

Unit - IV(i)
Peripheral Nervous System ①

Nervous System:- The network of nerve cells & fibers which transmits nerve impulses between parts of the body.

The nervous system is very important in helping to maintain the homeostasis (balance) of human body.

All body activities, voluntary & involuntary are controlled by the nervous system.

Two Major ComponentsCentral Nervous System (CNS)

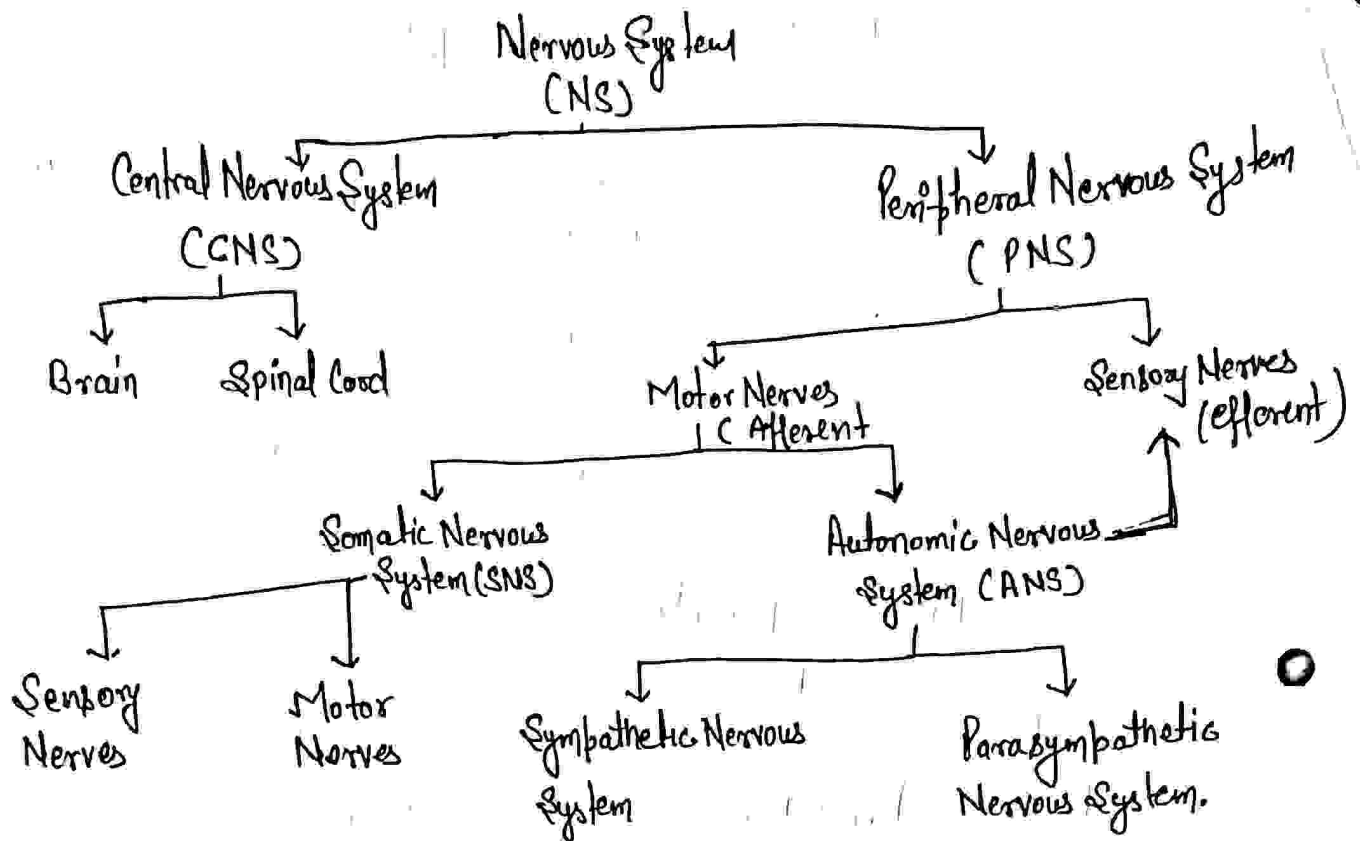
- Made up of the brain & spinal cord.

Peripheral Nervous System (PNS)

- Made up of all nerves that leads into & out of the CNS

Peripheral Nervous System :-

- The PNS consists of the nerves and ganglia outside the brain & spinal cord. The main function of PNS is to connect the CNS to the limbs & organs, essentially serving as a relay between the brain & spinal cord & the rest to the body.
- These nerves extend from the central nervous system to the outermost area of the body.
- The nervous system is divided into the two type i.e CNS & PNS
- PNS further divided into different parts.



① Somatic Nervous System (SNS): Greek word - Soma - which means "body".
 • The somatic nervous system is voluntary.

• The somatic nervous system consists of sensory neurons & motor neurons.

Sensory Neurons: - They convey information from somatic receptors in the head, body wall, limbs and from receptors of special senses of vision, hearing, taste & smell to the CNS.

Motor Neurons: - They conduct impulses from the CNS to skeletal muscles.

② Autonomic Nervous System (ANS)

• ANS is involuntary. The ANS consists of Sympathetic & Parasympathetic.

Sensory Neurons: - They convey information from autonomic sensory receptors located primarily in visceral organs such as stomach & lungs to the CNS.

Motor Neurons: - They conduct nerve impulses from the CNS to smooth muscles, cardiac muscles and glands.

(ii)

Somatic Nervous System:-

✓ It is the part of PNS system responsible for carrying sensory & motor information to & from the CNS.

- SNS name derived from greek word SOMA which mean 'body'.
- It is responsible for transmitting sensory information as well as for voluntary movement.
- SNS contains two major types of Neurons:-

1. Sensory Neurons (Afferent Neurons)

2. Motor Neurons (Efferent Neurons)

● 1. Sensory Neurons (Afferent Neurons): It carry information from the neurons to CNS.

2. Motor Neurons (Efferent Neurons). It carry information from the brain & spinal cord to muscle fibers through out the body.

• It carry information from CNS to other organs.

Sensory-Somatic Nervous Systems:- S-SNS consists of

• 12 pairs of Cranial Nerves

• 31 pairs of Spinal Nerves.

● (A) Spinal Nerves:- Spinal nerves or nerve roots, branch off the spinal & pass out through a hole in each of vertebrae called the Foramen.

These nerve carry information from the spinal cord to the rest of the body & from the body back up to the brain. There are 31 pairs of

spinal nerves:-

8 Cervical

12 Thoracic

5. lumbar

5 Sacral

1 Coccygeal

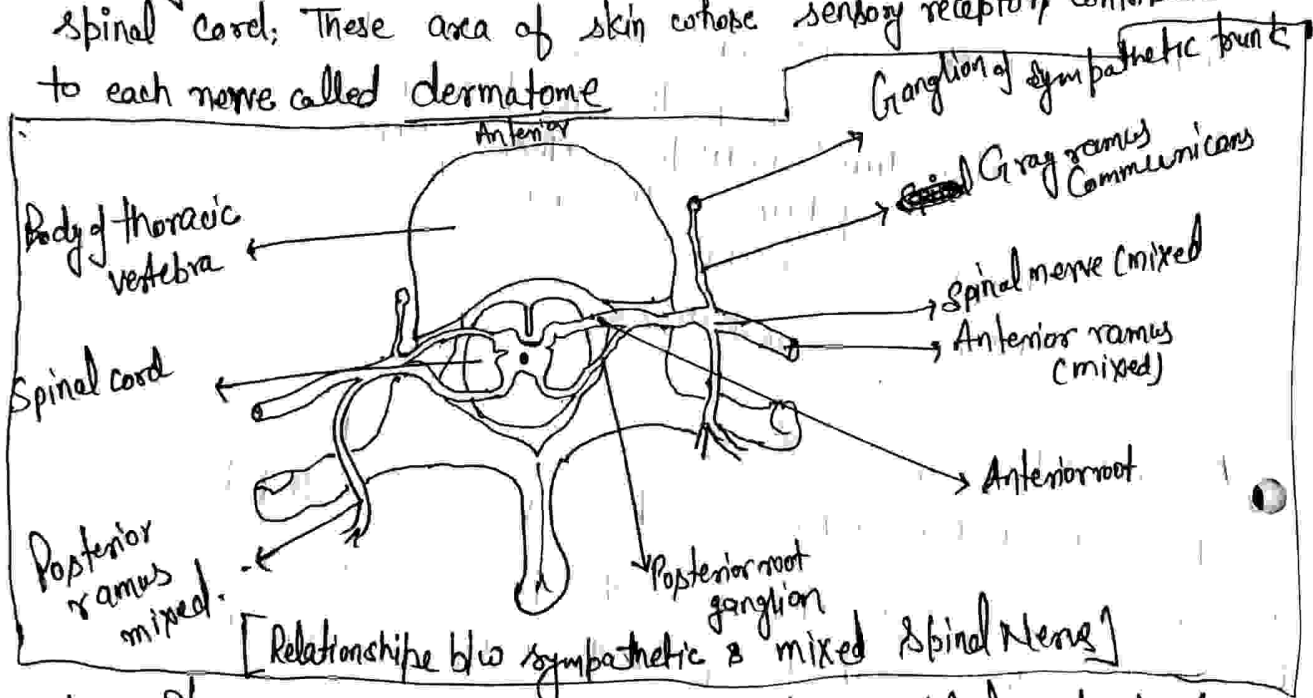
Atypical spinal nerves has two connections to the cords:—^(IV)

- Posterior
- Anterior.

Anterior Nerve Root: It consists of nerve fibres which the axons of the nerve cells in the anterior column of grey matter of spinal cord.
 & In the thoracic & lumbar regions sympathetic nerve fibres which are the axons of cells in the lateral columns of grey matter.

Posterior Nerve Root: It consists of sensory nerve fibres. Just outside the spinal cord there is spinal ganglion, consisting of a little cluster of cell bodies.

- Sensory nerve fibres pass through these ganglia before entering the spinal cord; These area of skin whose sensory receptors contribute to each nerve called dermatome



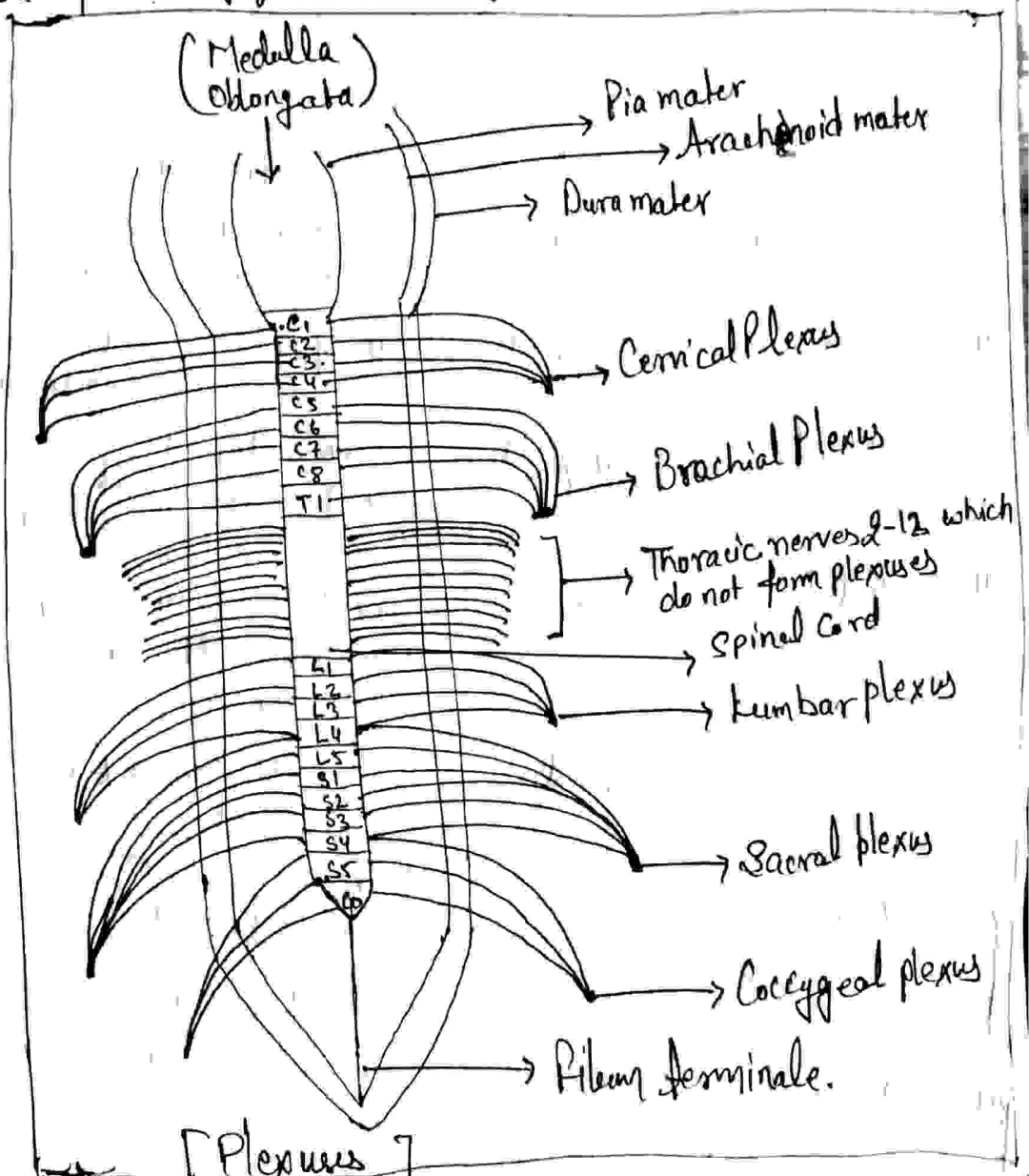
Nerve Plexuses: At certain regions of the spinal cord some individual nerve trunks unit to form Plexuses.

There are five large Plexuses of mixed nerves formed on each side of vertebral column.

- Cervical plexuses
- Brachial plexuses
- Lumbar plexuses
- Sacral plexuses
- Coccygeal plexuses.

(v)

- i) **Cervical Plexuses**:- It is formed by the anterior rami of the first four nerves.
- ii) **Brachial Plexuses**:- The anterior rami of the lower four cervical nerves & a large part of the first thoracic nerve form the brachial plexus.
- iii) **Sacral Plexuses**:- It is formed by the anterior rami of the lumbosacral trunk & the 1st, 2nd & 3rd sacral nerves.
- iv) **Lumbar Plexuses**:- It is formed by the anterior rami of the first three & part of four lumbar nerves.
- v) **Coccygeal Plexuses**:- The coccygeal plexus is a very small plexus formed by part of the fourth & fifth & the coccygeal nerves.



(VI)
(B) Cranial Nerves: They are 12 pairs of nerves attached to the brain.

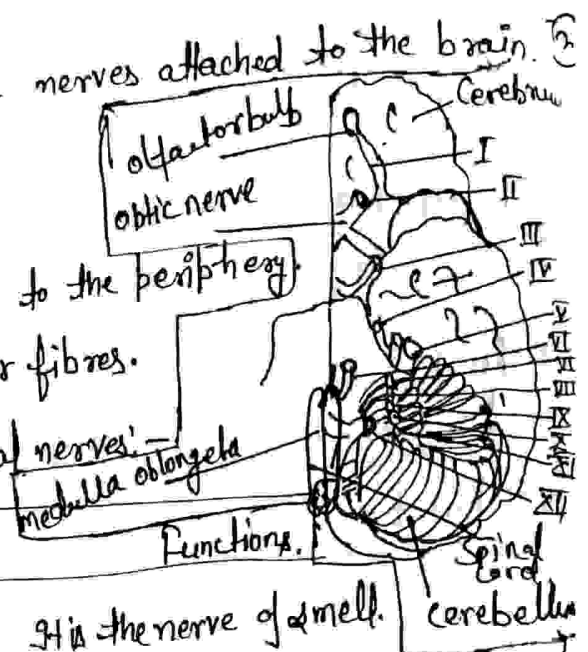
These may be sensory, motor or mixed.

Sensory: Carrying impulse to the brain.

Motor: Carrying impulses from the brain to the periphery.

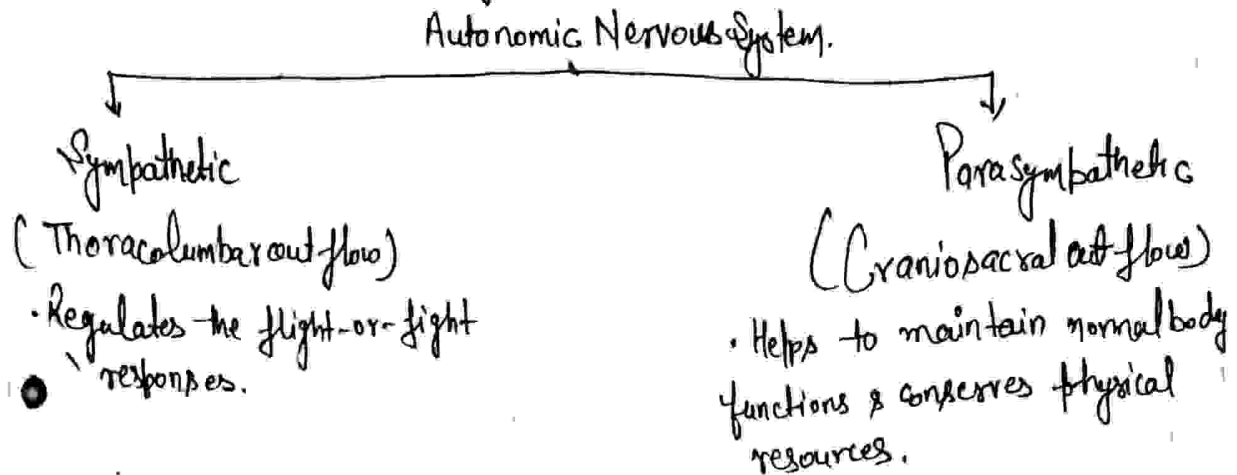
Mixed: Containing both sensory and motor fibres.

The following are the 12 pairs of Cranial nerves:



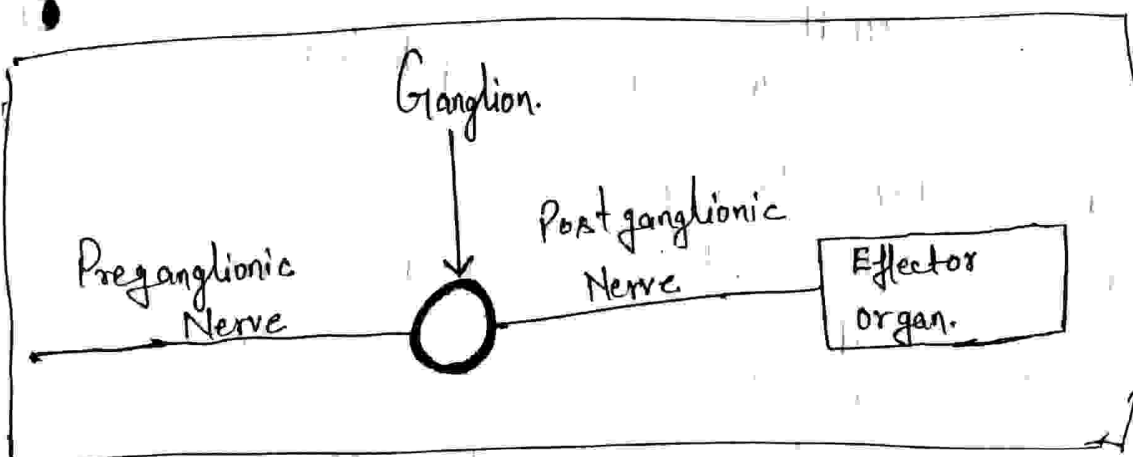
| S.No. | Name of Nerve | Nature | Functions. |
|-------|------------------|---------------|---|
| I | Olfactory | Sensory | It is the nerve of smell. |
| II | Optic | Sensory | It is nerve of vision. |
| III | Oculomotor | Motor | Supplies the muscles of eyeball or eye movements. |
| IV | Trochlear | Motor | Supplies the muscles of eye ball. |
| V | Trigeminal | Mixed. | Sensory fibres to face & forehead. Motor fibres to muscles of mastication. |
| VI | Abducense | Motor | It supplies the muscles of eye ball or muscle conditioning. |
| VII | Facial | Sensory/Motor | Sensory for taste Motor for facial muscles & salivary gland. |
| VIII | Auditory | Sensory | Consists of two parts i.e. <u>Cochleare nerve</u> - the nerve of hearing <u>Vestibular</u> : Nerve of equilibrium & balance. |
| IX | Glossopharyngeal | mixed. | Sensory to tongue & motor to pharyngeal muscles. |
| X | Vagus | mixed. | Main nerves of PNS, speech, heart muscles S.M & few gland. |
| XI | Accessory | motor | Swallowing, moving head, sh.ouder |
| XII | Hypoglossal | Motor | It supplies the muscles tongue |

- Reflex Action — at last page (VII)
- ② Autonomic Nervous System: It is the part of peripheral nervous system responsible for regulating involuntary body functions such as blood flow, heart beat, digestion & breathing. It controls tissues which are not under voluntary control.



Both the sympathetic & parasympathetic essentially consist of:

- i) A Preganglionic Nerve
- ii) A Ganglion.
- iii) A postganglionic Nerve.
- iv) An Effector organ which the nerve supplies.

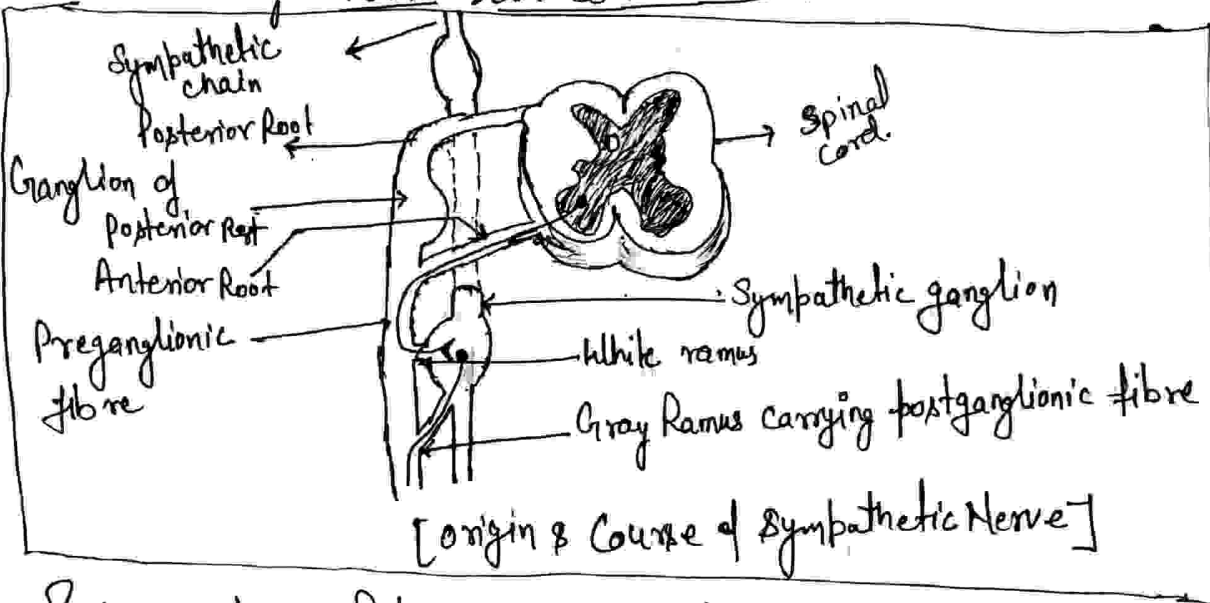


(VIII)
 (A) Sympathetic Nervous System:-

- ◆ The sympathetic nervous system is located to the sympathetic chain, which connects to skin, blood vessels & organ in the body cavity
- ◆ The sympathetic chain is located on both sides of the spine & consists of ganglia.

⇒ Preganglionic fibres:- The preganglionic fibres of sympathetic nervous system arise from the lateral horn cells of the spinal cord.

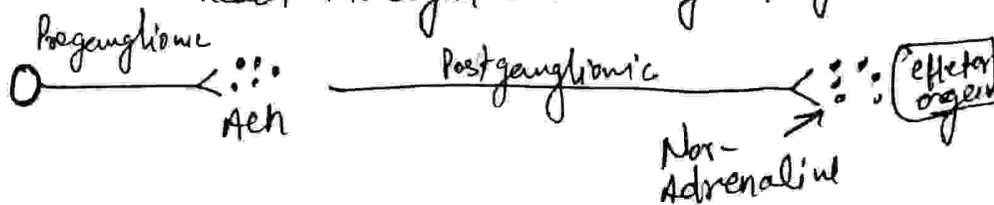
• They pass through anterior nerve roots of spinal nerves & run for a short distance in the spinal nerve and from the spinal nerves, they are communicated to ganglia of sympathetic chain through white rami communicantes.

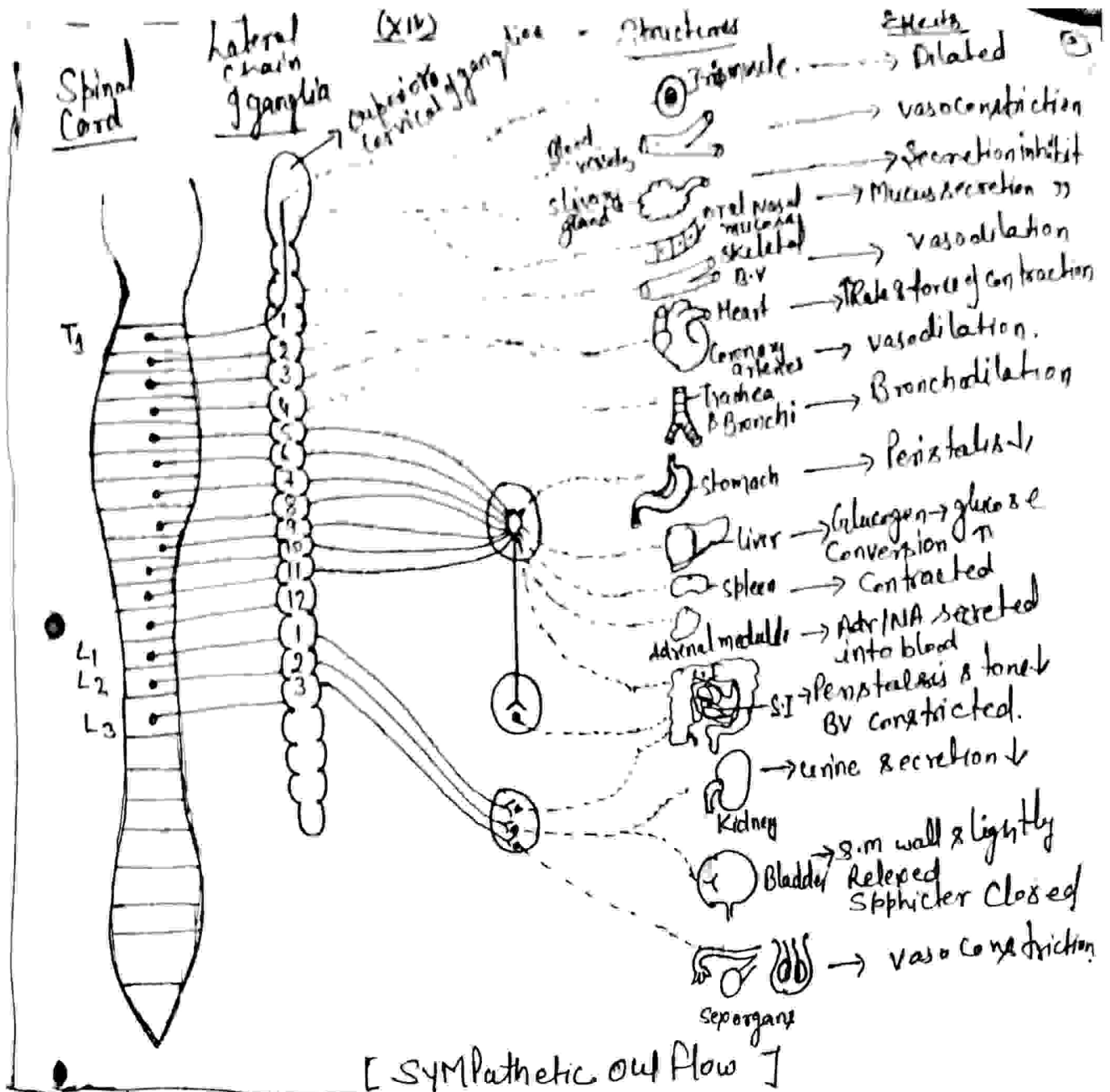


⇒ Post ganglionic fibres:- They are from gray rami communicantes which arises from the ganglionic of sympathetic chain.

↓
 Enter into spinal Nerve of the same level

↓
 Reach the organ which they supply





Note

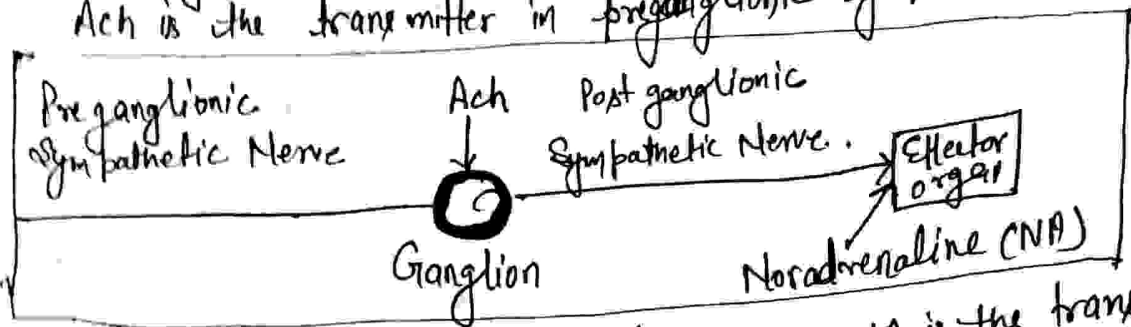
- i) Solid lines - Preganglionic fibres
- ii) Broken lines PostGanglionic fibres.

- Stimulated the heart beat
- Raises Blood pressure
- Dilates the pupils
- Dilates the bronchi
- Stimulates glycoagenolysis - the conversion of liver glycogen - gluco^s.
- Inhibit peristalsis in the GI tract
- Inhibit contraction of the bladder & rectum.
- Urine secretion will increase
- Blood vessels constricted.

Chemical Transmitters

(X)

- The transmitter in preganglionic sympathetic nerve is Acetylcholine (ACh) which is liberated at the ganglion. ACh is the transmitter in preganglionic sympathetic nerve also.



- But in postganglionic sympathetic nerves, NA is the transmitter. It is liberated at the postganglionic sympathetic nerve ending.

B) Parasympathetic Nervous System.

The parasympathetic nervous system is the branch of the autonomic nervous system (ANS) responsible for the body's ability to recuperate & return to a balanced state after experiencing pain or stress.

⇒ Preganglionic fibers: — The preganglionic fibres of parasympathetic nerves arise from cells present in — Midbrain, Medulla, & Sacral portion of spinal cord ⊕

- From midbrain the fibres emerge through oculomotor nerve
- From the medulla, they emerge through facial

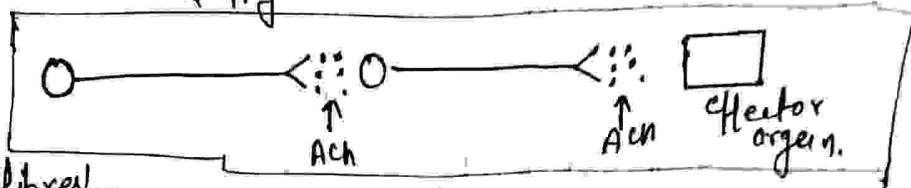
glossopharyngeal & vagus nerve.

- From the sacral portion of spinal cord, they arise from anterior column of 2nd, 3rd & 4th lumbar segments

↓
Then pass through anterior roots of the corresponding spinal nerves.

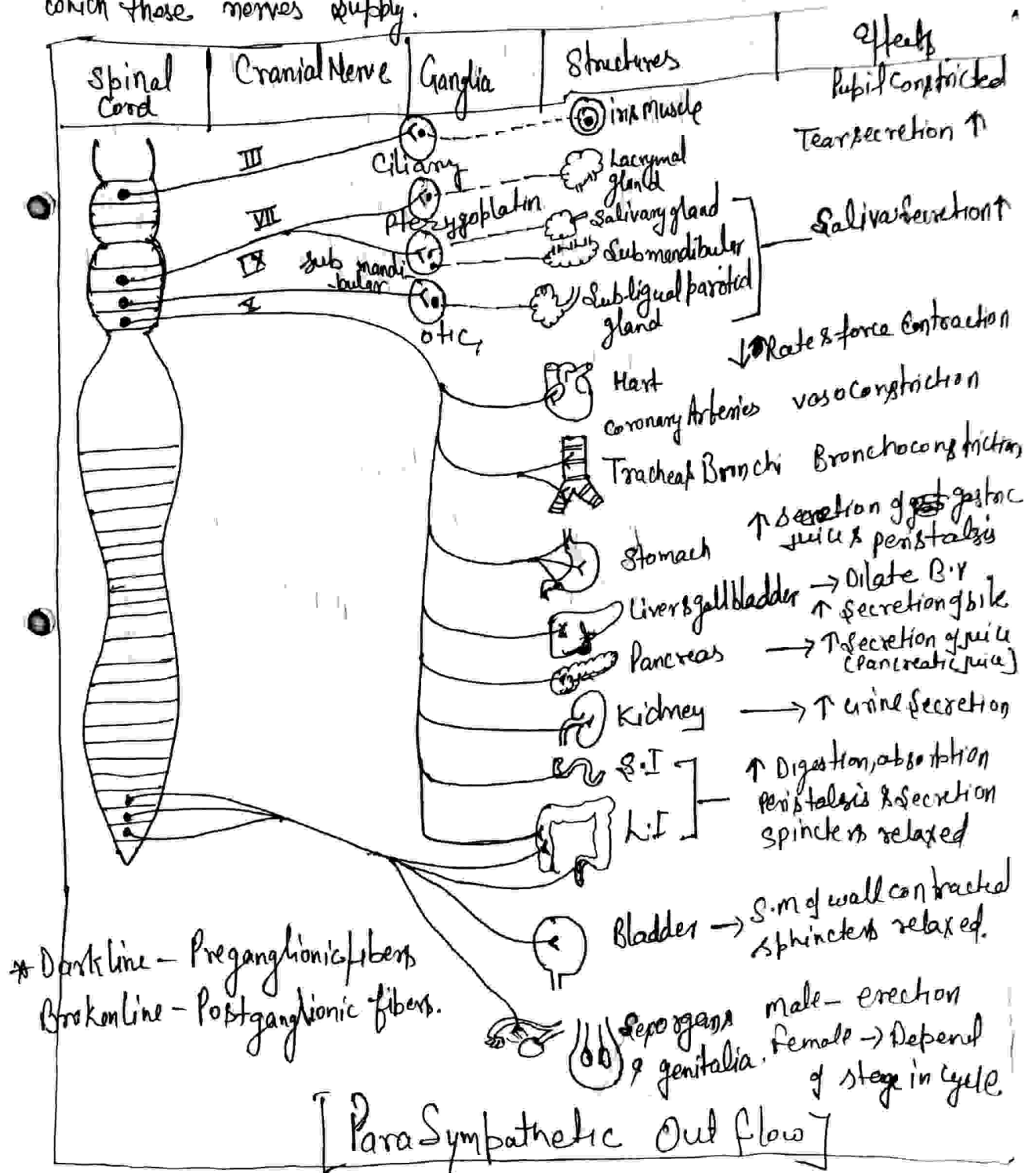
↓
All these nerves end in a ganglion

(XI)
 These parasympathetic ganglia are very near to the structures which these nerves supply.



Postganglionic fibres:-

They arise from the ganglia & then reach the structures which these nerves supply.

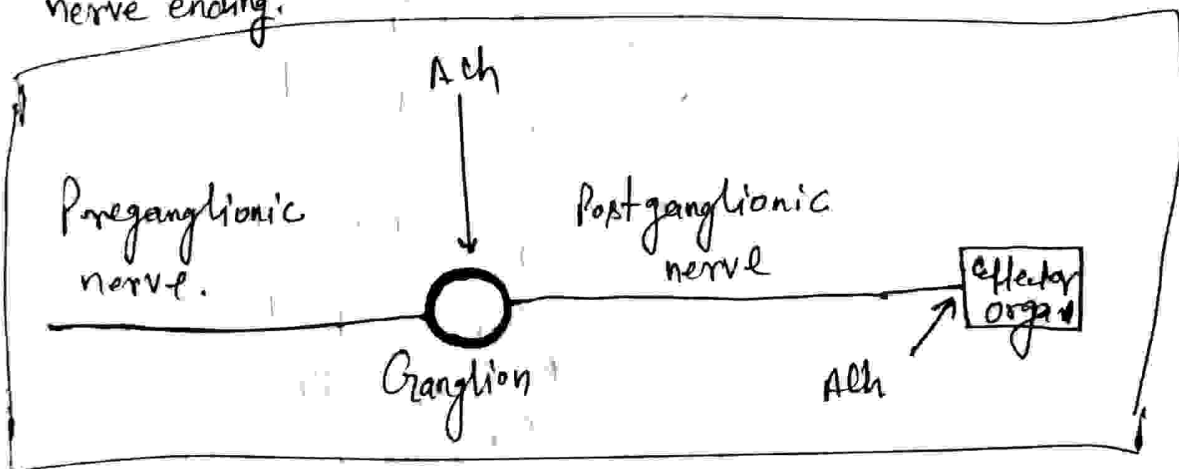


(XII)

- Slowing down of the heart beat
- lowering of blood pressure
- Constriction of the pupils
- ↑ blood flow to the skin & viscera
- Paralysis of the GI tract.

Chemical Transmitters:-

- The transmitter in preganglionic parasympathetic nerve is acetylcholine (ACh) which is liberated at the ganglion.
- ACh is the transmitter in postganglionic parasympathetic nerve. It is liberated at the postganglionic parasympathetic nerve ending.



| (XIII) <u>Difference Between SNS & PSNS</u> | |
|---|---|
| Sympathetic NS | Parasympathetic NS |
| <p>i) Sympathetic nervous system is part of ANS, that serves to accelerate the heart rate, constrict blood vessels and raise blood pressure.</p> <p>ii) Originates from cranial, thoracic & lumbar regions of the CNS.</p> <p>iii) Prepares the body for an intense physiological activity.</p> <p>iv) Action is a quick response.</p> <p>v) Ganglion are found close to CNS but away from effector.</p> <p>vi) Pre-ganglionic fibers are short & post-ganglionic fibers are long.</p> <p>vii) A large number of post-ganglionic fibers are found.</p> <p>viii) Covers a large area in the body.</p> <p>ix) Generates a diffused effect at its target area.</p> <p>x) Noradrenaline is released at the effector.</p> <p>xi) Generates an excitatory homeostatic effect.</p> <p>xii) Increases heart beat, blood level & metabolic rate.</p> <p>xiii) Dilates the pupil of the eye.</p> <p>xiv) Inhibits the saliva secretion.</p> <p>xv) Dilates the bronchial tubules.</p> | <p>i) Parasympathetic nervous system is part of ANS that slow the heart rate, increase intestinal & glandular activity, & relax the sphincter muscles.</p> <p>ii) Originates from cranial & sacral regions of CNS.</p> <p>iii) Relaxes the body by inhibiting high energy functions.</p> <p>iv) Action is slow response.</p> <p>v) Ganglion found close to CNS effector but away from CNS.</p> <p>vi) Pre-ganglionic fibers are short ^{long} and post-ganglionic fibers short.</p> <p>vii) A small number of post-ganglionic fibers are found.</p> <p>viii) Covers small area in the body.</p> <p>ix) Generates a localized effect at its target area.</p> <p>x) Acetylcholine (ACh) is released at the effector.</p> <p>xi) Generates an inhibitory homeostatic effect.</p> <p>xii) Decreases heart beat, blood level & metabolic rate.</p> <p>xiii) Stimulates the pupil of the eye.</p> <p>xiv) Stimulate the secretion of saliva.</p> <p>xv) Constricts the bronchial tubules.</p> |

xvi) Release Adrenaline from the adrenaline glands.

xvii) Increase the activity of the digestive system.

xviii) Increase the rate of glycogen breakdown

xix) Decrease the urinary output

xx) Contracts the rectum.

xvi) No action on adrenal gland.

xvii) Decrease the activity of the digestive system.

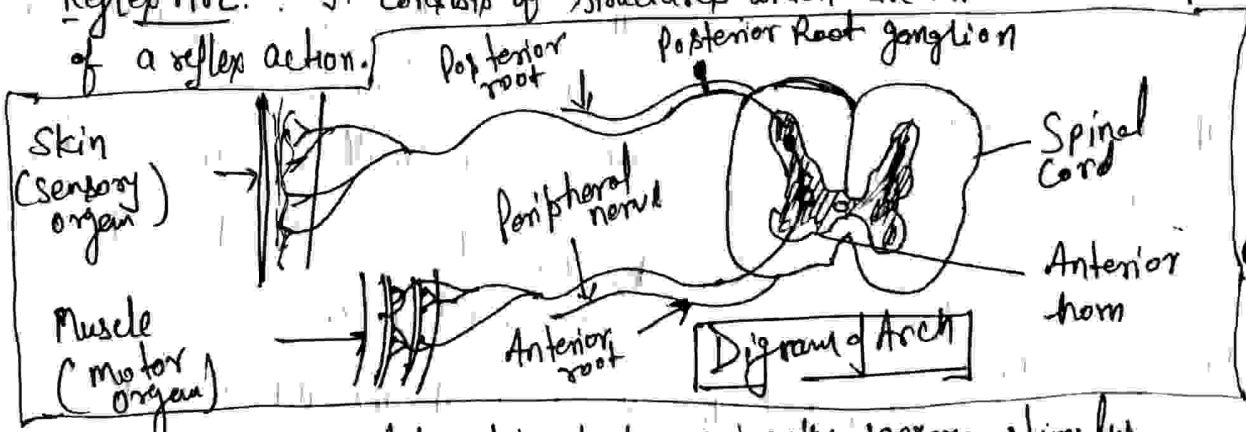
xviii) Decrease/No effect on the glycogen breakdown.

xix) Increases the urinary output.

xx) Relax the rectum

Reflex Action :- Reflex Action occurs independent of it is concerned with involuntary movements. It is a defence mechanism manifesting as a quick & automatic motor response for sensory stimulus.

Reflex Arc :- It consists of structures which are involved in the production of a reflex action.



→ Sensory Organ :- Like skin which receives the sensory stimulus.

→ Sensory nerve - which arises from the sensory organ, through a peripheral nerve, it terminates at the posterior nerve root of spinal cord.

→ Motor nerve which commences from the anterior horn cell of spinal cord. The nerve transmits the impulses to the motor organ such as muscles.

Importance :- Impulses of reflex action are carried only to the spinal cord & not to the motor cortex of brain. The impulses from the spinal cord are conveyed to the motor organ. So the response is quick & immediate. (XIV)

Special Senses

①

- Special sense organs are characterized by large & complex organs each with a unique function.
- Sensory organs have special receptors that allow us to smell, taste, see, hear and maintain equilibrium or balance. Information conveyed from these receptors to the CNS is used to help to maintain homeostasis.

Organ of Special Senses are:-

- Eye
- Ear
- Nose
- Tongue.

① Eye

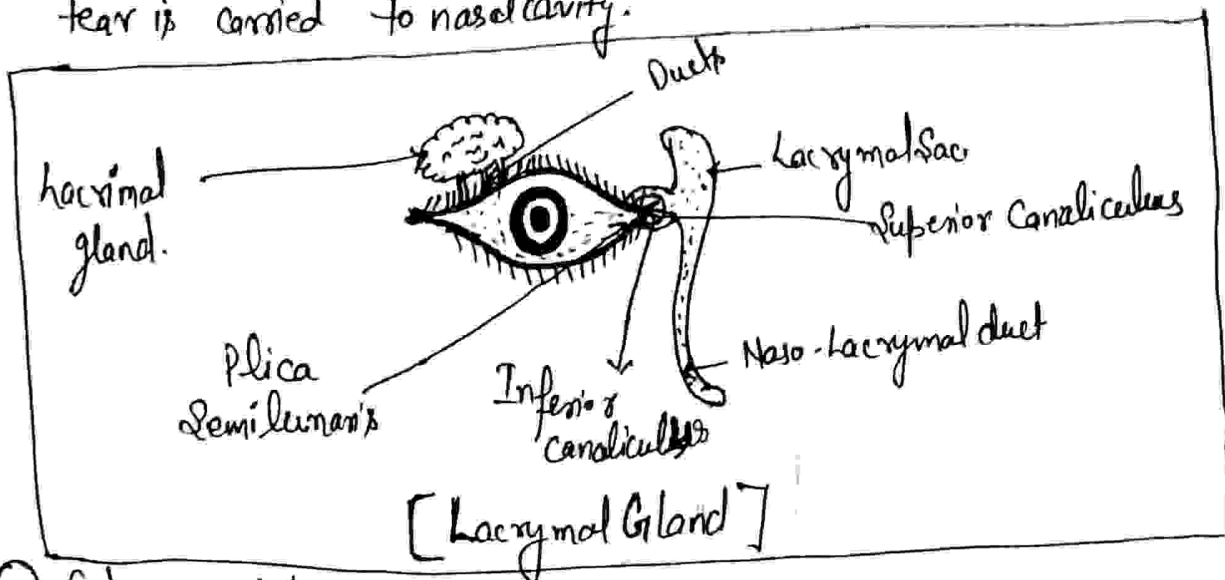
Eye is a sensory organ of vision which is situated in the orbital cavity of skull. It contains the eye ball which is surrounded & supported by a number of accessory structures.

Accessory Structure of Eye:-

- ① Eye brows:- These are hairy & arches of thick skin over the eyes. They protect eyes from sweat, dust, & rain drop etc.
- ② Eyelids:- They are the upper & lower eyelids which protect eye. The upper eyelid is larger & more mobile. It is raised by levator palpebrae muscle.
- Both upper & lower eyelids protect the eyes from excessive sun-light & foreign objects & spread lubricating secretions around the eye ball.

(c) Lacrimal apparatus / glands:-

It is concerned with the production of tear & it consists of
 - Lacrimal gland - Situated in the lateral & upper eyelid
 - Lacrimal duct, lacrimal sac & nasolacrimal duct through which tear is carried to nasal cavity.

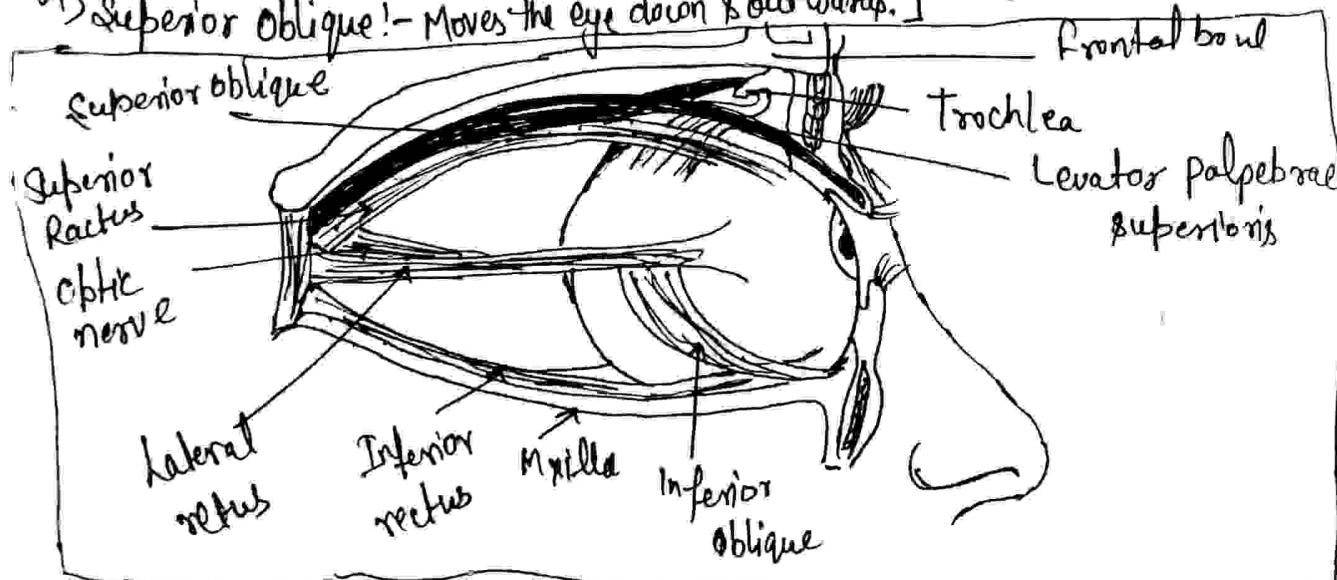


(d) Extrinsic Muscles of Eye:- The eye ball is moved by six muscles. These muscles arise from the posterior bony wall of orbit inserted in to the sclera.

- i) Superior rectus! - Moves the eye upwards,
- ii) Inferior rectus! - Moves the eye down wards,
- iii) Medial rectus! Moves the eye In wards,
- iv) Lateral rectus! - Moves the eye out wards,
- v) Inferior oblique! - Moves the eye up & outwards.
- vi) Superior oblique! - Moves the eye down & outwards.

} These are straight muscles.

} These are Oblique muscles.



(2) **Eye Ball**:- Almost spherical in shape & it is situated in the anterior part of orbital cavity. Eye ball contains 3 coats & three light-transmitting structures. The three coats of eye ball are:-

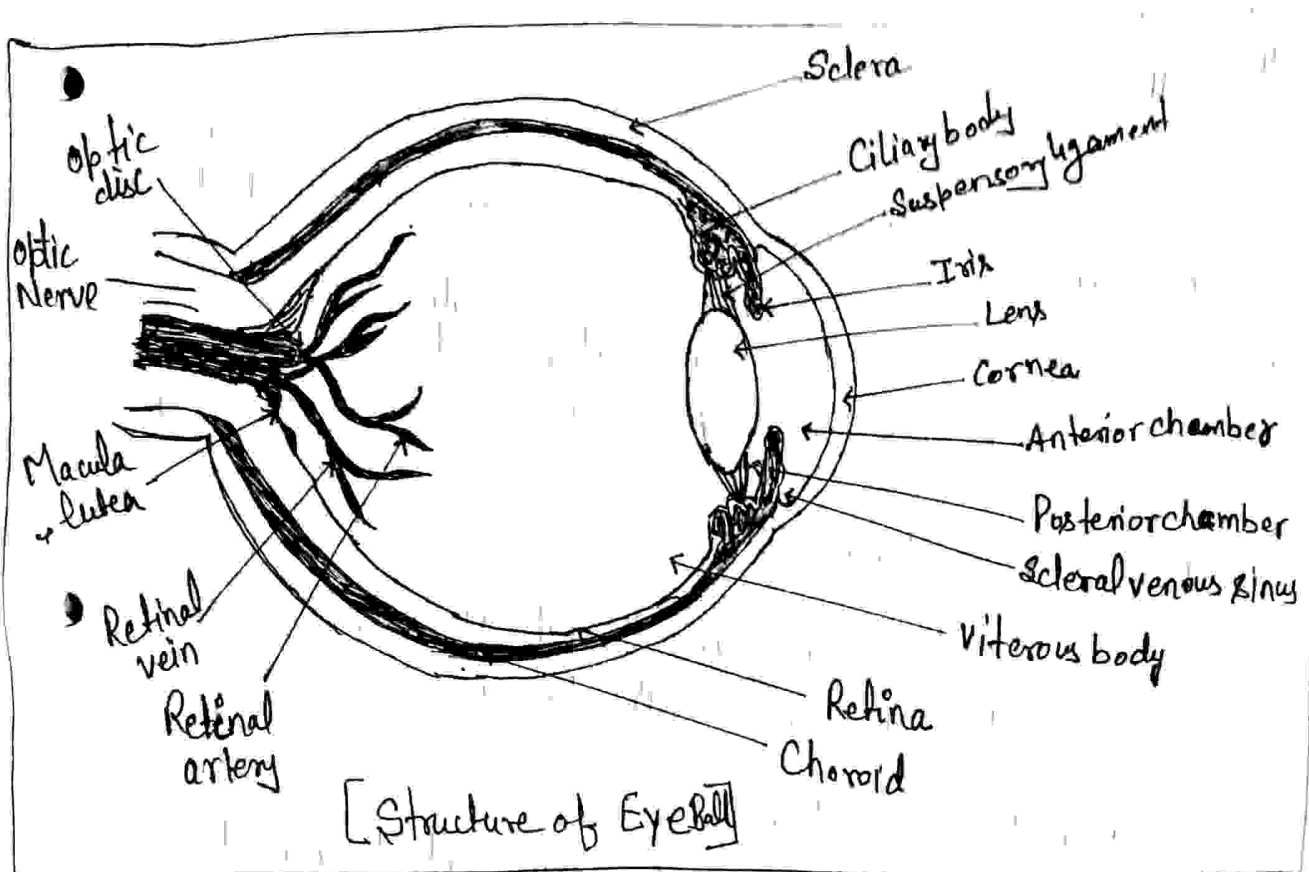
(1) **Outer fibrous coat**:- It contains sclera & cornea.

(2) **Middle vascular coat**:- It contains choroid, ciliary body and iris.

(3) **Inner nervous coat**:- It contains Retina, optic disc, macula.

The three light transmitting structures are:-

(i) Aqueous humour (ii) Lens (iii) Vitreous humour.



(1) Outer Fibrous Coat

(i) **Sclera**:- Outer part of the eye ball. It covers the entire eye ball except cornea.

- Sclera protects the internal structures & also maintains the shape of eye ball

- The optic nerve passes through the posterior aspect of sclera & reaches the Retina.

Cornea: It is transparent and has a convex anterior surface.

It has no blood supply but it is richly supplied by sensory nerves.

* At the junction of sclera & cornea is an opening known as Canal of Schlemm.

② Middle vascular coat:-

i) Choroid:- It is a thin, pigmented and highly vascular membrane. It lies in the posterior compartment of the eye & lies b/w the inner surface of sclera & retina.

ii) Ciliary body:- It is the anterior continuation of choroid & it lies between choroid & iris. The ciliary body contains ciliary muscle. The suspensory ligament of lens is attached to ciliary muscle.

iii) Iris:- It is the anterior continuation of ~~choroid~~ ^{Ciliary body} & it lies between iris & lens. Iris is a pigmented membrane and the colour of eye is dependent on its pigments.

Iris has a central opening called pupil. Two sets of iris muscles control the pupil.

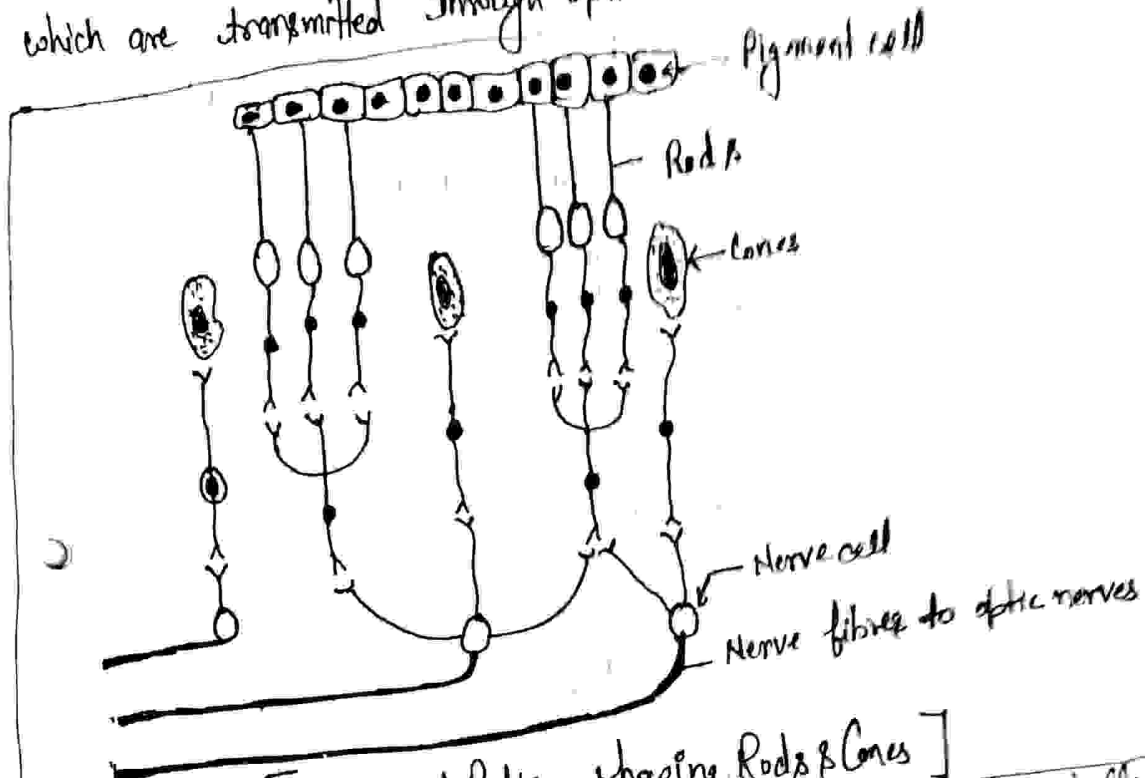
- Circular muscles which reduce the pupillary size.
- Radial muscles which increase the pupillary size.

③ Inner nervous coat:-

i) Retina:- It is the inner most nervous coat of eyeball and lies immediately deeper to choroid. The retina contains

- Nerve cells & Nerve fibres which are in the inner surface (facing the chamber of eye)
- Some special structures called Rod & Cones, which are on the outer or choroidal surface of retina.

These rods and cones receive the light & the rest of impulses which are transmitted through optic nerve.



[Layers of Retina showing Rods & Cones]

ii) Optic disc: It is the point where the optic nerve leaves the eye ball. This point does not contain retina & it is insensitive to light so this point called as blind point.

iii) Macula: It is a small area of retina situated just lateral to the entrance of optic nerve. It is exactly opposite to the centre of pupil. Direct or near vision is focussed on macula.

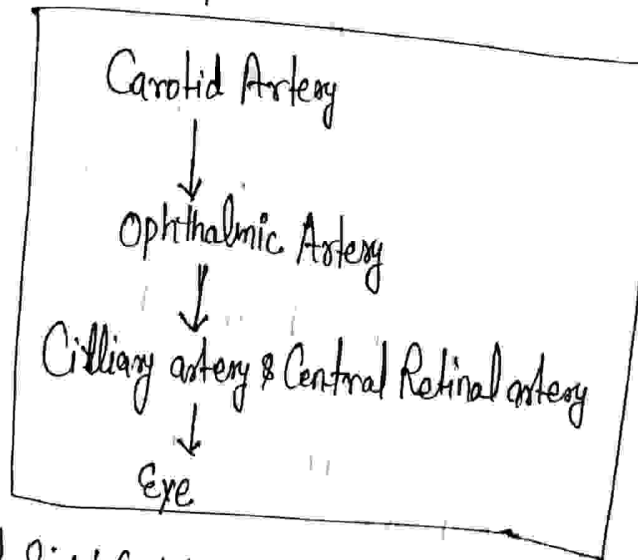
④ Light Transmitting Structures:-

• Lens:- lens is present behind the pupil & lies within the cavity of eye ball. A crystalline protein arranged like the layers of an onion, make up the lens transparent & lacks blood vessels. The lens have to focus images on the retina to facilitate clear vision.

ii) Aqueous humour:- It is a fluid present in the both the ant and posterior chambers of eye.
Posterior b/w iris & lens, and anterior b/w cornea in front & iris, ciliary body back

iii) Vitreous humour:- It is a jelly like fluid which fills the space b/w lens & retina & maintain the shape of eye. It keeps it keeps the retina in contact with ~~choroid~~ & choroid.
Sclera

Blood Supply to Eye

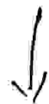


Mechanism of Sight (Vision)

Light enter the eye through Cornea

↓
Iris & pupil regulate the amount of light entering the eye.

↓
Image is then focused through the lens on the retina



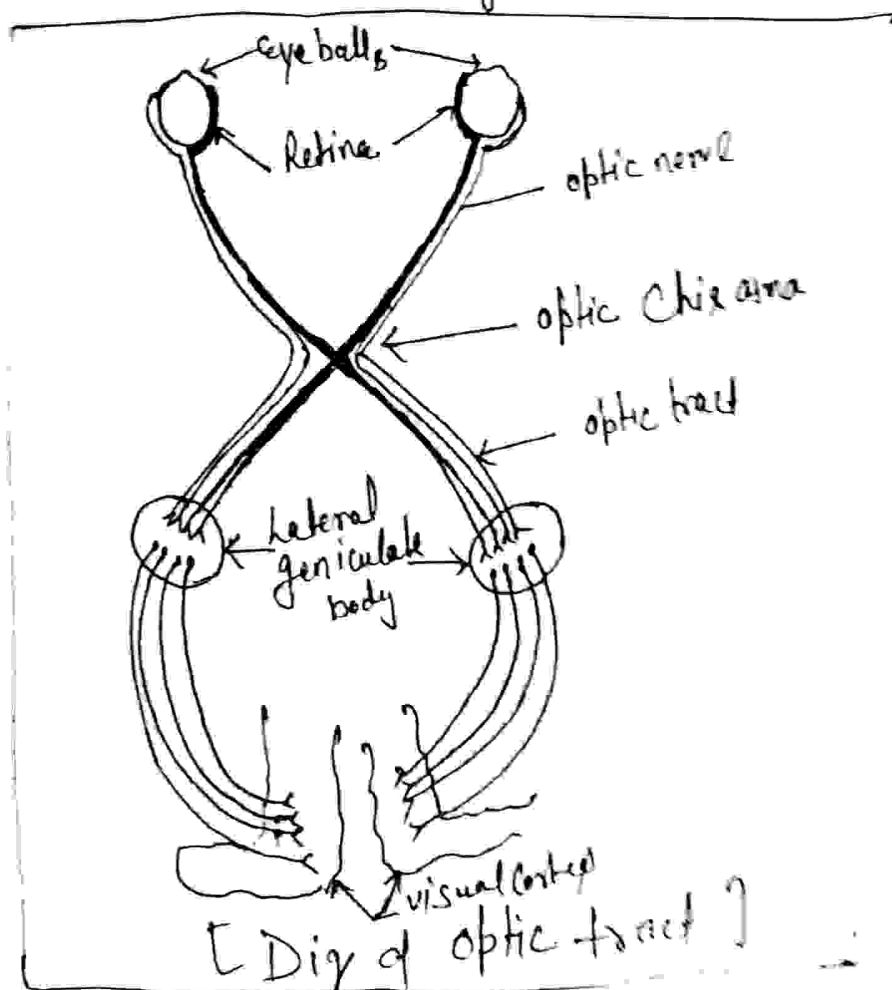
↓
 Pigmented Choroid darkens the interior of the eye
 Reduces scattering & reflection of light

↓
 Image stimulates by the receptors present in
 the rod & cones of retina.

↓
 Impulses are carried through optic nerve
 The optic nerves of both side cross called optic chiasma

↓
 from optic chiasma, the impulses are carried by optic tract
 & visual cortex present in the occipital lobe of brain

↓
 Here the image is ~~processed~~ processed



Accommodation!- It is the focussing of the lens for vision. Ciliary muscles which are attached to the lens control the mechanism of accommodation

⇒ The contraction & relaxation of these muscle alter the focal length of the lens.

⇒ Contraction of these muscles focuses the lens for near vision

⇒ Relaxation of these muscles focuses the lens for distant vision

* Focussing the lens for distant vision is called as cycloplegia or Paralysis of accommodation.

Diseases of Eye

- i) Contract!- Opacity of lens is termed as Contract. It is caused by the degenerative changes in the cells of the lens.
- ii) Glaucoma!- It is an increase in intraocular tension produced due to excessive collection of aqueous humor. Unless properly treated it may lead to blindness due to retinal damage.
- iii) Presbyopia!- It is a defect in accommodation, It occurs in old age due to loss of elasticity of the lens.
- iv) Myopia!- (Short Sight)!- Occurs due to an increase in the antero-posterior diameter of the eye ball. So the image is formed in front of the retina. The patient can see the near objects without difficulty. But distant objects cannot be seen easily. This is corrected by using Concave lens.
- v) Hypermetropia (Long Sight) Occurs due to decrease in antero-posterior diameter of the eye ball. So image falls behind the retina. Near object cannot be seen easily. This is corrected by using Convex lens.

5

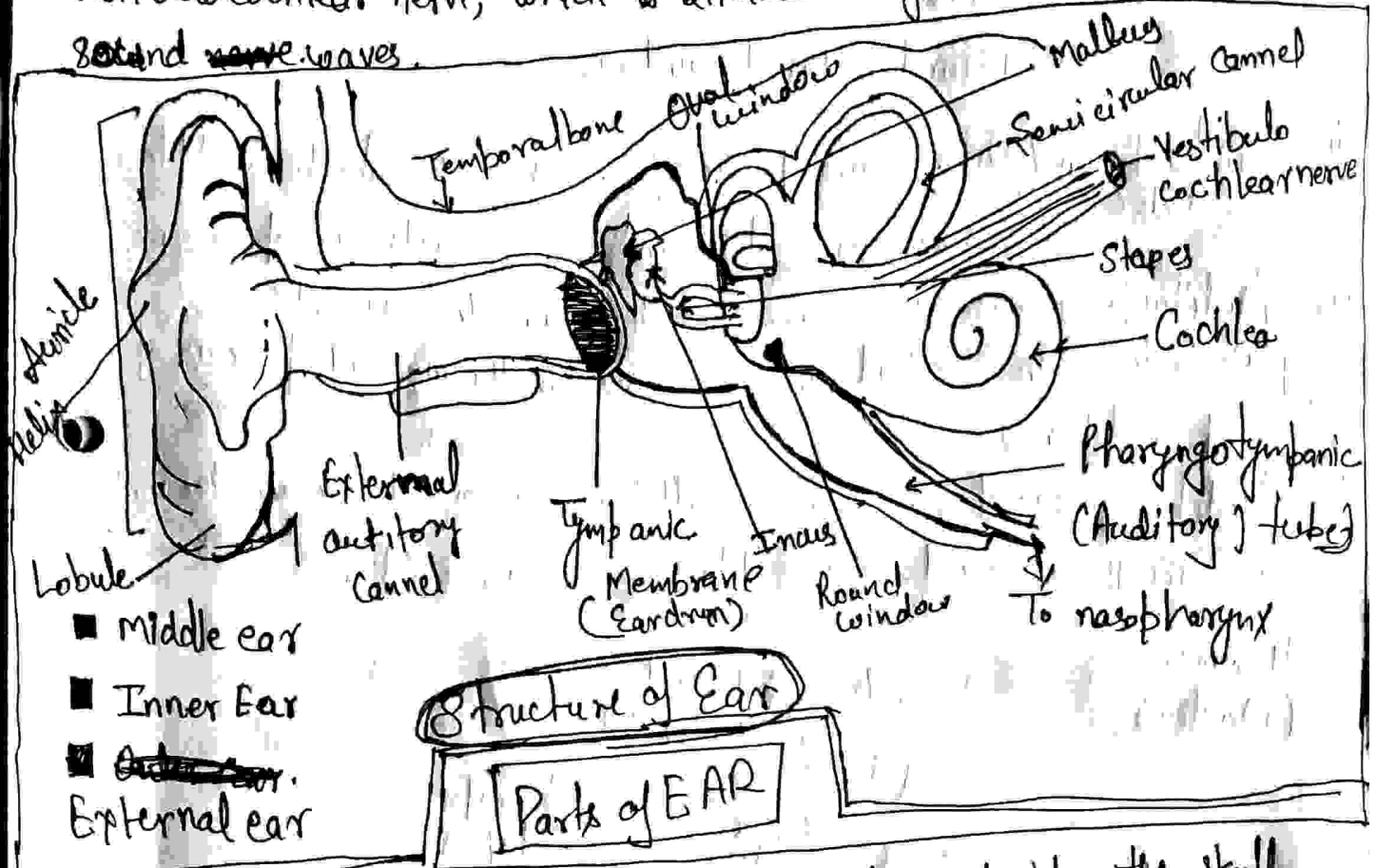
Functions of Eye (on the basis of eye parts)

| Parts | Functions |
|--------------|---|
| Sclera | Tough outer layer of the eye which covers & protects eye ball. |
| Choroid | Prevents internal reflection of light & nourishes retina. |
| Retina | Contains rods & cones which convert light into nerve impulses. |
| Ciliary body | A ring of muscle controlling the shape of curvature of the lens. |
| Iris | Controls the pupil size thus controls entry of light. |
| Pupil | A hole in the iris that lets light into the back of eye. |
| Lens: | Accommodation & focusing of light onto the retina. |
| Cornea | Bends incoming light focusing it on the retina. |
| Blindspot | Exit point of the optic nerve cutting through the retina so no rods or cones. |
| Optic nerve. | Carries the impulses from the rods & cones to the visual center of the brain. |

Unit - IV

EAR

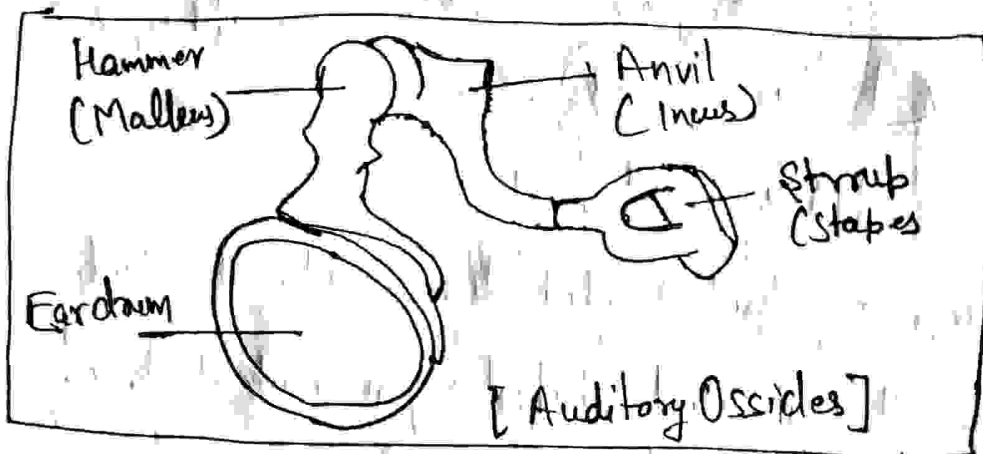
Ear is the organ of hearing and also involved in balance. It is supplied by the 8th cranial nerve that is the cochlear part of the vestibulocochlear nerve, which is stimulated by vibrations caused by sound waves.



- ① External Ear:— Only part which lies outside the skull.
- i) Pinna/Auricle: It is a funnel shaped organ made of elastic fibrocartilage. It helps to collect the sound waves.
- ii) External Auditory Meatus/Canal:— It is a small channel lined by skin & wax secreting glands. It conveys the vibrations of sound to the tympanic membrane / Eardrum.

2) Middle Ear :- It is a small cavity in the temporal bone.

- i) Tympanic Membrane :- Also called eardrum which form the lateral wall.
- ii) Two Foramina in the inner or medial wall called
 - Fenestra ovalis / oval window
 - Fenestra Rotundum / Round window.
- iii) Eustachian (Pharyngotympanic) Tube :- Through which middle ear communicates anteriorly with mesopharynx.
- iv) Auditus :- A narrow channel which connects the middle ear posteriorly with mastoid antrum (Present in the mastoid process of temporal bone)
- v) Auditory ossicles :- Three small bones arranged across the middle ear. The three ossicles are :- Malleus, Incus, & Stapes



- The handle of malleus is fixed to the eardrum & other head of malleus is connected to incus which in turn is connected to stapes.

3) Internal Ear :- The internal ear is also called as labyrinth.

It consist two part

- Bony Labyrinth
- Membranous Labyrinth.

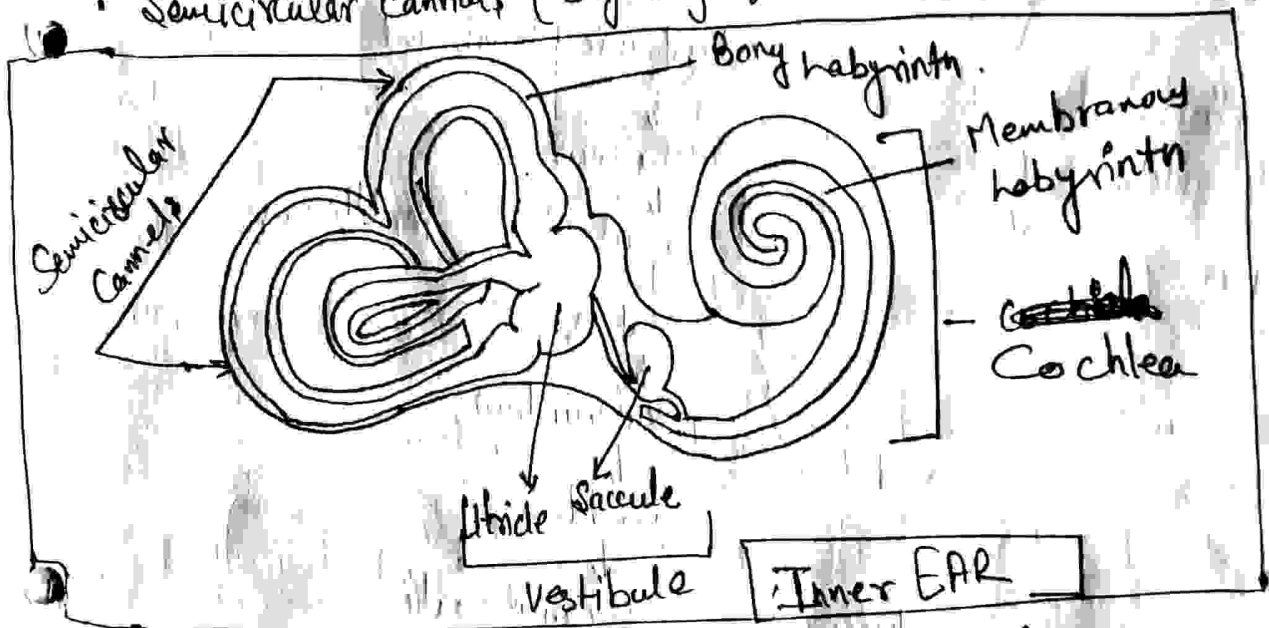
Membranous Labyrinth:- which lies in the bony labyrinth. ③

- The membranous labyrinth is filled with a fluid called endolymph.

ii) Bony labyrinth:- which consists of a series of channels. The bony labyrinth contains fluid called perilymph.

Bony labyrinth contains three structures:-

- vestibule
- Cochlea (organ of hearing)
- Semicircular canals (organ of equilibrium)



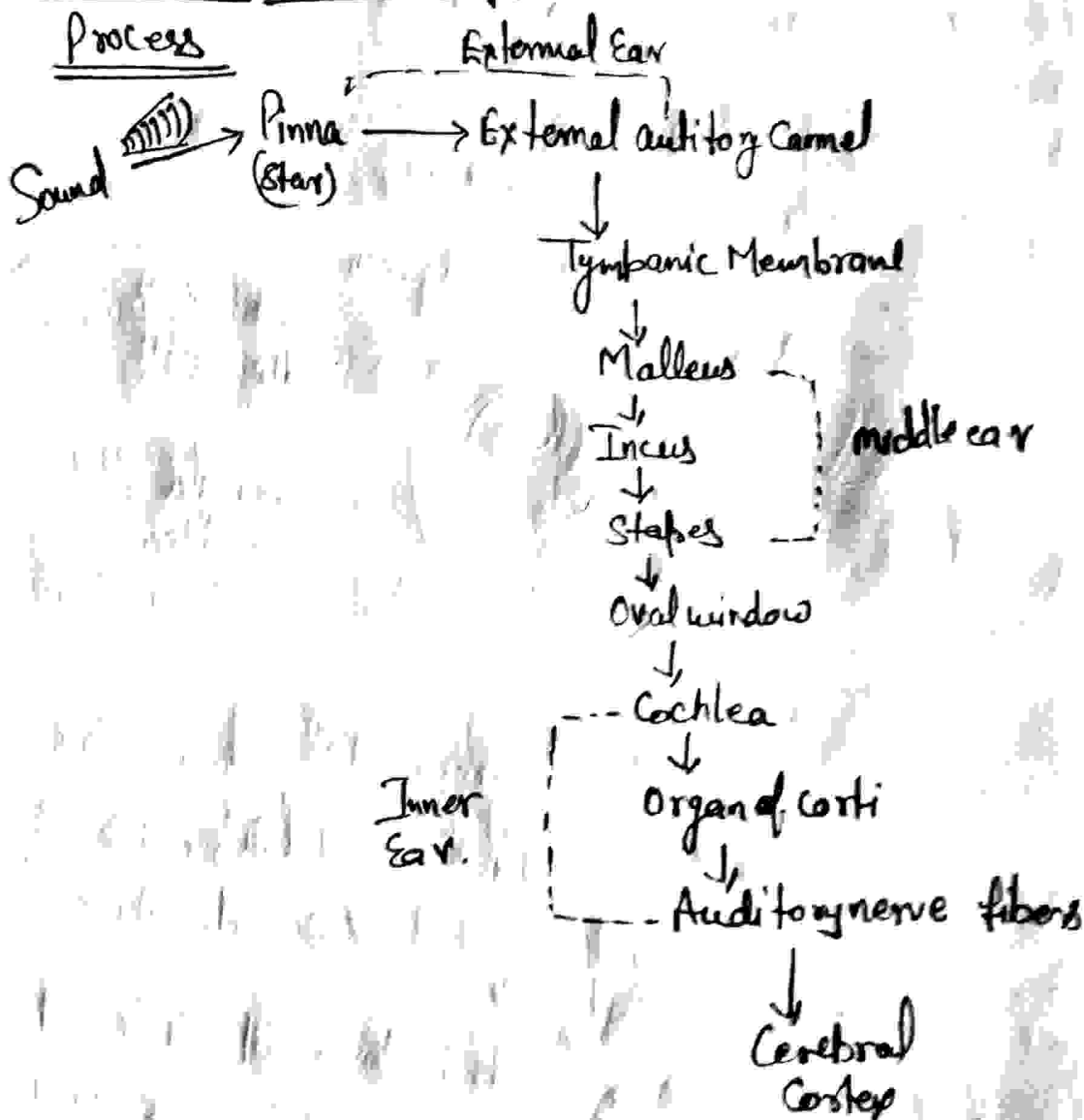
i) Vestibule:- It is the central part, it is also ~~called~~ Cochlea & Semicircular canals. It contains utricle & saccule which are the part of membranous labyrinth.

ii) Cochlea:- It is a spiral canal which looks like the shell of snail.

Modiolus is a central column of spongy bone ~~around~~ around which the spiral canal twines.

ii) Semicircular Canals :- Each ear has three semicircular canals which are placed at right angles to each other. They are posterior, superior & lateral semicircular canals. Each semicircular canal has enlarged end called ampulla. It has endings of vestibular nerve & also some hair like projections.

Mechanism of Hearing :-



Events Involved in Hearing

③

(i) Sound wave arrive at the tympanic membrane



(ii) Movement of the tympanic membrane causes displacement of the auditory ossicles



(iii) Movement of the stapes at the oval window establish pressure waves in the perilymph of the vestibular duct.



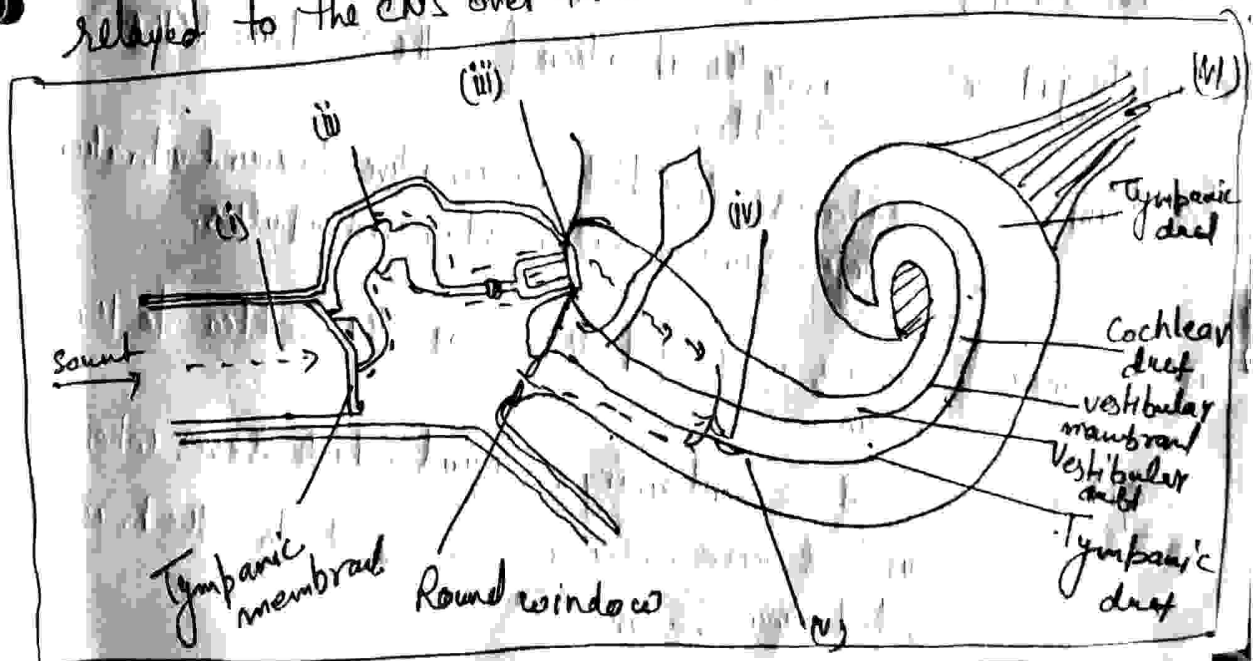
(iv) The pressure wave distort the basilar membrane on their way to round window of tympanic duct.



(v) Vibration of the basilar membrane causes vibration of hair cells against the tectorial membrane.



(vi) Information about the region & the intensity of stimulation is relayed to the CNS over the cochlear branch of cranial nerve VIII



Diseases of EAR

i) Deafness:- It is the damage of a part of conduction system or pathway, ear drum, bones, middle ear & inner ear lead to conduction deafness while damage to external nerve fibres of cochlear nerve cause nerve deafness.

ii) Otitis externa:- The otitis externa refers to the inflammation of external auditory canal.

iii) Impacted Cerumen:- It is a condition in which ear wax accumulates in ear canal leading to blockage and pressure on ear canal.

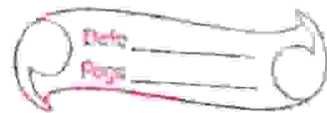


iv) Furunculosis:- It is infectious disorder characterized by formation of boils in the hair follicles.

v) Otitis Media:- It is the inflammation of the mucous membrane of middle ear, eustachian tube & mastoid process.

Function of ear

| Parts | Function. |
|------------------|--|
| Middle ear bones | Vibrate when sound wave reach to it |
| Auditory Nerve | Carry the vibration from the ear drum to the Cochlea |
| Ear drum | Contains cells, which are sensitive to sound vibrations change sound vibrations into nerve impulses. |
| Circular Canals | Carries nerve impulses from the cochlea to the brain |
| Cochlea | 3 tubes containing a liquid, which moves when the your head move, Messages are sent to the brain to control your balance |



NOSE

Nose is the most protruding part of the face. It bears the nostrils and is the first organ of the respiratory system. It is also the principal organ in the olfactory system. The shape of the nose is determined by the nasal bones and cartilage including the nasal septum which separates the nostrils & divides the nasal cavity into two. On an average the nose of a male is larger than that of a female.

STRUCTURE

Several bones and nasal cartil-

- ages makes up the bony - cartila-
- ginous framework of the nose,
and the internal structure.

The nose is also made up of
types of soft tissue such as
skin, epithelia, mucous membra-
- ne, muscles, nerves & blood. In
the skin there are sebaceous
glands & in the mucous membe-
- rane there are nasal glands.

The framework of the
nose is made up of bone and
cartilage which provides strong
protection for the internal stru-
- ctures of the nose. The arrange-
- ment of the cartilages allows
flexibility through muscle cont-
- rol to enable airflow to be
modified.

Bones that are possessed by a
human nose are nasal
bones, lacrimal bones, maxilla

Vomer bones & palatine bones. These bones provide structure & framework to the nose.

Cartilages The nasal cartilages are the septal, lateral, major alar and minor alar cartilages. It provides structure and support to the nose.

External Nose It includes nasal ridge that borders between the root and tip of the nose which in profile can be variously shaped.

It also includes ala of the nose is the lower lateral surface of the external nose, and it covers in the dense connective tissue. It forms a rounded eminence around the nostril.

Internal Nose It includes the cavities, lateral walls, roof of cavity, Choanae, Nasal valves, Nasal septulae, muscles.

- **Nasal Cavity:** It is the large internal space of the nose. It is lined with hair and mucous membranes. It warms or moistens & filters the air entering the lungs.
- **Lateral wall:** It is a region of the nasopharynx essential for humidifying & filtering the air we breathe in nasally.
- **Roof of cavity:** is formed in its upper third to one half by the nasal bone & more inferiorly by the junctions of the upper lateral cartilage & nasal septum.



- **Choanae** : These are the two openings, one from each fossa called choanae. It gives entrance to the nasopharynx and rest of the respiratory tract.
- **Nasal Valves** : Valve area in the cavity responsible for producing resistance to the flow of air. This enables an increased time for warming & moistening the air.
- **Nasal Vestibule** : It is the frontmost part of the nasal cavity & is enclosed by cartilages. It holds the unwanted particles entering the nose / lungs.
- **Muscles** : Facial & neck muscles provides movement of nose.

Mechanism Of Smelling

Olfactory nerves originate as chemoreceptors in the mucous membrane of the roof of the nasal cavity above the superior nasal conchae. On each side of the nasal septum, nerve fibers pass through the cribriform plate of the ethmoid bone to the olfactory bulb where interconnections & synapses occur. From the bulb, bundles of nerve fibers form the olfactory tract, which passes backwards to the olfactory area in the temporal lobe of the cerebral cortex in each hemisphere where the

impulses are interpreted & colour perceived.

FUNCTION

- Breathing : Nose traps the unwanted dust particles at the opening & hence, helps in the normal breathing.
- Cleansing : Sneezing & nose blowing helps in the cleansing of dust particles or foreign agents of the body.
- Smell : It is the main function of the nose i.e. smell. It help us to recognise the smell around us, whether it is good or not.

- Taste - Although taste is a completely separate sense than smell, the nose plays a role in the way the tongue perceives taste. Individuals with a congested nose report a decreased sense of taste.
- Voice - Air resonating in your nose affects the sound of your voice.

DISORDERS

OF

NOSE

NASAL POLYPS

Nasal polyps are those soft abnormal growths from the sinuses cavities on the surface of the nasal mucosa.

Symptoms -

Headaches, Snoring, Running Nose, Distorted sense of smell, etc.

Treatment -

- Avoid all medication that contain aspirin.
- Avoid over-the-counter nasal sprays.
- FESS, which is a surgical method.



RHINITIS

MEDICAMENTOSA

It is a condition of rebound nasal congestion brought on by extended use of topical decongestants and that works together constricting blood vessels in the lining of the nose.

Causes -

Pregnancy, Chronic rhinosinusitis & overuse of drugs, etc.

Treatment -

Treatment of Rhinitis medicamentosa involves withdrawal of the offending nasal spray by the surgery.

CHRONIC SINUSITIS

It is the inflammation and infection of the air-filled spaces that are located within the bones in & around the nose.

Cause -

Pregnancy, Nasal tumors, Low humidity, etc.

Symptom -

Sneezing, Tiredness, Running Nose, Severe headache, etc.

Treatment -

- Humidifier medications
- Possible surgery

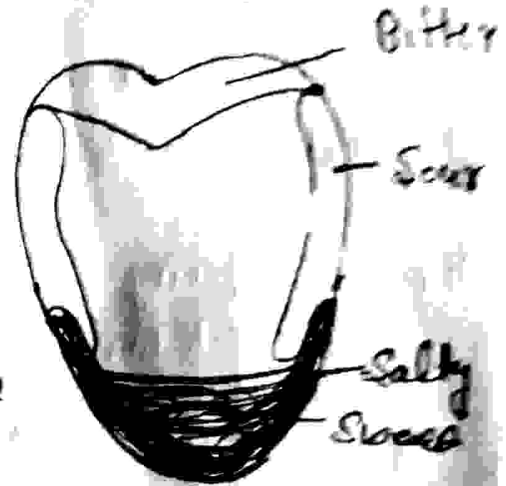
Unit - 4 Organ of Taste (Tongue)

The word taste comes from french word "taster" which means to touch. Taste is the detection & recognition of substances in relation to touch. Taste is the detection & recognition of substances in relation to touch.

The receptors for the sensation of taste are taste buds. The taste buds are present at the sides and base of the tongue.

Types of Taste buds

- i) Sweet — At the tip
- ii) Sour — At the back edge
- iii) Salty — At the front edge
- iv) Bitter — At the back

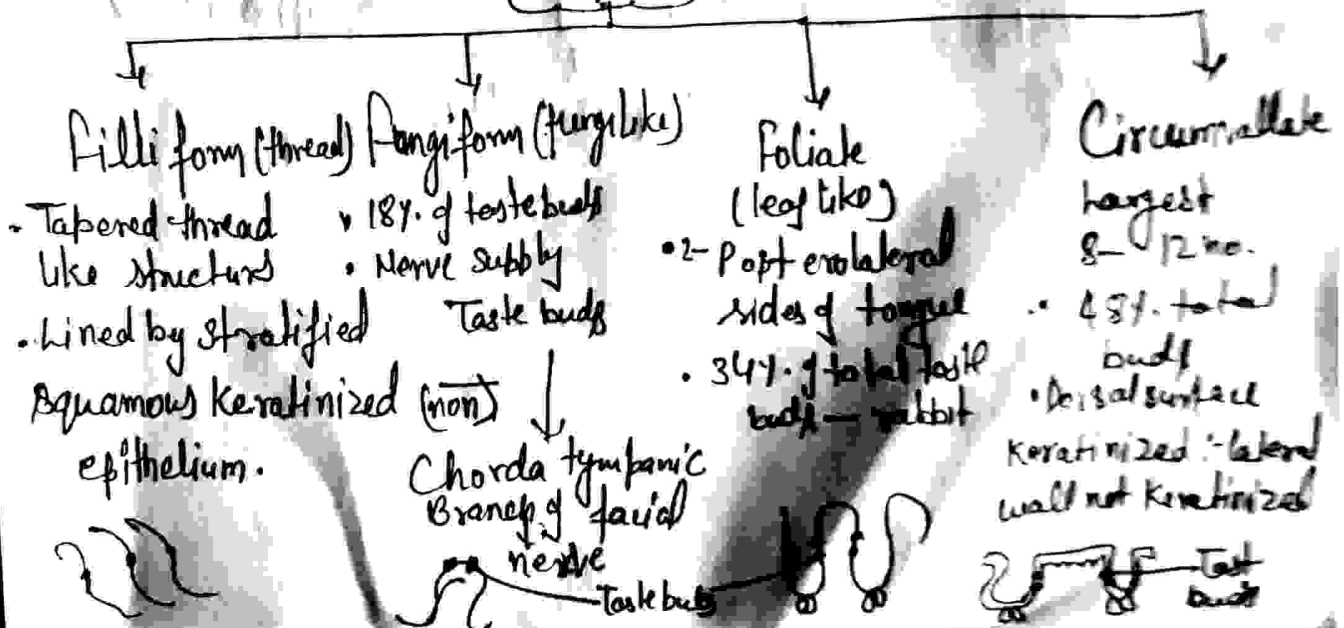


Location! — Mucous of tongue, soft palate, pharynx, epiglottis & esophagus

* Young adult — Approx. 9000 taste buds

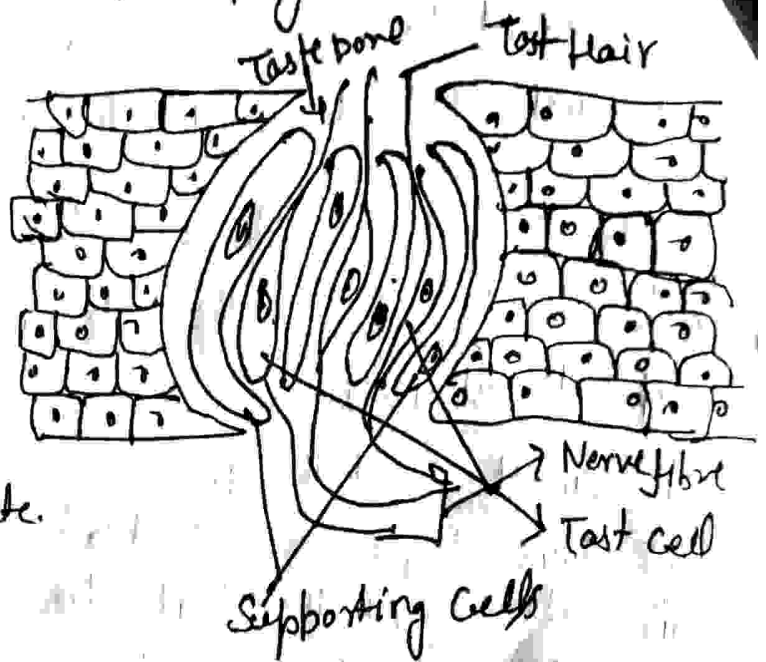
Papillae! — A small rounded protuberance on a part or organ of the body.

Papille



Taste buds — Barrel shaped 70 μm high & 40 μm diameter

- Components: —
- Cell
 - Taste Chamber
 - Taste pore



Taste chamber: —

Gel like material.

- Vit C & enzyme like acid
- phosphatase, esterase, ATPase etc.

- Taste pore: —
- Opening
 - 2-10 μm

Cells of the Taste buds

Supporting Cell (Dark cells)
 ↳ sustentacular
 — Columnar cells — darkly stained oval nuclei & granular cytoplasm — out capsule

Gratatory / Receptor (light cells)
 → single long microvillous
 → opening of taste buds
 — life span — 10 days.

Basal cells
 — stem cell found at periphery of taste bud near the connective tissue layer, producing supporting cells

Mechanism of stimulation of taste buds: - ②

Tastant (in sol. form) enters in pores of taste buds

↓
Reacts with receptor molecule on microvilli

↓
Opening/closure of ion channels (diff. for diff. taste modalities)

↓
Partial loss of -ve potential (receptor potential)

↓
Increase in Ca^{++} within taste cell

↓
Neurotransmitter release

↓
Action potential in sensory nerve.

● Function (Tongue)

- ✓ Suckling in infants
- ✓ Mastication.
- ✓ Mixing of food with saliva.
- ✓ Position food b/w teeth
- ✓ Formation of food bolus

Taste buds

- Taste is interpreted
- Impulse move to the parietal lobe of cerebrum
- Send an impulse through the sensory nerve fibers

Disease of Tongue

1) Ulcers of tongue!- Infective ulcers like herpes simplex infection

- Lichen planus

- Carcinoma

Glossitis Nutritional deficiencies & pernicious anemia & Candidosis cause inflammation & soreness of tongue. due to deficiencies of Iron, folic acid, Vit B12 & VB

Geographic!- (Erythema migrans)

It is an idiopathic benign lesion characterized by formation of red depapillated areas on tongue in "map" like configuration

Median Rhomboid Glossitis

It is defined as red depapillated rhomboid shaped area on dorsum of tongue caused by *Candida albicans* infection

Black Hairy tongue!-

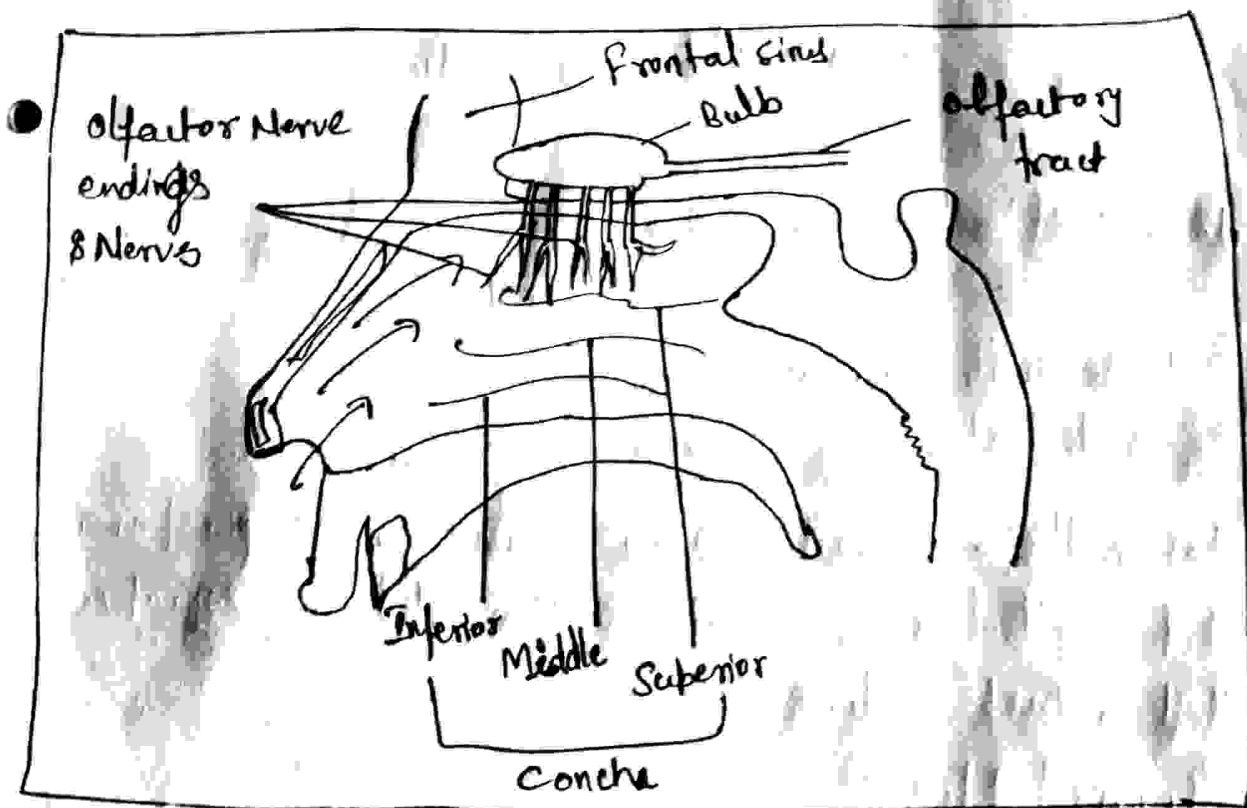
Hyperplasia of filiform papillae & overgrowth of pigment producing bacteria (as *Sporogillus* strain), Cause by smoking Antibiotic therapy, & Also excessive use of antiseptic mouth wash.

NOSE

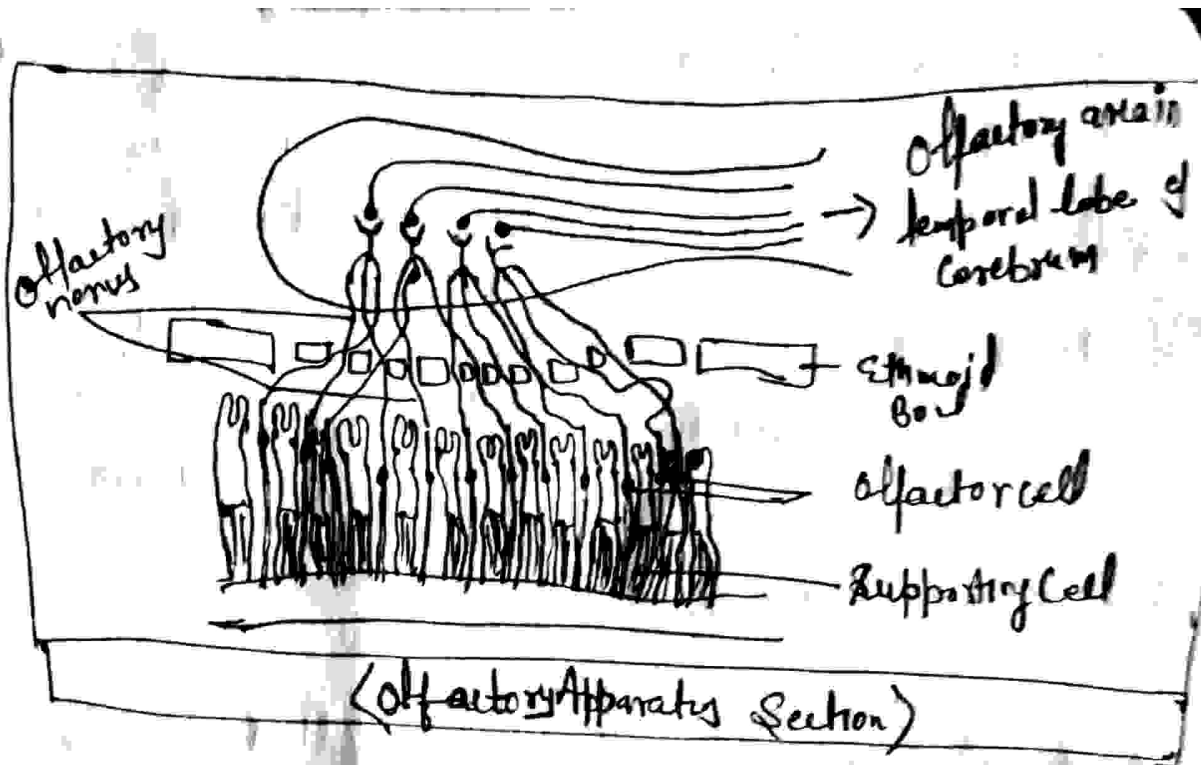
Nose is the organ of the sense of smell. The sensory nerves of smell are the olfactory nerves (first cranial nerve).

Olfactory Nerves:- These are the sensory nerves of smell.

They originate as specialized olfactory nerve endings (chemoreceptors) in the mucous membrane of the roof of the nasal cavity above the superior of nasal conchae.



- Each side of nasal septum nerve fibres pass through the cribriform plate of the ethmoid bone to the olfactory bulb, where interconnections of synapse occur.



Olfactory Cell! - These are the cells for smell sensation - bipolar nerve cells derived originally from the CNS

- 10 to 20 million Receptor cell
- Each olfactory receptor is a neuron

Olfactory bulbs! - Axons of receptors ~~contact~~ contact the primary dendrites of mitral cells, forming complex globular synapse called olfactory glomeruli

Function of Nose

- Breathing
- Smell
- Air Conditioning of inspired air
- Protection of lower airway
- Ventilation & drainage of P. NS (Paranasal Sinuses)
- Olfaction
- Nasal resistance.

Mechanism of olfactory cell stimulation

Odorant + Receptor protein

↓
Activation of G-protein

↓
Activation of adenylyl cyclase (AC)

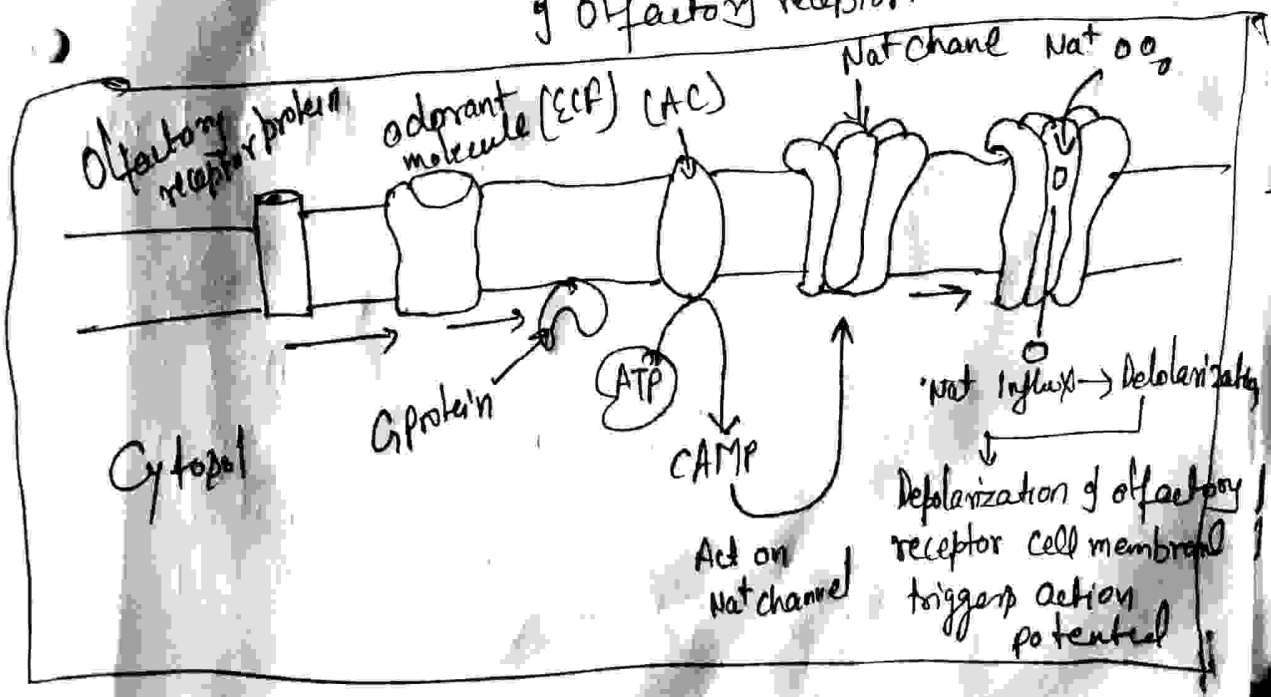
ATP → cAMP

↓
Opening of Na⁺ channels

↓
Na⁺ influx

↓
depolarization

↓
Nerve impulse & propagation along axon of olfactory receptor.



Diseases of Nose

- Nasal Vestibulitis :- Diffuse dermatitis of the nasal vestibule caused by *Staphylococcus aureus*. Cause by frequent picking of the nose.
- Rhinophyma :- Thickening & heaped raised lesions of the tip of the nose due to hypertrophy of sebaceous gland.
- Typically affects white male b/w 40 & 60 yrs. of age.
- Basal Cell Carcinoma :-
 - Most common malignancy of the skin commonly affecting the nose, long term exposure to sunlight.