

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

A person's hands are shown from a first-person perspective, holding a large, glowing, spherical object. The hands are silhouetted against the bright light of the sphere. The person is wearing a dark, long-sleeved shirt. The background is dark, making the glowing sphere the central focus. The text is centered on the sphere.

**Take that dream and
your vision for the
future and bring it
inside. You talk about
it. You plan for it. You
pray for it. Now it's
time make it happen.
May you be blessed
with inner vision. See
your dream from the
inside looking out and
watch as your dream
becomes reality.**



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَهُوَ الَّذِي أَنْشَأَ لَكُمْ السَّمْعَ

وَالْأَبْصَارَ وَالْأَفْئِدَةَ قَلِيلًا مَّا تَشْكُرُونَ

It is Allah Who has endowed you
with the faculties of **hearing** and
sight and has given you **hearts**.

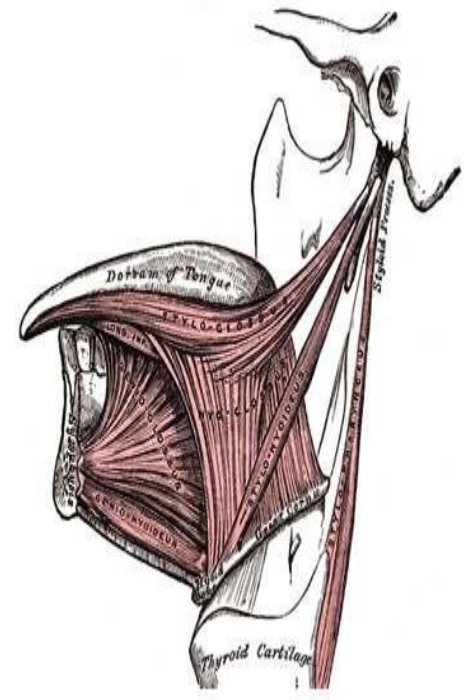
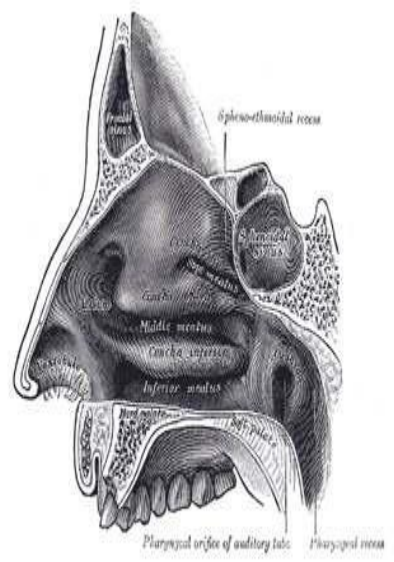
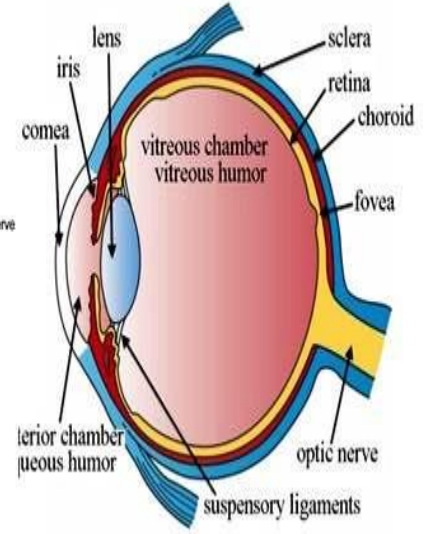
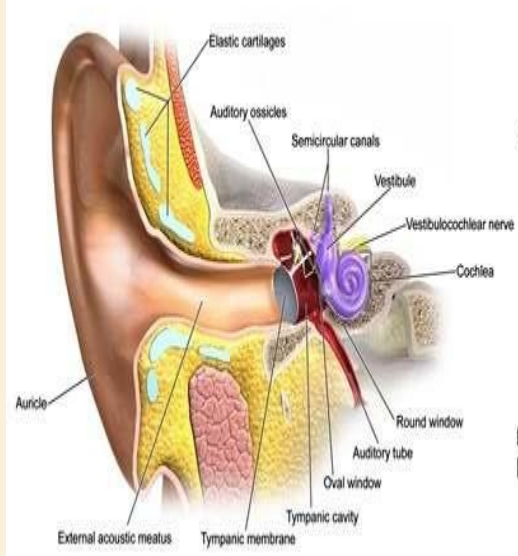
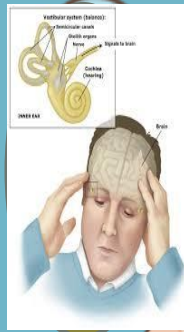
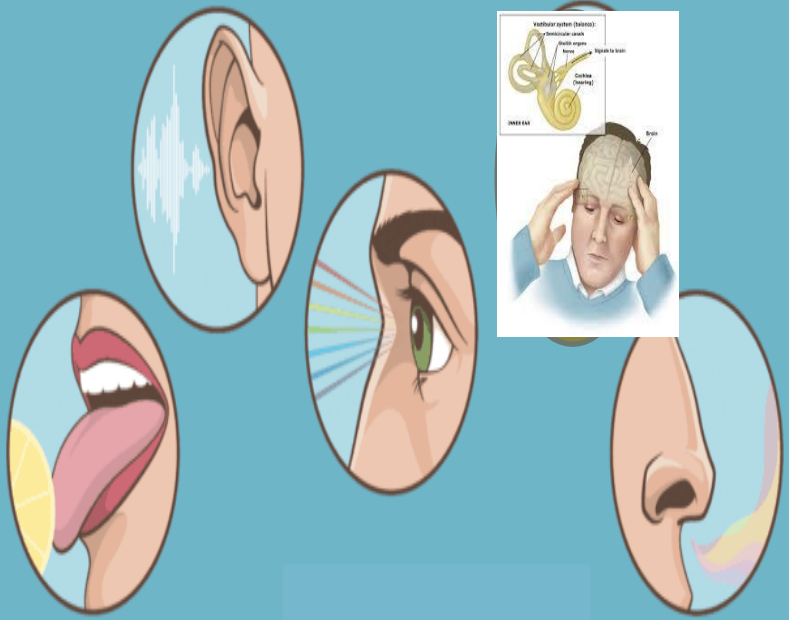
Scarcely do you give thanks.

—Quran 23:78

@fatimakarimms



Special Senses



What Are Special Senses?

DR ZUBIA SHAH

Special Senses

- 1. **Vision** (the eye)
- 2. **Hearing** (the ear → the auditory system)
- 3. **Balance** (the vestibular system)
- 4. **Smell** (the nose)
- 5. **Taste** (the tongue)

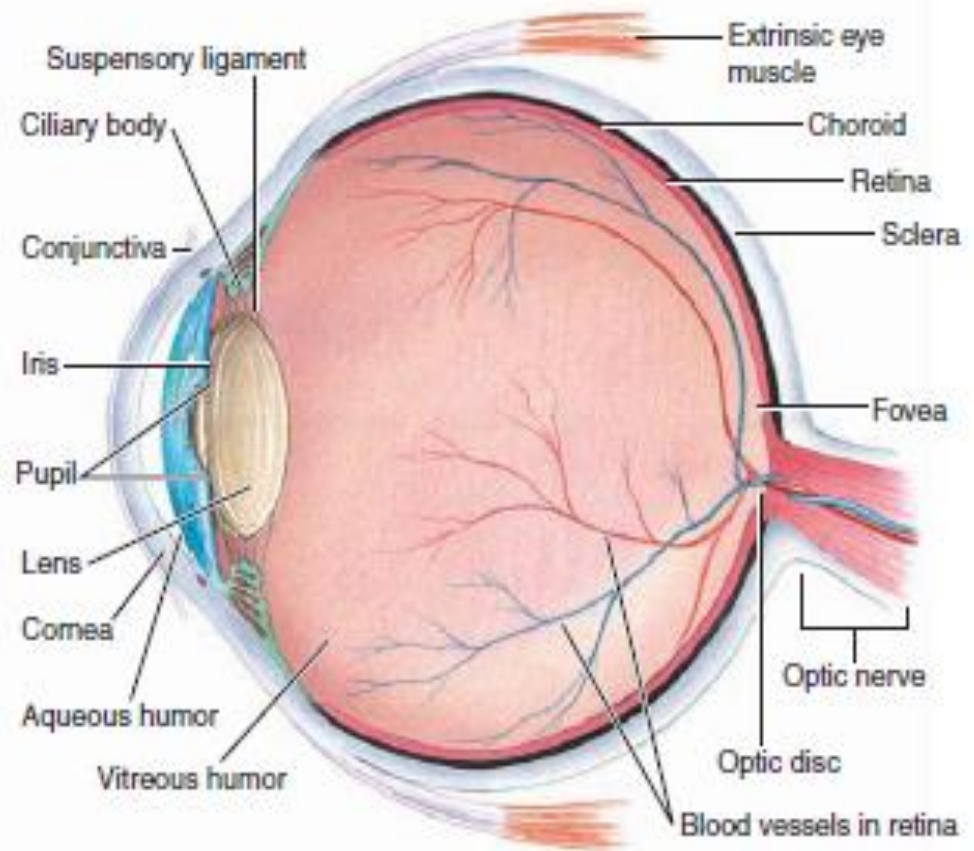
“And HE gave You (the faculties of) hearing And sight and feeling (And understanding).” (Quran 32:9)

Human Eye Ball

Structure of Eye

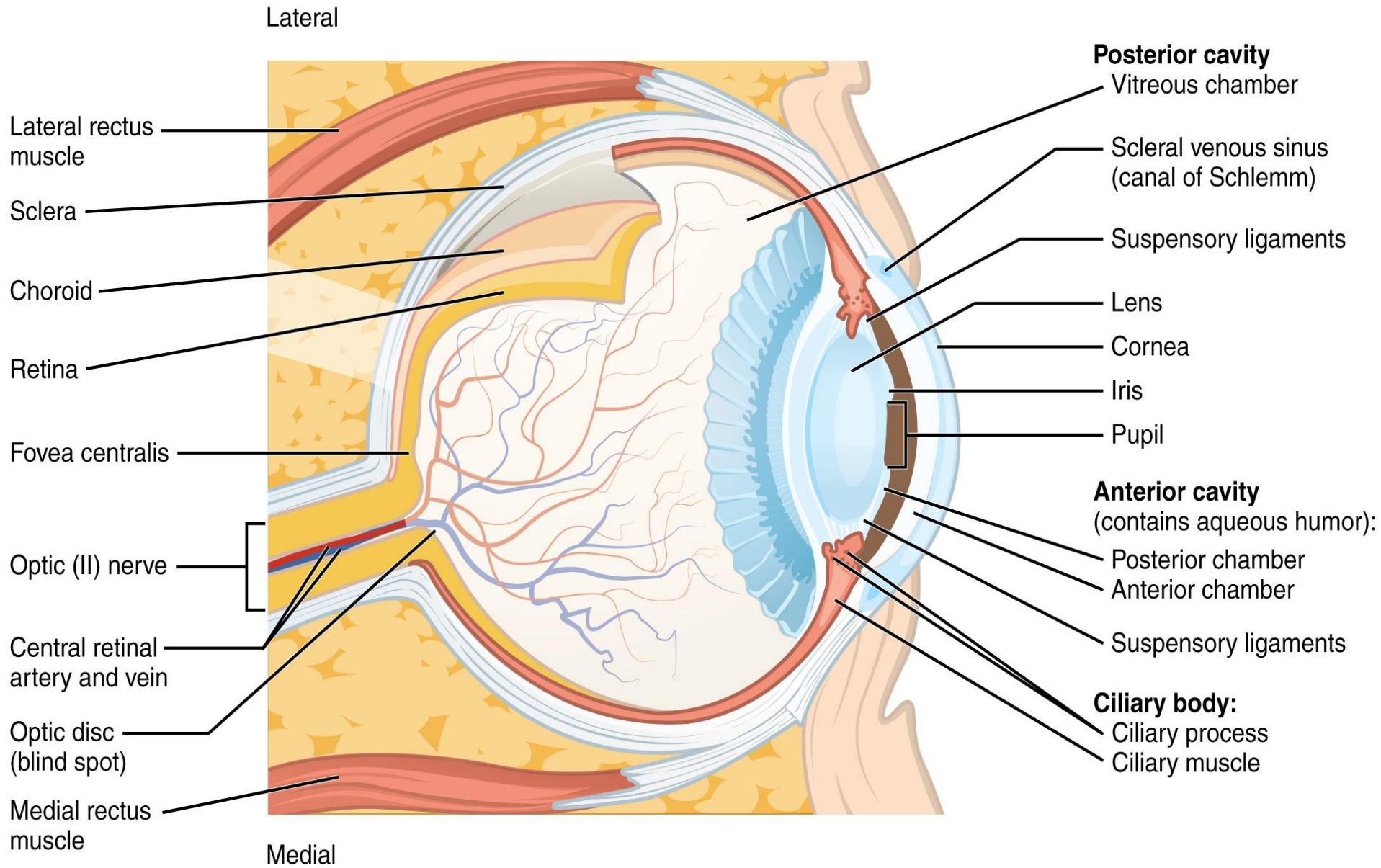


(a) External front view



(b) Internal sagittal view

Structure of Eyeball



Conjunctiva

Thin mucous membrane which covers the exposed part of eye called **BULBAR** and is reflected onto the inner surface of eyelids....called **PALPEBRAL CONJUNCTIVA**

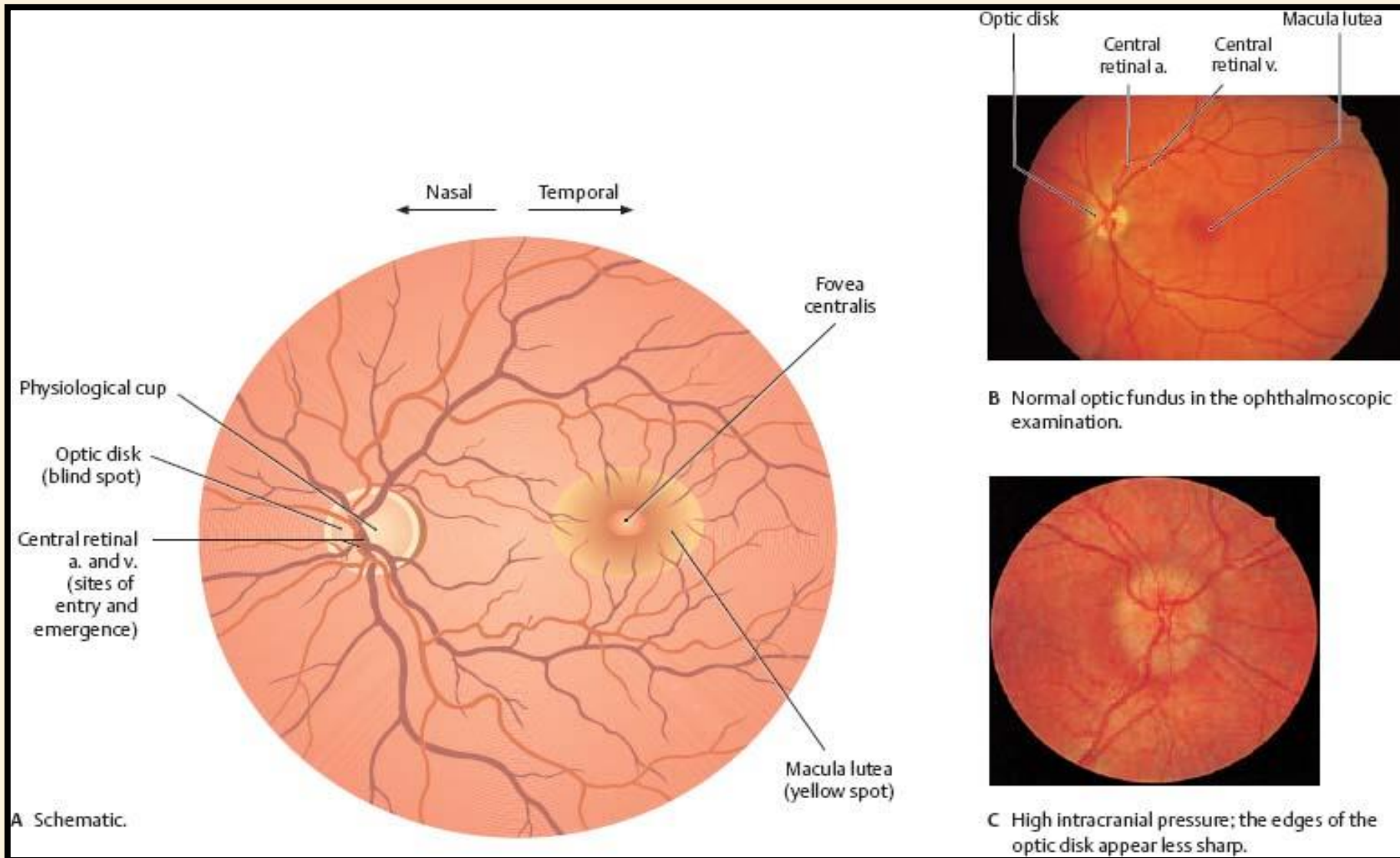
Fundus of the Eye

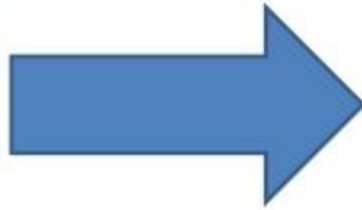
- Inner most layer visible
- **OPTIC DISC** and **MACULA**
- Axons of ganglion cells unite to form optic nerve and the point where it leaves the retina is **OPTIC DISC**, pale area having no rods and cones is the physiological **BLIND SPOT**

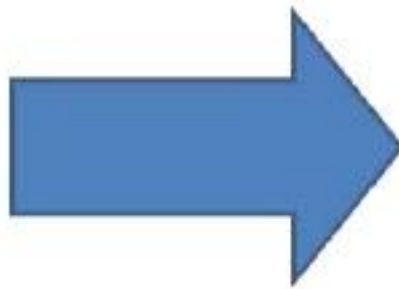
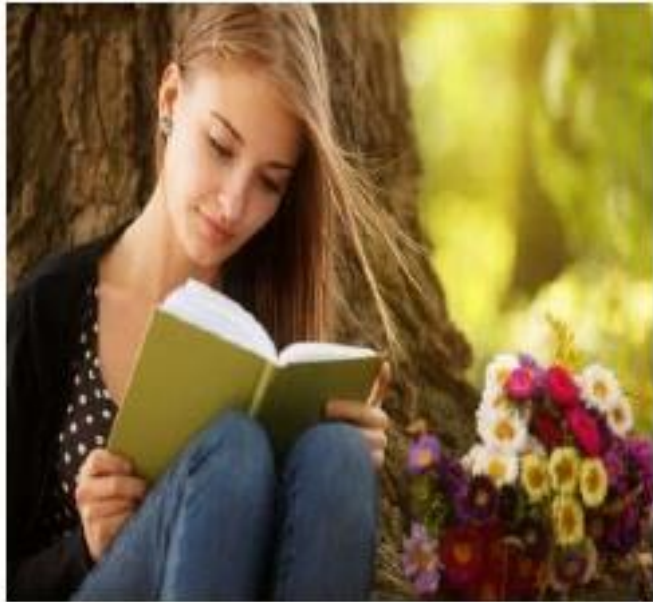
Macula

- **YELLOWISH area** lateral to optic disc in the fundus
- The central point is **FOVEA CENTRALIS** containing only cones and is responsible for acute vision
- Vision in rest of fundus is **Extrafoveal** and is blurred
- Macular degeneration is a cause of blindness

Fundus Oculi







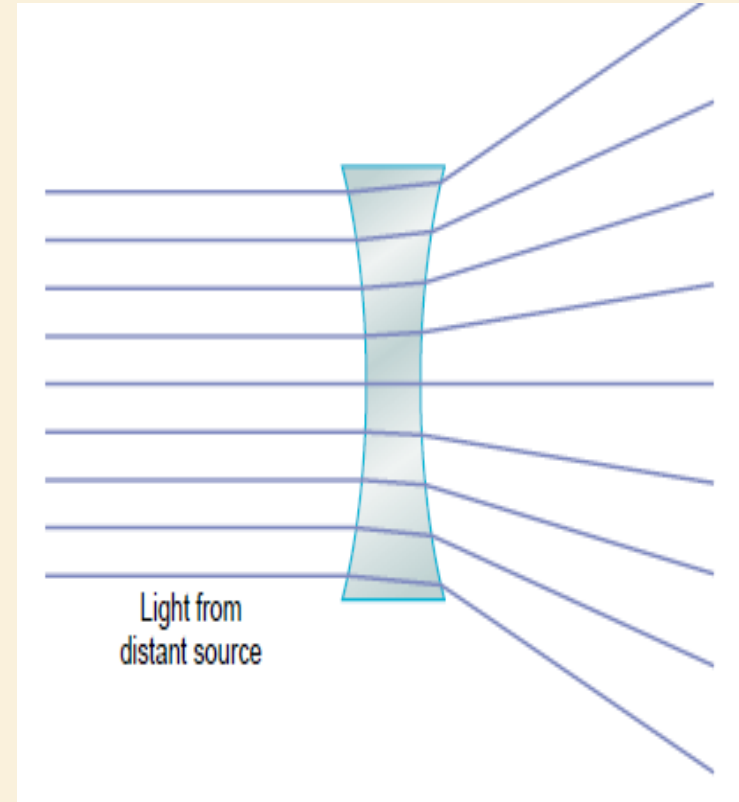
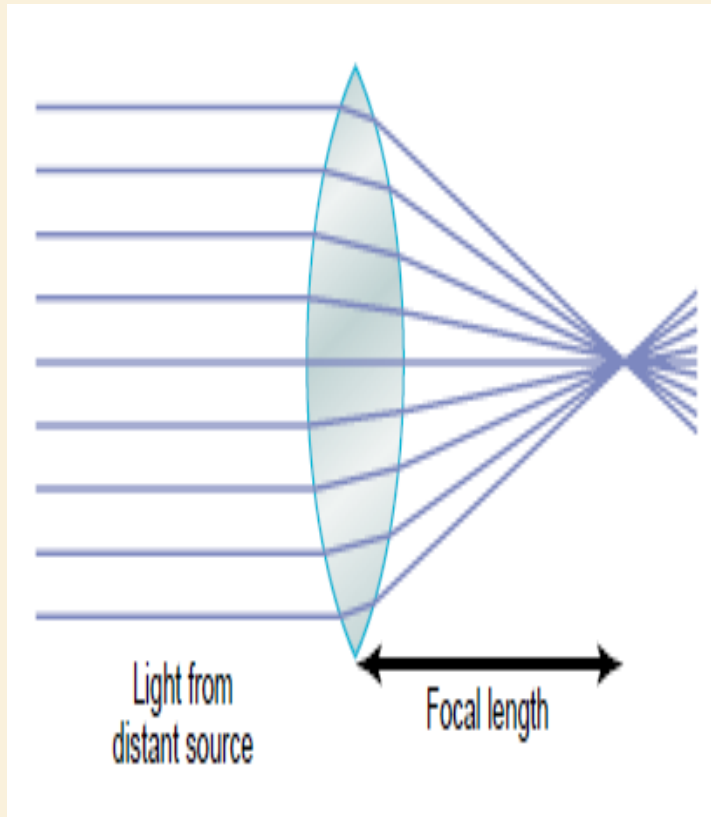
Physical Principles of Optics

Errors of Refraction

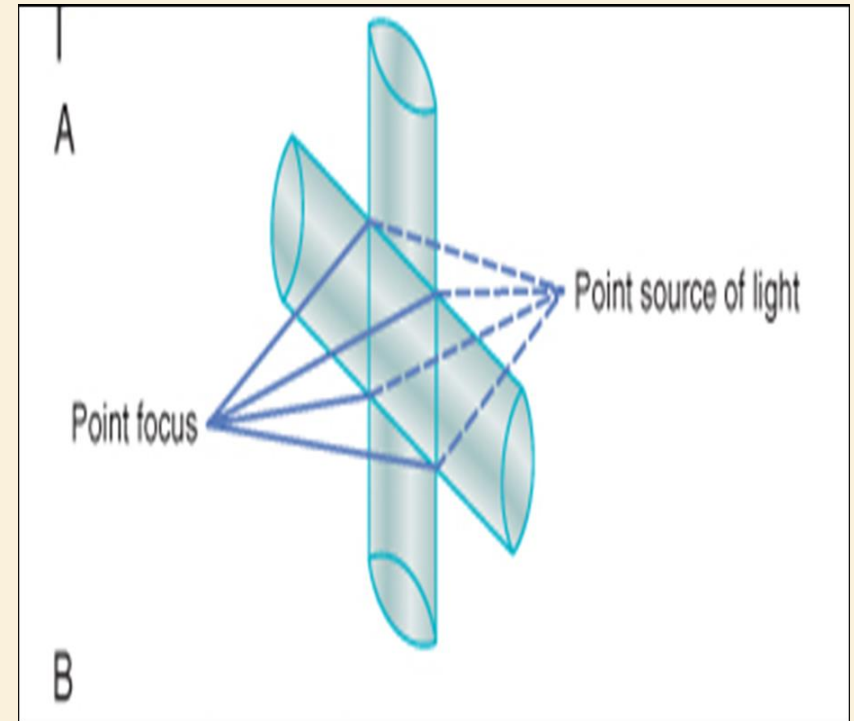
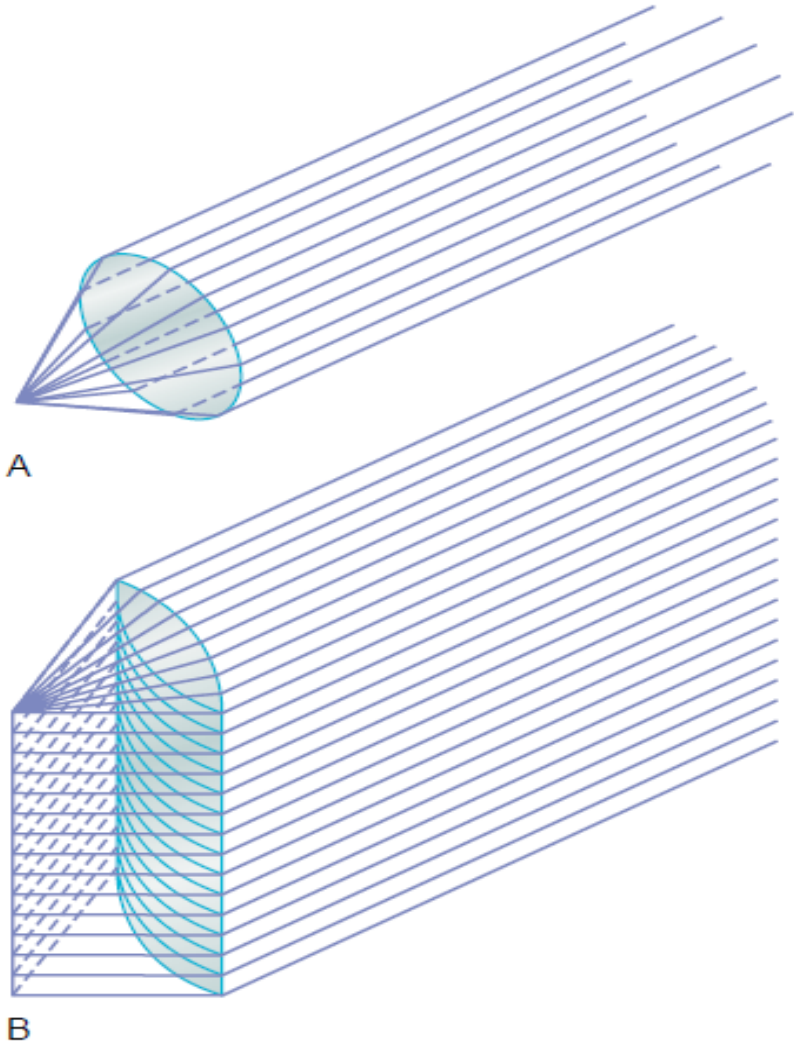
Learning Objectives

- **Recall The Principles Of Optics.**
- **Apply These Principles To Lenses.**
- **Define The Refractive Power Of Lens.**
- **Describe Errors Of Refraction.**

Principles of Optics



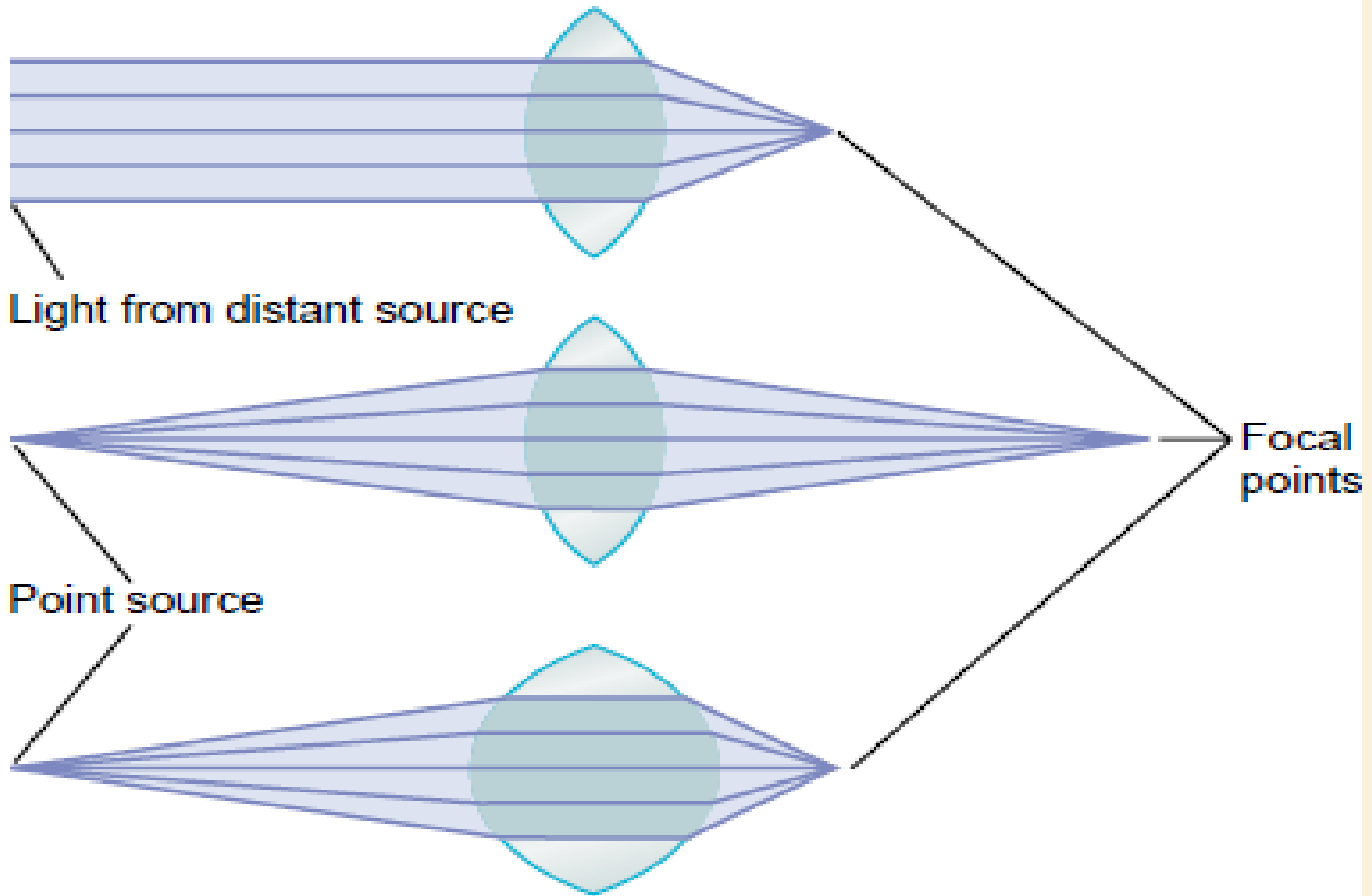
Point Focus and Line Focus Spherical and Cylindrical Lenses



Measurement of the Refractive Power of a Lens – “Diopter”

- The more a lens bends light rays, the greater is its “**refractive power**”.
- This refractive power is measured in terms of ***diopters***
- The refractive power in diopters of a lens is equal to **1 meter divided by its focal length**

Parallel and Point Sources of Light



If the focal length of a lens is 0.1 m, its refractive power will be

- A. 0.25 diopter
- B. 0.75 diopter
- C. 1.0 diopter
- D. 1.33 diopter
- E. 10 diopter

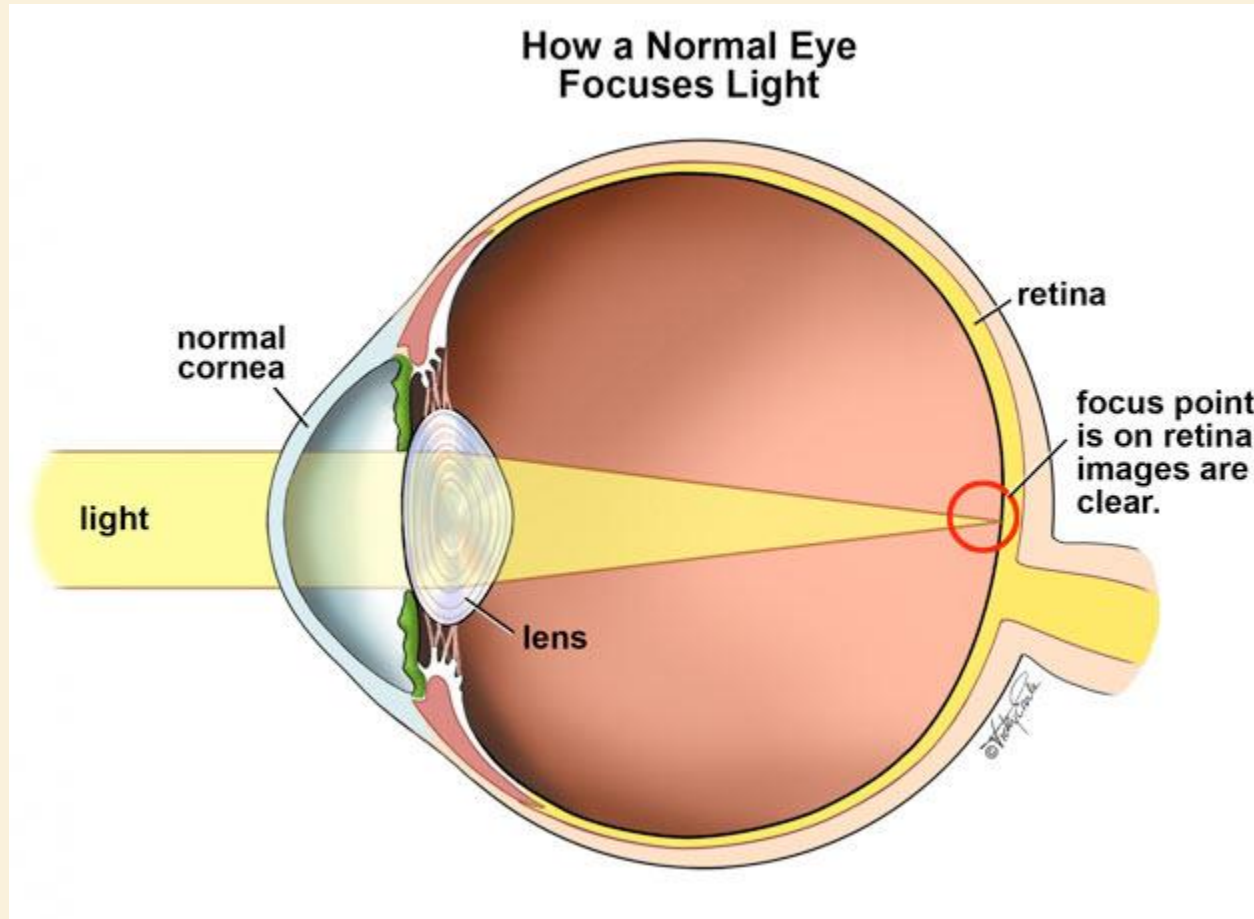
EMMETROPIA

NORMAL EYE

Normal Eye (Emmetropia)

- Eye is normal, or “**Emmetropic**” if parallel light rays from distant objects are in sharp focus on the retina when **ciliary muscle is completely relaxed**
- But the eye must contract its ciliary muscle for near objects

Refraction of Light in Normal Eye



What are the Errors of Refraction?



Errors of Refraction

A condition in which light rays do not come to a point focus on retina

- 1. Hyperopia/Farsightedness**
- 2. Myopia/Shortsightedness** (more common)
- 3. Astigmatism**
- 4. Presbyopia** (age related)

PREVALENCE OF REFRACTIVE ERRORS

Prevalence of Refractive Errors

- Uncorrected refractive errors led to **visual impairment in 101.2 million** people and **blindness in 6.8 million people in 2010**
- A high prevalence of refractive errors in South Asian population

Hassan *et al.*, 2018

(Journal of Current Ophthalmology

Volume 30, Issue 1, March 2018, Pages 3-22)

CAUSES OF REFRACTIVE ERRORS

Causes of Refractive Errors

- **Myopia** → Eye Strain, reading in Dark, more time on screens, Hereditary
- **Hyperopia** → Hereditary
- **Astigmatism** → Genetic predisposition and injuries to the eye
- **Presbyopia** → Aging process

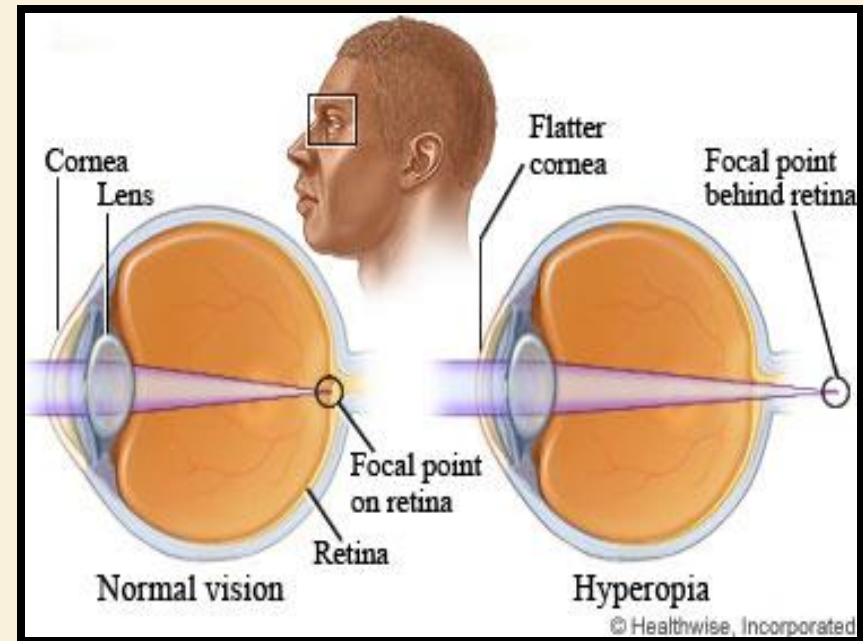


FARSIGHTEDNESS/HYPEROPIA

Hyperopia / Farsightedness

- Parallel light rays focused **behind the retina**
- **Refractive power of lens is weak or**
- **Eyeball is small**

- **Convex lenses (Plus)**
to correct Hyperopia



Hyperopia (Farsighted)



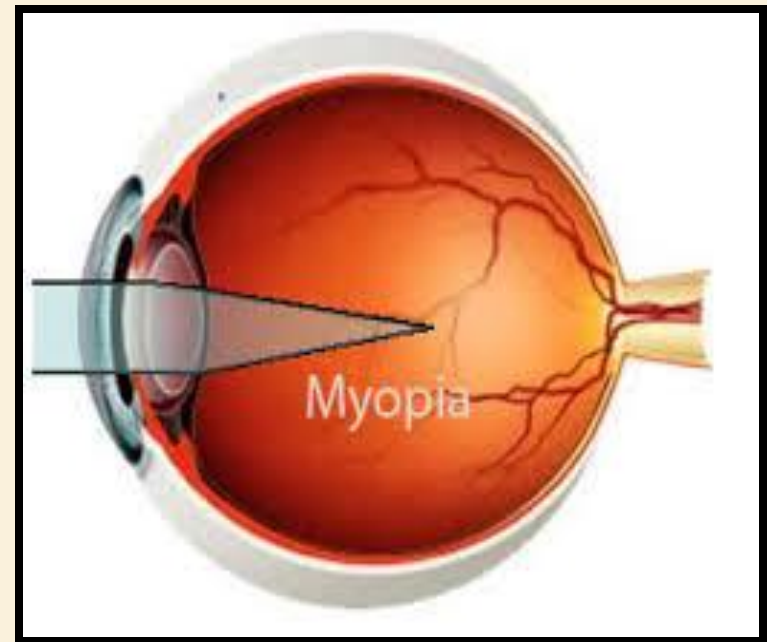
Emmetropia (perfect vision)



SHORT SIGHTEDNESS / MYOPIA

Myopia or Near Sightedness

- Parallel light rays focused **in front of the retina**
- **Refractive power of the lens system is too strong or**
- **Eyeball is big**
- The person **cannot see the far objects**
- **Correction with concave lenses (Minus)**



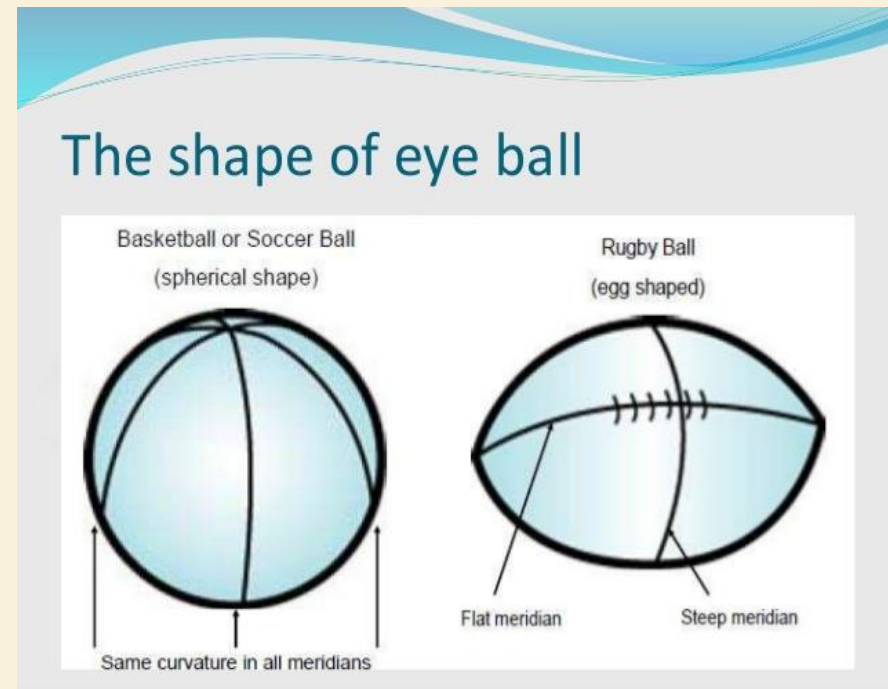


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ASTIGMATISM

Astigmatism

- Usually, an **oblong shaped cornea**
- Light rays from different planes are focused differently and we get two or more focal points
- <https://nei.nih.gov/health/errors/astigmatism>



Signs and Symptoms

Headaches

Eyestrain

Squinting

Distorted or
blurred vision
at all distances

Difficulty
driving at night

Astigmatism

Original

aio

Compromise

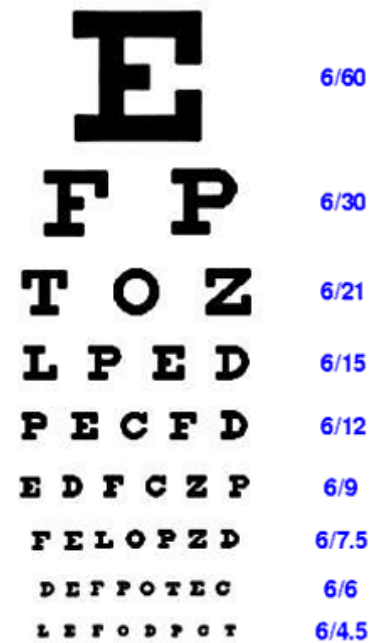
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Horizontal Focus

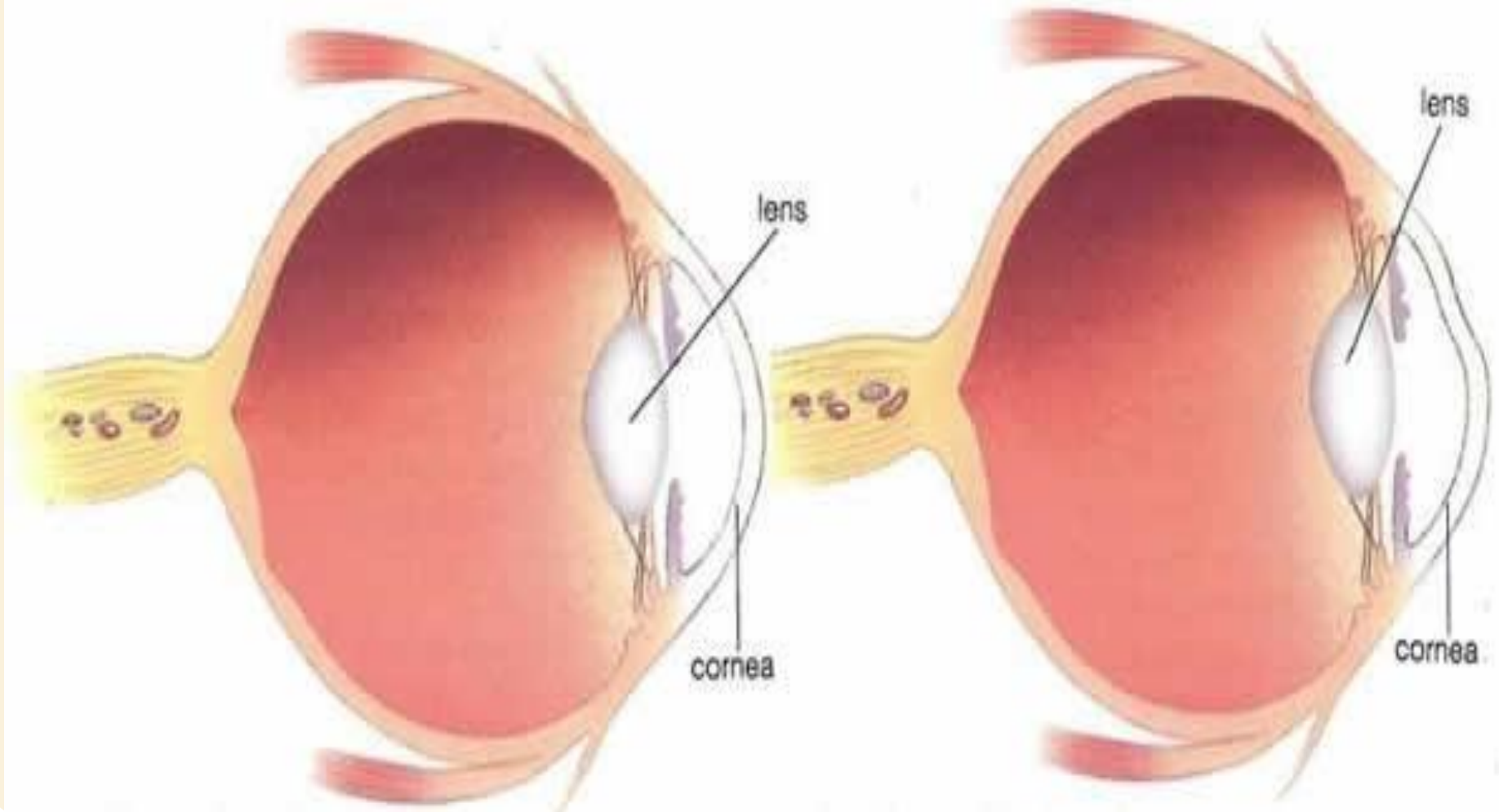
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Vertical Focus

aio

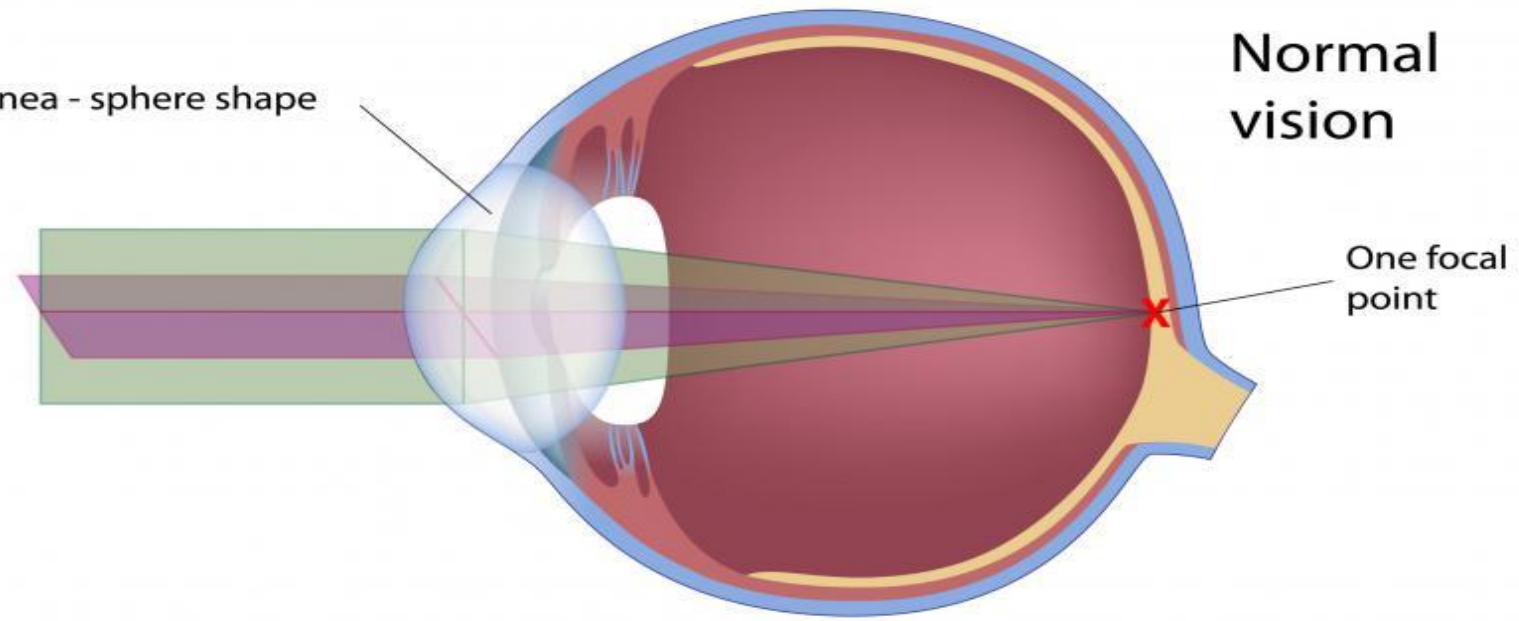


An Abnormally Shaped Cornea Results In Astigmatism



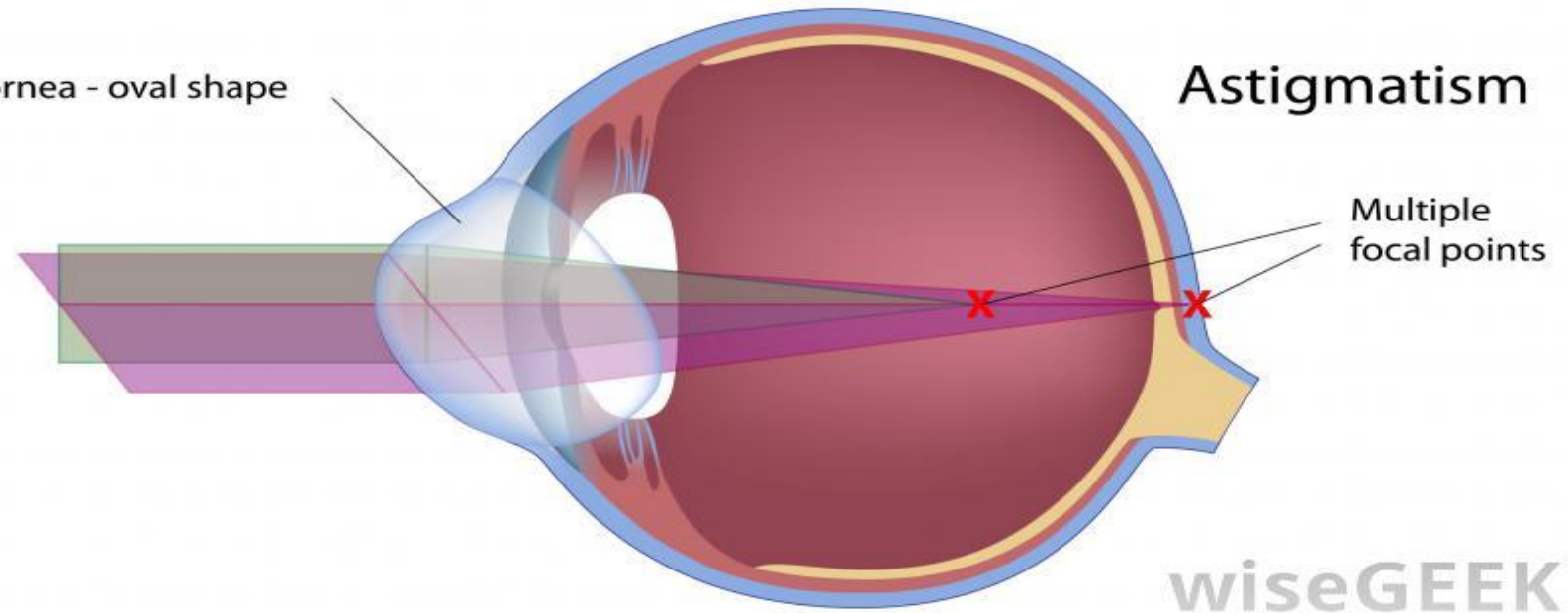
Cornea - sphere shape

Normal vision



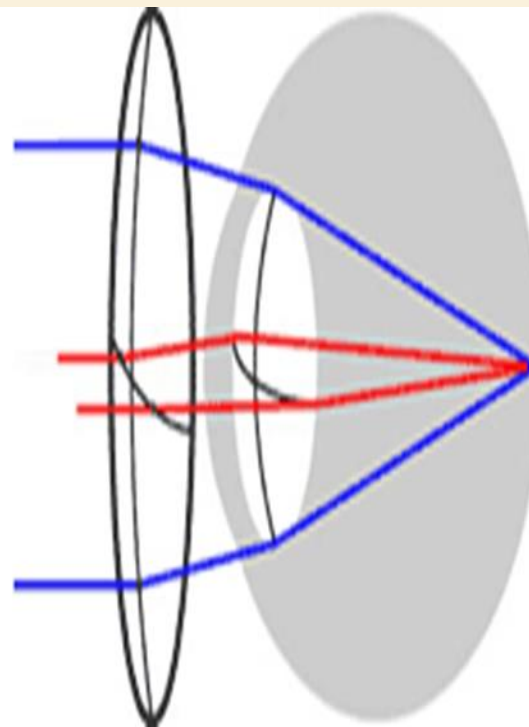
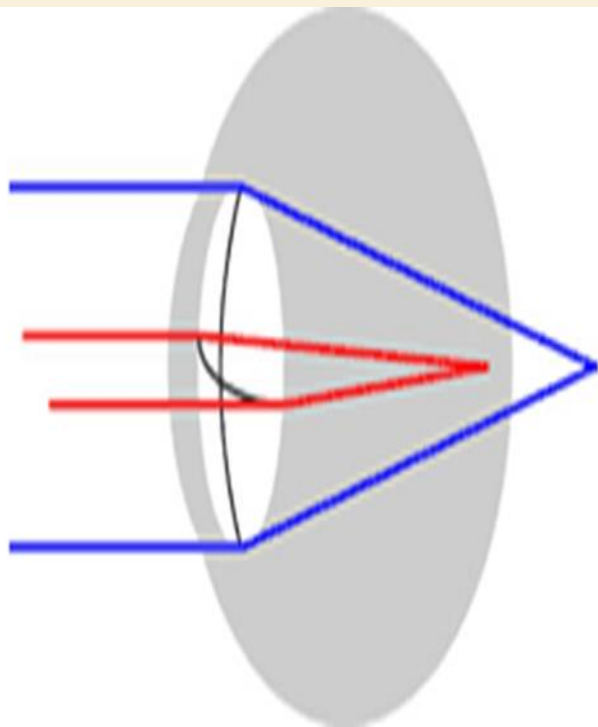
Cornea - oval shape

Astigmatism



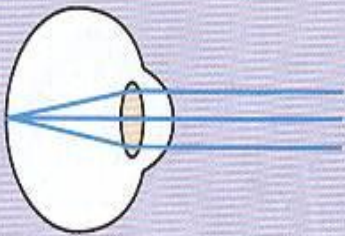
Correction of Astigmatism

- **Cylindrical lens**



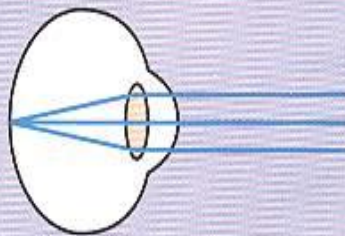
Lenses with different respective meridian refractivity matched to the astigmatic axis are used to correct astigmatism.

Correction of Errors of Refraction

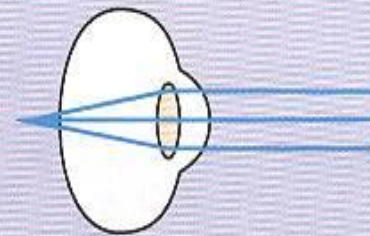


Emmetropia (normal vision)
Rays focus on retina

(a)

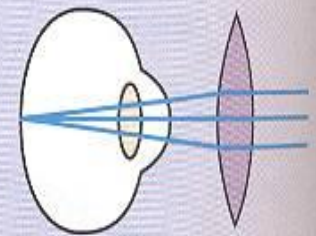


No correction necessary

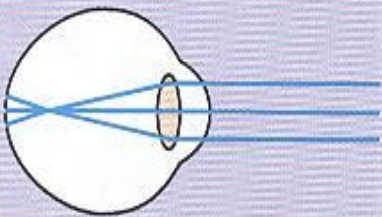


Hyperopia (farsightedness)
Rays focus behind retina

(c)

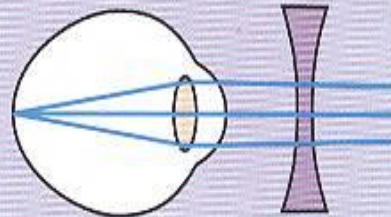


Convex lens corrects
farsightedness

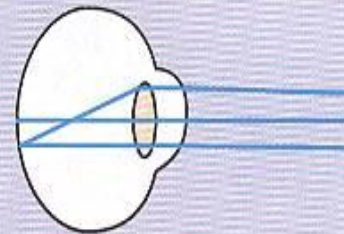


Myopia (nearsightedness)
Rays focus in front of retina

(b)

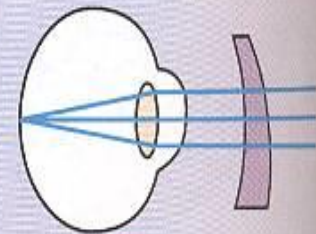


Concave lens corrects
nearsightedness



Astigmatism
Rays do not focus

(d)

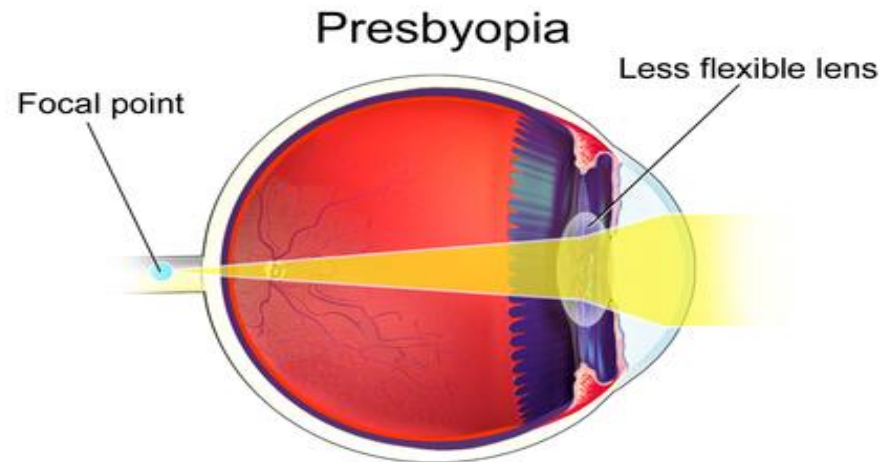
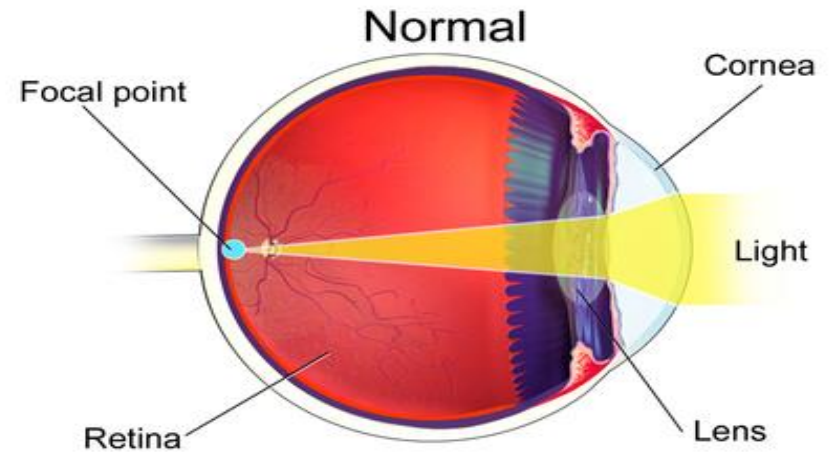


Uneven lens corrects
astigmatism

PRESBYOPIA



Presbyopia



The lens ages and stiffens, bringing the focal point behind the retina and causing blurry vision

<https://nei.nih.gov/health/errors/presbyopia>

Symptoms And Signs of Presbyopia

- Hard time reading small print
- Problem seeing near objects
- Headaches
- Eyestrain

Pathophysiology of Presbyopia

- **Advancing age** →
 - Denaturation of the lens proteins
 - Loss of elasticity of lens
 - Accommodation power is reduced or lost
 - Lens has fixed refractive power

Corrected by use of **Convex lens** →
Reading glasses or surgery

CORRECTION OF REFRACTIVE ERRORS

Correction of Errors of Refraction



EYEGASSES



CONTACT LENSES



SURGERY → reshape the cornea into convex or concave lens using ultraviolet laser

Prevention



- Regular checkups
- Less screen time
- Healthy lifestyle

References

Guyton and hall Physiology

Sherwood Physiology

<https://nei.nih.gov/health/errors/astigmatism>

<https://nei.nih.gov/health/errors/Myopia>

www.sciencedirect.com/science/article/pii/S2452232517300227#!

Lesson Plan For Next Class

- Reduced Eye
- Accommodation
- Autonomic innervation of eye
- Control of pupillary aperture
- Pupillary Light Reflex
- Horner's Syndrome
- Argyll Robertson's Pupil
- Cataract



thank you!

