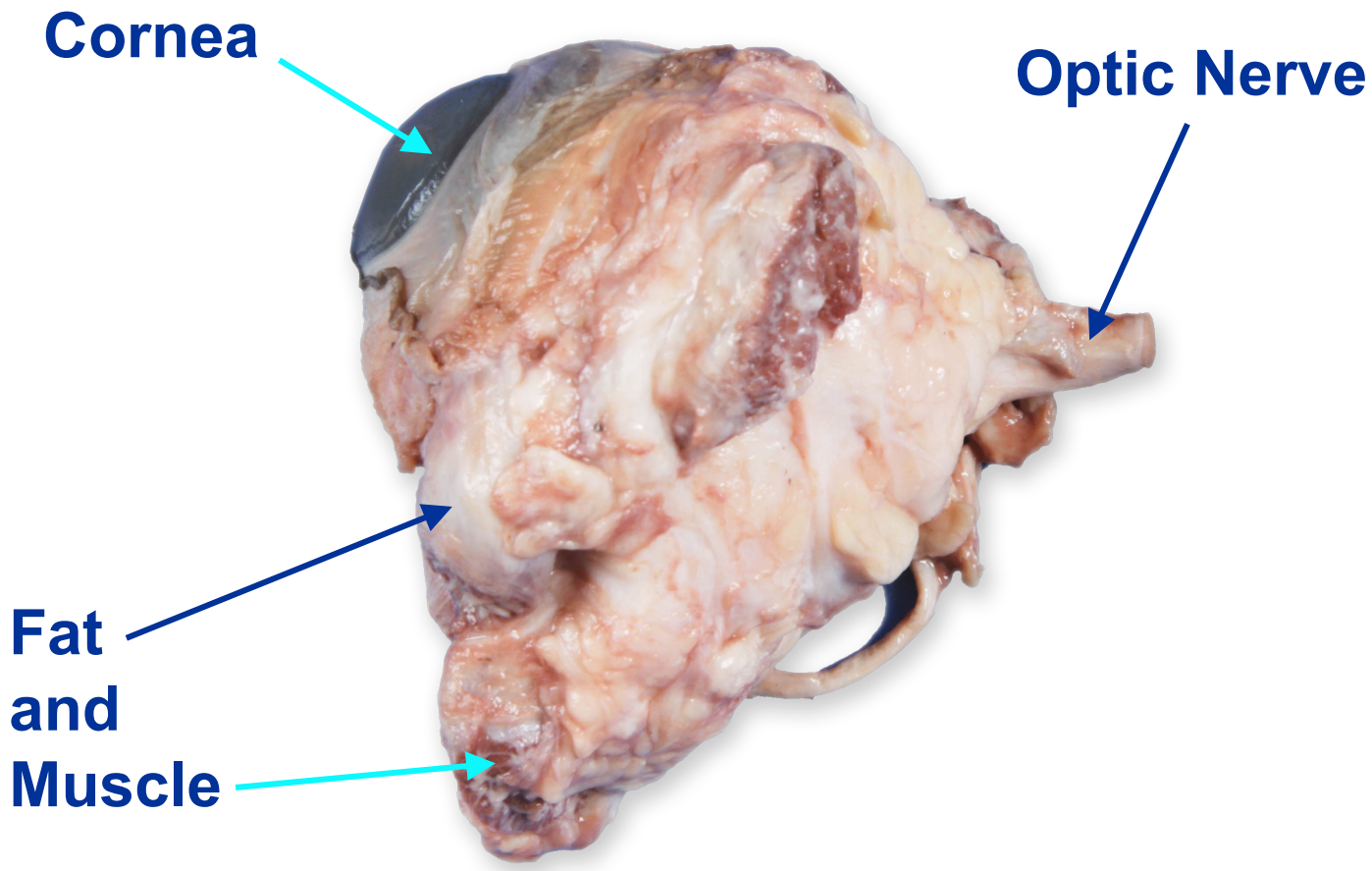
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External Anatomy

Locate the following:

- Cornea
- Optic nerve
- Surrounding fat and muscle



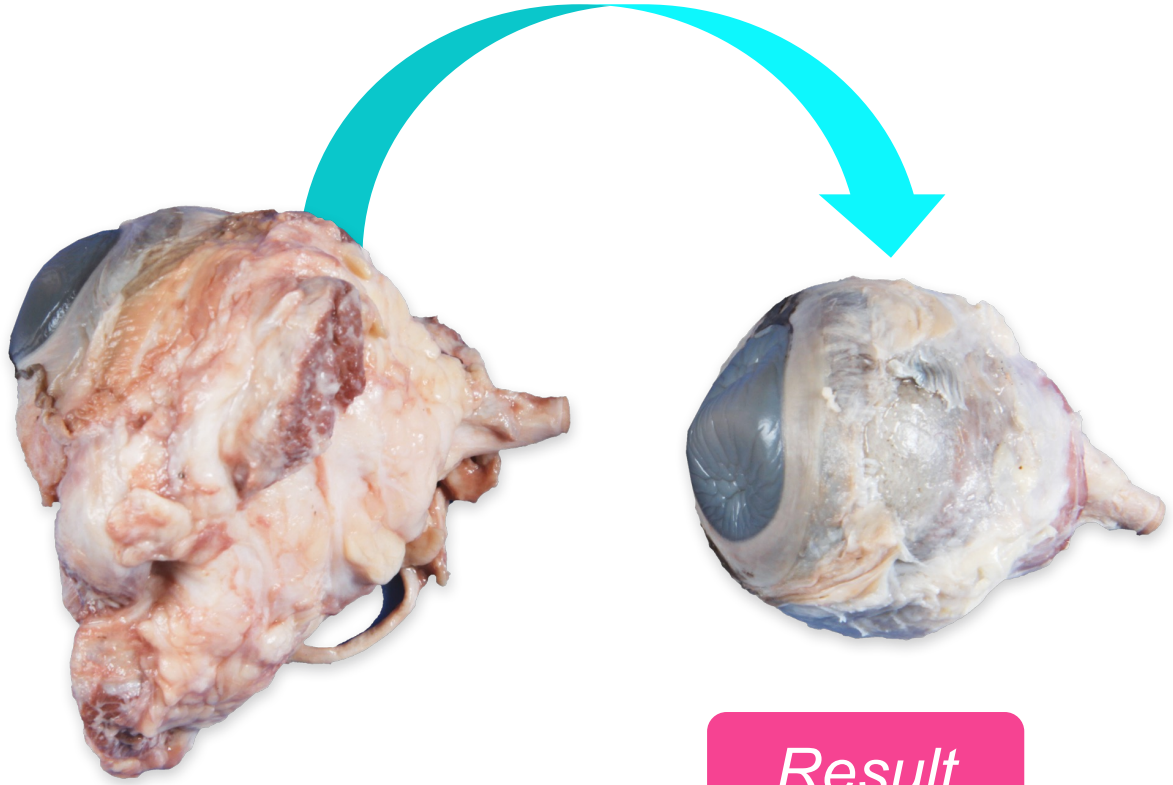
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External Anatomy

Remove the fat and muscle:

- Use your scissors.
- Don’t cut the optic nerve!

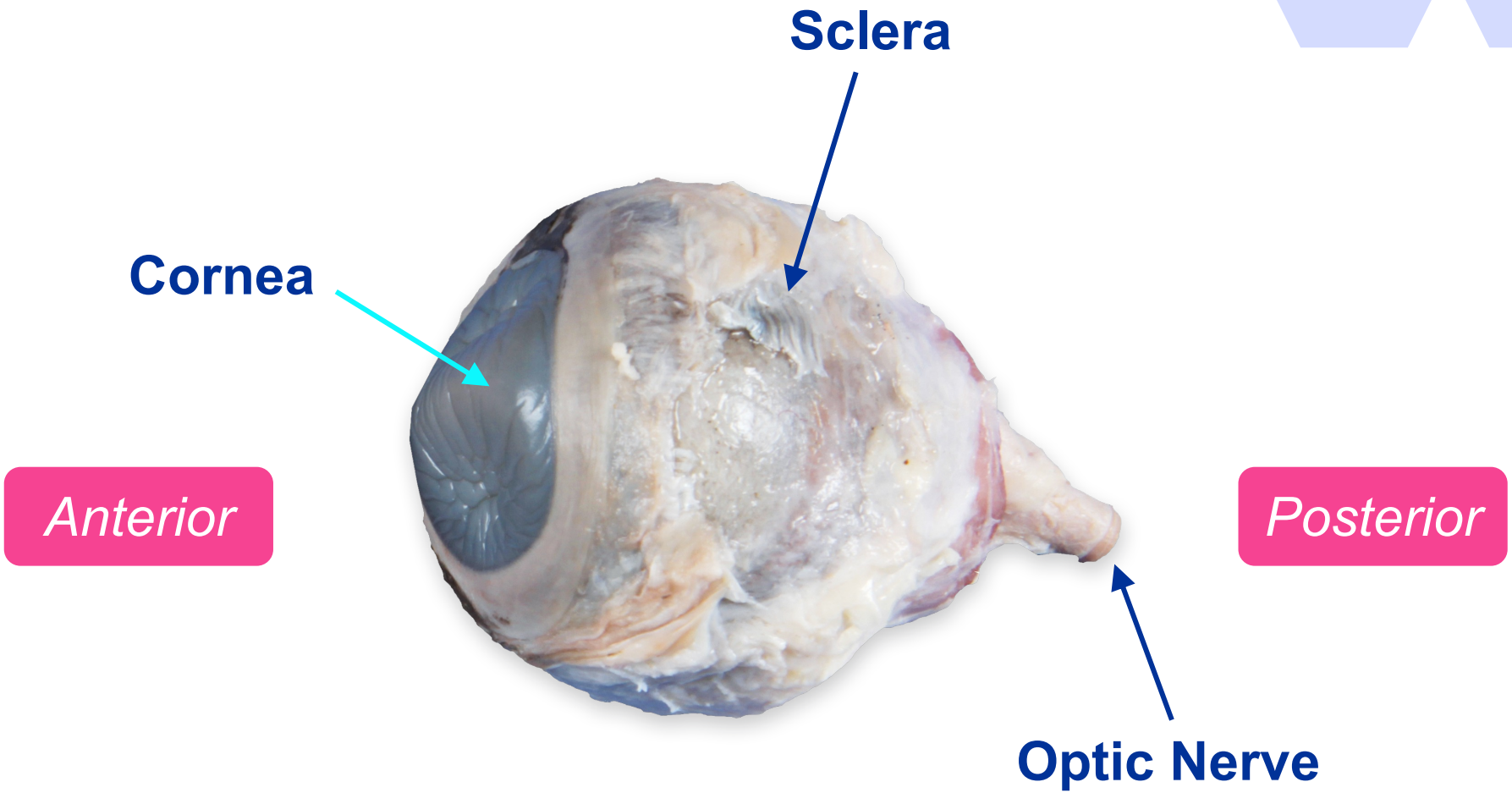
Hint:
Pull and flatten the tissue, then cut.



Result

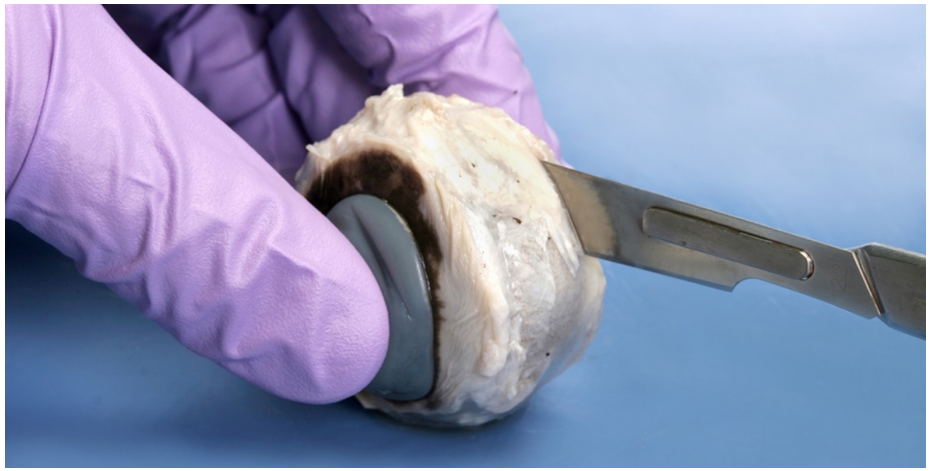
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External Anatomy



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It’s Eye-Opening!

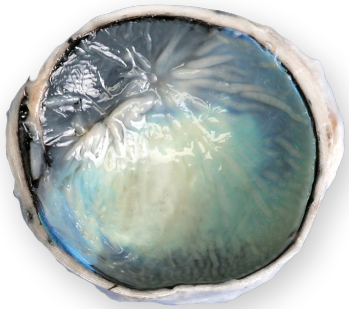


Cut a cross section as shown.

Teacher tip: *You may wish to start the incision with a scalpel and allow your students to finish with scissors.*



Anterior



Posterior

Separate the anterior and posterior halves of the eye.

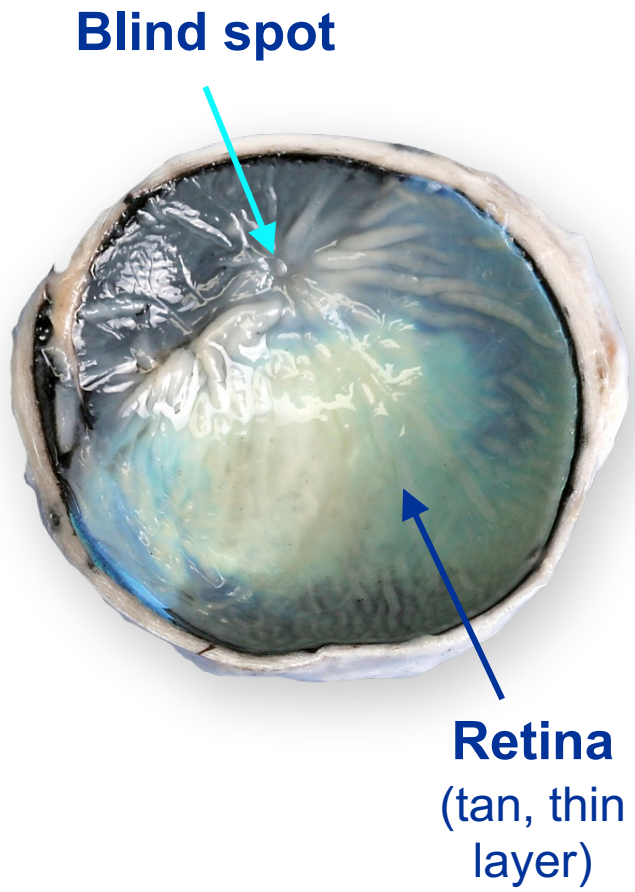
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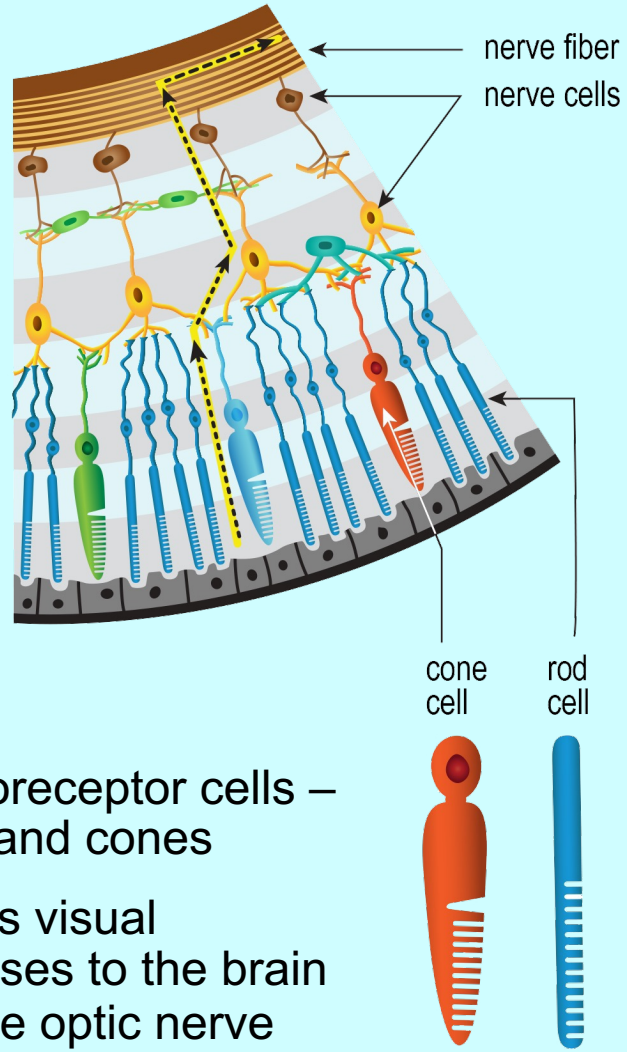
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Internal Anatomy: Posterior

Locate:

- Retina
- Blind Spot



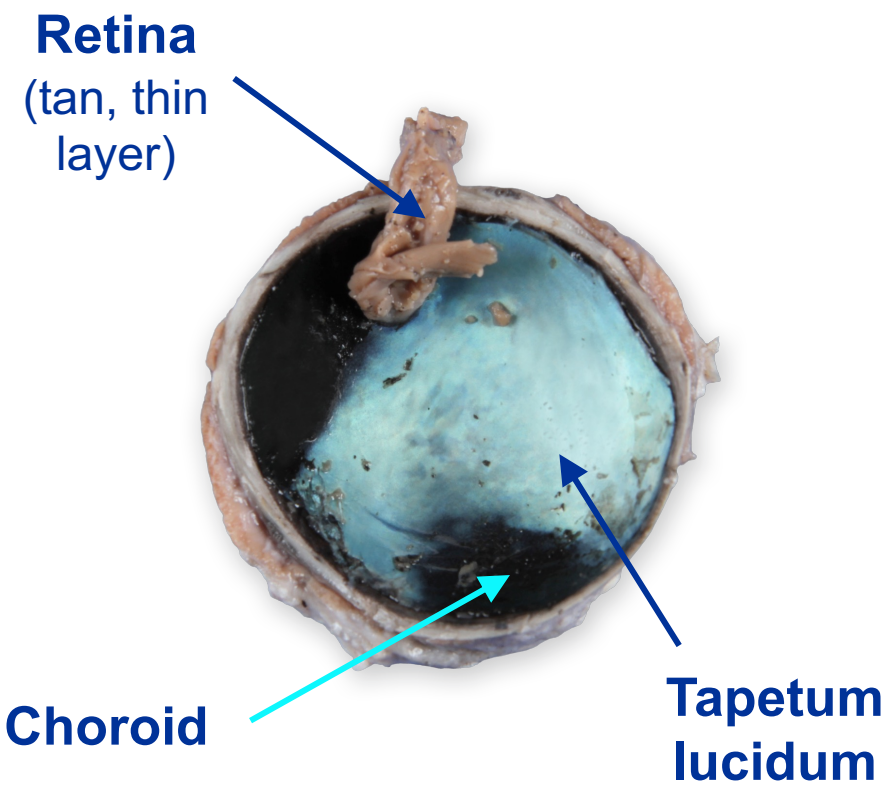


Retina

- Photoreceptor cells – rods and cones
- Sends visual impulses to the brain via the optic nerve

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Internal Anatomy: Posterior



With your finger, gently move the retina so you can see the back of the eye.

Locate:

- Choroid
- Tapetum Lucidum

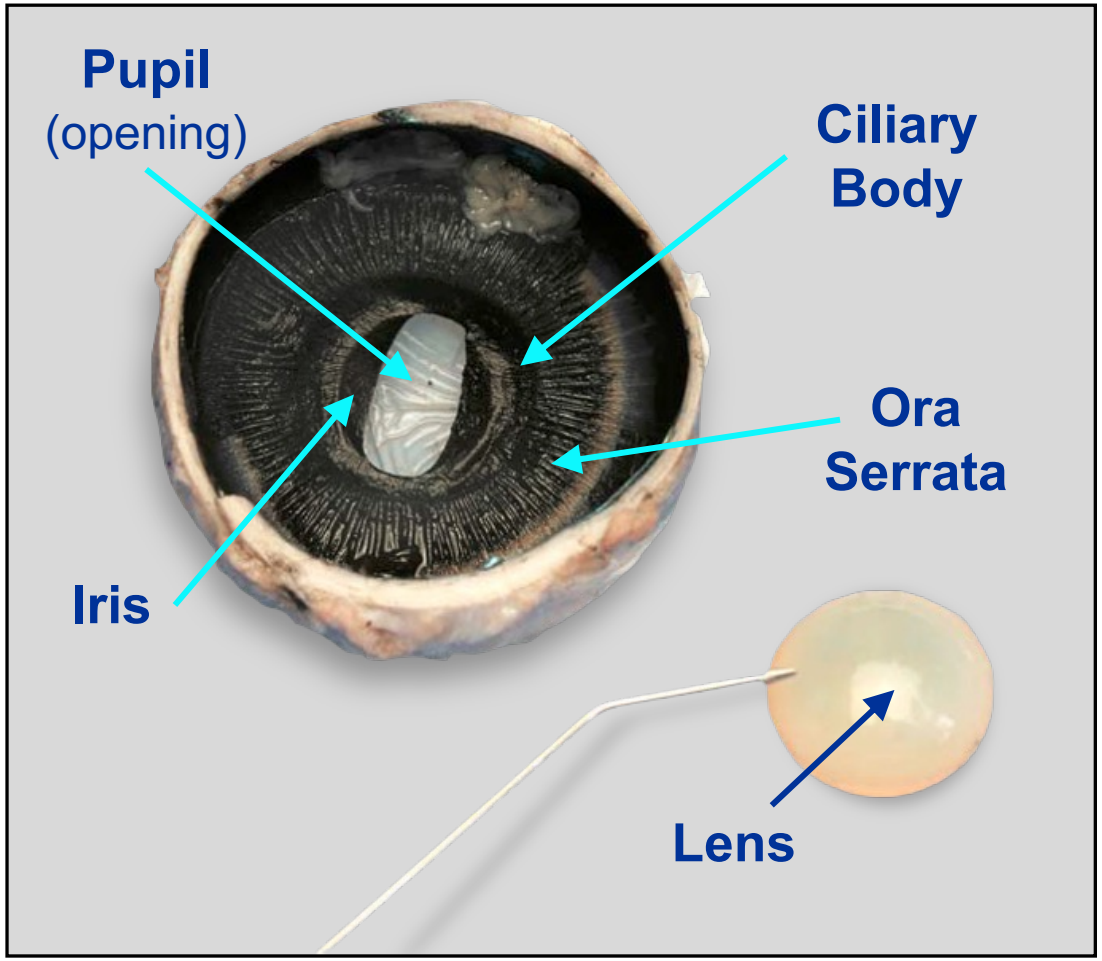
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Eyeshine: Tapetum Lucidum



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Internal Anatomy: Anterior



Remove:

- Vitreous humor
- Lens

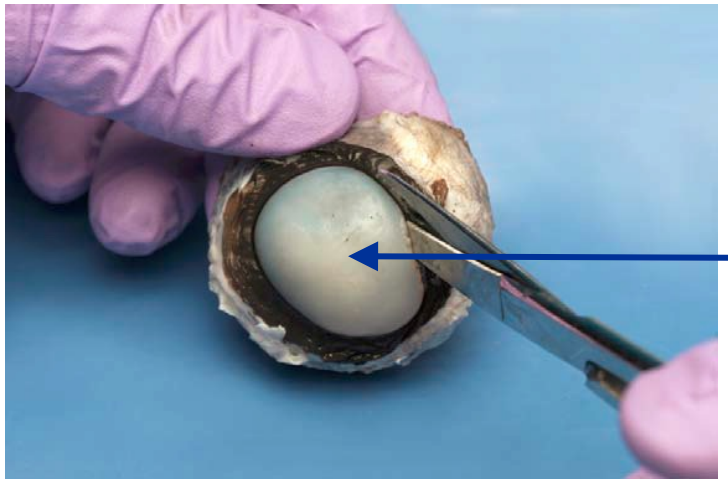
Locate:

- Iris
- Pupil
- Ora Serrata
- Ciliary Body

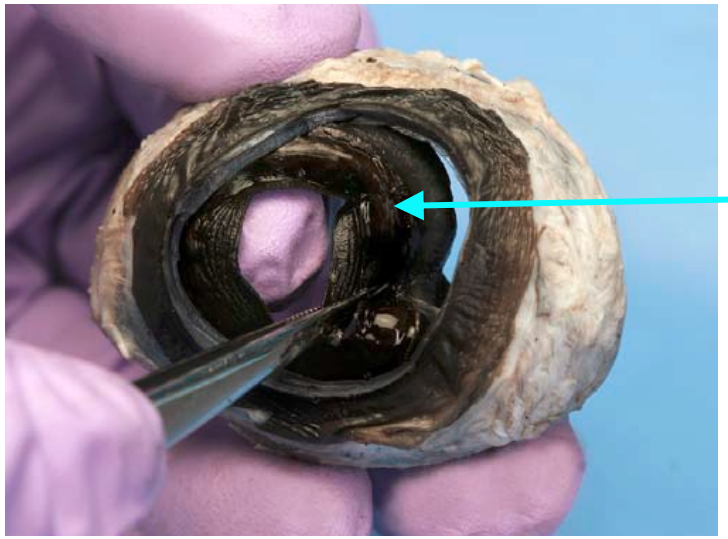
Not pictured: Aqueous humor

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Internal Anatomy: Anterior



Carefully cut through the thick cornea.



Tease the iris away from the inner surface of the eye.

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Internal Anatomy



Cornea

Iris

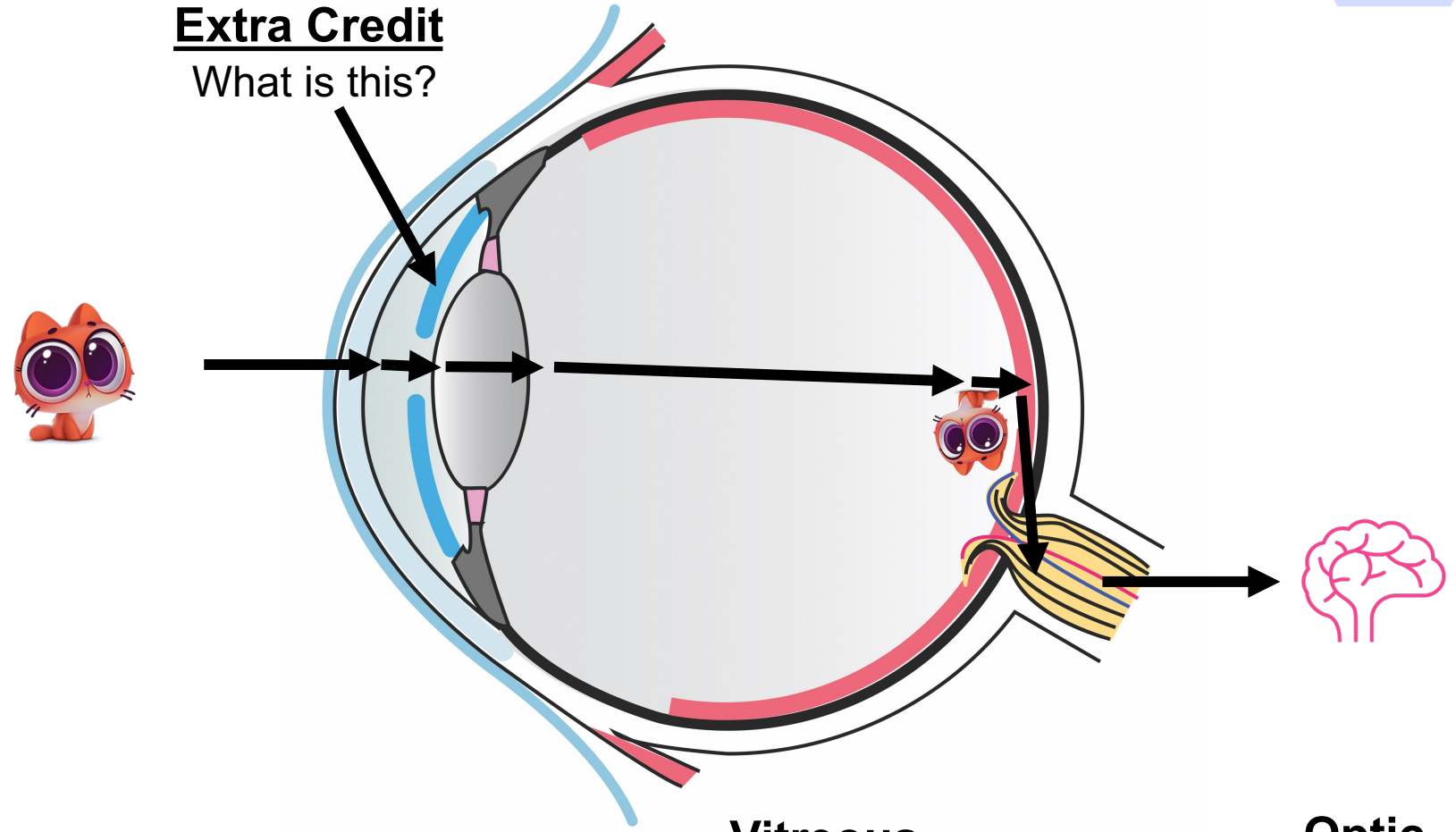
Sclera

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Now You See Me(ow)!

Extra Credit

What is this?



Cornea → Pupil → Lens → Vitreous Humor → Retina → Optic Nerve → Brain

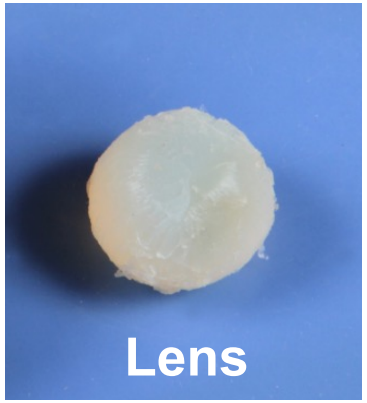
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Common Eye Disorders

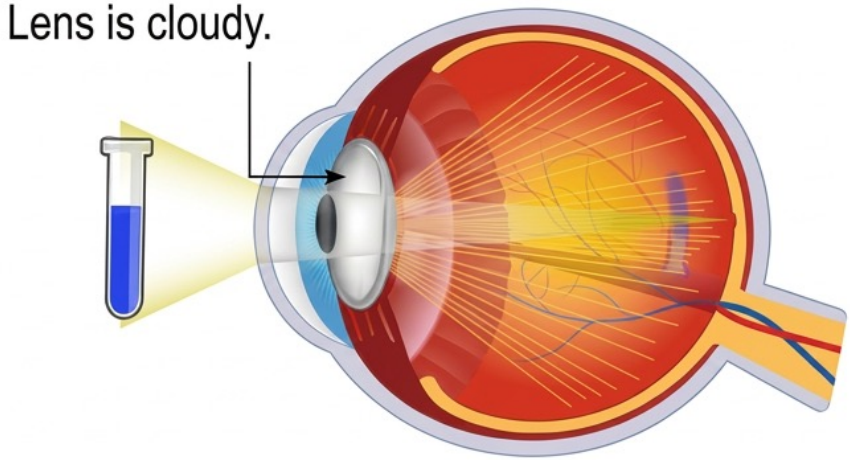
Characteristics:

- Biconvex
- Flexible
- Transparent
- Attached to suspensory ligaments of ciliary body



Functions:

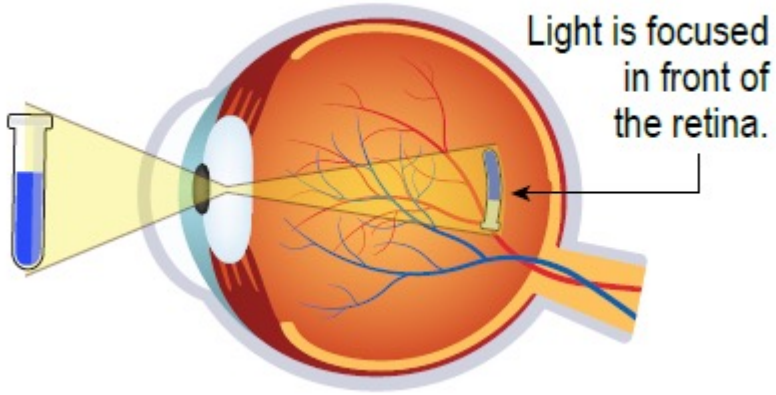
- Refracts light onto retina
- *Accommodation* – changes shape to adjust focal point
  - Curved – near objects
  - Flat – distant objects



Cataracts

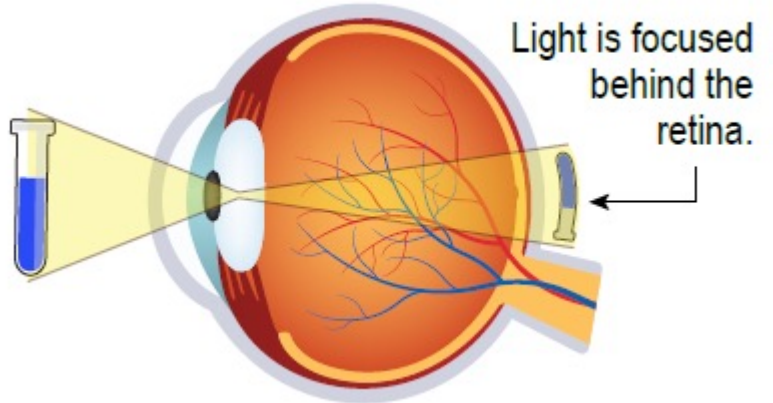
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Common Eye Disorders

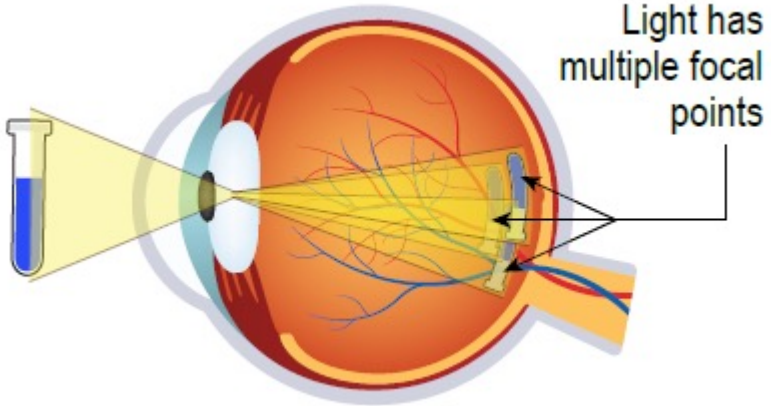


Myopia
(nearsightedness)

Refractive Errors



Hyperopia
(farsightedness)



Astigmatism

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