

CNS - Brain + spinal cord

PNS: 12 Cranial nerves + 31 peripheral spinal nerves

Cephalons:

- Forebrain - Prosencephalon
  - Made up of Telencephalon (cerebral) + Diencephalon (thalamus, hypothalamus)
- Midbrain - Mesencephalon
- Hindbrain (Rhombencephalon)
  - Made up of medulla oblongata (myelencephalon) and cerebellum (metencephalon)

Cephalic flexure creates the two separate axis in the brain

Pontine flexure is dorsal to the pons

Cervical flexure is ventral to the cervical spine.

Transverse plane cuts from dorsal to ventral, turn 90 degrees from cerebrum to brainstem.

Grey and white matter: In the brain, peripheral layers are cell bodies (Grey matter unmyelinated), central layers are myelinated axons (white matter).

Meninges

Dura mater: wrap around veins and arteries. Flax cerebri in the sagittal groove, tentorium cerebelli around the cerebellum, fibrous and tough.

Arachnoid mater: lines the gyri and sulci, have subarachnoid space containing cerebrospinal fluid, and trabeculae connective tissues

Pia mater: Innermost lining blood vessels, perivascular (around vessels) space contribute to CSF formation

4 Ventricles: 2 lateral ventricles, connected to the third ventricle via intraventricular foramen, connect to fourth ventricle in the brainstem via cerebral aqueduct.

Brainstem: Midbrain, Pons, Medulla oblongata. 3 peduncles connect the cerebellum

- Telencephalon: the cerebral cortex:
  - Longitudinal fissure: separate L/R cerebral lobes
  - Central sulcus: Separate frontal/parietal lobe
  - Lateral sulcus: separate temporal lobe
  - 6 cortical layers, populated by purkinje cells, all layers except 1 receives input from another brain region
  - Areas on the cerebral cortex categorised by Korbinian Brodmann based on functions
  - Broca's area on dominant frontal lobe - speech generation, connected to Wernikes via
  - Wernike's area on dominant temporal lobe - speech interpretation
  - Cortical pathways:
- Diencephalon: Located medial-ventral to telencephalon, contains the thalamus and its associated structures:
  - Thalamus: integration of information, structures correspond to cortex areas

- Epithalamus: Habenula nucleus (connect limbic systems) and pineal gland (epiphysis, secrete melatonin)
  - Hypothalamus: infundibulum connects pituitary gland (hypophysis)
    - Paraventricular nucleus and supraoptic nucleus innervate posterior pituitary (neurohypophysis)
    - Hypothalamus secretory neurons project into anterior pituitary (adenohypophysis)
  - Mammillary body with limbic functions
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- Neuronal arrangement: layers: soma and dendrites in different layers. Nucleus: aggregation of soma.
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- Hippocampus:
    - Archicortex contains 3 layers instead of 6
    - Consist of 4 regions of cornu ammonis (CA1~4)
    - Parahippocampal structures: subiculum + entorhinal cortex.
    - Contain place cells
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- Basal ganglia: caudate and putamen
    - Internal capsule passes through
    - Disruption leads to parkinson's, Huntington's
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- Cerebellum:
    - have folias instead of sulcus and gyrus
    - Three layers: Molecular, piriform, granular
    - Purkinje cells soma located in the molecular layer, bifurcate into molecular layer, axon extend down into granular layer
    - Input:
      - Climbing fibre from inferior olive: active to modify model in the cerebellum, increase in spiking lead to weakening of synapse between purkinje and active parallel fibre
      - Mossy fibre connect to granular cells, Visual, auditory, vestibular, proprioception, mechanoreception, efference copy.
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- Circle of Willis:
    - Anterior to posterior:
      - Anterior communication a.
      - Anterior cerebral a. (Medial telencephalon)
      - Middle cerebral a. (Temporal)
      - Int. carotid a. (Input)
      - Post. Communication. a.
      - Post. Cerebral. A. (Ventral and posterior)
      - Basillar a. - pontine artery
      - Vertebral artery (input)