Meninges

- Dura mater
- Arachnoid mater
- Pia mater
Cerebrospinal Fluid

- Support
- Protection
- Signaling
- Derived from blood
- 150mL
- 500mL/day
- Found in subarachnoid space & w/i ventricles
CSF formation by choroid plexuses

- Ependymal cells
- Capillary
- Connective tissue of pia mater

Wastes and unnecessary solutes absorbed

Cavity of ventricle

Section of choroid plexus

CSF forms as a filtrate containing glucose, oxygen, vitamins, and ions (Na⁺, Cl⁻, Mg²⁺, etc.)
Blood-Brain Barrier

- Astrocyte
- Nucleus
- Perivascular feet
- Erythrocyte inside capillary
- Capillary
- Continuous basement membrane
- Tight junction between endothelial cells
- Nucleus of endothelial cell
4 Main Parts of the Brain

- Cerebrum
- Diencephalon
- Cerebellum
- Brainstem
Cerebral Hemispheres

Longitudinal Fissure
Cerebral Hemispheres

- Sulci
- Gyri

Brain Growth > Bone Growth
Basic Structure of a Cerebral Hemisphere

- Gray Matter
- White Matter
- Islands of Gray Matter (Cerebral Nuclei)
Primary Motor Cortex

- Precentral gyrus
- Voluntary motor control
- Pyramidal neurons
Motor Homunculus
Premotor Cortex

- Anterior to primary motor cortex.
- Learned/patterned skills.
- Planning movements.
Motor Speech Area

- Broca’s area

- Typically in left hemisphere anterior to inferior premotor cortex.

- Directs muscles of tongue, lips, and throat in speech production.

- Involved in planning speech production.
Prefrontal Cortex

- Anterior frontal lobes
- Analysis, cognition, thinking, personality, conscience, impulse control.
Primary Somatosensory Cortex

- Postcentral gyrus.
- Sensory neurons in skin and proprioceptors
- Contralateral
Somatosensory Association Cortex

- Posterior to the primary somatosensory cortex.
- Uses multiple sensory inputs to create a complete comprehension of the object being felt.
Primary Auditory Cortex

- Superior margin of the temporal lobe, next to lateral sulcus.

- Sound waves excite receptors in the inner ear which send info to the auditory cortex.
Wernicke’s Area

Involved in understanding written and spoken language
Olfactory Cortex

- Olfactory epithelium receptors bind odorants in the nose. Signals are sent thru the cribriform plate and to the olfactory cortex.

- Very much involved in memory and emotion.
Primary Visual Cortex

- Light strikes retinal rods and cones and signals are sent to the primary visual cortex.
- Largest sensory cortex.
Visual Association Area

• Surrounds the primary visual cortex.
• Lets us “see” what we’re looking at.
Insula

Motor Cortex
Somatic motor association area

Gustatory Cortex

Olfactory Cortex

Auditory Cortex
Primary auditory cortex
Auditory association area

Central sulcus
Parietal Lobe

Sensory Cortex
Somatic sensory association area

Visual Cortex
Primary visual cortex
Visual association area

Frontal Lobe

Temporal Lobe
Lateral sulcus
Occipital Lobe
Basal Nuclei

- Planning
- Starting/stopping/deciding
- Learned behaviors

- Emotions & Moods

Cerebral nuclei
- Caudate nucleus
- Putamen
- Globus pallidus
- Lentiform nucleus
- Clausrum
- Amygdaloid body

Corpus striatum
Diencephalon

- Forms the central core of the brain.
- 3 paired gray matter structures: Thalamus, Hypothalamus, Epithalamus
Thalamus

- 80% of the diencephalon
- Sensory relay station where sensory signals can be edited, sorted, and routed.
- Also has profound input on motor (via basal nuclei and cerebellum) and cognitive function.
Hypothalamus

- Paraventricular nucleus (Water Balance / Stress)
- Lateral hypothalamic area
- Dorsal hypothalamic area
- Medial Peroptic (Blood Pressure)
- Anterior hypothalamic area (Body Temperature)
- Anterior commissure
- Frontal cortex
- Supra-optic nucleus (Water Balance)
- Optic nerve
- Optic chiasm
- Anterior pituitary
- Posterior pituitary
- Posterior hypothalamic area (Shivering)
- Dorsomedial nucleus (GI Tract)
- Ventromedial nucleus (Satiety)
- Mammillary body (Feeding)
- Suprachiasmatic (Biological Clock)
Pituitary Gland

- Anterior portion synthesizes and secretes: Follicle stimulating hormone, luteinizing hormone, prolactin, growth hormone, and others.
- Posterior portion stores and secretes: Antidiuretic hormone and oxytocin (which are produced by the hypothalamus).
Epithalamus – Pineal Gland

• Melatonin

• Sleep-wake cycle
Midbrain

• Location
• Cerebral aqueduct
• Cerebral peduncles
• Tectum
• Corpora quadrigemina
Superior Colliculus

Fixation

Smooth pursuit

Diencephalon

Midbrain

Pons

Medulla oblongata

Tectal plate

Superior colliculi

Inferior colliculi

Thalamus

Pineal gland

Cerebral peduncle

(b) Posterolateral view
Inferior Colliculus

Auditory integration

- Diencephalon
- Midbrain
- Tectal plate
- Pons
- Medulla oblongata
- Superior colliculi
- Inferior colliculi
- Thalamus
- Pineal gland
- Cerebral peduncle

(b) Posterolateral view
Pons

- Location

- Tracts

- Nuclei
Medulla Oblongata

- Location
- Pyramids
- Decussation
- Nuclei
Medulla Oblongata

- Pyramid
- Decussation of pyramids
Cerebellum

- Location
- Complex movements
- Attention/language
Limbic System
Pathways to the Brain

- Sensory (ascending) & Motor (descending)
Sensory Pathways

- Receptor to Brain
- Somatosensory vs Viscerosensory
- 2-3 neuron path
- Paired
- Decussation
Motor Pathways

• Brain to Effector (e.g. skeletal muscle)

• 2 (at least) neuron path

• Paired

• Decussation