Anatomy of the brainstem

Section Level	General features	Nuclei	Fibres	Notes
Medulla Oblongata				
1 Level of decussation of the pyramids [motor]	Closed medulla -> the cavity is the central canal **anterior** to the central canal -> the motor decussation [pyramidal fibres] **posterior** to the central canal-> *medially*: nucleus gracilis and nucleus cuneatus, *laterally* -> fasciculus gracilis and fasciculus cuneatus Lateral to nucleus cuneatus -> the spinal nucleus of trigeminal	Nucleus gracilis Nucleus cuneatus Spinal nucleus of trigeminal	Decussation of lateral corticospinal [motor] fibres -> pyramid Fibers of the lateral spinothalamic tract & amt. and post. spinocerebellar tracts pass and remain unchanged	The spinal nucleus of the trigeminal is called so because it's longitudinal and reaches the spinal cord. It receives input from other nerves but mainly the trigeminal. One of the 3 sensory nuclei of the trigeminal. Receives **pain, temperature and crude touch** of the head & neck area.
2 Level of decussation of the lemnisci [sensory]	Closed medulla -> the cavity is the central canal **anterior** to the canal -> sensory decussation [PCML] and anterior to the decussation is the pyramids **posterior** to the canal -> the synapse between nucleus gracilis and cuneatus with fasciculus gracilis and cuneatus The spinal nucleus of the trigeminal lies **posterolaterally**.	Nucleus gracilis Nucleus cuneatus Spinal nucleus of trigeminal	Decussation of the posterior column - medial lemniscus fibres [sensory] Fibers of the anterolateral system start to form the **spinal lemniscus** with the spinotectal tracts	
3 Level of olives	Opened medulla -> the cavity is the 4th ventricle **Most anterior** -> pyramids **Midline structures** -> medial lemniscus, tectospinal tract, medial longitudinal fasciculus The **olivary nuclear complex** lies anterior and forms the olive bulge **Posterolaterally** -> inferior cerebellar peduncle **Laterally** -> spinal nucleus of trigeminal **Posterior** -> central grey area: nuclei of hypoglossal, vagus, vestibulocochlear	Hypoglossal nucleus -> motor, most medial Dorsal nucleus of vagus -> parasympathetic Nucleus of tractus solitarius -> special sensation, taste Medial and inferior nuclei of vestibular Nucleus ambiguus -> motor for glossopharyngeal, vagus and accessory	**Posterior spinocerebellar** head to the inferior cerebellar peduncle **Climbing fibres** from olive to cerebellum -> coordinate skeletal muscles movement **Medial lemniscus** -> carries sensation from the contralateral part of the body **Tectospinal** -> visual reflexes **Medial longitudinal fasciculus** -> connect fibres from trochlear, oculomotor, abducent, vestibular and cervical segments together -> control movement of the eyes with the head and maintenance of balance	
4 Level just inferior to the Pons	No major changes	Lateral vestibular nucleus replaces inferior vestibular nucleus Ant. and post. cochlear nuclei appear on the ant. and post. part of the inf. cerebellar peduncle		

Pons				
Internal structure of Pons [general]	Trapezoid body -> *sensory fibres of the cochlear nerve coming from the cochlea reach the ant. and post. cochlear nuclei and synapse,* then some of these fibres ascend ipsilaterally but the majority crossover and ascend, forming the **trapezoid body**. **anterior** to it -> basilar part and in the middle basilar groove **posterior** to the body -> tegmentum		The fibres that crossover, forming the trapezoid body ascend forming the **Lateral lemniscus**	
1 Level through caudal part [facial colliculus]	**Posterior to the trapezoid body** [tegmentum] -> medial lemniscus, medial longitudinal fasciculus Superior, inferior and middle peduncles can be seen, spinal nucleus of trigeminal, parts of the vestibular nucleus, abducens nucleus, facial nucleus Parts of the reticular formation start to appear. **Anterior to the trapezoid body** -> basilar part where transverse pontine fibres move from the cerebrum through pons to the cerebellum, pontine nuclei	Abducens nuclei Spinal nuclei of trigeminal Motor nuclei of facial Salivatory-lacrimatory [superior salivatory] nucleus of facial [parasympathetic] *salivatory -> receives from the hypothalamus* *lacrimal -> from the hypothalamus [emotional] and trigeminal sensory nuclei [reflex]* Part of nucleus of tractus solitarius -> special sensation from the anterior ⅔ of the tongue	Fibres of the reticular formation Motor fibres for the facial nerve -> they move posteriorly and do a u-turn around the abducens nucleus forming the **Facial colliculus**	
2 Level through cranial	**Tegmentum** -> superior and middle peduncles [the middle disappears], main/ principle nucleus of trigeminal replaces the spinal nucleus, medial lemniscus and spinal lemniscus lateral to it **The basilar part** -> no changes	Main/principle nucleus of trigeminal [sensory] -> fibres that synapse in this nuclei crossover along with fibres coming from the spinal and mesencephalic nuclei and form the **Trigeminal lemniscus** Motor nucleus of trigeminal -> medial to the main nucleus		The main nucleus of trigeminal receive **discriminative sensations** from the head and neck [like DCML system for the rest of the body]

Midbrain				
Midbrain in general	the cavity is the cerebral aqueduct, anything posterior to it is called **tectum**, anything anterior to it is called **cerebral peduncle,** the cerebral peduncle is divided by **substantia nigra** into **tegmentum** posteriorly and **crus cerebri** anteriorly		1. **crus cerebri** -> divided into: medial ⅕ -> frontopontine fibres, lateral ⅕ -> temporopontine fibres and middle ⅗ -> corticospinal fibres 2. **substantia nigra** -> dopaminergic fibres and melanin,	substantia nigra is anatomically part of the midbrain and functionally part of the basal nuclei, responsible for *initiation of movement*, degeneration -> **parkinson's disease** [bradykinesia or akinesia].
1.Level of inferior colliculus	The cavity of the section is the **cerebral aqueduct**. ***Posterior*** to it -> inferior colliculus [auditory] ***Anterior*** to it -> nucleus of trochlear, medial longitudinal fasciculus [anterolateral to the trochlear nucleus], decussation of superior cerebellar peduncle, lateral to it is the reticular formation ***On either side of the duct*** -> mesencephalic nucleus of trigeminal ***Posterior to substantia nigra*** [medial to lateral] -> medial lemniscus, spinal lemniscus, trigeminal lemniscus & lateral lemniscus.	Nucleus of trochlear nerve, the 2nd order neurons turn posterior around the cerebral aqueduct and mesencephalic nuclei of trigeminal and emerge from the posterior aspect to the midbrain	Medial longitudinal fasciculus, medial, spinal, trigeminal and lateral lemnisci, decussation of cerebral aqueduct, reticular formation	Lateral lemniscus (auditory fibres ascending from trapezoid body) *terminate* in the inferior colliculus
2.Level of superior colliculus	The cavity is the **cerebral aqueduct** ***Posterior*** to it -> superior colliculus & pretectal nucleus ***Anterior*** to it -> oculomotor nucleus [anterolateral to the duct], Medial longitudinal fasciculus [anterolateral to the nucleus of oculomotor], *red nucleus* and decussation of rubrospinal tract ***On either side of the duct*** -> trigeminal mesencephalic nucleus	Nucleus of the oculomotor nerve. Posterolateral to this is the **Edinger-Westphal** *parasympathetic* nucleus of the oculomotor. Red nucleus (most prominent feature) Mesencephalic nucleus of trigeminal **Pre**tectal nucleus posterior to the superior colliculus	Early decussation of rubrospinal tract fibres	The pretectal nucleus is responsible for the light reflex • extra