Sense Organs

- The sense organs enable us to be aware of the condition of the environment.
- A receptor is any specialised tissue or cell sensitive to a specific stimulus.

Mechanoreceptor: Receptors of touch, i.e pressure on the skin due to mechanical change.

Chemoreceptors: Receptors of taste of the tongue and smell of the nose due to chemical influence.

Photoreceptor: Receptors of light present in rods and cones of the retina of eyes.

Thermoreceptors: Heat and cold receptors in the skin due to change in temperature.

The Eyes.

- The two eyes are located in deep sockets called orbits.
- The upper and lower moveable eyelids protect the front surface of the eyes.
- The eyebrow prevent the raindrops or the tricklings perspiration from getting into the eyes.
- Tear glands are also known as lacrimal glands.
- There are 6-12 tear gland.
- The functions of the tear gland are: Lubricate the surface of the eye, and wash away the dust particles.
- Tear glands posses antiseptic properties because of the enzyme lysozyme which effectively eliminates germs.
- A thin membrane which covers the entire front part of the eyes is called conjunctiva.
- Due to viral infections of the conjunctiva, we suffer from eye disease called conjunctivitis.

Structure of the Eyeball.

- The wall of the eyeball is composed of the following three concentric layers:

1. Sclerotic Layer (outer layer)

- The white visible portion of the eyeball is nothing but the sclera
- The sclera covers the coloured part of the eye, i.e the cornea.

2. Choroid layer (Middle layer)

- It is richly supplied with blood vessels to provide proper nourishment.
- The choroid expands in the front of the eye to form a ciliary body
- The smooth muscles in the ciliary body alter the shape of the lens.
- Iris is also a part of the choroid.
- The iris partially covers the lens. It leaves a circular opening in the centre called a pupil.
- The muscles of the iris regulate the size of the pupil. Thus, the pupil regulates the amount of light entering the eye.

3. Retina (Inner layer)

- It possesses two types of sense cells → rod and cones.
- The rod cells are sensitive to dim light and do not respond to colour.
- The cone cells are sensitive to bright light and are responsible for colour vision.

Comparison between Rods and cones.

Rods	Cones.
These cells are more in number. It is located at the periphery of the retina.	These cells are less in number It is located in the centre of the retina

They contain the pigment rhodopsin	They contain the pigment iodopsin.

Yellow spot and blind spot.

Yellow spot	Blind spot
• It contains a maximum number of sensory cells, particularly cones. • This is the region of colour vision and the brightest vision.	• It does not contain any sensory cells. • This is the region of no vision.

Lens

- It is transparent, biconvex and crystalline.
- It is held by a suspensory ligament which attaches the lens to the ciliary body.

Aqueous and vitreous chambers.

- The lens divides the inner cavity of the eyeball into two chambers.

Aqueous chamber	Vitreous chamber
• The front chamber between the lens and the cornea. • It is filled with a clear, watery liquid called aqueous humour	• larger chamber behind the lens. • It is filled with transparent, jelly like fluid called vitreous humour

It refracts light	It protects the retina and its nerve endings.

four major steps in seeing an object.

- Light rays reflected from the object enter the eyes through transp--arent structures.
- first, the curvature of the cornea converges the rays to some extent, and then the lens converges them further.
- The image on the retina is inverted and real.
- The light energy produces chemical changes in rods and cones which send the nerve impulse. This nerve impulse is sent to the cerebrum through the optic nerve. The cerebrum gives the sensation of sight.
- The brain interprets the inverted image on the retina, and the object is seen upright.

Accommodation Vision

- The process of focusing the eyes at different distances is called accommodation. This is brought about by change in the curvature of the lens.
- for distant vision, the lens is more flattened.
  The lens remains stretched by the suspensory ligaments.
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- For near vision, the lens becomes convex and rounded.
- When the ciliary muscles contract, they pull the ciliary body forward. This action releases the tension of suspensory ligaments, causing the lens to become convex and rounded.

Light and dark Adaption.

Dark adaptation: When we move from a bright-place to dark one, we might have trouble seeing objects for a bit. This is

called dark adaptation.

Light Adaptation : When we move from a dark place to a brightly lit one, we might experience a moment of dazzling effect for a short period of time. This is known as light adaptation.

Common defects of the eyes

1. Myopia (short-sightedness) : The near objects are seen clearly, but distant objects appear blurred. The lens is too curved. Myopia is corrected by suitable concave lens.
2. Hyperopia (Hypermetropia / long-sightedness) : Difficulty in seeing nearer objects. The lens is too flat.
3. Astigmatism : Some parts of the object are seen in focus, while others appears blurred.
4. Presbyopia : Observed in older people. The near objects cannot be seen clearly.
5. Cataract : The lens turns opaque and the vision is reduced.
6. Night blindness : Difficulty in seeing in dim light. Due to non-formation rhodopsin in rod cells.
7. Colourblindness : Colour blind people cannot distinguish between certain colours such as red and green.
8. Squint : The eyes converge leading to cross eye.

9. Corneal opacities : The cornea of patients gets scarred and turns opaque and non-functional. Can cause minor irritation, vision problems and even blindness.

Stereoscopic Vision.

Humans, monkeys and apes are able to perceive depth or the relative distance of objects because they simultaneously focus on an object with both eyes. This overlapping of images from both eyes creates a three-dimensional effect.

After-Images: When one looks at a brightly coloured objects and then looks at a dark surface, an image of the object in the same colour will persist. This is known as persistence image or after-image.

The ear: The human ear has the three following main divisions:

Outer ear: It consists of pinna/auricle and auditory canal.

Middle Ear: It contains three ear ossicles - malleus (hammer), incus (anvil) and stapes (stirrup) - and the eustachian tube

- The eustachian tube connects the cavity of the middle ear with the throat.

Inner Ear

- It is also known as membranous labyrinth.
- It contains cochlea and the semicircular canals.
- The cavity of cochlea is divided into three parallel canals, The middle canal consists of the organ of corti which is responsible for hearing.
- The ends of the semicircular canals widen to form an ampulla
- The ampulla contains sensory cells.
- The short stem joining the bases of semi-circular canals to the cochlea is called is called the vestibule.
- The vestibule contains two sacs - utriculus and sacculus.

Functions of the ear: Two functions of the ears are hearing and body balance.

1. **Hearing**: The pinna gathers sound waves and guide them into the external auditory canal. These waves then reach the eardrum, causing it to vibrate.

(1) Equalises the air pressure on either side of the ear drum.
(2) Sets the three ear ossicles into vibration.

- Transmits vibration to the membrane of the oval window.
- Sets the fluid in the cochlear canal into vibration.
- Sensory cells of cochlea transmit impulses to the auditory nerve.

2. **Body Balance**.

- The sensory cells located in the semicircular canals are concerned with dynamic equilibrium, which occurs when the body is in motion.
- The sensory cells in utriculus and sacculus are concerned with static equilibrium, i.e. when the body is stationary

Hearing Impairment.

Hearing Impairment.

- Sensorineural Hearing loss (cochlea or auditory nerve is damaged)
- Conduction Hearing loss (Sound waves are blocked either in the outer or middle ear).