Sensory Organs

Animals possess some specialised structures to perceive the different type of changes (=stimuli) occurring in their external environment. These structures are known as **sense organs.** After receiving these stimuli, sensory organs transmit these to the central nervous system through the sensory nerve fibres.

A sensory organ is only sensitive to a specific kind of stimulus to which it is specialized like temperature, chemicals, touch, light etc. Based on their location in the body sensory organs are of three types:

1. **Exteroreceptors :** These sense organs receive stimuli from external environment because they remain in contact with the external environment. Example- nose, eyes, tongue, ears and skin.
2. **Interoreceptors :** These sensory organs are associated with internal environment of body and receive the changes taking place in the internal environment. Examples- changes in the composition of blood, concentration of carbon-dioxide, hunger, thirst, asphyxia etc.
3. **Proprioreceptors :** These sensory organs are present in joints, tendons, muscles and connective tissues which perceive the tension and pressure exerted during the movement of the body.

   In human body, five types of exteroceptors are found which are known as sense organs. The main sense organs include skin, eye, nose, ear and tongue.
   - Eye and ear are also called **"teleoreceptors"**, because these receive impulse from far places.

Eye [Photoreceptor]

- These are photosensitive organs.
- Each eye is an hollow ball like round structure, it is called eye ball. Each eye - ball is situated in the notch of bone in the skull. It is called "Eye - orbit". Human eyes are situated in eye orbit lateral to nose.
- Only 1/5th part of whole eye is seen from out side in between the eye lashes.
  Remaining 4/5th part is in the eye orbit.

(1) Eye Lids or Palpebrae :

There are two muscular eyelids for the protection which having lashes at one side. Both the eyelids are named according to their situation i.e. upper & lower eyelids.

- There is present one more transparent membrane in the eye. It is called **nictitating membrane** or third eye lid. It is vestigial in humans.

(2) Glands : For the cleaning and for lubrication/moisturising the exposed part of eye.

Following glands are founds in each eye.

(a) Meibomian Glands : These are present at Inner surface of eyelids. They secrete an oily substance, which is scattered at the edges of eye lids.

It makes the movement of eye lids frictionless.

(b) Lacrimal Glands : At outer angle of each eye ball and associated with accessory lacrimal gland, which secrete water like substance "Tear", which moistens and cleans the exposed part of eye. "Tear" is slightly alkaline fluid and contains bacteriolytic enzyme Lysozyme.

(c) Gland of Zeis : It is situated in margin of eye lid.

(3) Muscles of Eye Balls :

There are **6 skeletal muscles** present in the eyeball which help in rotation of eye ball into eye orbit. Out of these 4 are rectus muscles and 2 are oblique muscles. They are also called as extraoccular muscles.

- Any defect in one of the these eyeball muscles (e.g. muscle may remain small or extra large than required) causes **strabismus** or **squint eyes** . In this defect, eye ball remains inclined to any of the one side. Eye muscles are innervated by occulomotor (III), Pathetic (IV) and Abducens (VI) Nerve.

Internal Structure of Eye Ball

The wall of remaining eye ball has three layers :

(1) Fibrous Tunic :

It is the outermost covering of eye ball. It is made up of hard and thick connective tissue.

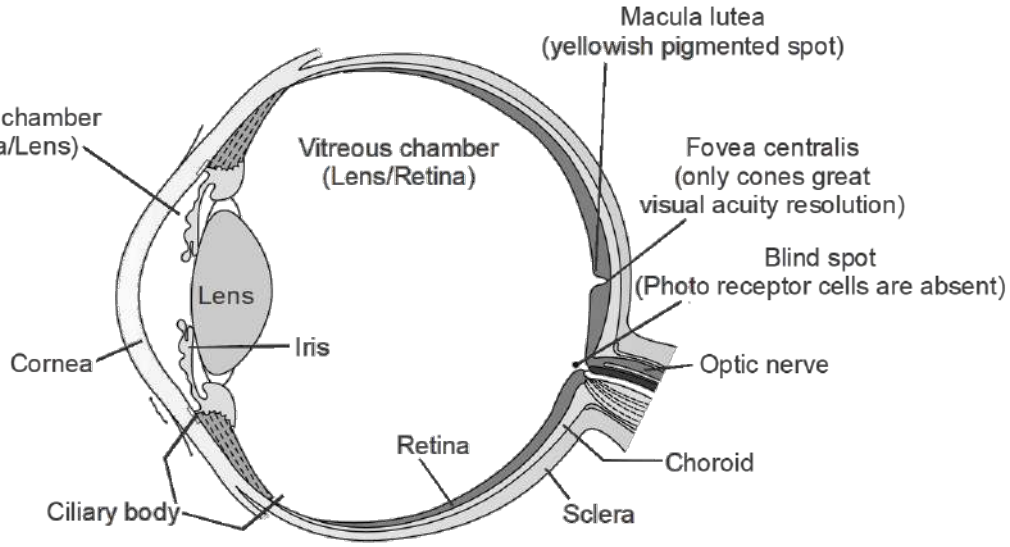


Diagram showing part of an eye

The layer is divided into 2 parts :

(a) Cornea :

- It is the outer visible part of fibrous tunic and is made of **Nonkeratinized stratified squamous epithelium**.
- Cornea transplantation is successful because it lacks blood vessels.

(b) Sclera :

- It is made up of white, hard, opaque thick fibrous connective tissue. It is the inner portion of eye ball. It is non-vascularised. This layer is of white colour, so it is also called **"White of eye".**
- The joint between cornea and sclerotic layer is called "**Limbus**" or "Sclero - corneal junction".
- Inner layer of eyelids remain streched over anterior part of sclera (limbus) in the form of translucent membrane. It is called **conjunctiva**. Conjunctiva is the thinnest epidermis in human body.

(2)_Vascular Tunic_:

- It is the middle layer of eyeball. It is coloured part of eyeball.
- Due to the presence of network of blood capillaries it is highly vascularized.
- Melanin pigment is found in this layer. Due to the presence of melanin pigment eye looks like green, blue, brown and black in colour.
  This layer has three parts :

(a) Choroid :

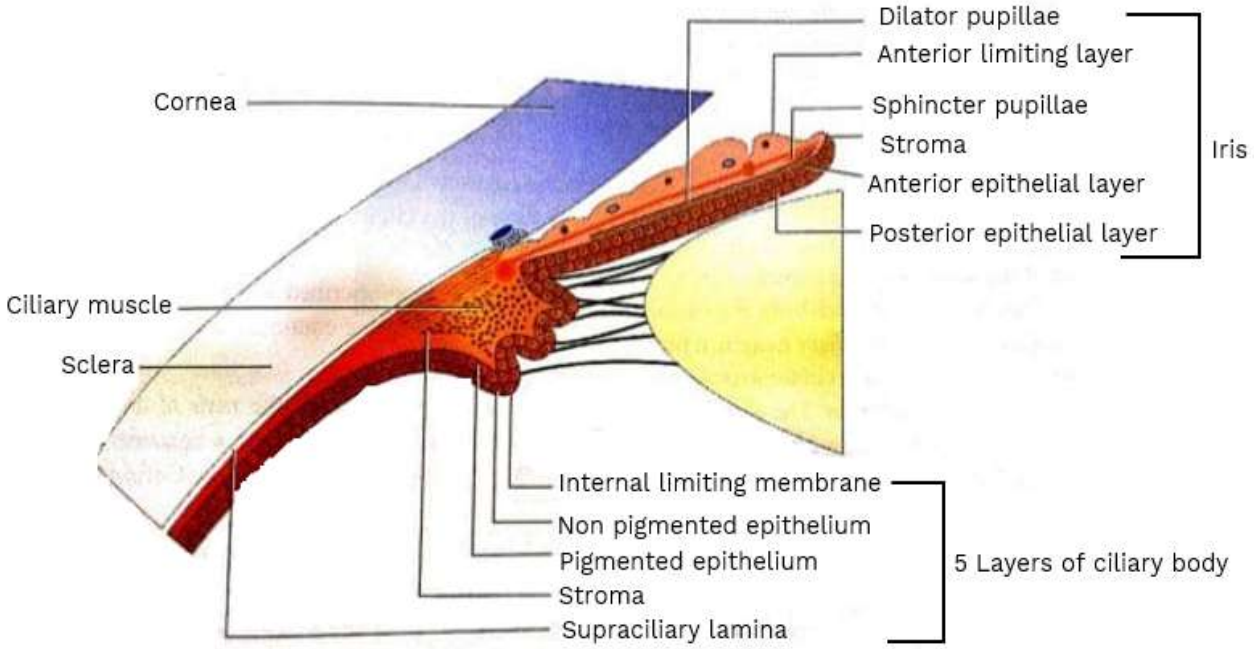
- Choroid is the thin part of vascular tunic which lie below the sclera.
- Posterior 2/3 part of vascular tunic.
- It contains abundant pigment cells & blood vessels.
- It is dark bluish. It darkens the cavity of eyeball to prevent internal reflection of light.
- It nourishes the retina.

(b) Ciliary Body :

- Anterior thick part.
- It is the lower swollen portion below limbus.
- It has ciliary processes which project into eyeball.
- It has ciliary muscles (i) circular (ii) meridional.

(c) Iris :

Choroid layer or vascular tunic separates from sclerotic layer (Just after the cornea) inclines towards inner side and forms a coloured screen, it is called **iris.** There is present an aperture in the Centre of iris, it is called **Pupil**. Light rays enter in the eyeball through pupil.



2 types of muscles are related with iris.

(i) Radial Dilatory Muscles :

These are outer unstriated muscles, these are expanded in the iris breadth wise. Iris becomes constricted if these muscles contract and diameter of pupil is increased at that time. It happens in dim light.

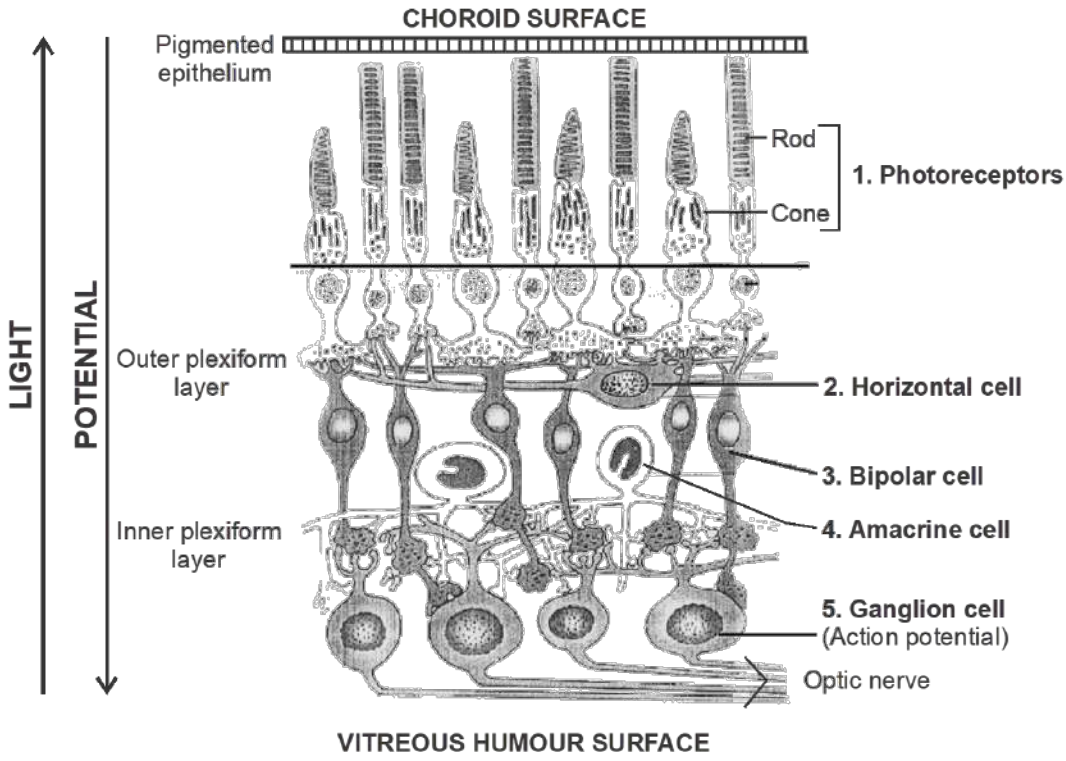
(ii) Circular Sphincter Muscles :

- These are scattered in inner part of iris. Due to the contraction (In bright day light or high flashes of light) of these muscles in high light, Iris expands breadth wise and diameter of pupil is decreased.
- Iris controls the intensity of light by increasing or decreasing the diameter of pupil i.e. Iris acts as diaphragm of a camera.
- The parasympathetic fibres constrict & sympathetic fibre dilate the pupil.
- Colour of eye like blue, grey, brown is due to the layer of pigmented cells.

(3) Neurosensory Tunic :

It is the inner most layer of eye ball and consists of 2 parts :

(a) Sensory Layer : This layer is made up of specialized sensory cells. Rods and cones are found in this layer. Receptor cells are also known as photoreceptors/visual cells.



- Rods are long, thin, cylindrical structures/cells. These are numerous in number. (1110-1125 Lacs)
- Rods differentiates between light and dark. These are more sensitive than cones.
- A purple coloured pigment is found in rods called **Rhodopsin**/Visual purple.
- Cones are thick and small cells which differentiate among different colours in full light.(65 Lacs)
- **Iodopsin/Visual violet** is present in cones.
- A horizontal neurons layer is present just below the rods and cones, it is called **outer plexiform** layer. This layer connects rods and cones together.
- Then comes the layer of bipolar neurons. Each bipolar neuron has a dendron and one axon. Presence of bipolar neurons is a speciality of retina. Rest parts of body have multipolar neurons. Their dendrites form synapses between rods & cones.

- Axons are jointed together by specific nerve cells, called **Amacrine cells**. Such neurons do not have nerve fibres.
- The layer of amacrine cells is called "**Inner plexiform layer**".

(b) Ganglionic Layer : This layer is made up of nerve ganglia. These nerve ganglia form synapses with axons of bipolar neurons.

- Axons of all nerve cells combine to form optic nerve. This optic nerve penetrates the retina and goes to brain.
- *The optic nerves leave the eye and the retinal blood vessels enter it at a point medial to and slightly above the posterior pole of the eye ball. Photoreceptor cells are not present in that region and hence it is called the **blind spot**. At the posterior pole of the eye lateral to the blind spot, there is a yellowish pigmented spot called **macula lutea** or **yellow spot** with a central pit called the **fovea**. The fovea is a thinned-out portion of the retina where only the cones are densely packed. It is the point where the visual acuity (resolution) is the greatest.*
- **Lens :** A **transparent**, **biconvex** lens is present just after iris. Lens is connected by ciliary body with the help of **"Suspensory ligaments"** called **zonula of zinn".** These ligaments are flexible and this can slide the lens and can change it's focal length. Lens divides the cavity of eyeball into two chambers. Lens is made of crystalline protein.

  (i) Aqueous Chamber :

  The part of eye ball which lies between cornea and lens is filled with an alkaline fluid, it is called **aqueous humor**. It is a type of transparent tissue fluid. It is formed by filtration of blood through the capillaries of ciliary body.

  Iris divides this aqueous chamber into two parts:

  - **Anterior Chamber :** This chamber lies between cornea and iris, it is called Venous chamber. Veins carry CO_2, metabolic wastes outside from here.
  - **Posterior Chamber :** This chamber lies between iris and lens, it is called arterial chamber. Arteries supply O_2 and nutrients here.

  (ii) Vitreous Chamber : Cavity of eye ball which lies between lens and retina is called vitreous chamber. A jelly like fluid (transparent and thick like albumin) is filled in this chamber, This is called vitreous humor.

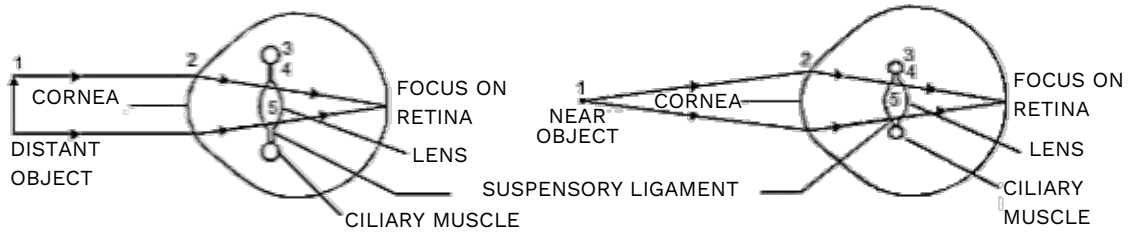
  - In this fluid 99% water, some salts, a mucoprotein called vitrin and a mucopolysaccharide- Hyaluronic acid are present. Gelatinous nature of vitreous humor depends upon fibrillar protein & hyaluronic acid which is formed during embryonic stage.
  - Vitreous humor is secreted by the glands of ciliary body.
  - Both these fluid maintain proper pressure inside the cavity of eye ball. These check the eye ball from collapsing.
  - Aqueous humor drained out by **canal of schlemm** into blood capillaries and again reach upto blood.
  - If this canal of schlemm is blocked by any reason and fluids do not return back to veins, fluid is increased in the chambers of eye. Then pressure is increased inside the eye ball. Thus retina pressure is increased. This is known as **glaucoma** (Black cataract).

Working of Eyes :

- Light rays emitted by any object enter the eye. A small, real and inverted image of object is formed at retina. Sensory cells of retina are sensitized, and optic nerve carries this impulse to brain. At this time animal is able to see the object.
- Cornea, aqueous humor and biconvex lens completely refract the light rays coming from object. As a result of this an inverted image is formed at retina. Just like diaphragm of a camera iris of eye, decreases or increases the diameter of pupil according to light. Iris expands to decrease the pupil in high intensity of light so a small amount of light touches the retina.
  When light is dim, iris itself constricts to increase the diameter of pupil.

Accommodation or Focussing :

The ability to change the focal length of lens by changing the curvature of lens, is called **accommodation** power.



1. Parallel light reach eye
2. Cornea refracts light rays
3. Ciliary muscle relaxed
4. Suspensory ligament under maximum tension
5. Lense flattened

1. Diverging light rays strike eye
2. Cornea refracts light rays
3. Ciliary muscle contracted
4. Suspensory ligament loos
5. Lense thickened

Diagram showing Changes during accommodation

- In normal condition muscle fibres of ciliary body remain relaxed and lens is stretched by its suspensory ligaments, and due to this lens is flat. A flat lens has more focal length. As a result of this eye can see long distant objects easily.
- To see nearby objects, sphincter muscles of ciliary body contract and ciliary body becomes broad, suspensory ligaments becomes loose and relaxed. As a result of this relaxation of ligament, lens becomes biconvex, and now its focal length is reduced. Now animal is able to see nearby object easily.

Chemical Explanation of Vision

- Cones and rods of eye are stimulated by light rays. It is a chemical event.
- A shiny visual purple pigment is found in rods of retina called Rhodopsin. It is formed by a protein **opsin** and a coloured pigment **Retinal**, just like haemoglobin of blood.
- **Opsin** is also called **scotopsin**.
- In bright light, rhodopsin is decomposed into opsin protein and retinal pigments. This chemical change is sight impulse. This sight impulse is carried by optic nerve to the brain, and animal is able to see.
- In dark, rods synthesize rhodopsin again with the help of opsin, retinal and enzyme.

- This is the reason that we can not see any thing, when we move to dark place from a enlighted place (for some time only). In the same way we are unable to see in light if we are coming from dark place because it will take time to synthesize or decompose the rhodopsin
  It is called **Adaptation**.
- For resynthesis of rhodopsin, animal blinks its eyelids.
- Retinal is formed by vitamin A so deficiency of vit A causes **Night blindness**.
- Cones able us to differentiate among colours and bright light. Cones have a pigment called Iodopsin in place of rhodopsin of rods. It is decomposed into **photopsin** and **retinal.**
  There are three types of cones in retina :
  (a) Red cones (b) Green cones (c) Blue cones
- We are able to acknowledge different colours due to these three types of cones and their combination.
- **Red, green** and **blue are the primary colours**.

Dimlight vision - Scotopic vision
Bright light vision - Photopic vision

Some Important Defects of Eye

1. **Hypermatropia (Far Sightedness) :**
   - In this defect of eye, person is able to see objects placed at far distance but is unable to see objects close to him or her.
   - This defect is due to small size of eyeball or flatness of lens. In this defect image is formed **behind the retina.** To cure this defect person should wear **convex** lenses in spectacles.
   - Sometimes in old age this defect may occur due to reduction in the flexibility of lens or ciliary body, then it is known as **Presbyopia**, which is rectified using **Bifocal** lens.

2. **Myopia or Nearsightedness or Short Sightedness :**
   - In this defect of eye, person is able to see objects near/ close to him or her but is unable to see objects placed at far distance.
   - This is due to enlargement of eyeball or increased convexity of lens.
   - In this defect image is formed before the retina because light rays coming from distant objects converge before retina.
   - To overcome this defect person should wear **concave** lenses in spectacles.

3. **Astigmatism :** In this defect curvature of cornea is changed as a result of that light rays do not focus on macula lutea but somewhere else, causing incomplete and blurred vision. This defect may be cured by **cylindrical** lenses.

4. **Cataract :** In this defect, lens becomes more solid, brown or more flat. It occurs in old age mostly. The lens becomes opaque, and reduces its power of accommodation. At this stage person can not see. A new lens is administered in place of defective lens by operation.

5. **Glaucoma :** If the canal of schlemm is blocked in eyeball, aqueous humour can not return to veins again as a result pressure is increased in eye chambers and retina is damaged, and person becomes totally blind.

Concept Builder

1. Which of the following statements is not correct about chorid ?

(1) It is the most vascular structure (2) It is black in colour

(3) It prevent internal reflection of light (4) It is the visual portion of retina

2. In moonlight we cannot see the colours, because :

(1) Cones and rods are equally functional (2) Only cones are functional

(3) Only rods are functional (4) Depolarisation at cone cells

3. Mark the incorrect statement :

(1) Sclera is composed of dense connective tissue

(2) The choroid layer is thick in the anterior part in comparison to posterior 2/3 of eye ball.

(3) Retina contains three layer of cells, and from outside to inside it is ganglionic cells, bipolar cells and photoreceptor cells

(4) The diameter of pupil is regulated by the muscle fibres of iris.

4. Arrange the following based upon the mechanism of vision ?

(a) Absorption of visible wavelength of light by rods and cones

(b) Change in the permeability of photoreceptors cells

(c) Dissociation of retinal from opsin

(d) Generation of action potential in the ganglionic cell

(1) a b, c, d (2) a,c, b,d (3) a, d, b, c (4) a, c, d, b

5. Suspensory ligament is highly tensed when,

(1) Object is very near

(2) Object is distant

(3) Tension of suspensory ligament is independent of the distance of an object

(4) Ciliary muscles fully contract

6. Mark the correct statement :

(1) Blind spot contains only rods (2) Blind spot contains only cones

(3) Blind spot contains both rods and cones (4) fovea contains only cones

Concept Builder (Answer-Key)						
Que.	**1**	**2**	**3**	**4**	**5**	**6**
Ans.	4	3	3	2	2	4

Ear [Phonoreceptor]

There are two main functions of ears :

(1) To receive sound waves (hearing)

(2) To maintain body balance. ***Primary function of ear is to maintain the balance of body.***

Structurally human ear may be divided into three parts :

(a) External ear (b) Middle ear

(c) Internal ear

External Ear :

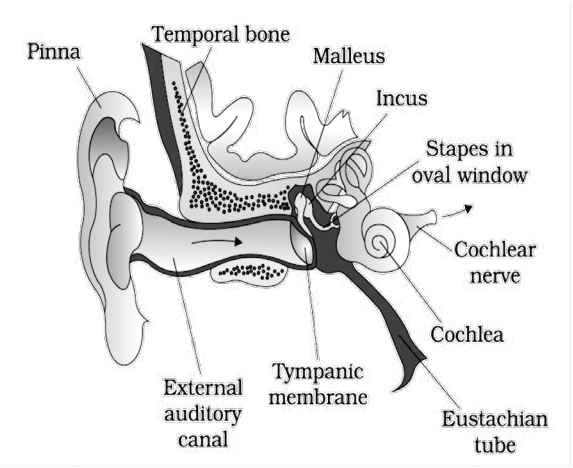
It is the outer part of ear. It is well developed in mammals only. External ear may be divided again into 2 parts

(i) Ear pinna (ii) Ear canal

(i) Ear Pinna : These funnel like structure, skin of ear pinna is hairy. These are having **yellow elastic cartilage**. Muscles of man's ear pinna are vestigial.

(ii) Ear Canal or External Auditory Meatus : It is a 24 mm long canal which is expanded from base of pinna to inner side.

- At the end of ear canal a stretched, thin, obliquely placed membrane is present, it is called **ear drum** or **tympanic membrane**. It separates the ear canal to middle ear.
- In the wall of external auditory meatus or ear canal there are found **modified sweat glands** called **ceruminous** glands. These secrete **cerumen** or ear wax, which moisten the ear drum and protects it.
- *Ear drum is a part of middle ear.*



Middle Ear

- Middle ear is also called tympanic cavity. It is filled with air.
- Middle ear cavity is connected by pharyngeal cavity through a canal. It is called **Eustachian tube**. Due to this tube, pressure at both the side of tympanic membrane remains always equal. This duct maintain sound equilibrium. It expels high volume sounds through mouth, to avoid the damage of ear drum.
- Tympanic cavity is connected by internal ear cavity by two apertures
  (i) Oval aperture-fenestra ovalis (oval window) and
  (ii) Round aperture-fenestra rotundus (round window). A thin and firm membrane covers each aperture.
- Three ear ossicles are present and arranged in a chain with movable joints connected together in tympanic cavity. These ear ossicles are :
  (a) Malleus : It is situated towards outer ear. It is the **largest** of three and of hammer shaped.
    - Inner broad part of malleus is connected by incus. Malleus and incus are Joint together by **synovial hinge joint**.

(b) Incus : The ossicle is anvil shaped. Its outer broad part is connected by malleus and inner thin part is connected by **stapes.** Incus is joined by stapes by **ball and socket joint**.

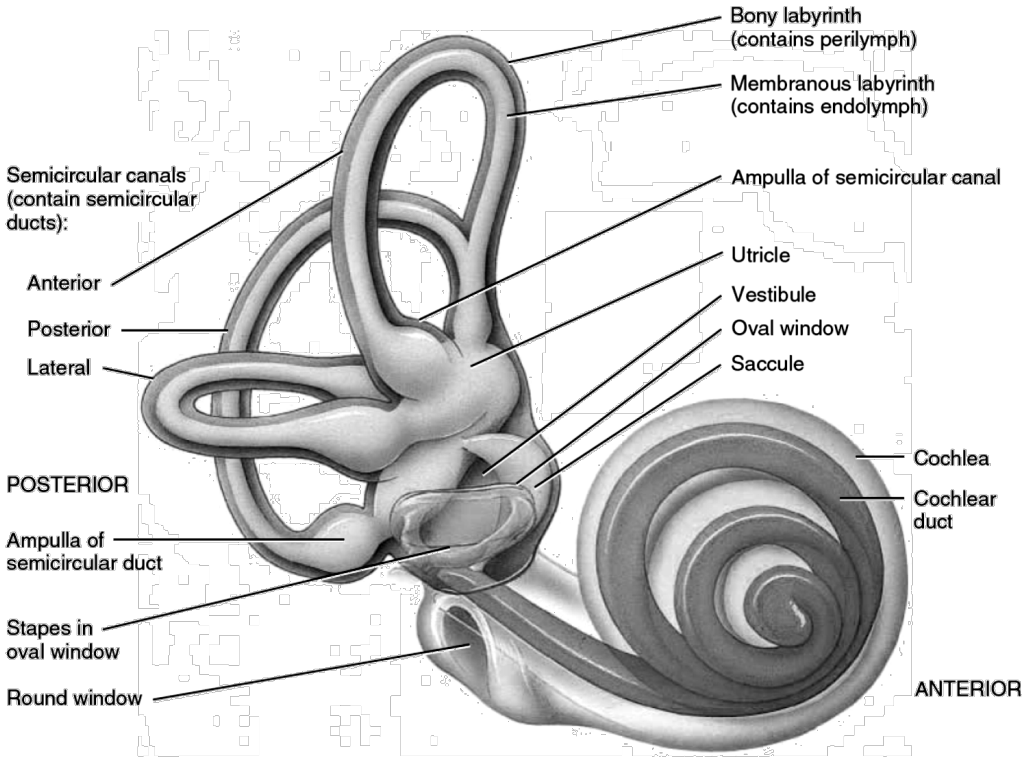
(c) Stapes : It looks like stirrup of horse.

- It is the **smallest** bone of body.
- Stapes is connected to incus at one side and on the other side it is connected to membrane stretched over fenestra ovalis.
- All the three ear ossicles are arranged in ear cavity by ligaments. These carry sound wave from ear drum to internal ear through fenestra ovalis.

Internal Ear :

It consist of (1) Bony Labyrinth (2) Membranous Labyrinth.

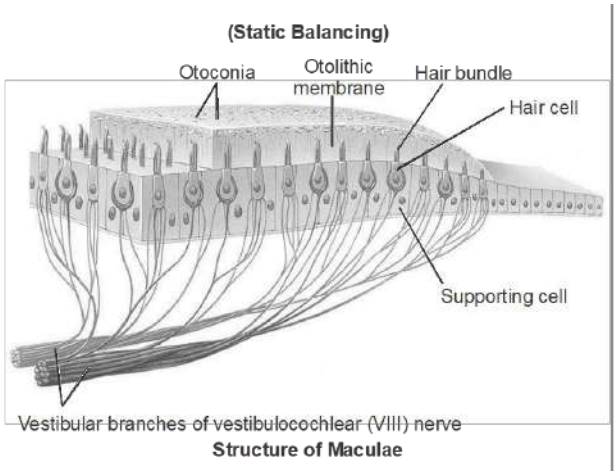
- Internal ear is enclosed in the **petrous part** temporal bone which form a bony capsule out side the internal ear it is called bony labyrinth.
- Internal ear is a complex structure made up of semi transparent membrane. It is called membranous labyrinth.
- Bony labyrinth cavity is field with perilymph.
- Endolymph is filled in membranous labyrinth.
- There are two main bag like chambers in membranous labyrinth, **utriculus and sacculus.**
- Utriculus is comparatively large. Three semi-circular canals arise from utriculus at 90^0 angle to each other and open into utriculus again. These are called **semi-circular canals.**
  (i) Anterior or superior semi-circular canal
  (ii) Posterior semi-circular canal
  (iii) External or lateral or horizontal semi-circular canal.
- The distal end of each semi-circular canal is some what swollen, called **Ampulla**.
- Sacculus is smaller than utriculus. Its back side is coiled like spring. It is called **cochlear canal** having 2¾ coils in humans.



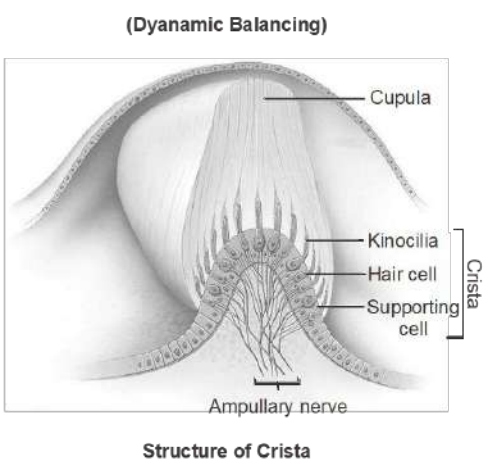
Components of right internal ear

(a) Internal Structure of Inner Ear :

- The inner wall of membranous labyrinth is lined by cuboidal epithelium and outer wall is lined by connective tissue richly supplied with blood capillaries.
- Membranous labyrinth is filled by endolymph which is a milky, mucilaginous fluid.
- Distal end of each semi-circular canal becomes swollen called ampulla. In this ampulla, internal cuboidal epithelium forms a ridge like projection called **crista ampullaris.** Sensory cells have sensory hair on free surface which remains embded into a gelatinous mass called **cupula.**
- One structure is present in utriculus and one in sacculus, these are called **Maculae**. Numerous $CaCO_3$ particles are found in endolymph which are called **Otoconia.**
- The sensory cells situated in internal ear are in contact with small nerves. All these thin nerve combine to form **vestibular nerve (branch of auditory nerve)**.
- Sensory crista and maculae are related with equilibrium of body
- **Cristae** control and maintain body equilibrium at the time of movement and **Maculae** regulate this at static position.



Structure of Maculae

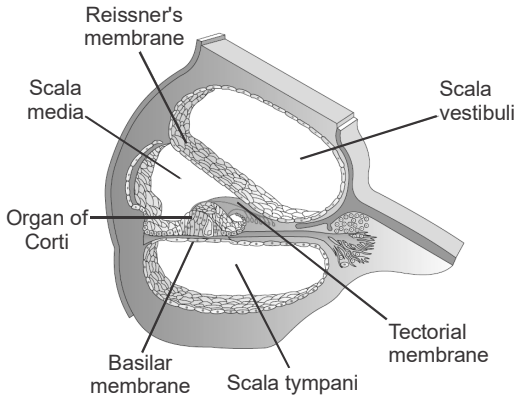


Structure of Crista

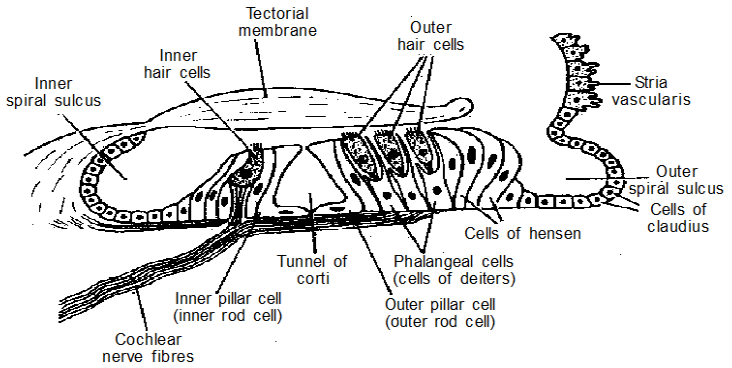
(b) Internal Structure of Cochlea & Cochlear Canal : Cochlear duct is connected by bony labyrinth in such a way that it divides the cavity of labyrinth into dorsal and ventral chambers. So in a transverse section of cochlea following three chambers are seen clearly.

(i) Scala Vestibuli : It is situated at dorsal side and is filled with perilymph.

(ii) Scala Tympani: It is situated at the ventral side below the cochlear duct. It is also filled by perilymph.



Diagrammatic representation of the sectional view of "Cochlea"



ORGAN OF CORTI

(iii) Scala Media : It is the triangular cavity of cochlear duct that is situated between scala vestibuli and scala tympani. It is filled with endolymph.

- Thin dorsal wall of cochlear duct is called **Reissner's membrane**.
- Ventral wall of scala media is thick called **Basilar membrane**. Scala vestibuli and scala tympani are connected through a small aperture at the free edge of cochlea. This aperture is called **helicotrema**.

(c) Organ of Corti : A sensory ridge is present at the whole length of central line at epithelium lining of basilar membrane of scala media. It is called **organ of Corti**. It has two types of cells

(i) Sensory cell (ii) Supporting or suspensory cell.

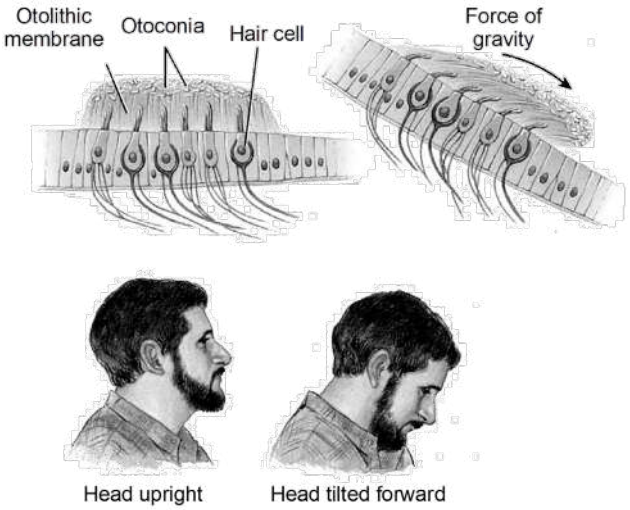
- At the ventral surface of sensory cells there are thin fibres of auditory nerve present that form cochlear branch.
- Above the organ of corti a thin jelly like membrane is inclined called **tectorial membrane.** In this membrane, all the sensory hair's free edges embeded.
- Main credit of hearing goes to "Organ of Corti".

(d) Working of Ear :

- Ears are stato-acoustic organs of body. Thus these help in hearing and balancing the body. **Equilibrium :** The first and **basic function of ears** is to **maintain balance** of body.
- This act is done by utriculus, sacculus and three semicircular canals, which are collectively called vestibular apparatus. Equilibrium impulse/sensation is of two types :

(i) Static Balancing : Its relation is from the point of view of gravity and position of head in static conditions of body and its changes.

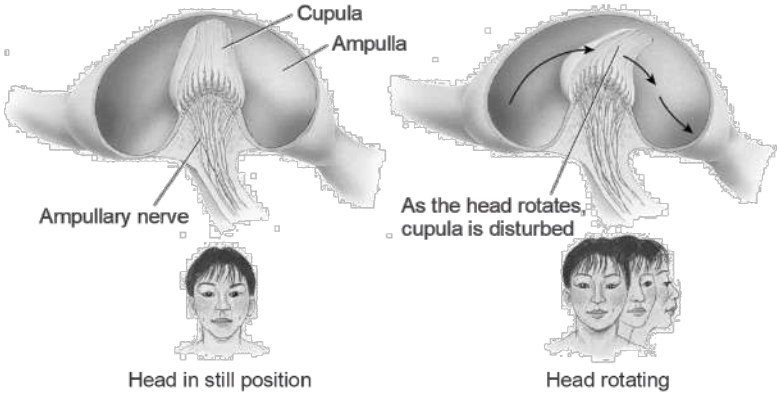
- The senses of these changes (of head) are produced and carried mainly by utriculus, sacculus and their sensory maculae.
- Sensory hair of ridge are sensitized by **otoconia or otolith or ear dust**. These sensations or impulses are carried to brain by auditory nerve After it messages of appropriate reactions are send through motor fibres to the skeletal muscles of body.



Static Balancing

(ii) Dynamic Equilibrium :

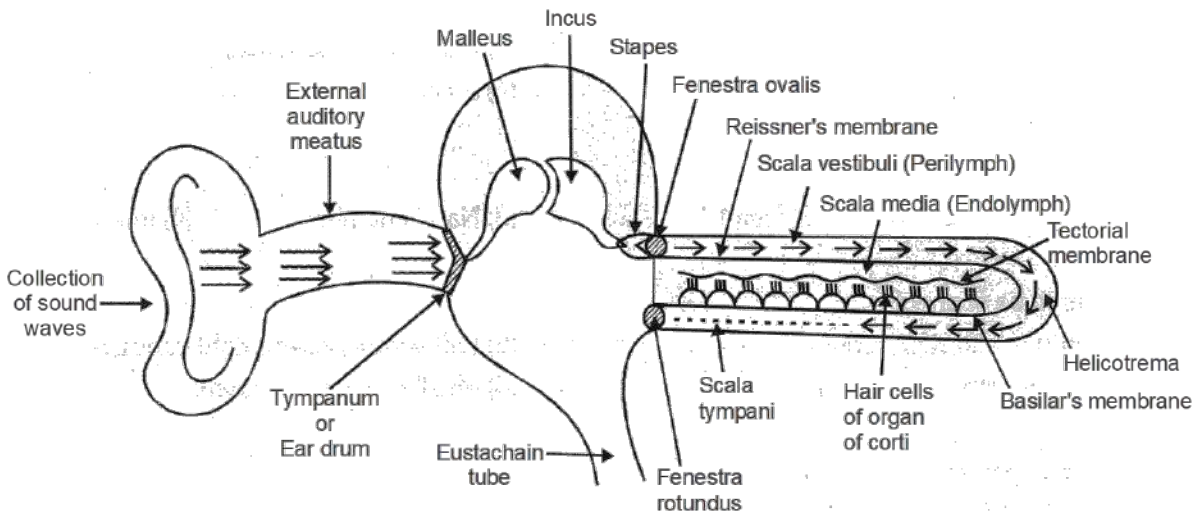
- It is the action to maintain balance of body during movement.
- This act is done by crista ampullaris of semicircular canals.
- At the time of movement the endolymph of ampula produces waves in it. Cupula of ampula are effected by these waves and sensory cells get irritated. This sensation or stimulation is carried to brain by auditory nerve and proper messages are send to muscle of legs in reply. Due to this body is balanced at the time of walking.



Dyanamic balancing

(e) Mechanism of Hearing :

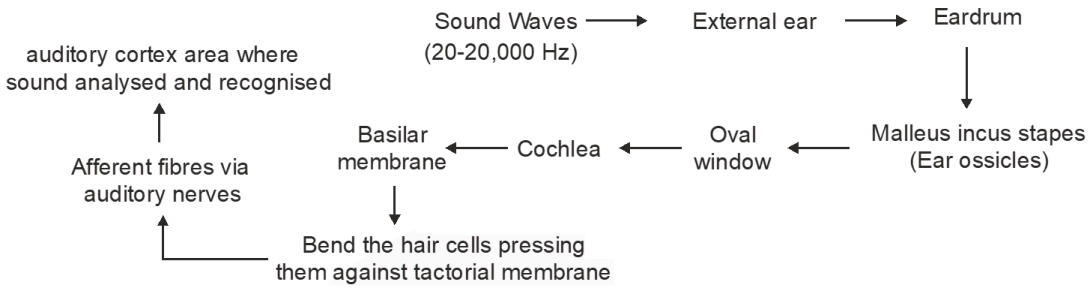
- This act is done by **"Organ of Corti"**.
- Sound waves are collected by ear pinnae. These sound waves travel through ear canal and hit the ear drum. As a result of it ear drum get vibrated.
- These vibrations reach up to stretched membrane of fenestra ovalis through ear ossicles. Ear ossicles work as lever.
- As a result of this travelling (from ear drum to fenestra ovalis) sound waves become more strong.



- When the membrane of fenestra ovalis starts vibrating, perilymph of scala vestibuli also starts vibrating, some vibrations reach up to scala tympani (fenestra rotundus) and its perilymph.
- Due to these vibrating waves, reissner membrane and basilar membrane of the walls of scala media also start vibrating. These vibrations travel through endolymph reach upto organ of corti. The organ of corti also starts vibrating.
- At this place, sensory hair of sensory cells (cells of organ of corti) hit by the tectoreal membrane. Now stimulation of hearing takes place.

- Cochlear nerve carries this impulse to brain through auditory nerve. Appropriate messages are send to receptor organs by brain accordingly.
- Vibrations / waves produced by cochlea travel through perilymph, reach up to membrane stretched at fenestra Rotandus and are destroyed.
- Some sound waves are also destroyed, when coming from helicotrema.

Flow Chart :



Concept Builder

1. Sequence of the fluid present from upper to lower chamber of cochlea is (P = perilymph, E = endolymph):
(1) P → E → P (2) P → E → P (3) E → P → E (4) P → E → E

2. Sensory hair cells are present in :
(1) Cristae (2) Maculae (3) Cochlea (4) All of these

3. Which of the following statement is not correct regarding cochlea ?
(1) It consists of a bony spiral canal that makes about $2\frac{3}{4}$ turns around
(2) It contains three chambers, the upper scala vestibuli, middle scala media, and the lower scala tymph.
(3) The middle and upper chamber communicate through oval window
(4) Cochlea contains hair cells arranged in four rows

4. Which of the following function is not associated with middle ear ?
(1) Amplification of sound wave
(2) Body equilibrium
(3) Transmission of sound wave from external ear to internal air
(4) Static equilibrium

5. Mark the largest ear ossicle in case of human :
(1) Malleus (2) Incus (3) Stapes (4) Columella auris

6. Tectorial membrane is present is :
(1) Upper chamber of cochlea (2) Middle chamber of membranous labrinth
(3) Lower chamber of Cochlea (4) Between external ear and middle ear

Concept Builder (Answer-Key)						
Que.	**1**	**2**	**3**	**4**	**5**	**6**
Ans.	1	4	3	4	1	2

Exercise - I

(A) Eye

1. Which is responsible for colour detection?

(1) Cones (2) Rods

(3) rods and cones (4) Choroid

2 Rhodopsin is a constituent of :

(1) Cornea (2) Choroid

(3) Rods (4) Cones

3. When the sensation for white light is produced?

(1) By various combination of cones & their photopigment

(2) When all three cones are stimulated equally

(3) When the cones are stimulated unequally

(4) By various combination of rods and their photopigments

4. The order of three layers of cells in retina of human eye from inside to outside is :

(1) Bipolar cells, photoreceptors, ganglion cells

(2) Ganglion cells, rods, cones

(3) Ganglion cells, bipolar cells, photoreceptors cells

(4) Photoreceptor cells, ganglion cells, bipolar cells

5. Which of the following pair of structure of eye are transparent ?

(1) Cornea and lens

(2) Lens and sclera

(3) Iris and lens

(4) Cornea and iris

6. If the source of bright light in front of eye suddenly become bright :

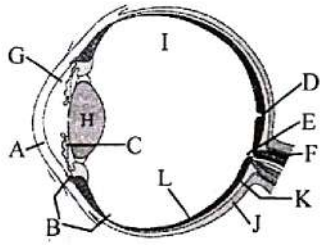
(1) Pupil contract

(2) Focus of lens changes

(3) Vitreous humor becomes liquid like

(4) Retina blood supply is cut off

7. Given below is diagram showing parts of an eye. Which of them is/are incorrectly described ?



(1) A - cornea, B - ciliary body, C - iris

(2) D - fovea, E - blind spot, F - optic nerve

(3) G - aqueous chamber, H - Lens, I - vitreous chamber

(4) J - retina, K - sclera, L - choroid

8. The focal length of the lens in eye is controlled by :

(1) Vitreous humor (2) Ciliary muscles

(3) Iris muscles (4) Pupil

9. Night blindness is caused due to :

(1) Hypermatropia

(2) Myopia

(3) Defective cornea

(4) Deficiency of rhodopsin in rods

10. Where is the cavity of vitreous humor found ?

(1) Between sclerotic and choroid

(2) Infront of lens

(3) Behind lens

(4) Between choroid and retina

11. Function of iris is to :

(1) Alter diameter of pupil

(2) Close eye lids

(3) Secrete aqueous humor

(4) Move the lens

12. When we move from dark to light, we fail to see for some time but soon the visibility become normal ? It is :

(1) Accommodation (2) Adaptation

(3) Photoperiodism (4) Mutation

13. Area of most active vision in eye where sharp image is formed is called :

(1) Blind spot (2) Yellow spot

(3) Lens (4) Pupil

14. Blind spot in the eye is located :

(1) In the center of pupil

(2) In the center of lens

(3) In fovea contralis

(4) Where optic nerves leaves retina

15. _____ are the first cells in the visual pathway that generate action potentials.

(1) Photoreceptor cells

(2) Bipolar cells

(3) Ganglion cells

(4) Horizontal cells

16. The common defect of eye which develops in old age is :

(1) Glaucoma (2) Astigmatism

(3) Presbyopia (4) Myopia

17. Ciliary muscles are found in :

(1) Junction of choroid and iris in eye ball

(2) Inside larynx to regulate pitch of sound

(3) Between ribs to assist in breathing movement

(4) At base of cilia in ciliated epithelium

18. The aperture controlling the light entering in eye is called :

(1) Iris (2) Pupil

(3) Blind spot (4) Sclerotic layer

19. Myopia is a defect in human eyes in which the image is formed :

(1) Behind retina and can be corrected by using convex lens

(2) Behind retina and can be corrected by using concave lens

(3) Infront of retina and can be corrected by using concave lens.

(4) Infront of retina and can be corrected by using convex lens.

20. In hypermetropia, the image is formed:

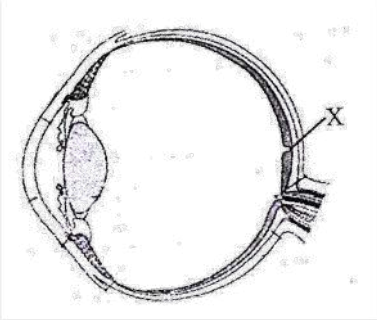
(1) Before retina and is corrected by convex lens

(2) Behind retina and is corrected by convex lens

(3) Before retina and is corrected by concave lens

(4) Behind retina and is corrected by concave lens

21. In given structure 'x' eye part shows the following feature :



(A) Densely packed with cones

(B) Visual acuity is sharpest

(C) It's thinned out portion of retina

(D) It is central pit of macula lutea present below the blind spot.

(1) A & B (2) B & D

(3) A, B & C (4) A & D

22. Which one of the following diseases in man belongs to the same category as haemophilia ?

(1) Hypermatropia (2) Rabies

(3) Night blindness (4) Colour blindness

23. A small region on the retina of the eye which contains only cones is called :

(1) Area centralis

(2) Fovea centralis

(3) Blind spot

(4) Ora serrata

24. For the synthesis of rhodopsin, which of the following food is needed ?

(1) Mango (2) Rice

(3) Carrot (4) Tomatoes

25. No image formation occurs on blind spot of retina because :

(1) it is not present of the optical axis of the eye

(2) Here cones and rods are absent

(3) On this part only cones are present

(4) The nerve fibres of this region do not contribute in the formation of optic chiasma

26. Highly vascular and pigmented layer of human eyes is :
(1) Retina (2) Sclerotic
(3) Choroid (4) Cornea

27. The part of human eye which acts like diaphragm of camera is :
(1) Pupil (2) Iris
(3) Lens (4) Cornea

28. Three layers in eye ball from inside to out side are :
(1) Retina, choroid, sclerotic
(2) Choroid, retina, sclerotic
(3) Sclerotic, choroid, retina
(4) Sclerotic, retina, choroid

29. Aqueous humor is secreted by :
(1) Iris (2) Ciliary body
(3) Lens (4) Cornea

30. Aqueous humour & vitreous humour are separated by :
(1) Cornea (2) Conjunctiva
(3) Lens (4) All

31. In Glaucoma :
(1) Eye ball elongates
(2) Eye ball shortened
(3) Fluid pressure increase in eye
(4) Cornea become opaque

32. Space between cornea & lens is :
(1) Aqueous chamber
(2) Vitreous chamber
(3) Fovea centralis
(4) Canal of schlemm

33. What conditions are developed after deficiency of vitamin A ?
(1) Night blindness
(2) Keratinization of cornea
(3) Keratinization of conjunctiva
(4) All the above

34. Function of vitreous humor is :
(1) Nutrition to lens
(2) Maintain intraocular pressure
(3) Reflection
(4) All the above

35. Which of the following structure of eye is artificially implanted ?
(1) Choroid
(2) Lens
(3) Retina
(4) Choroid & lens both

36. Which structure of eye is related to focussing of eye ?
(1) Lens
(2) Cornea
(3) Retina
(4) Aqueous and vitreous humor

37. Which statement is wrong about conjunctiva ?
(1) Ectodermal origin
(2) Presents on the central part of cornea
(3) Vascular
(4) Covers the anterior part of sclera

38. Which one of the following is the correct difference between Rod Cells and Cone Cells of our retina?

		Rod Cells	Cone Cells
(1)	Overall function	Vision in poor light	Colour vision and detailed vision in bright light
(2)	Distribution	More Concentrated in centre of retina	Evenly distributed all over retina
(3)	Visual acuity	High	Low
(4)	Visual pigment contained	Iodopsin	Rhodopsin

39. Cornea transplant in humans is almost never rejected. This is because :
(1) It is composed of enucleated cells
(2) It is a non-living layer
(3) Its cells are least penetrable by bacteria
(4) It has no blood supply

40. Vitreous humor is :
(1) Colloid
(2) Jelly fluid
(3) Mucoid connective tissue
(4) All of the above

41. Central pit of retina where visual acuity is greatest ?
(1) Macula lutea (2) Fovea
(3) Blind spot (4) Lens

42. Which of the following cranial nerve does not control the movement of eyeball ?

(1) Occulomotor

(2) Trochlear

(3) Glosspharyngeal

(4) Abducens

43. Consider the following statement (A-D) related to adult human eye and find out the **correct** statements :

(A) **Sclera** – external layer composed of dense connective tissue.

(B) **Choroid** – highly vascular and thin part over the anterior two-thirds of the eye ball.

(C) **Iris** – pigmented, transparent, visible coloured portion of the eye.

(D) **Pupil** – aperture surrounded by the iris in front of lens.

(1) A and D (2) B and C

(3) A, B, C (4) All of these

44. In our eyes, optic nerve leave the eye and the retinal blood vessels enters at a point called **blind spot,** which is characterised by all except one :

(1) Located medial to and slightly above the posterior pole of the eye ball.

(2) Photoreceptor cells are absent.

(3) Point of emergence of optic nerve.

(4) It is a portion of retina where only cones are densely packed.

45. Fovea (a central pit in *macula lutea*) is the point where visual acuity is greatest. In fovea :

(1) Only rods are densely packed

(2) Only cones are densely packed

(3) Both rods and cones are densely packed

(4) Cones are more in number

(B) Ear

46. Correct sequence of regions in organisation of auditory mechanoreceptor organ is :

(1) Pinna – Tympanic membrane – Auditory canal – Cochlea – Malleus – Incus – Stapes – Anditory

(2) Pinna – Malleus – Incus – Stapes – Auditory canal – Tympanic membrane – Cochlea – Auditory nerve

(3) Pinna – Auditory canal – Tympanic membrane – Malleus – Incus – Stapes – Cochlea – Auditory nerve

(4) Pinna – Cochlea – Tympanic membrane – Auditory membrane – Auditory canal – Incus – Malleus – Stapes – Cochlea – Auditory nerve

47. The fluid found in semicircular canals of internal ear is :

(1) Perilymph (2) Endolymph

(3) Haemolymph (4) Lymph

48. In internal ear otolith organ is present in:

a. Semicircular canal b. Saccule

c. Utriculus d. Cochlea

e. Ampulla

Choose the **correct** option :

(1) a, b and c (2) b and c only

(3) b, c and e (4) a, b and e

49. What is true regarding mechanism of hearing ?

(1) The movements of hair cells bend basilar membrane, pressing it against the tectorial membrane

(2) The movements of basilar membrane bend the tectorial membrane pressing it against hair cells

(3) The movements of tectorial membrane bend the hair cells pressing it against the basilar membrane

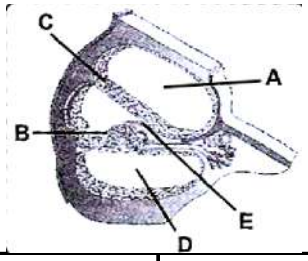
(4) The movements of basilar membrane bend the hair cells pressing them against the tectorial membrane

50. Chief function of semicircular canals of internal ear:
(1) Balancing and hearing.
(2) To perceive sound vibrations of high frequency.
(3) To maintain dynamic equilibrium of the body while the body is imbalance.
(4) To transmit sound vibration to the auditory nerve.

51. Which structure helps a person to maintain equilibrium ?
(1) Cochlea
(2) Eustachian tube
(3) Semicircular canals
(4) Hammer like bone

52. Which one is incorrect statement regarding ear ?
(1) Each semicircular canal lies in a different plane at right angles to each other.
(2) The membranous semicircular canals are suspended in endolymph of bony canals.
(3) Saccule & utricle contains a projecting ridge called macula.
(4) Crista and macula are the specific receptors of the vestibular apparatus responsible for balance and posture.

53. Identify the option with correct description of the structures labelled as A, B, C, D and E in the adjacent figure showing sectional view of cochlea:



(1)	**A.** Filled with perilymph	**C.** Separates scala vestibuli from scala tympani
(2)	**B.** Located on basilar membrane	**D.** Terminates at the oval window
(3)	**C.** Contains hair cells that acts as auditory receptors	**E.** Thin elastic membrane against which hair cells are pressed.
(4)	**A.** Ends at the oval window	**D.** Filled with Perilymph

54. Read the following statements about ear ossicles and find out the correct option:
(a) The middle ear contains three ossicles called malleus, incus and stapes.
(b) Malleus is attached to the tympanic membrane.
(c) Stapes is attached to the round window of the cochlea.
(d) Ear ossicles increase the efficiency of transmission of sound waves to the inner ear.

Options :
(1) a, b, c, d (2) a, b, d
(3) b, c, d (4) a, c, d

55. Cochlea of mammalian ear is concerned with :
(1) Balancing of body
(2) Hearing
(3) Perception of atmospheric pressure
(4) Both (1) and (2)

56. Tectorial membrane is located in?
(1) Scala vestibuli
(2) Tympanic cavity
(3) Scala media
(4) Scala tympani

57. The fluid surrounding the membranous labyrinth of human is called :
(1) Perilymph
(2) Endolymph
(3) Haemolymph
(4) Cerebrospinal fluid

58. The inner ear contains a complex system located above the cochlea called .....**(A)**..... It is influenced by gravity and movements and help us in .....**(B)**.....
(1) **A**-Organ of corti, **B**-Hearing
(2) A-Organ of corti, B-Maintaining posture
(3) A-Vestibular apparatus, B-Maintaining posture
(4) **A**-Macula, **B**-Hearing

59. The vibrations produced in the ear drum are transmitted through the ear ossicles to the fluid filled internal ear via :
(1) Oval window
(2) Both oval and round window
(3) Round window
(4) Helicotrema

60. By the stimulation of which structure of human ear, the sound waves are perceived by brain :
(1) Basilar membrane
(2) Tectorial membrane
(3) Meissner's membrane
(4) Sensory hair cells of organ of corti

61. Which of the following statement is correct regarding "Structure of ear"?
(1) The ear ossicles increase the efficiency of transmission of sound wave.
(2) Malleus is attached with oval window.
(3) Eustachian tube connects middle ear cavity with larynx.
(4) Middle ear contain three ear ossicles called malleus, incus and sphenoid.

62. Otolith (otoconia) are $CaCO_3$ particles found in :
(1) Crista (2) Macula
(3) Bones (4) Vitreous humor

63. Which of the following is anvil shaped ear ossicle?
(1) Incus (2) Malleus
(3) Stapes (4) Humerus

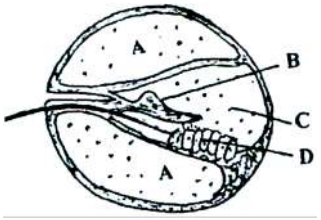
64. Which of the following is stirrup shaped ear ossicle ?
(1) Incus (2) Stapes
(3) Malleus (4) Humerus

65. The ear ossicles of man lie in the :
(1) Auditory capsules
(2) External auditory meatus
(3) Tympanic cavity
(4) Tympanic bulla

66. The scala vestibuli communicates with scala tympani through narrow canal called :
(1) Ductus endolymphaticus
(2) Helicotrema
(3) Ductus utriculi
(4) Sacculo utricular canal

67. Joint between malleus & incus is :
(1) Synovial hinge joint
(2) Synovial ball socket joint
(3) Pivot joint
(4) Glinding joint

68. Given below is a diagrammatic cross section of a single loop of human cochlea :



Which one of the following options correctly represents the names of three different parts ?
(1) D : Sensory hair cells, A : Endolymph, B : Tectorial membrane
(2) A : Perilymph, B : Tectorial membrane, C : Endolymph
(3) B : Tectorial membrane, C : Perilymph, D : Secretory cells
(4) C : Endolymph, D : Sensory hair cells, A : Serum.

69. In the tympanic cavity there is an aperture in which the stapes is fitted it is :
(1) Foramen rotundus
(2) Foramen triosseum
(3) Fenestra ovalis (oval window)
(4) Fenestra rotandus (round window)

70. Function of eustachian tube is to :
(1) Provide air to the ear ossicles
(2) Remove dirt from the middle ear
(3) Keep middle ear in proper shape
(4) To maintain proper air pressure in middle ear for protecting them from damage by loud sound.

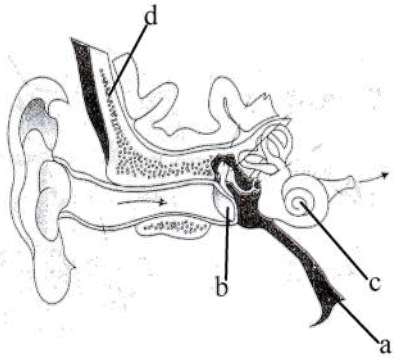
71. The sound vibration are finally exhausted in :
(1) Organ of corti
(2) Fenestra rotundus
(3) Fenestra ovalis
(4) Tympanic membrane

72. Which of the following structure is not related to body balance ?
(1) Maculae (2) Crista
(3) Organ of corti (4) Ampulla

73. Scala media is present in :
(1) Part of middle ear
(2) Cochlear canal
(3) Chamber of semicircular canal
(4) Chamber which is related to perilymph

74. Body balance during dynamic condition is initiated (stimulated) by which structure :
(1) Otoconia
(2) Cupula
(3) Stereocilia of crista
(4) Kinocillium of maculae

75. Find out the correct labelling for a, b, c, d in diagram :



	(a)	(b)	(c)	(d)
(1)	External auditory	Tympanic membrane	Cochlea bone	Temporal meatus
(2)	Temporal bone	Tympanic membrane	Cochlear nerve	Eustachian tube
(3)	Eustachian tube	Tympanic membrane	Cochlea bone	Temporal
(4)	Cochlea	Tympanic membrane	Auditory bone	Temporal meatus

76. High frequency resonance of the basilar membrane occurs :
(1) Near the base
(2) Near the apex
(3) In between base and apex
(4) Any where (not fixed)

Answer - Key

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	1	3	2	3	1	1	4	2	4	3	1	2	2	4	3	3	1	2	3	2	3	4	2	3	2
Que.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	3	2	1	2	3	3	1	4	2	2	1	2	1	4	4	2	3	1	4	2	3	2	2	4	3
Que.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	3	2	4	2	2	3	1	3	1	4	1	2	1	2	3	2	1	2	3	4	2	3	2	2	3
Que.	76																								
Ans.	1																								

Exercise - II

1. Which of the following is true for Fovea?
(1) Thinest part of choroid
(2) Central thin part of optic disc
(3) Central pit of macula lutea
(4) Only rods are present

2. The photosensitive compounds (Photopigments) in the human eyes are composed of opsin (a protein) and retinal this retinal is formed by :
(1) an aldehyde of vitamin-A
(2) a ketone of vitamin-A
(3) an aldehyde of vitamin-D
(4) a ketone of vitamin-D

3. At the base of cochlea, the scala vestibuli ends at ..... where as scala tympani terminates at the ..... which opens to the middle ear.
(1) oval window, round window
(2) round window, oval window
(3) circular window, oval window
(4) round window, circular window

4. In mechanism of hearing, impulses are transmitted by afferent fibres via auditory nerves to the auditory cortex of the brain, which cells remain in the close contact with the afferent nerves fibres?
(1) Basal end of hair cell
(2) Apical part of each hair cell
(3) Any part of hair cells
(4) Stereocilia of hair cells

5. Eustachian tube connects the middle ear to ..... which helps in equalising the pressure on either side of .....
(1) Pharynx, basilar membrane
(2) Pharynx, tympanic membrane
(3) Buccal cavity, reissner's membrane
(4) Buccal cavity, tympanic membrane

6. The specific receptors of the vestibular apparatus responsible for maintenance of balance of body and posture are :
(A) Organ of corti (B) Crista
(C) Macula (D) Cochlea
(1) A and D (2) B and C
(3) A and C (4) C and D

7. Match the columns with column-1 and column-2 :

Column-1		Column-2	
(A)	Opsin	(i)	Specific receptors of the vestibular apparatus
(B)	Retinal	(ii)	basilar membrane
(C)	Organ of corti	(iii)	Regulate balance and posture of the body
(D)	Crista & macula	(iv)	Auditory receptors
(E)	Rods	(v)	Purplish-red protein
(F)	Cones	(vi)	A protein
		(vii)	Red, green & blue lights
		(viii)	An aldehyde of vitamin A

(1) A → (vi), B → (viii), C → (ii), (iv), D → (i), (iii), E → (v), F → (vii)
(2) A → (vi), B → (viii), C → (i), (iii), D → (ii), (iv), E → (v), F → (vii)
(3) A → (vi), B → (viii), C → (ii), (iv), D → (v), (vii), E → (i), F → (iii)
(4) A → (vi), B → (viii), C → (v), (vii), D → (i), (iii), E → (ii), F → (iv)

8. The diameter of the ___A___ is regulated by the muscle fibres of ___B___.
(1) A - lens B - Iris
(2) A - Pupil B - Ciliary body
(3) A - Pupil B - Iris
(4) A - Lens B - Pupil

9. ____(I)____ is a structure which contains hair cells that act as ___(II)___ and is located on the ____(III)____.

	(I)	(II)	(III)
(1)	Vestibular apparatus	Balancing organ	reissner's membrane
(2)	Organ of corti	Hearing organ	Tectorial membrane
(3)	Organ of corti	auditory receptors	basilar membrane
(4)	Organ of corti	auditory receptors	vestibular membrane

10. Cochlea of ear is divided into three chambers by two membranes that are ____ and _____.
(1) Basilar membrane, Tectorial membrane
(2) Basilar membrane, Otolith membrane
(3) Otolith membrane, Tectorial membrane
(4) Basilar membrane, Reisner's membrane

11. The space between the __A__ and the __B__ is called the vitreous chamber and is filled with a __C__ vitreous humor.
(1) A-lens, B-retina, C-opaque
(2) A-lens, B-retina, C-transparent
(3) A-cornea, B-lens, C-transparent
(4) A-cornea, B-retina, C-aqueous

12. Mark the **incorrect** statement regarding rod cells in our retina ?
(1) High visual acuity
(2) Scotopic/Twilight vision
(3) High sensitivity for light
(4) More numerous than cones

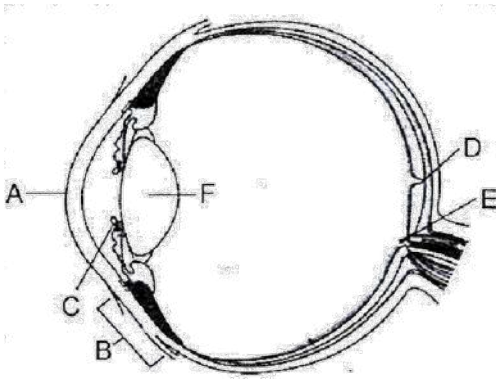
13. Cornea and lens of eye are :
(1) Transparent and help in image formation on retina
(2) Transparent and diverge light rays on retina and image formation
(3) Sensitive and richly supplied by nerves
(4) Sensitive and richly supplied by blood vessels

14. Which of the following statement is wrong for choroid of eye ?
(1) External layer of eyeball which is highly vascular
(2) Bluish in colour
(3) Posterior 2/3 part of vascular tunic
(4) Present below the sclera.

15. Which part of the ear is influenced by gravity and movements ?
(1) Vestibular apparatus (2) Cochlea
(3) Organ of Corti (4) Ear ossicles

16. There are some functions of photoreceptor cells. Which of the following are not functions of rods?
A. Daylight vision B. Twilight vision
C. Scotopic vision D. Colour vision
E. Photopic vision F. Dim light vision
(1) A, D and F (2) B, C and D
(3) B, C and F (4) A, D, E

17. Given below is a diagram showing parts of an eye, mark the option with correctly matching statement with its labelling ?



(1) (C) Visible coloured portion of the eye
(2) (B) Non vascular, transparent portion
(3) (D) Photoreceptor cells are absent in this region
(4) (E) Portion of retina where only the cones are densely packed

18. Which of the following order is correct for structure involved in visual pathway?
(a) bipolar cells (b) visual cortex
(c) ganglion cells (d) aqueous humor
(e) lens (f) cornea
(g) optic nerve
(h) photoreceptor cells
(1) f, d, e, c, a, h, g, b (2) f, d, e, h, a, c, g, b
(3) f, d, e, h, a, b, g, c (4) f, e, d, c, a, h, b, g

19. The ciliary body itself continues forward to from a pigmented and opaque structure called ____ which is the visible coloured portion of the eye.
(1) Paras iridica (2) Iris
(3) Cornea (4) Choroid

20. Dancers and sports person are able to maintain their porper body position by using their internal sense of balance. Sensing of this sort of body's internal condition and position is performed by:
(1) Organ of corti (2) Crista
(3) Macula (4) Otolithic organ

21. Mark the **incorrectly** matched pair regarding the structure with its location and functions :

	(I)	(II)
(1)	Otolith organs	Located in utriculus and sacculus and is related with static equilibrium
(2)	Organ of corti	Located on basilar membrane and contains hair cells that acts as auditory receptors
(3)	Auditory cortex area	Located on temporal lobe where sight impulse are analysed and retinal image is recognised
(4)	Ear ossicles	Located in middle ear cavity and increases efficiency of transmission of sound waves to the inner ear.

22. Which of the following is a correct match of ear part and its function?

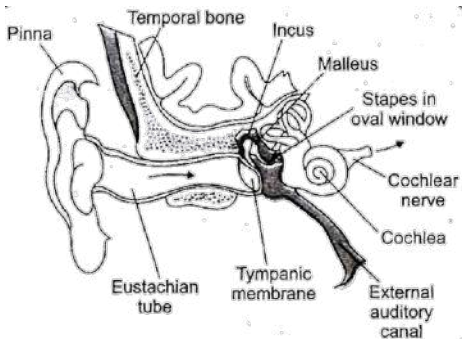
(1) **Organ of corti –** Increase the efficiency of sound wave

(2) **Basilar membrane –** determines pitch of the sound

(3) **Tectorial membrane –** Separates scala vestibuli from scala tympani

(4) **Semicircular canal –** Equalises the pressure on either sides of the ear drum

23. In given below diagrammatic view ear, how many parts are **wrongly** labelled ?



(1) 3 (2) 4 (3) 5 (4) 6

Answer - Key

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Ans.	3	1	1	1	2	2	1	3	3	4	2	1	1	1	1	4	1	2	2	2	3	2	2

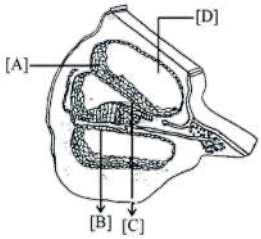
Exercise – III (Previous Year Questions)

[AIPMT – Pre – 2012]

1. Which part of the human ear plays no role in hearing as such but is otherwise very much required ?
(1) Vestibular apparatus
(2) Ear ossicles
(3) Eustachian tube
(4) Organ of corti

[AIIMS – 2012]

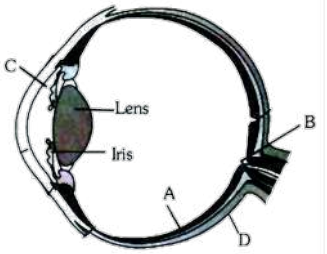
2. Identify A, B, C, D in the given diagram. Which of the following among these has been correctly identified along with its function ?



(1)	D-Scala vestibuli	Contains endolymph
(2)	A-Tectorial membrane	Transmission of nerve impulse.
(3)	C-Reissner's membrane	Bears organ of Corti
(4)	B-Basilar membrane	Induction of ripple movement

[NEET – UG – 2013]

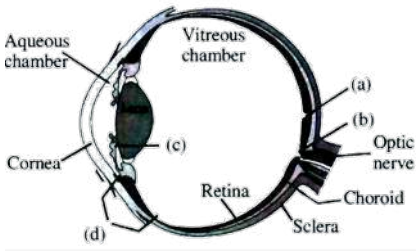
3. Part A, B, C and D of the human eye are shown in the diagram. Select the option which gives correct identification along with its functions/characteristics :



(1) D-Choroid - its anterior part forms ciliary body
(2) A-Retina-contains photo receptors-rods and cones
(3) B-Blind spot-has only a few rods and cones
(4) C-Aqueous chamber reflects the light which does not pass through the lens.

[AIIMS – 2013]

4.



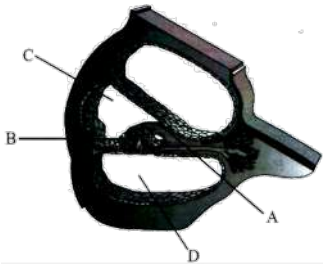
For the given diagram which labelling and function is correctly matched/ described ?
(1) (a) → Fovea → Rods are densely packed
(2) (b) → Blind spot → No image formed
(3) (c) → Choroid → Colour part of the eye which regulates diameter of pupil.
(4) (d) → Ciliary body → No role in accomodation

[AIPMT – 2014]

5. Which one of the following statements is not correct?
(1) Retinal is the light absorbing portion of visual photo pigments.
(2) In retina the rods have the photopigment rhodopsin while cones have three different photopigments.
(3) Retinal is a derivative of Vitamin C.
(4) Rhodopsin is the purplish red protein present in rods only.

[AIIMS – 2014]

6. The figure shows a diagrammatic representation of the sectional view of cochlea with labels A, B, C and D. Select the option with correct identification and main characteristic or function:



(1) D–Scala tympani –filled with endolymph
(2) C–Scala media–filled with perilymph
(3) B–Hair cells–pressing against the tectorial membrane as a result nerve impulses are generated
(4) A–Reissner's membrane–responsible for causing auditory reflex.

[AIPMT – 2015]

7. A gymnast is able to balance his body upside down even in the total darkness because of :
(1) Vestibular apparatus
(2) Tectorial membrane
(3) Organ of corti
(4) Cochlea

[Re-AIPMT – 2015]

8. In mammalian eye, the 'fovea' is the center of the visual field, where :
(1) More rods than cones are found
(2) High density of cones occur, but has no rods
(3) The optic nerve leaves the eye
(4) Only rods are present

[NEET – 2016]

9. Choose the correct statement :
(1) Nociceptors respond to changes in pressure.
(2) Meissner's compuscles are thermoreceptors
(3) Photoreceptors in the human eye are depolarised during darkness and become hyperpolarised in response to the light stimulus.
(4) Receptors do not produce graded potentials.

10. Photoresensitive compound in human eye is made up of :
(1) Opsin and retinol
(2) Transducin and restinene
(3) Guanosine and retinol
(4) Opsin and retinal

[NEET – 2017]

11. Good vision depends on adequate intake of carotene-rich food.
Select the best option from the following statements.
(a) Vitamin A derivatives are formed from carotene
(b) The photopigments are embedded in the membrane discs of the inner segment.
(c) Retinal is a light absorbing of Vitamin A
(d) Retinal is a light absorbing part of all the visual photopigments.

Options :
(1) (a) and (b) (2) (a), (c) and (d)
(3) (a) and (c) (4) (b), (c) and (d)

[NEET – 2018]

12. The transparent lens in the human eye is held in its place by :
(1) Smooth muscles attached to the ciliary body
(2) Ligaments attached to the ciliary body
(3) Smooth muscle attached to the iris
(4) Ligaments attached to the iris

[NEET – 2019]

13. Which of the following statements is correct?
(1) Cornea is convex, transparent layer which is highly vascularised.
(2) Cornea consists of dense matrix of collagen and is the most sensitive portion of the eye.
(3) Cornea is an external, transparent and protective proteinaceous covering of the eye-ball.
(4) Cornea consists of dense connective tissue of elastin and can repair itself.

[NEET – 2019 (Odisha)]

14. Which of the following receptors are specifically responsible for maintenance of balance of body and posture?
(1) Basilar membrane and otoliths
(2) Hair cells and organ of corti
(3) Tectorial membrance and cacula
(4) Crista ampullaris and macula

[NEET – 2020]

15. Match the following columns and select the correct option.

	Column-I		**Column – II**
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iv)	(iii)
(2)	(ii)	(iii)	(i)	(iv)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(iv)	(ii)	(i)	(iii)

[NEET – 2020 (Covid - 19)]

16. Match the following columns and select the correct option :

	Column-I		**Column – II**
(a)	Rods and Cones	(i)	Absence of photoreceptor cells
(b)	Blind Spot	(ii)	Cones are densely packed
(c)	Fovea	(iii)	Photoreceptor cells
(d)	Iris	(iv)	Visible coloured portion of the eye

(1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
(2) (a)-(ii), (b)-(iii),(c)-(i), (d)-(iv)
(3) (a)-(iii), (b)-(iv),(c)-(ii), (d)-(i)
(4) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

ANSWER-KEY																
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Ans.	1	4	2	2	3	3	1	2	3	4	2	2	3	4	4	1