Pathway of Special Somatic Sensation

Pathways	First order neurons	Second order neurons	Third order neurons	Highest centre
Auditory	• Cell bodies in the **spiral ganglion** in the cochlea of the internal ear . • Their **peripheral processes** terminate on the hair cells of the organ of Corti (**the auditory receptors**). • Their **central processes** form the **cochlear root** of the vestibulo-cochlear nerve. • It **crosses** the ponto-cerebellar **angle** in its way to enter the **pons**.	•Cell bodies lie in the **dorsal and ventral cochlear nuclei of the pons .** •The **majority of** their axons **cross** the middle line in the **tegmentum** of the lower pons **decussating** with their fellow of the opposite side forming the **trapezoid body**. These fibres **terminate** at the 3rd order neurons on the **opposite side**. •The **minority** of their axons remain on the **same side** to synapse with the ipsilateral 3rd order neurons.	• **3 pontine nuclei**: **1-Superior olivary nucleus.** **2-Nuclei of the trapezoid body.** 3- **Nucleus of lateral lemniscus.** • The **axons** of these nuclei form the **lateral lemniscus** which **ascends** from the pons to the midbrain where its fibres **enter** the **brachium of inferior colliculus** either directly or indirectly (after synapsing in inferior colliculus) . • The fibres of brachium of inferior colliculus end in **4th order neurons** which are cells of **medial geniculate body (MGB) of the metathalamus** . Their axons pass through the **sublenticular part of the internal capsule**, then **radiate** in the white matter forming the **auditory radiation .**	• **Auditory sensory cortical area** in **superior temporal gyrus** of the temporal lobe (**area 41 and 42**).

Vestibular	• **Bipolar cells of the vestibular ganglion** which are present in the *bottom* of the internal auditory meatus. • Their **peripheral processes** pass to the **vestibular end organs** in utricle, saccule and semicircular ducts. • Their **central processes form vestibular nerve which pass through the internal auditory meatus to** enters the brain stem at **the ponto-cerebellar angle** •	•**4 vestibular nuclei** *:* ▪ **Superior, lateral and upper 1/2 of medial** vestibular nuclei lie in the lower part of the pons . ▪ **Inferior and lower 1/2 of medial** vestibular nuclei lie in the open medulla. • **Afferents:** 1.Central processes of the cells of the **vestibular ganglion** which constitute the **vestibular nerve .** 2.From the cerebellum (**cerebello-vestibular fibres**) reaching the pons via the **inferior cerebellar peduncle** • ***Efferents:*** to 1.Cerebellum (**vestibule-cerebellar** fibres). 2.Spinal cord (medial and lateral **vestibulo-spinal** tracts). 3.Nuclei of oculomotor, trochlear and abducent nerves of **both sides** through the **medial longitudinal bundle** to coordinate the **conjugate movements of both eyes.** **4.Thalamus** and the **cerebral cortex**.	• **No third order neuron in vestibular pathway .** • **Vestibular pathway play an important role in *equilibrium*.** •	• **Cerebellum** • **Vestibular sensory cortical area is the operculum , lower part of inferior frontal gyrus and lower part of area 3,1,2** •

Visual	• Bipolar cells of the retina. They have: ▪ Peripheral processes ending at the rods and cones. ▪ Central processes synapsing with 2nd order neurons.	• Ganglion cells of the retina. Their axons collect to emerge from the eyeball as the optic nerve. At the optic chiasma: ▪ Nasal fibres cross the middle line in the optic chiasma to enter the optic tract of contralateral side. ▪ Temporal fibres pass directly without crossing into the optic tract of the ipsilateral side.i.e. Each optic tract contains: - Temporal fibres of the same side. - Nasal fibres from the opposite side. ▪ The fibres of the optic tract divide into two groups: - Visual fibres which synapse with 3rd order neurons . - Reflex fibres which pass through the brachium of superior colliculus to end at: • The pretectal nucleus: for papillary light reflexes. • The superior colliculus: for body-visual reflexes.	• Cells of the lateral geniculate body (LGB). • Their axons pass backwards through the retrolenticular part of the internal capsule to diverge in the white matter forming the optic radiation	• Occipital cortical area (17) . • Visual association areas (area 18 and 19) are responsible for recognition of the visual impulses (images) received in area 17. •