TOPIC: THE LENS AND FOCUSING LIGHT ON THE RETINA

Optics: Lenses and Refraction

- Light _____ (or bends) when it passes between media of different densities.
- A convex lens is used to refract light in way that allows it to be _____.

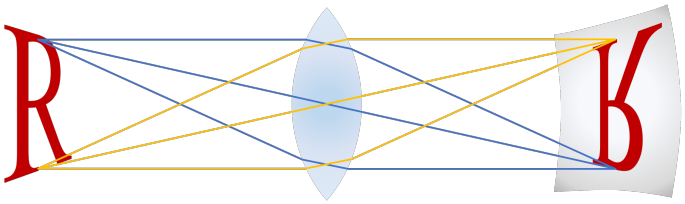
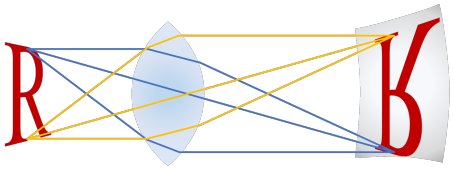
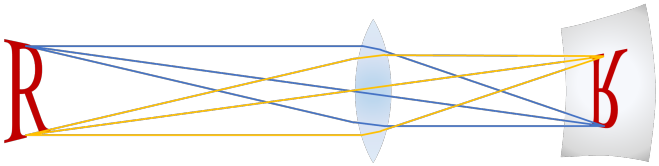


Image produced by a convex lens will be _____ (upside down and backwards).

- The _____ of the lens affects how much the light is bent, allowing us to focus at different _____.





- More convex (rounder) - _____ refraction.
  - Focus is on close objects.
- Less convex (flatter) - _____ refraction.
  - Focus is on far objects.

EXAMPLE: You're reading a book in the library. You look up to see a friend entering the room. How would you expect the lens of your eye to change shape in order focus on your friend across the room?

- Lens shape while focusing on the book: _____
- Lens shape while focusing on the student: _____

PRACTICE: True or False: if false, choose the answer that corrects the statement.

The lens of the eye focuses on nearer objects by becoming less convex.

a) True.

b) False, our eyes focus on nearer objects by moving the lens further from the retina.

c) False, our eyes focus on nearer objects by changing the shape of the cornea.

d) False, the lens of our eyes focus on nearer objects by becoming more convex.

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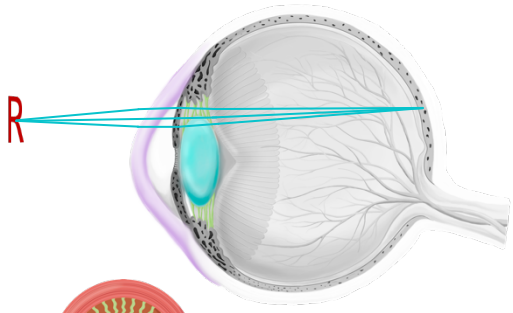
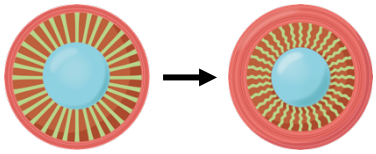
Accommodation: Changing Focal Distance



- Light is refracted by 2 structures in the eye:
  1. **Cornea**: most refraction, but not flexible – cannot focus.
  1. **Lens**: flexible to allow for focus.
     - Lens is NORMALLY _____ to be flatter.



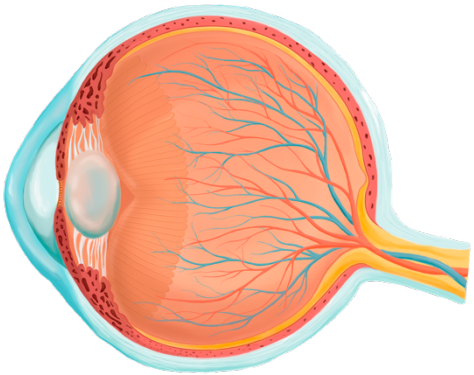
- To focus on near objects, the eye uses multiple systems.

1. Lens Accommodation	2. Accommodation Pupillary Reflex	3. Eyeball Convergence
Ciliary muscles _____, releasing tension on the lens. Lens bulges—more _____.	Pupil _____, blocking light from hitting the edges of the lens.	Eye's cross to focus image on _____.

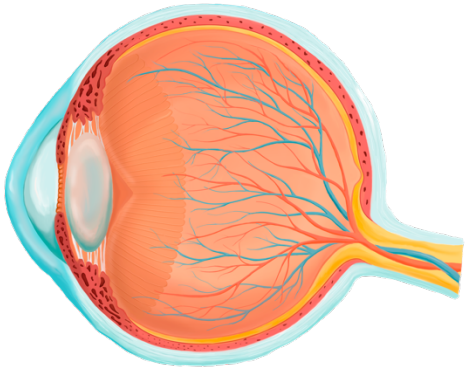
Note: As we get older, lenses become less _____— lose ability to accommodate.

EXAMPLE: The two images below represent cross sections of the same eye when focused at two different focal lengths. Based only on the images, can you determine which eye is focused on something close, and which is focused on something far? Draw arrows to two structures that are different between the images that lead you to make your conclusions.

*Note that the changes shown are exaggerated for the purposes of illustration.



Focus distance: _____



Focus distance: _____

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PRACTICE: Two of the processes involved in accommodation for near vision involve contracting a muscle. In which answer choice below is the muscle matched with the correct form of accommodation?

a) Ciliary muscles—Lens accommodation.

b) Ciliary muscles—Accommodation pupillary reflex.

c) Pupillary dilator—Accommodation pupillary reflex.

d) Pupillary constrictor—Lens accommodation.

PRACTICE: In a previous example, you saw that when reading a book, your lens is rounder or more convex, but when you look up to see a student entering the library, your lens becomes flatter or less convex. What muscle action results in the lens becoming less convex?

a) Ciliary muscles contract.

b) Ciliary muscles relax.

c) Pupillary constrictors contract.

d) Pupillary dilators relax.