

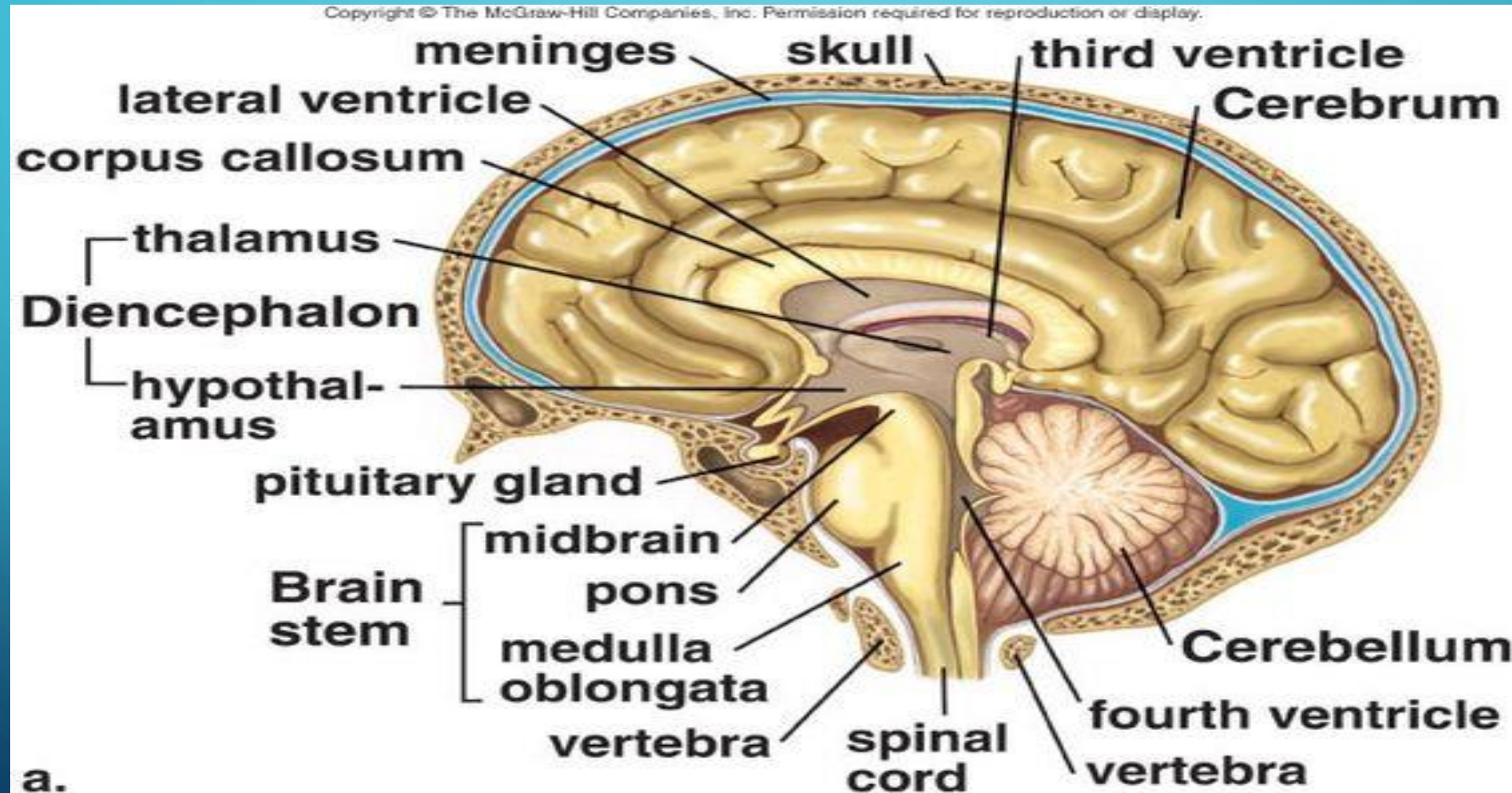


PSYCHOLINGUISTICS

4TH LECTURE

LANGUAGE AND MIND/BRAIN

LANGUAGE AND THE BIOLOGY OF BRAIN



LANGUAGE AND THE BIOLOGY OF BRAIN

- The concept of biological foundations of the human language is as old as the language itself for language is deep-rooted in human brain. The concept of language in brain was controversial for centuries. However, the idea was accelerated with the emergence of generative grammar in the mid-20th century when Chomsky rejected behaviorism and proposed the idea of generative grammar.

CONT...

- Chomsky set the stage for a broader investigation of the biological foundations of language and gave the concept of innateness saying that grammar is hard-wired in brain.
- Ever since, linguists started taking interest in the biology of brain and its relation with language. These advancements attracted linguists and researchers to Psycholinguistics and Neurolinguistics to have a deep insight into human language.

LANGUAGE AND BRAIN

- Whereas Psycholinguistics is the study of language in relation to mind, Neurolinguistics looks the relation of language and brain. Since it is an admitted fact that language is rooted in the biology of brain, understanding the biology of language is critical to understanding the language itself.
- Modern research reveals that the biological base of language has focused on brain anatomy, trying to know which part of brain has connection with acquisition, production and comprehension of language.

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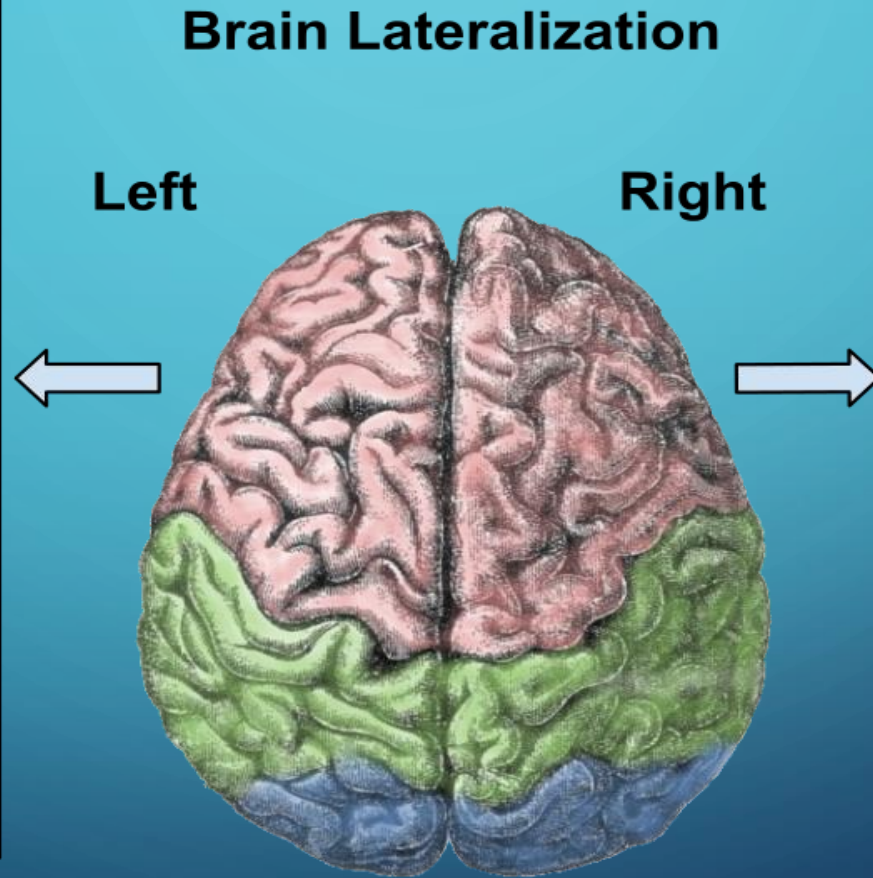
- It is therefore, important to study the biology of brain, (its parts) in order to have a close insight into its anatomy and know the parts of brain that relate language.
- We know that the entire function of human body and its actions, be it physical and mental, are controlled by brain. Language is both physical and mental phenomenon and has roots in the brain whence from it originates and controlled. It is therefore, of prime importance to study the biology of brain.

HUMAN BRAIN

- Human brain (the control system of body) is enclosed in the skull whose hard bones ensure its protection from injuries and all sorts of external effects.
- It consists of two hemispheres (the right hemisphere and the left hemisphere) which are made up of about 10 billion nerve cells (also called Neurons) which are connected by a network of fibers called CORPUS CALLOSUM, made of a million of neurons.
- The outer surface of the brain is called cortex, a gray-colored, which is decision-making part and receives messages.

SEE THE PICTURE

- Analytical thought
- Detail Oriented Perception
- Ordered Sequencing
- Rational Thought
- Verbal
- Cautious
- Planning
- Math/Science
- Logic
- Right Field Vision
- Right Side Motor Skills

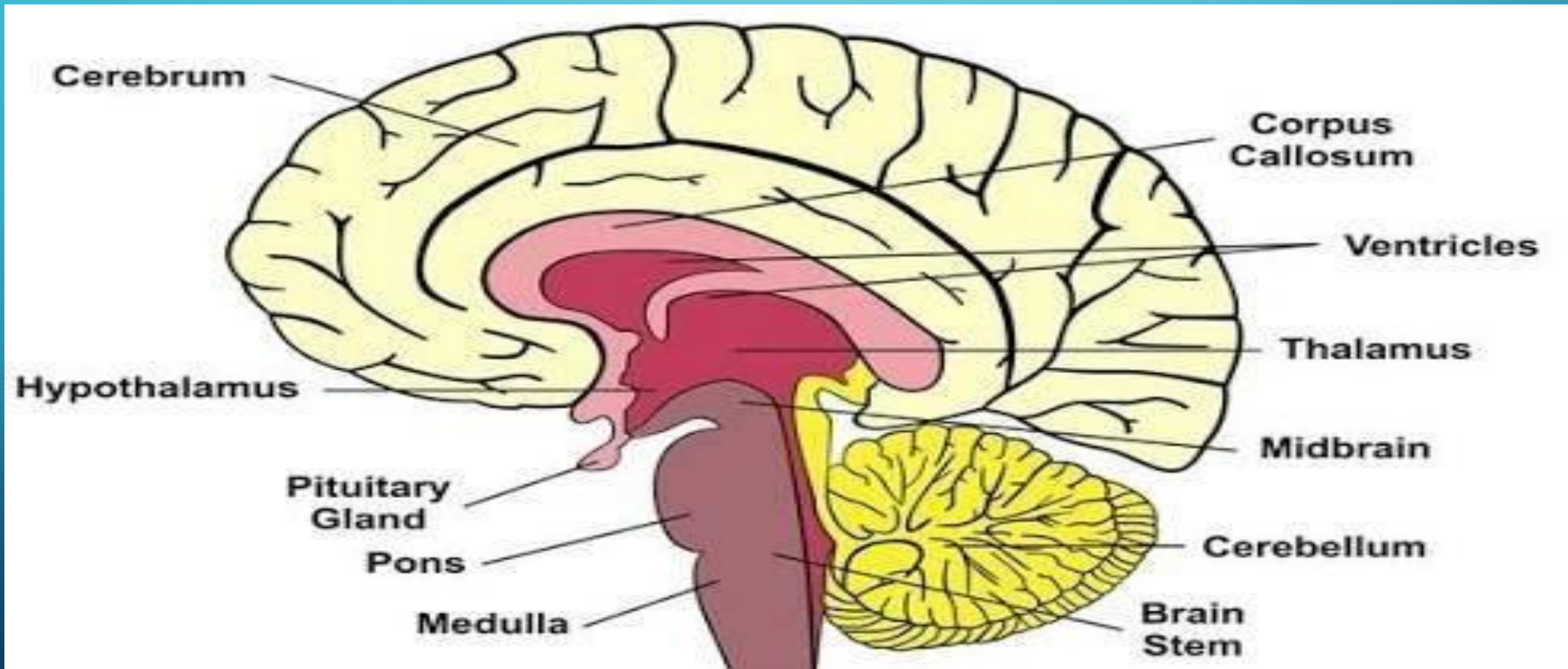


- Intuitive Thought,
- Holistic perception
- Random Sequencing
- Emotional Thought
- Non-verbal
- Adventurous
- Impulse
- Creative Writing/Art
- Imagination
- Left Field Vision
- Left Side Motor Skills

CONT...

- **CORPUS CALLOSUM**, is a network of fibers made up of about 200 million neurons. It connects the right and the left hemispheres which would have been separate parts otherwise.
- Neurologists and linguists agree upon the fact that break down of corpus callosum will result in a complete separation of the two hemispheres as two separate parts.

THE BRAIN



DIFFERENT PART OF BRAIN

- **1. Cerebrum:**

Cerebrum is the largest part of the brain having two hemispheres. It is a highly developed part of the Central Nervous System and controls different functions such as Speech, Vision, the thought process, movement of limbs, creativity and emotions. Cerebrum itself has many different lobes for different functions.

- **2. Corpus Callosum:** It serves as a bridge to coordinate the activities between the two Cerebral hemispheres.

CONT...

- **3. Ventricles:** These are open spaces in the brain for the production and circulation of the Cerebrospinal fluid(CSF) which maintains the **Intracranial Pressure** and **Nutrition** of the Brain and Spinal Cord. Actually, CSF is produced in the choroid plexus formed by small capillaries lining the ventricles. Ventricles are Four in number. The ventricle in the picture is one of the Lateral Ventricles.

CONT...

- 4. **Cerebellum:** It is present below and behind the Cerebral hemispheres. Cerebellum controls the **balance (equilibrium)** of the body and prevents falls while running or walking. It also controls repetitive movements and muscle tone.
- 5. **Thalamus:** Thalamus serves the process of **consciousness** and **sleeping**.

CONT

- **6. Hypothalamus:** It serves as a **master endocrine gland** the body releasing various chemicals to regulate the function of Pituitary gland. Also **regulates body temperature.**
- **7. Pons:** It serves as a for the nerve fibers coming from the cerebrum and going down to the spinal cord. **It also gives rise to a number of cranial nerves.**

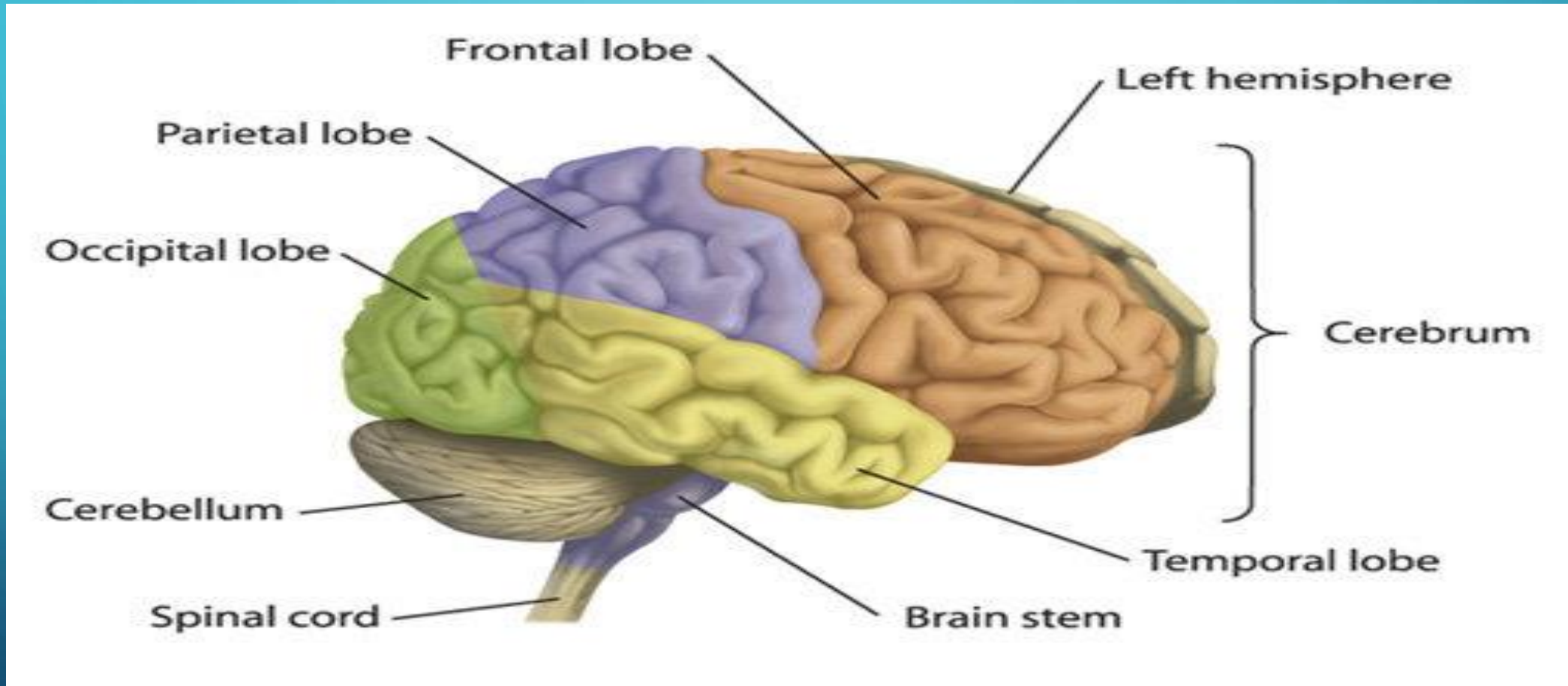
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- **8. Medulla:** It is responsible for the **maintenance of breathing and heart rate.** Certain cranial nerves also arise from medulla. Medulla **joins the brain to spinal cord.**

CEREBRUM ITSELF IS DIVIDED INTO VARIOUS LOBES:

- 1. Frontal Lobe: Associated with motor functions and emotions, thought process.
- 2. Temporal Lobe: Associated with hearing and speech.
- 3. Occipital Lobe: Associated with Vision.
- 4. Parietal Lobe: Associated with sensations like Touch, Temperature, Pain and Language Processing.

LOOK AT THE GIVEN PICTURE



DESCRIPTION

- The cerebrum is the top portion of the brain with two hemispheres connected by the Corpus Callosum -nerve fibers of myelinated axons or white matter - of the two hemispheres it consists of four lobes:
- The Frontal Lobe - are responsible for speech (Broca's Area), voluntary muscle movements, planning, judgment, personality, morals, and ethics.

CONT...

- The Parietal Lobe - are responsible for recognition of objects, understanding speech (Wernicke's Area), and memory.
- The Occipital Lobe - are responsible for sight; fibers from the retina of eye form the optic nerve. Thalamic fibers run to the occipital cortex, where visual interpretation occurs.

CONT...

- The Temporal Lobe - are responsible for auditory processing, balance, smell, and taste.
- The cerebellum is a smaller portion of the bottom brain; it coordinates and regulates muscular activity, which can include involuntary and voluntary muscle such as heart rate, breathing, etc.
- Finally there is the brain stem which connects sensory and motor functions between the brain and the spine.