

high-yield summary of the Vision lecture, focusing especially on physiology, and divided into:

- ♦ Core facts you MUST memorize
- ♦ Concepts you MUST understand to really “get” the physiology

## 1 Big Picture of Vision (Understand This First)

Vision requires 3 components:

1. The Eye → converts light into action potentials
2. Visual pathway → transmits impulses to brain
3. Visual cortex (occipital lobe) → interprets impulses as images

👉 If one fails → vision is impaired.

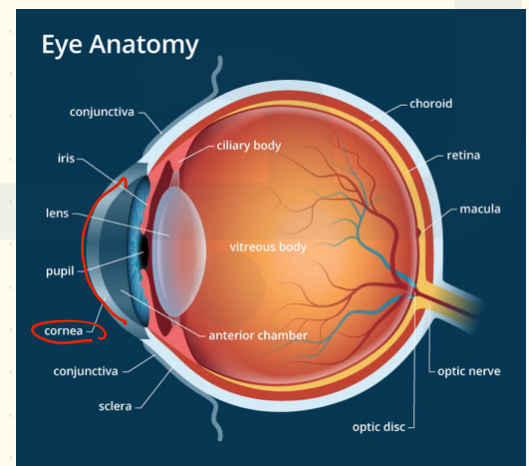


## 2 Optical System of the Eye (Very Important Physiologically)

Light passes through 4 refractive media:

- Cornea
- Aqueous humor
- Lens
- Vitreous humor

The goal = focus light on the retina (especially fovea).



## 3 THE CORNEA (Extremely High Yield)

### ♦ Must Memorize

unit that measures the refractive power of a lens.

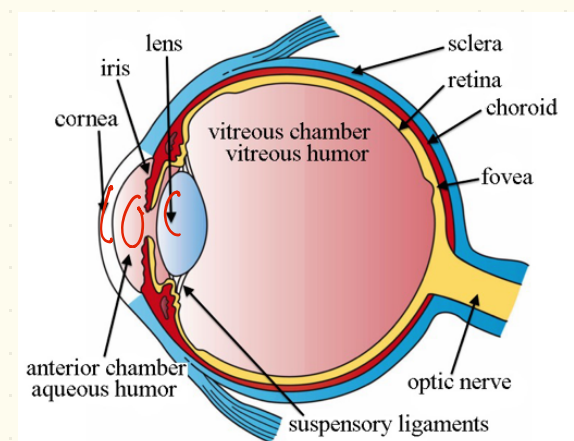
- Provides 44 diopters
- Accounts for ~75% of total refractive power
- Refractive index = 1.37
- Avascular
- Most sensitive structure in the body

### ♦ Why does cornea have strongest refractive power?

Because of:

- Large difference between refractive index of air (1) and cornea (1.37)

👉 Refraction is strongest at air–cornea interface.



## 🐛 Corneal Transparency (Important Physiology)

You must understand WHY it is transparent:

1. **Avascularity**
2. **Regular arrangement of collagen fibers**
3. **No myelin in nerve fibers**
4. **Relative dehydration** (VERY IMPORTANT)

Corneal dehydration mechanism:

- Metabolic pump → pumps fluid into aqueous humor
- Osmotic pump → tears & aqueous have higher osmolarity → fluid moves out

💡 If hydration increases → cornea becomes opaque.

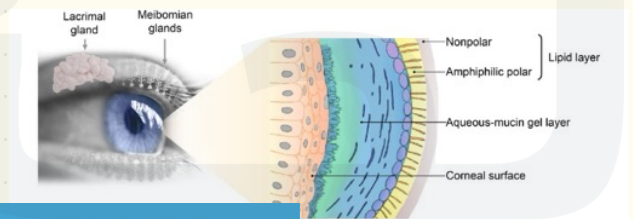
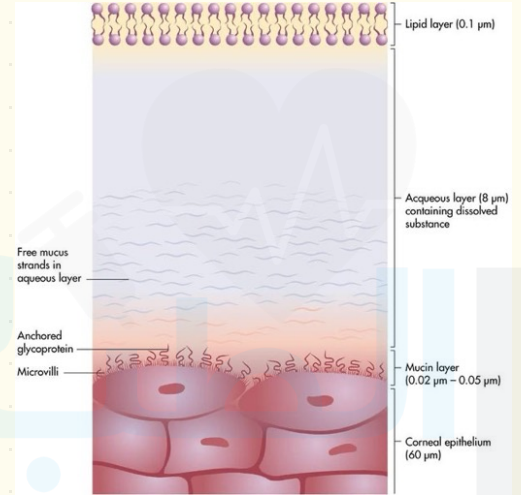
Precorneal Film (Exam Favorite)

3 layers:

1. Lipid (meibomian glands)
2. Tears (oxygen supply)
3. Mucus (goblet cells)

Function:

- Protects cornea
- Makes it smooth refractive surface



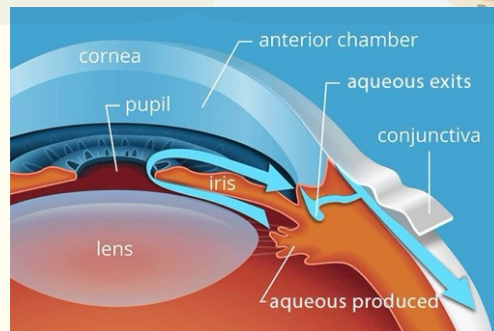
## 4 AQUEOUS HUMOR (Very Important)

◆ Formation & Flow (Must Know Pathway)

Produced by ciliary processes

Flow:

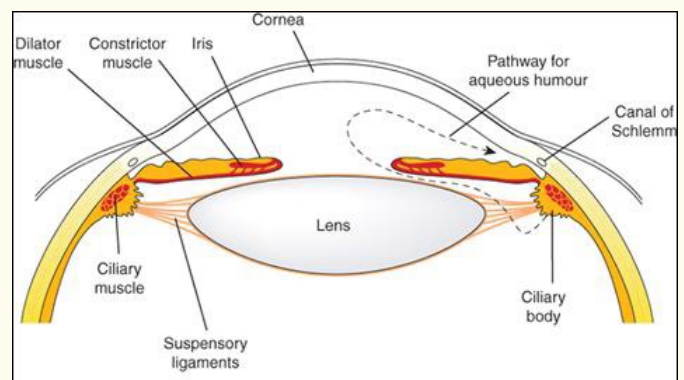
Posterior chamber → through pupil → anterior chamber → angle between cornea & iris → spaces of Fontana → Canal of Schlemm → ocular veins



🔴 Blockage → ↑ IOP → glaucoma

◆ Functions

1. Nutrition to cornea & lens
2. Maintains intraocular pressure
3. Refractive medium



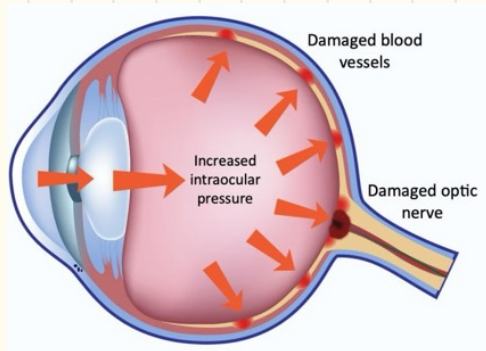
## 5 Intraocular Pressure (IOP) – VERY HIGH YIELD

Normal = 15–20 mmHg

Measured by → Tonometry

Caused by:

- Aqueous humor pressure
- Choroidal capillary pressure
- Vitreous pressure



Why IOP is Important Physiologically

1. Maintains globe shape
2. Keeps lens in position
3. Necessary for proper focusing

If IOP increases:

- Suspensory ligaments stretch
- Accommodation decreases

flatt lens



If IOP decreases:

- Ligaments relax
- Lens becomes more spherical
- Dioptic power increases

relax.



Understand relationship between pressure and accommodation.

## 6 THE LENS (Extremely Important for Physiology)

Must Memorize

- Biconvex
- Avascular
- Resting power = 15 D
- During accommodation = 30–32 D



Cornea 44 D  
aqu. h.

lens. 15 D → 30-32 D.  
vitreous

Accommodation (You MUST Understand This)

Accommodation = increase lens curvature for near vision

Mechanism:

Ciliary muscle contracts →

Suspensory ligaments relax →

Lens becomes more spherical →

Refractive power increases

Near vision requires increased refractive power.

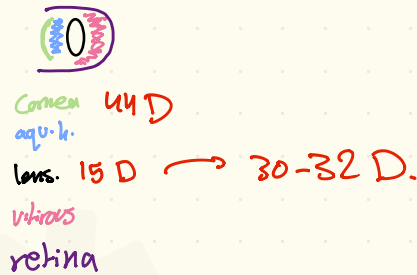
## Why Lens is Transparent?

1. Uniform fiber arrangement
2. Similar refractive index of layers
3. Avascular

## Nutrition from aqueous humor.

### 7 Vitreous Humor

- Gel-like
- High viscosity (hyaluronic acid)
- Supports retina
- Maintains shape
- Shock absorber

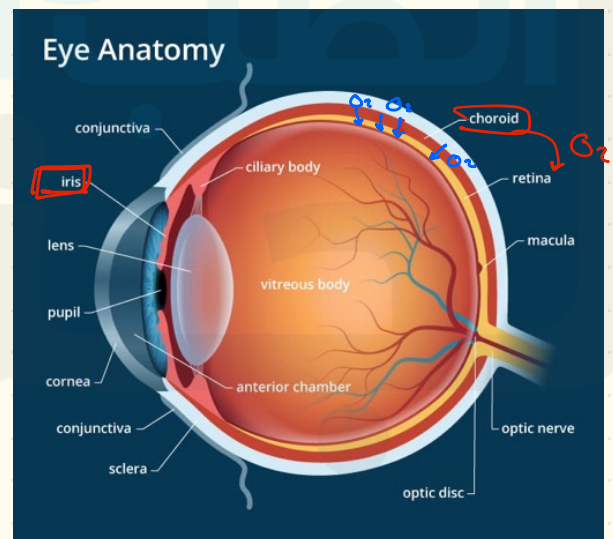


Less physiologically complex than aqueous.

### 8 CHOROID

Functions: يمتص الضوء المتناثر

- Absorbs scattered light (melanin)
- Supplies retina with oxygen
- Contributes to IOP



### 9 IRIS (Very Important for Autonomics)

Controls pupil diameter.

Two muscles:

1. Dilator pupillae
  - Radial fibers
  - Sympathetic
  - Mydriasis
2. Constrictor pupillae
  - Circular fibers
  - Parasympathetic (oculomotor nerve)
  - Miosis

Why pupil constriction is important?

- Increases depth of focus
- Reduces spherical & chromatic aberration
- Controls amount of light

Pupil diameter ranges:

1.5 mm → 8 mm

Light entering eye may vary 30 times.

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## 10 LIGHT PHYSIOLOGY (Very Important)

Visible spectrum:

4000–7000 Å

Red = long wavelength

Violet = short wavelength

Light interaction with objects:

- Reflection انعكاس
- Refraction الانكسار
- Absorption الامتصاص

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## Refraction Principle (Understand This Well)

Refraction depends on:

- Difference in refractive index
- Angle of incidence

If light hits at 90° → no bending.

Refractive index =

Velocity of light in air / velocity in medium

## 1 1 Neural Theory of Color Vision (Advanced but Important)

Color perception pathway:

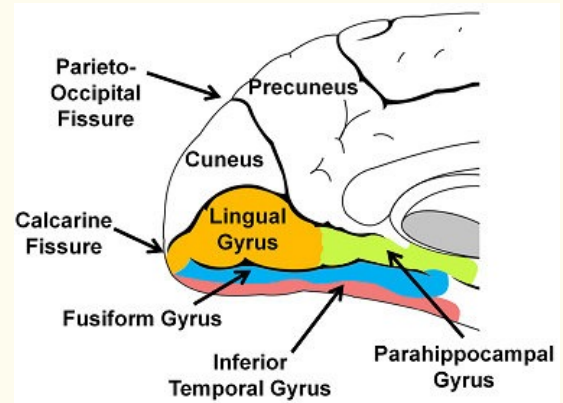
X ganglion cells →

Parvocellular neurons (LGN) →

Color-sensitive neurons (blobs) in visual cortex →

Lingual & fusiform gyri

This is higher-level processing.



## 🔥 Most Important Physiology Topics for Exams

Focus heavily on:

1. Corneal refractive power
2. Corneal transparency mechanisms
3. Aqueous humor flow pathway
4. Intraocular pressure regulation
5. Accommodation mechanism
6. Autonomic control of pupil
7. Refraction principles
8. Relationship between IOP and accommodation

## 🎯 What You Must Understand (Not Just Memorize)

If you deeply understand these 5 concepts → you will master this lecture:

1. Refraction physics
2. Why cornea is main refractive surface
3. How aqueous humor maintains IOP
4. How accommodation changes lens power
5. Autonomic control of pupil