

Brain Diagrams

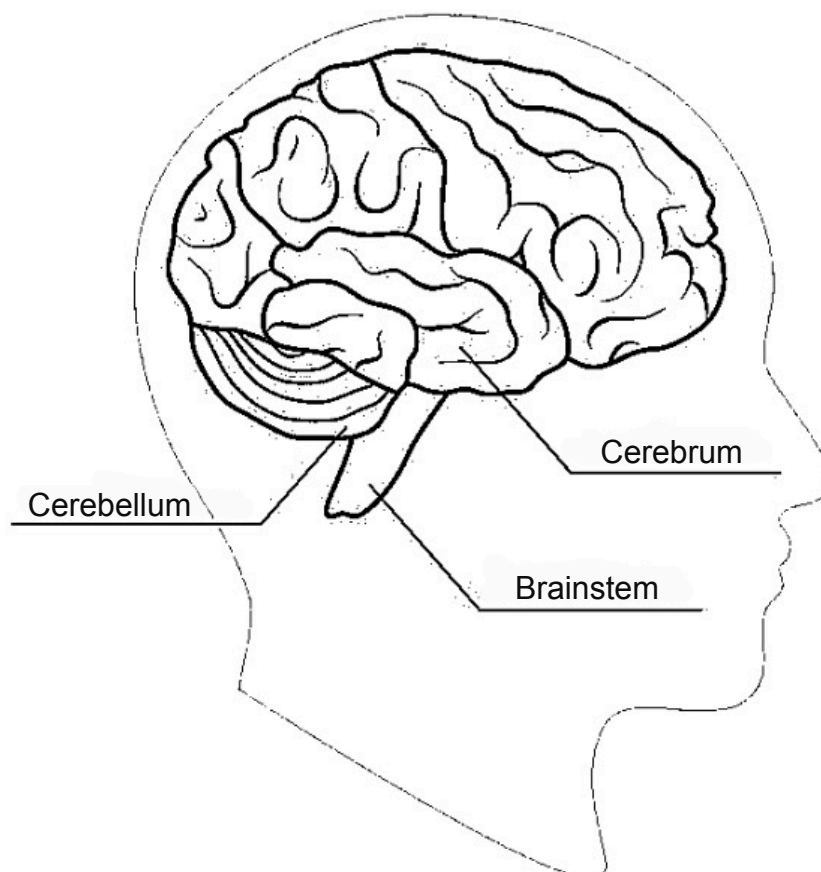
Overview of brain anatomy

The human brain is a complex organ divided into three major regions: the cerebrum, cerebellum, and brainstem. Each region has distinct structures and vital functions. This diagram illustrates these regions and provides insight into their roles within the nervous system.

Cerebrum: The cerebrum, the largest and most prominent region, is located at the front of the brain. It is responsible for advanced cognitive abilities, including speech, decision-making, reasoning, and problem-solving. Additionally, the cerebrum manages sensory perception—such as vision, hearing, and touch—and plays a central role in controlling voluntary movements.

Cerebellum: The cerebellum, often referred to as the “little brain,” is situated at the back of the head, below the cerebrum. It is critical for maintaining balance, posture, and muscle coordination. Beyond its motor functions, the cerebellum also contributes to emotional processing, social interaction, and cognitive tasks.

Brainstem: The brainstem, which connects the brain to the spinal cord, is essential for life-sustaining functions. Comprised of the midbrain, pons, and medulla, it governs reflexes, motor control, and sensory pathways. The midbrain processes movement and sensory input, the pons facilitate communication between brain regions, and the medulla oversees vital functions such as breathing, heart rate, and blood pressure.



Lobes of the brain

The cerebrum is divided into four distinct lobes in each hemisphere, each specializing in different functions. These regions—frontal, parietal, temporal, and occipital—are essential for processing information, managing sensory input, and guiding behavior.

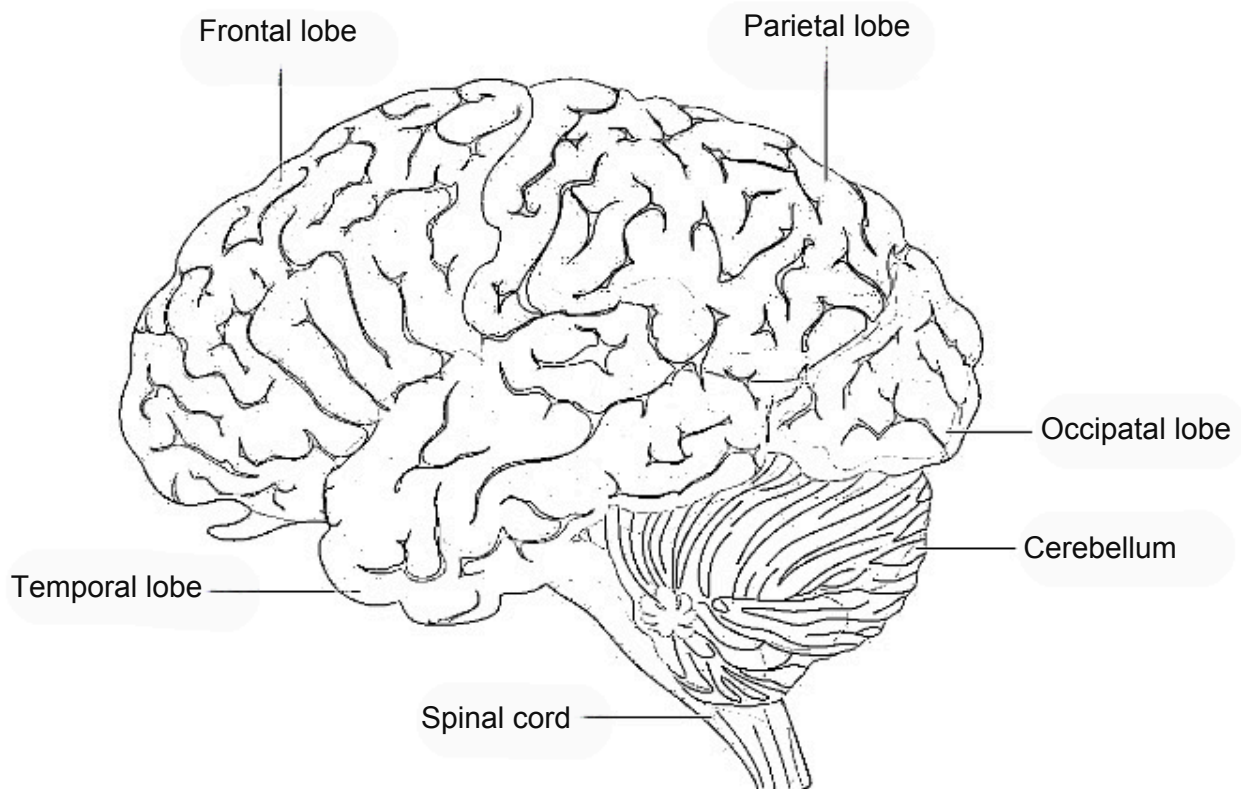
Frontal lobe: The frontal lobe, located at the front of the brain, is the largest and is critical for decision-making, personality, and voluntary movement. It also plays a role in smell recognition and houses Broca's area, which is vital for speech production.

Parietal lobe: The parietal lobe, positioned near the top and center of the brain, is responsible for interpreting sensory information such as touch and pain. It helps with object recognition, understanding spatial relationships, and contains Wernicke's area, a key region for language comprehension.

Occipital lobe: The occipital lobe, situated at the back of the brain, is primarily involved in processing visual information. It interprets visual stimuli and helps make sense of what the eyes perceive.

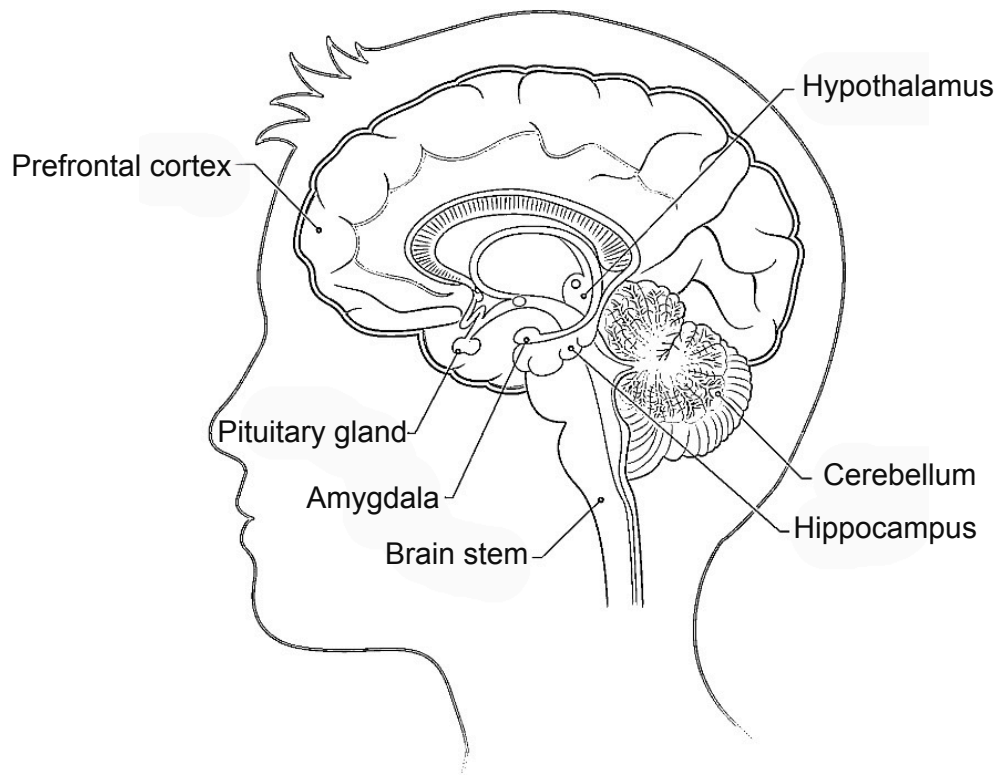
Temporal lobe: The temporal lobe, found on each side of the brain, is involved in auditory processing, short-term memory, and aspects of language and music. It also contributes to recognizing smells and is important for understanding sound and rhythm.

Each lobe works in conjunction with the others to ensure the brain's functions are seamlessly integrated, enabling complex behaviors and sensory experiences.



Deeper structures within the brain

Beneath the surface of the brain lies a network of crucial structures that regulate core bodily functions, process emotions, and play key roles in memory and biological rhythms.



Pituitary gland: The pituitary gland, a tiny structure located near the base of the brain behind the nose, is essential for managing the body's hormonal systems. It oversees hormone production in other glands, such as the thyroid and adrenal glands, and works closely with the hypothalamus to ensure proper communication and regulation.

Hypothalamus: Positioned just above the pituitary gland, the hypothalamus acts as a critical regulator of internal balance. It manages functions such as body temperature, hunger, thirst, and sleep cycles, while also contributing to emotional processing and memory. By sending signals to the pituitary gland, it directly influences hormonal activity throughout the body.

Amygdala: The amygdala, found in both hemispheres of the brain, is an almond-shaped structure involved in emotional regulation and memory. It plays a key role in recognizing threats and triggering responses like fear or stress, making it central to the brain's reaction to danger and reward.

Hippocampus: The hippocampus, located beneath the temporal lobes, is vital for learning and memory formation. Its distinctive curved shape is associated with navigation and spatial awareness, as well as the processing and retrieval of memories.

Pineal gland: Deep within the brain, the pineal gland produces melatonin, a hormone that helps regulate sleep-wake cycles. This small, light-sensitive structure plays an integral part in maintaining the body's circadian rhythms.

Ventricles: The brain also contains four interconnected ventricles, which produce and circulate cerebrospinal fluid (CSF). This fluid cushions the brain and spinal cord, removes waste, and delivers essential nutrients. The ventricles connect to the central canal of the spinal cord, ensuring that the fluid can circulate effectively throughout the central nervous system.

Additional notes

References:

Johns Hopkins Medicine. (2024). *Brain anatomy and how the brain works*.
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