

HUMAN ANATOMY AND PHYSIOLOGY

UNIT 4 NOTES

SENSORY ORGANS

- EYE
- EARS



CONNECT WITH US ON :



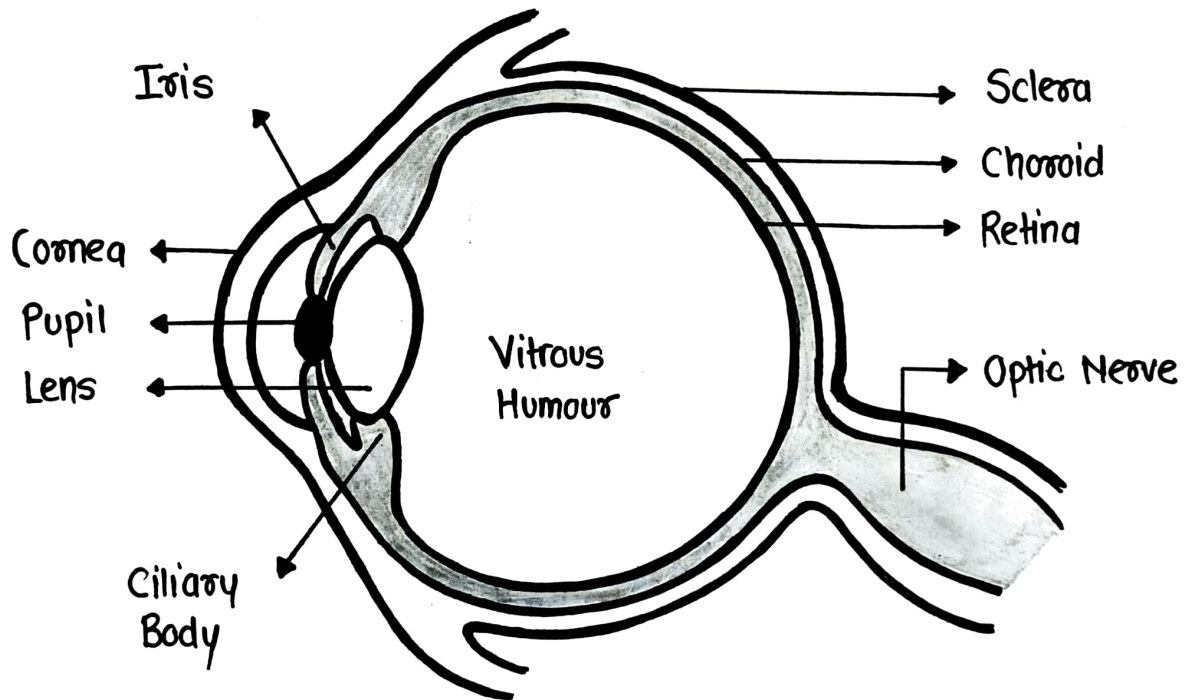
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HUMAN EYE

- Eye is a specialized sense organs which is responsible for vision.
- Eye provides vision by which we can see world around us.
- It is located in bony socket called as orbit.
- It is almost spherical in shape .
- Its diameter is about 2.5 cm (25mm).



Structure of Eye

The structure of eye can be divided into two major parts :

- Accessory Structures
- Eyeball

Accessory Structures of Eye

Accessory structures of eye includes :

- Eye brow
- Eye Lids
- Lacrimal Gland

Eye Brow

- In eye brow , hair follicles present.
- It prevents the eye from sweat , dust and other foreign particles.

Eye Lids

- They are made by thin layers of skin.
- On their edges , it contains curved hairs , called as Eyelashes.
- It prevents the eye from damage.

Lacrimal Gland

- It is also called Tear gland.
- It is present in both eyes.
- Lacrimal gland produces tears which clean the eyes and provide lubrication.

Eye Ball

- The eyeball is a spherical organ which houses the structures responsible for vision.
- Eyeball can be divided into three layers :
 - ① Fibrous Layer
 - ② Vascular Layer
 - ③ Inner Layer

Fibrous Layer

- It is the outmost layer of the eyeball.
- It mainly consist of :
 - ① Sclera
 - ② Cornea

Sclera

- It is tough white fibrous layer.
- It covers posterior 5/6th part of eye.
- It maintains shape of eye.
- It gives attachment to extrinsic muscle of eye.

Cornea

- In anterior part sclera converts into cornea.
- It is a clear transparent membrane.
- It focuses the light rays on retina.
- Its thickness is about 0.5 mm to 1 mm.

Vascular Layer

- It is the middle layer of the eyeball
- It is also known as Uvea.
- It mainly consist of :
 - ① Choroid
 - ② Ciliary Body
 - ③ Iris

Choroid

- It is located between sclera and ~~cornea~~.
- It covers middle posterior $5/6^{\text{th}}$ part of eyeball
- This layer is rich in blood supply.
- It appears dark brown in colour.

Ciliary Body

- In anterior part choroid converts into ciliary body.
- It contains ciliary muscles, which controls the shape of the lens.
- It produces the fluid present in the anterior region of the eye called Aqueous Humor.

Iris

- It is the part of the eye that determines colour of the eye.
- The colour of the iris varies due to amount of melanin.
- It also controls the amount of light entering in the eye.
- It is present behind cornea and in front of lens.
- In bright light iris contracts and decreases the size of pupil
- In dim light iris relaxes (dilates) and increases the size of pupil.

Pupil

- It is the small black hole in Iris where light enters.
- It regulates (controls) amount of light enters in the eye
- The size of the pupil is controlled by Iris muscles.
- Bright Light → Pupil size decreases
- Dim Light → Pupil size increases

Lens

- It is present behind pupil and Iris.
- It is highly elastic biconvex structure.
- The lens bends the light rays coming from object and focus them on retina.
- It lacks of blood vessels.

Aqueous Humour

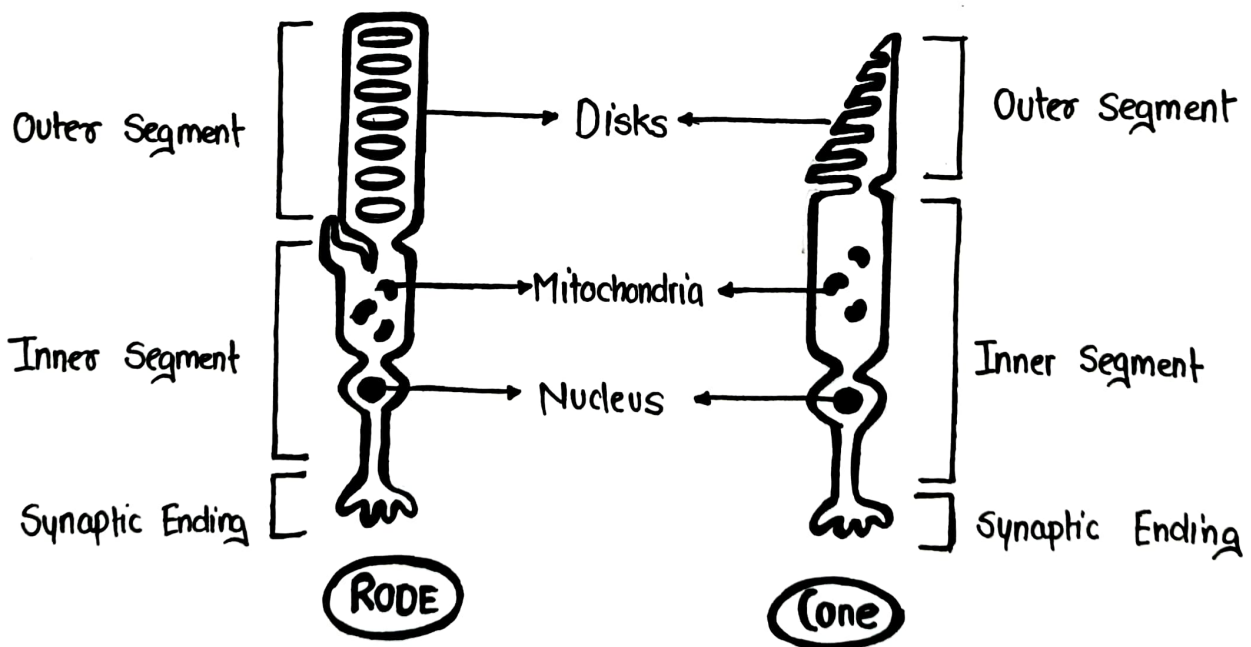
- Aqueous humour is a clear water like fluid present in the anterior part of the eye.
- It is similar to blood plasma but containing low protein concentration.
- It is secreted by ciliary body
- It provides the nutrition to the eye as well as maintain its pressure.

Inner layer

It is the innermost layer of the eye made of neuron cells mainly contains Retina

Retina

- It is the innermost layer of eye.
- It is extremely thin and transparent.
- It is a light sensitive layer.
- The main function of retina is to receive the light rays that lens has focused and converted them into neural (electrical) signals and send these signals to the brain for visual recognition
- The retina contains two types of photoreceptor cells.
 - ① Rods (Responsible for dark / night vision)
 - ② Cones (Responsible for daytime vision)



Vitreous Humour

- It is a clear gel that fills the space between the lens and retina
- It helps to maintain the shape of the eye.

PHYSIOLOGY OF VISION

- Light rays from an object enter into the eye first through cornea which is a clear transparent covering at the front of the eye.
- After that from passing through the aqueous humour the light rays enter into the pupil, where the pupil adjusts the amount of light.
- Now the light rays enter into the lens and the lens bends the light rays and focus them on the retina.
- On the retina, rods and cone cells are present which convert the light rays into electrical signals (nerve impulse).
- Now these electrical signals are sent to the optic nerve and then finally to the Occipital lobe, where the electrical signals are seen by the brain as visual image.

Major events in producing a clear image

- Refraction of Light
- Change in the size of the pupil
- Accommodation of Lens

Disorders of Eye

Myopia : Difficulty in seeing the distant object.

Hypermetropia : Difficulty in seeing the near object.

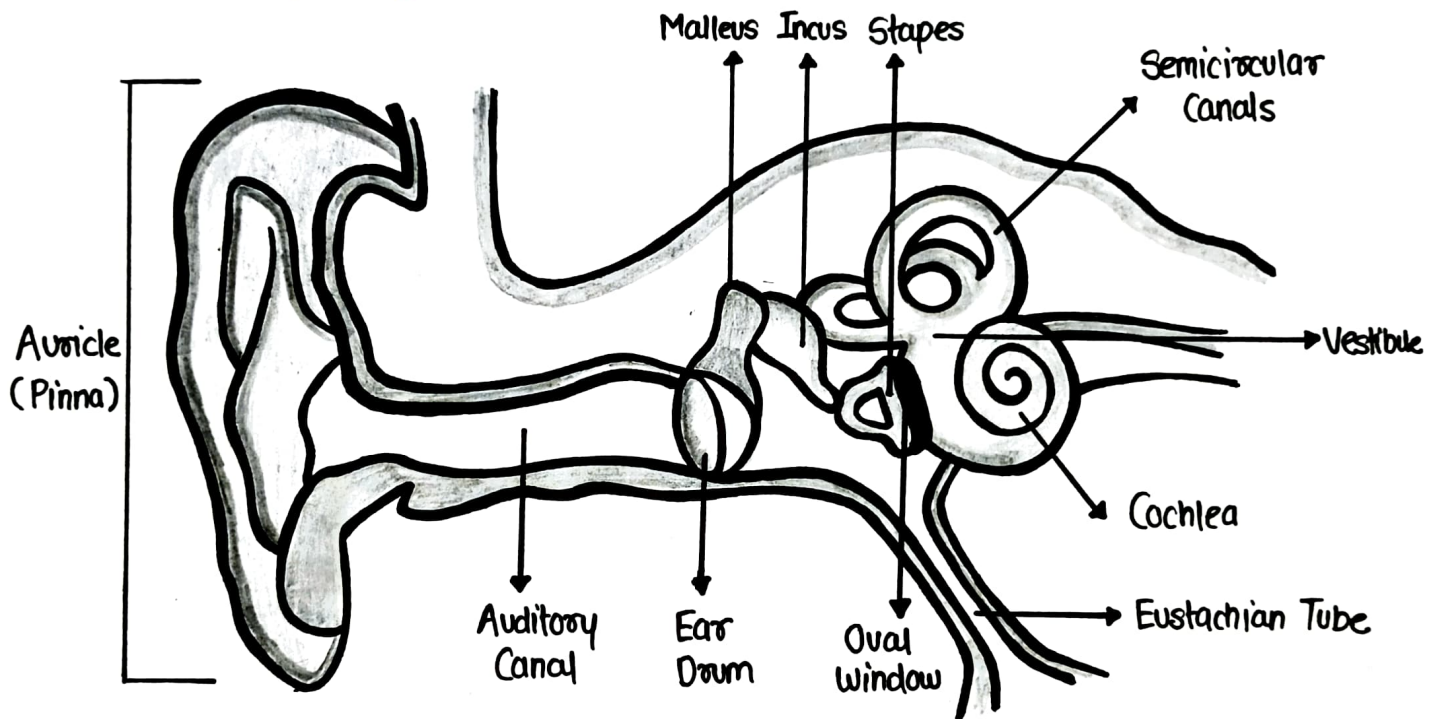
Glaucoma : Increased intraocular pressure due to excess production of aqueous humour.

Color Blindness : Defect in retina, Can't see one or more colours

Night Blindness : Not possible to see in dimlight.

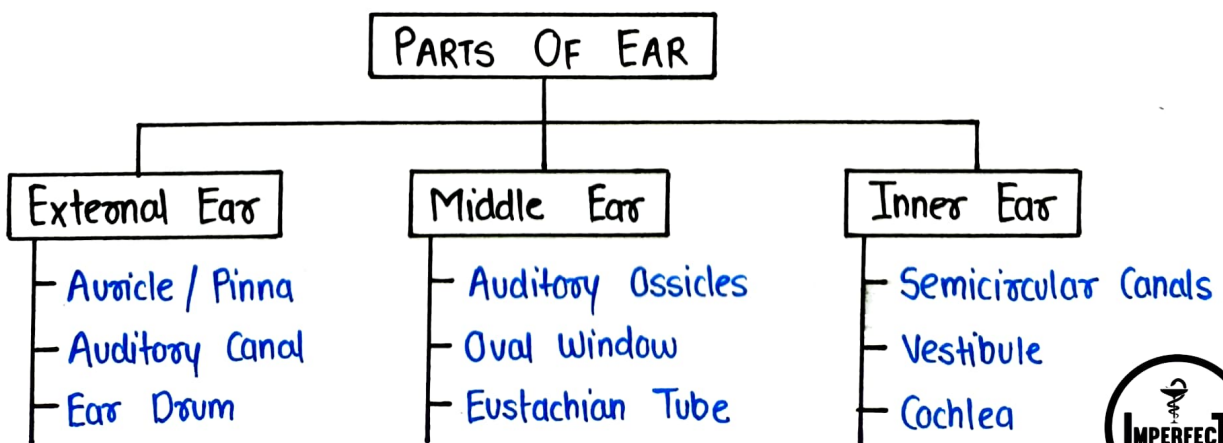
HUMAN EAR

- The ear is a sense organ which helps in hearing.
- It also helps to maintain the balance (equilibrium) of the body.
- It collects the sound waves and convert them into electrical signals and send to brain.



Parts of Ear

Ear can be divided into following three parts :



External Ear

- External ear mainly helps in collection of sound waves.
- The external ear mainly consist of :
 - ① Auricle / Pinna
 - ② External Auditory Canal
 - ③ Eardrum / Tympanic Membrane

Auricle / Pinna

- Auricle is a sheet of elastic cartilage covered with skin.
- There are mainly three different parts of Auricle
 - (1) Helix (Rim of auricle)
 - (2) Lobule (Inferior portion)
 - (3) Tragus (Inner portion)
- It opens into external auditory canal.

External Auditory Canal

- It is a tube like structure about 2.5 cm long.
- It extends from auricle to eardrum.
- It contains few hairs and ceruminous glands.
- Ceruminous Glands secrete ear wax which prevents ear from dust and foreign particles.

Eardrum

- It is also known as tympanic membrane.
- It separates the ~~mid~~ external ear from middle ear.
- It is thin and semi-transparent membrane.
- It is covered by epidermis.

Middle Ear

- It is a small, air filled cavity in the temporal bone lined by epithelial tissue.
- It is also known as Tympanic cavity.
- It is separated from external ear by eardrum
- It mainly consist of
 - ① Auditory Ossicles
 - ② Oval Window
 - ③ Eustachian Tube

Auditory Ossicles

- These are the three smallest bones of the body.
 - (1) Malleus (Hammer)
 - (2) Incus (Anvil)
 - (3) Stapes (Stirrup)
- Malleus is largest bone of auditory ossicles.
- Stapes is smallest bone of auditory ossicles.
- They are responsible for transmitting sound waves from the eardrum to the middle ear and then to the inner ear.
- These middle ear bones also increases the frequency of sound (amplify the sound)

Oval Window

- It is membrane-covered partition between middle and internal ear.
- It is directly in the contact with stapes.
- When the sound waves reaches the oval window, they have been amplified over 10 times by auditory ossicles.

Eustachian Tube

- It is also known as auditory tube.
- This tube connects the nasopharynx.
- Its length is about 4 cm.
- It maintains the pressure on both sides of the middle ear.

Inner Ear

- It is also called a labyrinth.
- It mainly consists of three parts :

① Semicircular Canals ② Vestibule ③ Cochlea

Semicircular Canals

- There are three semicircular canals present in the inner ear
- (1) Anterior Semicircular Canals (Vertical)
 - (2) Posterior Semicircular Canals (Vertical)
 - (3) Lateral Semicircular Canals (Horizontal)
- They help to maintain the balance of the body.

Vestibule

- It is the central part containing utricles and saccule.
- It maintains the balance of the body.

Cochlea

- It is a snail-shaped structure.
- The cochlea is filled with liquid and acts like a microphone, converts sound waves into electrical signals and sends them to the brain.

PHYSIOLOGY OF HEARING

Sound waves enters into Ear through auricle



Sound waves impact with ear drum & vibrate it



Vibrations pass through ossicles



Ossicles amplify sound and send it to the inner ear



Inner ear convert sound waves into electrical signals



These impulses (electrical signals) carried by auditory nerve towards hearing centre of the brain

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