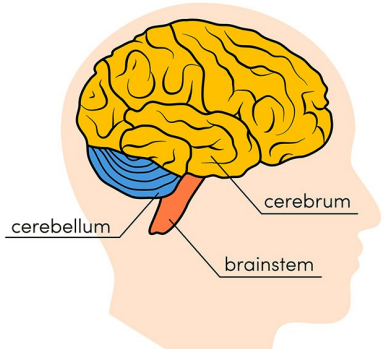
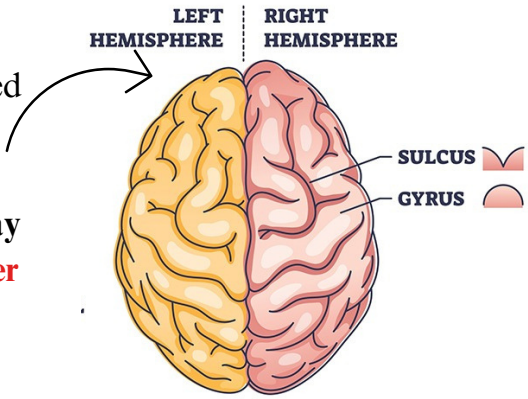
REGIONS OF OF THE BRAIN

At a high level, the brain can be divided into the cerebrum, brainstem and cerebellum.



CEREBRUM:

The **largest part of the brain** and is composed of right and left hemispheres together account for **85% of total brain mass.**
The **cerebrum** (front of brain) **comprises gray** matter **(the cerebral cortex)** and **white matter** at its center.

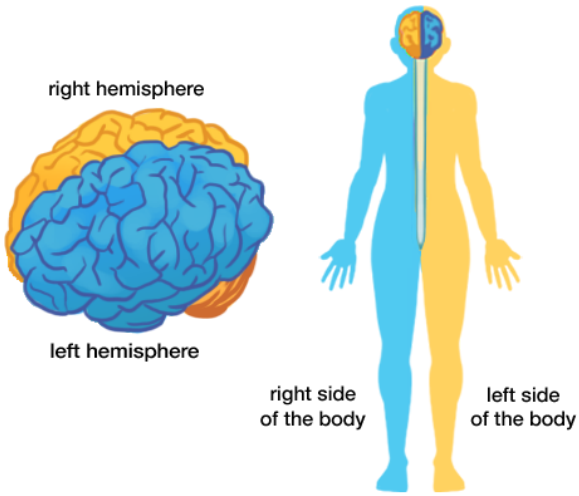


FUNCTIONS:

- Interpreting touch, vision and hearing
- Speech
- Emotions
- Learning
- Fine control of movement
- Regulates temperature
- Judgment, thinking and reasoning

RIGHT BRAIN – LEFT BRAIN:

The cerebrum is divided into two halves: the right and left hemispheres. They are **joined** by a **bundle of fibers** called the **corpus callosum** that transmits messages from one side to the other. Each hemisphere controls the opposite side of the body.
The left hemisphere controls speech, comprehension, arithmetic, and writing.
The right hemisphere controls creativity, spatial ability, artistic, and musical skills.



REGION AND FUNCTION OF CEREBRUM

FRONTAL LOBE

Region of the cerebrum located **under the frontal bone**; contains the primary motor cortex (precentral gyrus) and is ***involved in complex learning.***

TEMPORAL LOBE

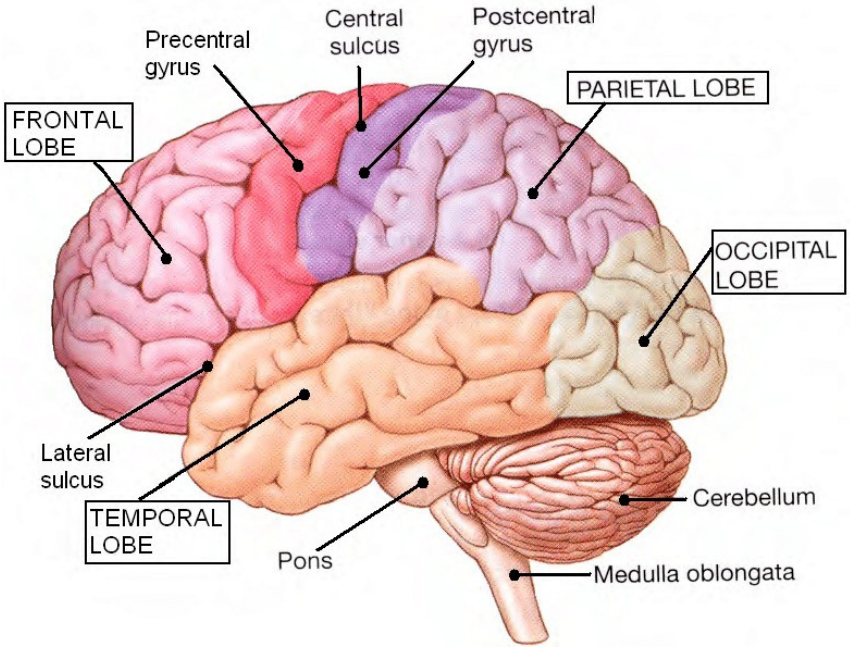
Region of the cerebrum located under temporal bone; processes information associated with hearing and equilibrium.

LATERAL SULCUS

Deep groove that separates the frontal and parietal lobes from the temporal lobe of the cerebrum

LONGITUDINALE FISSURE

Deep fissure that s**eparates the two hemispheres** (right and left) of the cerebrum.



PARIETAL LOBE

Region of the cerebrum located **under parietal bone;** contains the primary sensory cortex (postcentral gyrus) and is ***involved in language acquisition***.

CENTRAL SULCUS

Deep groove that **separates the frontal lobe** from the parietal lobe of the cerebrum.

OCCIPITAL LOBE

Region of the cerebrum located **under occipital bone;** processes ***visual information and understanding of the written word.***

INSULA

Region of the cerebrum deep within the **lateral sulcus;** processes ***information associated with hearing and equilibrium.***

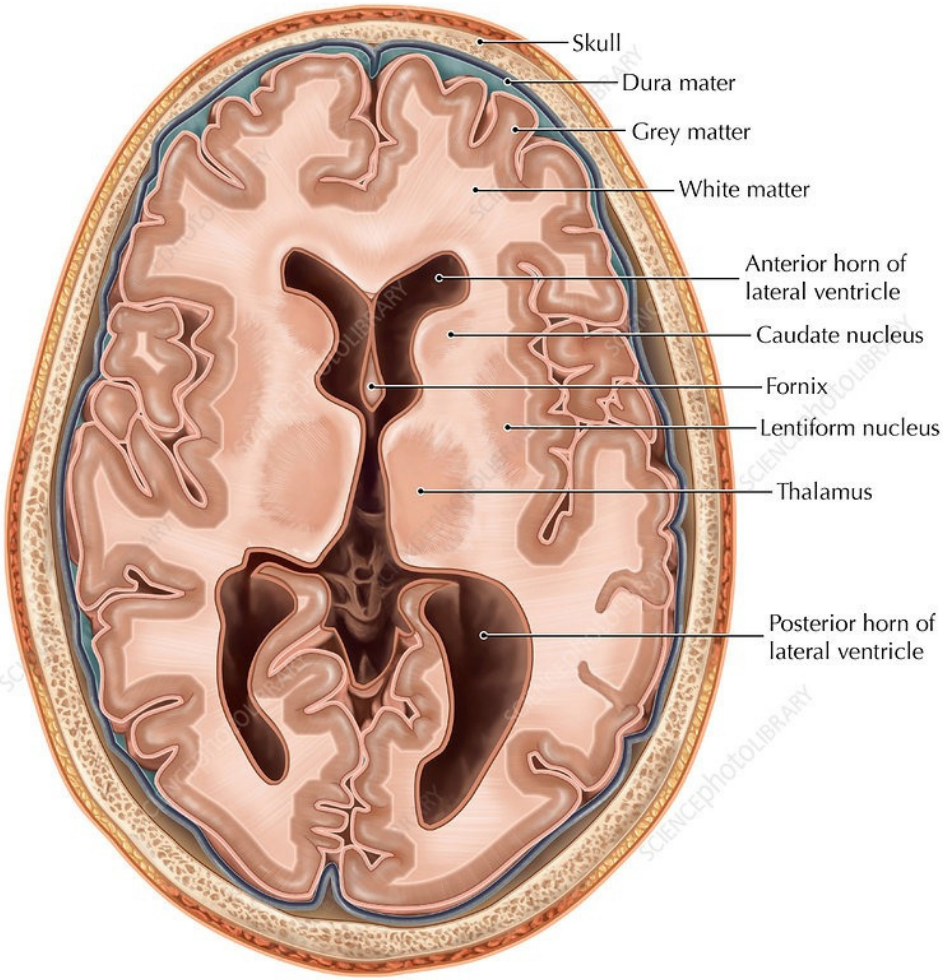
PARIETO OCCIPITAL SULCUS

Groove on medial surface of hemisphere that **separates the parietal lobe** from the occipital lobe of the cerebrum.

TRANSVERSE FISSURE

Deep fissure that **separates the cerebrum from the cerebellu**m.

CORPUS CALLOSUM	The major **bridge of white fibers** that *connects the two hemispheres of the cerebrum.*
FORNIX	Bridge of **white matter inferior** to the corpus callosum; ***links regions of the limbic system ('emotional' brain) together.***
ANTERIOR COMMISSURE	Bridge of **white fibers found near the anterior** tip of the corpus callosum; ***connects the two hemispheres of the cerebrum.***

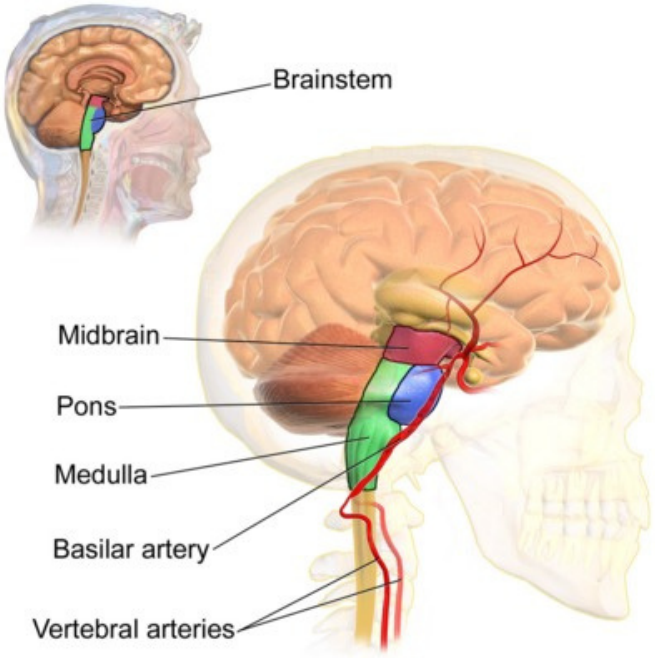


CAUDATE NUCLEUS	Basal nucleus ***initiates voluntary movements and coordinates slow skeletal muscle contractions*** (e.g., posture and balance)
PUTAMEN	A round structure located at the base of the forebrain Involved in learning and motor control, including speech articulation, language functions, reward, cognitive functioning, and addiction.
GLOBUS PALLIDUS	Is a structure in the brain ***To control conscious and proprioceptive movements.***

BRAIN STEM:

The brain stem begins **inferior to the thalamus** and acts as a relay center connecting the cerebrum and cerebellum to the spinal cord.

Positioned between the cerebrum and the spinal cord, the brain stem also **provides a pathway for fiber tracts running between higher and lower brain centers.**



FUNCTIONS:

- **Breathing**
- Heart rate
- Body temperature
- Wake and sleep cycles
- **Digestion**
- Sneezing
- Coughing
- Vomiting
- Swallowing.
- **Interpreting touch, vision and hearing**
- Speech
- **Emotions**
- Automatic behaviors necessary for survival.

REGION AND FUNCTION OF BRAIN STEM

MIDBRAIN

Region of brain stem between the **diencephalon and pons**; contains multiple fiber tracts running between higher and lower neural centers.

CEREBRAL PEDUNCLE

Bulge located on the **ventral aspect of the midbrain;** contains fiber tracts running between the cerebrum and spinal cord.

PYRAMID

Longitudinal ridge flanking **mid-line of the medulla** oblongata; contains fiber tracts running between the cerebrum and spinal cord.

SUPERIOR COLLICULUS

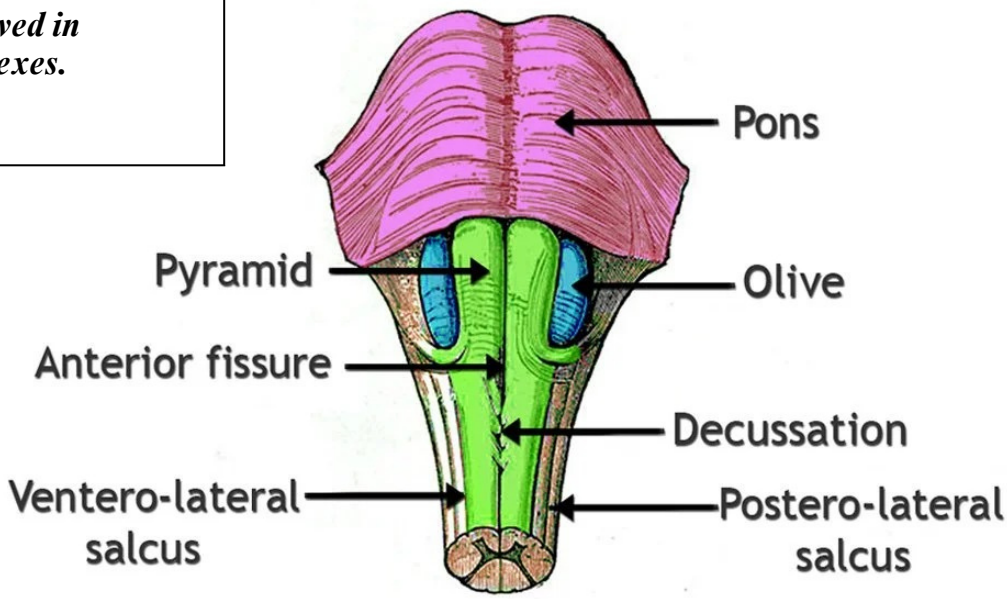
Part of midbrain (corpora quadrigeminal); contains **nerve** reflex centers ***involved in coordinated eye movements, focusing, and papillary responses.***

MEDULLA OBLONGATA

The most **inferior portion** of the brain stem; ***contains the cardiac, vasomotor, and respiratory centers.***

INFERIOR COLLICULUS

Part of the midbrain (corpora quadrigeminal); contains nerve reflex centers ***involved in auditory reflexes.***



PONS

Region of brain stem between the **midbrain and medulla oblongata;** serves as the bridge (connection) between the two ***regions, and the cerebellum.***

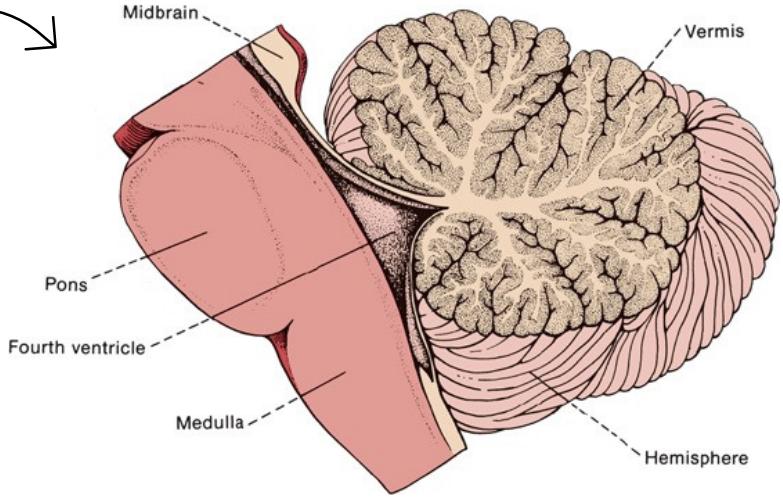
OLIVE

Located lateral to the **pyramid of the medulla oblongata;** ***regulates impulse propagation from the cerebrum and midbrain to the cerebellum***

CEREBELLUM:

Located on the **lower dorsal aspect of the brain,** **the cerebellum accounts for ~ 11% of the total brain mass.**
Like the cerebrum, the cerebellum has **two major hemisphere**s with an outer cortex made up of gray matter with an inner region of white matter.

The cerebellum is **located dorsal to the pons and medulla** and it protrudes under the occipital lobes of the cerebral hemispheres, from which it is separated by the transverse fissure.



FUNCTIONS:

- **Coordinate muscle movements**
- Maintain posture, balance.
- Appropriate patterns of skeletal muscle contraction for smooth
- **Agility needing for our daily lives (e.g., driving).**

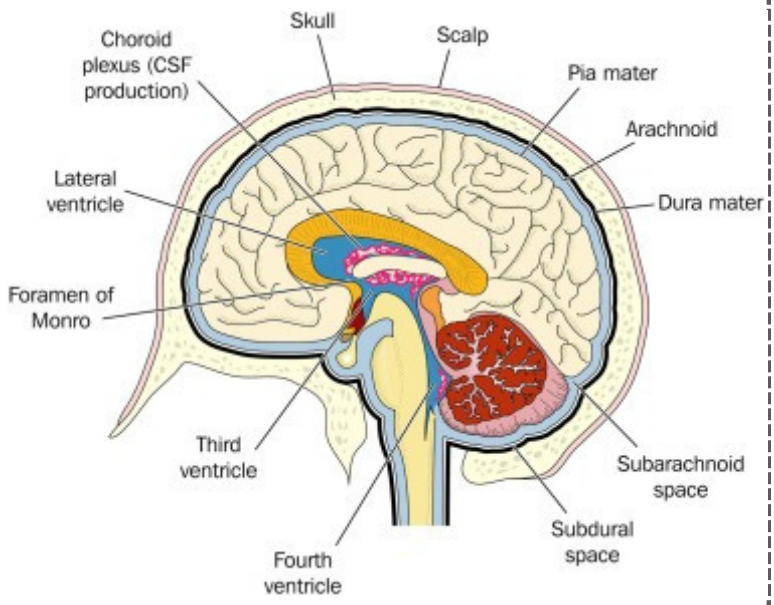
REGION AND FUNCTION OF CEREBELLUM

VERMIS	**Mid-line ridge of tissue** (‘worm-like) that connects the **two cerebellar hemispheres together.**
FOLIA	Fine, transversely-oriented pleat-like gyri on the surface of the cerebellum; increase surface area.
CEREBELLAR PEDUNCLES	Connection points between the **cerebellum and brain stem;** contains fiber tracts running between the cerebellum and midbrain, pons, and medull
ARBOR VITAE	Distinctive pattern of **white matter deep within the cerebellum**; resembles a branching tree

VENTRICLES

Situated within the brain are **central hollow civilities** called **ventricles**. These ventricles are continuous with one another and with the central canal of the spinal cord.

The **hollow** ventricular chambers are filled with **cerebrospinal fluid,** a fluid that forms a liquid cushion for the brain.
The **cerebrospinal** fluid **helps nourish the brain** and there is some evidence that hormones circulate in the brain via this pathway.



FUNCTIONS:

- **Produce and secrete cerebrospinal fluid** to protect and maintain your central nervous system.
- Clearing out toxins and waste products released by nerve cells.
- One such waste product—the amyloid A-b peptide—increases the risk of Alzheimer's disease if too much accumulates in the brain.
- **Shock absorption**
- Nutrition
- Intracranial pressure
- Circulation keeps the temperature of your brain and spine stable.
- Contains numerous **immune cells** that monitor your central nervous system for foreign agents that could damage your vital organs.

CHAMBER AND FUNCTIONS

LATERAL VENTRICLES

C-shaped chambers buried deep within each cerebral hemisphere; ***house choroid plexin that produces cerebrospinal fluid.***

SEPTUM PELLUCID

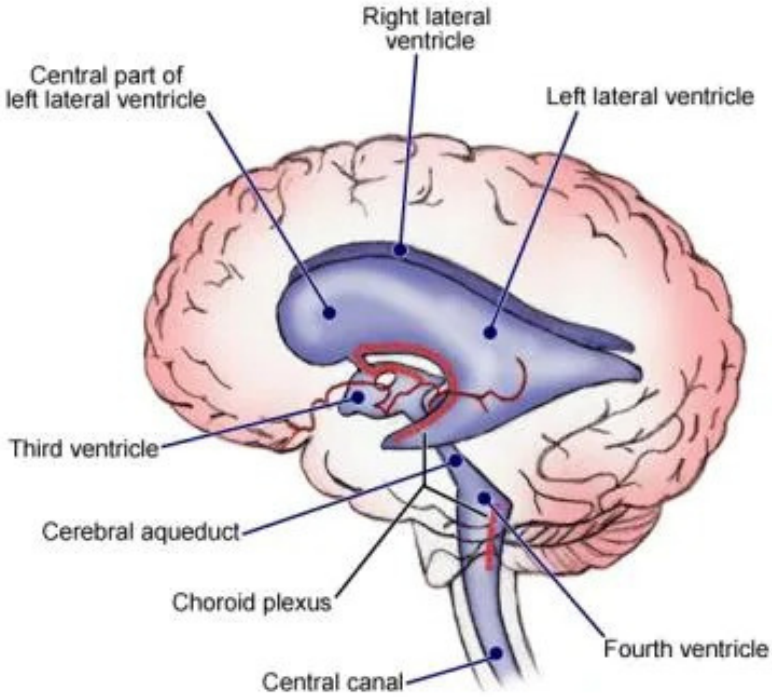
Thin **vertical** partition that separates lateral ventricles.

INTERVENTRICULAR FORAMEN

Small **opening between each lateral ventricle** and the third ventricle; drains cerebrospinal fluid.

THIRD VENTRICLE

Chamber **surrounding the thalamus;** houses a choroid plexus that ***produces cerebrospinal fluid.***



FOURTH VENTRICLE

Chamber that occupies the **space between the dorsum of the pons medulla** and the overlying cerebellum; houses ***cerebrospinal fluid.***

CEREBRAL AQUEDUCT

Narrow passageway between the third ventricle and the fourth ventricle; contains cerebrospinal fluid.

CENTRAL CANAL

Central **opening that runs through the medulla oblongata** and is continuous with the spinal cord; ***contains cerebrospinal fluid.***

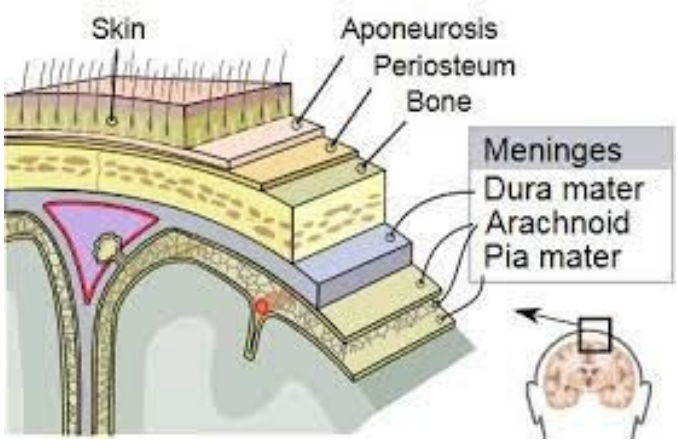
MENINGES

The meninges are **three connective tissue membranes** that lie just external to the brain.

Medical conditions affect the meninges

Meningitis. This is an infection of your meninges. The infection can be caused by bacteria, fungus or viruses.

Subdural hematoma. This is bleeding that occurs between your dura mater and arachnoid mater due to a tear your meninges.in a blood vessel.



Meningiomas. These are tumors that grow in

FUNCTIONS:

- **Cover and protect the brain**
- Protect blood vessels and enclose venous sinuses
- Contain cerebral spinal fluid
- Form partitions within the skull.

TISSUE LAYER AND FUNCTION OF MENINGES

DURA MATER	**External leathery** tissue layer ('tough mother'); ***protects brain, encloses venous sinuses, and forms partitions within the skull.***
ARACHNOID MATER	**Middle tissue** layer forming loose brain covering ('spider mother'); houses cerebrospinal fluid.
DURA MATER	**Innermost delicate tissue** layer ('gentle mother') adhered tightly to brain; contains many blood vessels.
ARBOR VITAE	Distinctive pattern of **white matter** deep within the cerebellum; resembles a branching tree

LOBES OF THE BRAIN

The **cerebral hemispheres** divide the brain into **lobes**. Each hemisphere has **4 lobes** Each lobe may be divided, once again, into areas that serve very specific functions.

FRONTAL LOBE:

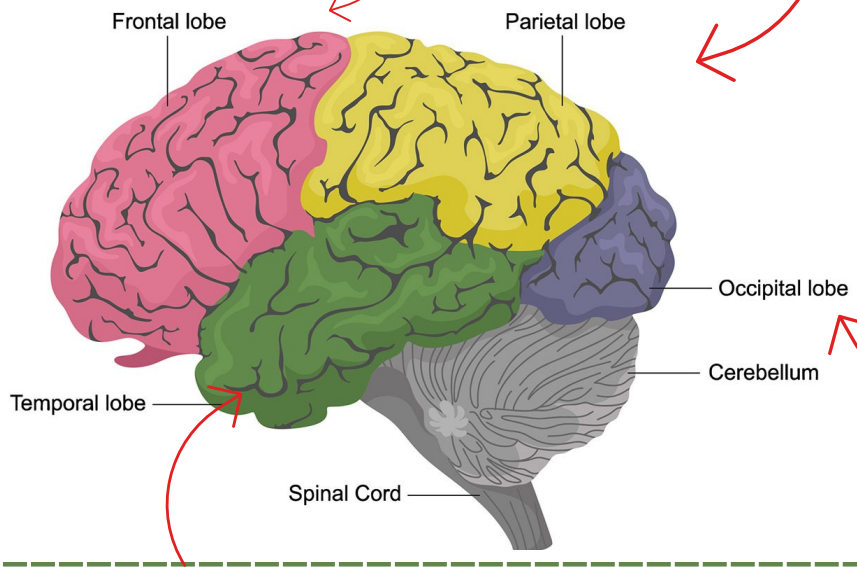
The **frontal** lobes are the **largest lobes** in the human brain and they are also the most common **region of injury in traumatic brain injury.**

- Personality, behavior, emotions
- Judgment, planning, problem solving
- Speech: speaking and writing
- (Broca's area)
- Body movement (motor strip)
- Intelligence, concentration, self
- awareness

PARIETAL LOBE:

Parietal lobe is a **key part** of your **understanding** of the world around you.

- Interprets language, words
- Sense of touch, pain, temperature
- (sensory strip)
- Interprets signals from vision,
- hearing, motor, sensory and memory
- Spatial and visual perception



OCCIPITAL LOBE:

The **occipital** lobes sit at the **back of the head**

- Visual perception
- (color, light,
- movement)

TEMPORAL LOBE:

The **temporal** lobes sit behind the ears and are the **second largest lobe.** They are most commonly associated with processing auditory information

- Understanding language (Wernicke's area)
- Memory
- Hearing
- Sequencing and organization

DEEPER STRUCTURES WITHIN THE BRAIN

PITUITARY GLAND:

Called the **"master gland,"**
Is a **pea-sized structure** found deep in the brain **behind** the bridge of the **nose**.

FUNCTIONS:

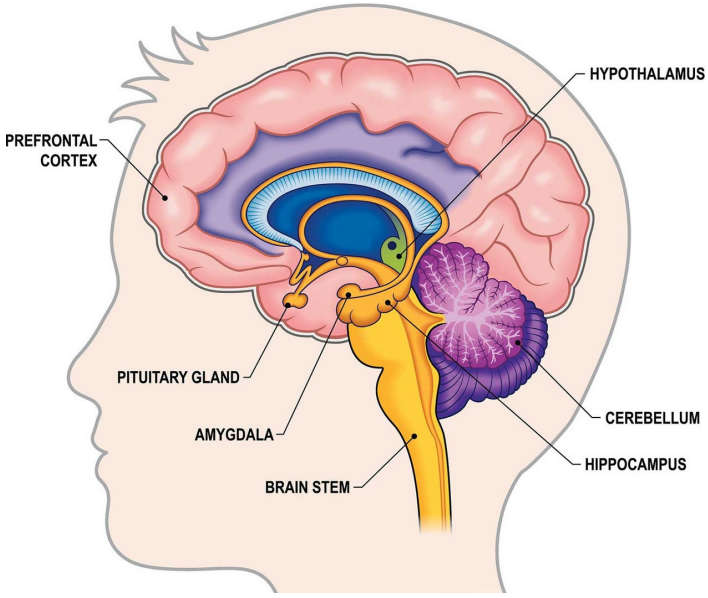
Governs the function of other glands in the body
Regulating the flow of hormones from the thyroid, adrenals, ovaries and testicles.
It receives chemical signals from the hypothalamus through its stalk
Blood supply.

AMYGDALA:

Small, **almond**-shaped structures, an amygdala is located under each half (hemisphere) of the brain.

FUNCTIONS:

- Regulate emotion
- **Memory**
- Associated with the brain's
- reward system,
- Stress, and the "fight or flight"
- **Response when someone**
- **perceives a threat.**



HIPPOCAMPUS:

A **curved seahorse-shaped** organ on the underside of each temporal lobe, the hippocampus is part of a **larger structure called the hippocampal** formation.

FUNCTIONS

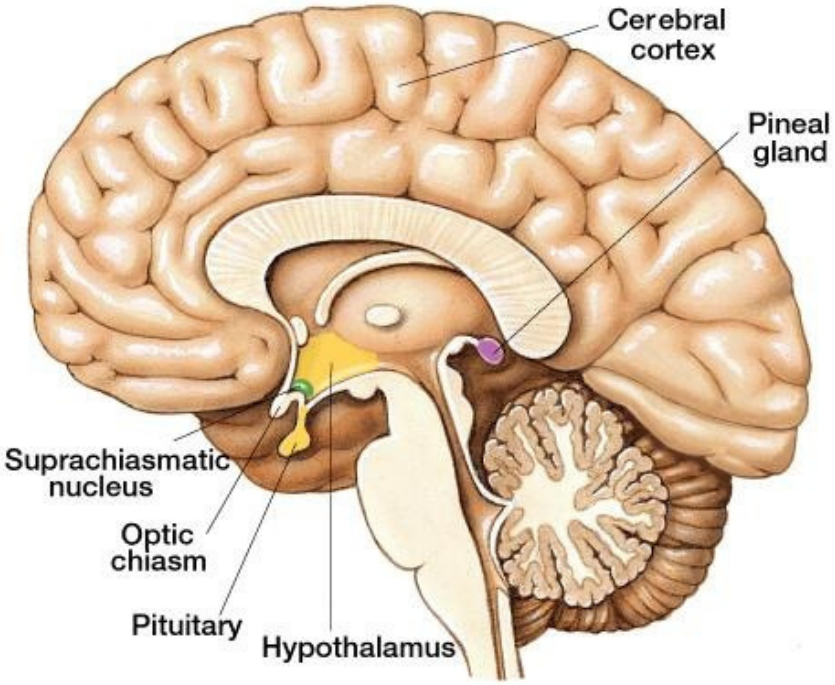
- **It supports memory**
- Learning, navigation and perception of space.
- Receives information from the cerebral cortex and may play **a role in**
- **Alzheimer's disease.**

PINEAL GLAND:

The **pineal** gland is located deep in the brain and attached by a **stalk to the top of the third ventricle.**

FUNCTION:

- The pineal gland responds to light and dark and secretes melatonin, which **regulates circadian rhythms and the sleep-wake cycle**.



SUPRACHIASMATIC NUCLEUS

(SCN) is a **bilateral structure l**ocated in the anterior part of the hypothalamus. **It is the central pacemaker of the circadian timing system**

FUNCTION:

- Regulates most circadian rhythms in
- the body.
- Multiple afferent neuronal tracts
- project to the SCN
- Feeding
- Drinking
- Body temperature

HYPOTHALAMUS:

The **hypothalamus** is located above the pituitary gland and **sends it chemical messages that control its function.**

FUNCTION:

- Regulates body temperature
- Synchronizes sleep patterns Controls hunger and thirst
- Plays a role in some aspects of
- memory and emotion.