BHARATHIDASAN UNIVERSITY

Program: M.Sc., Biomedical Science

Course Code : 18BMS48E4N

Course Title : Neurobiology

Brain Anatomy and Function

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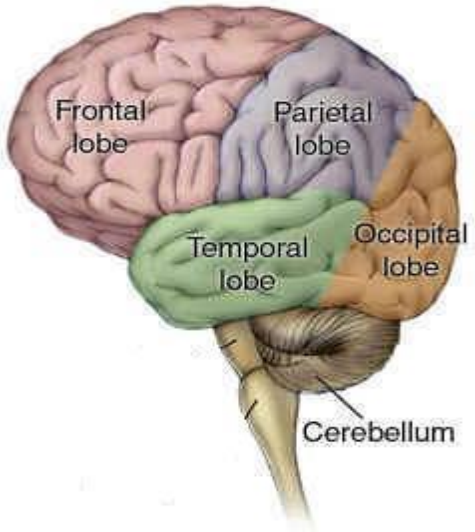
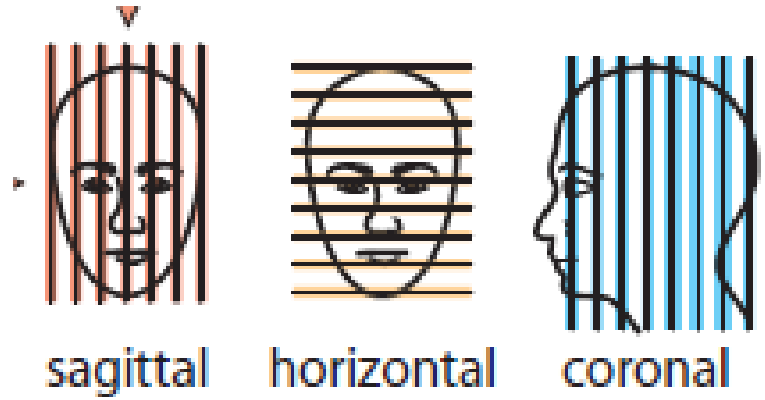
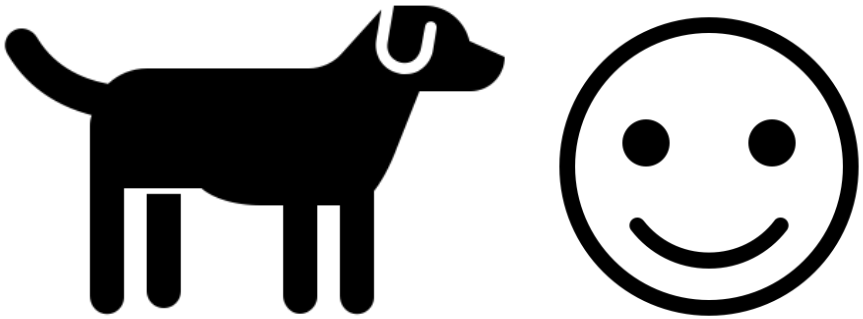
Dept. of Biomedical Science

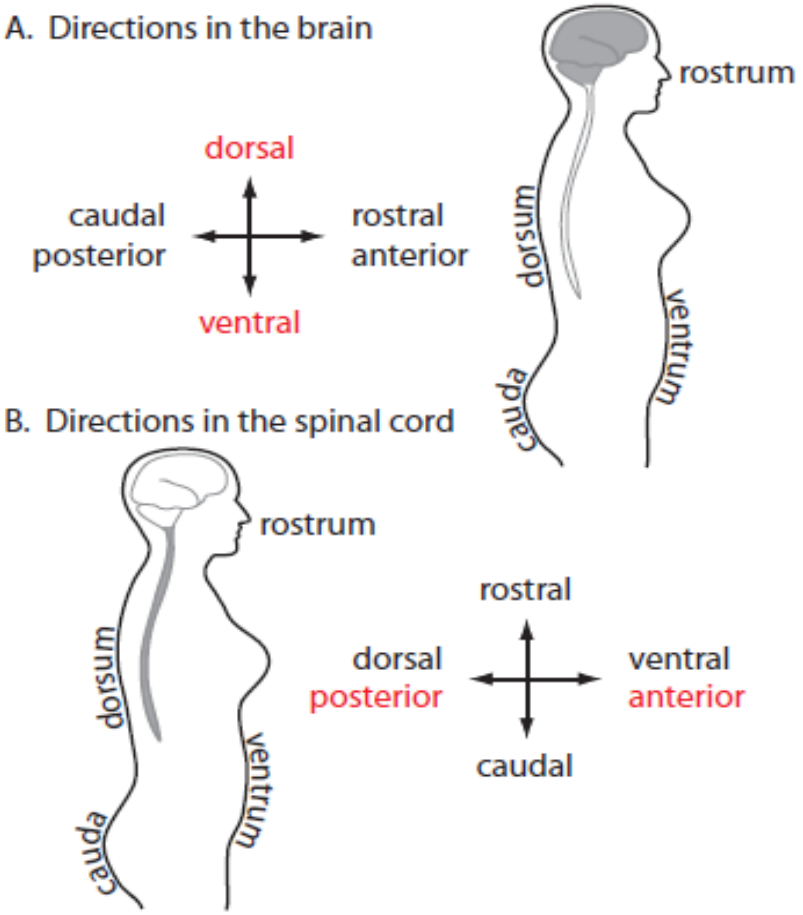
Brain Anatomy and Function

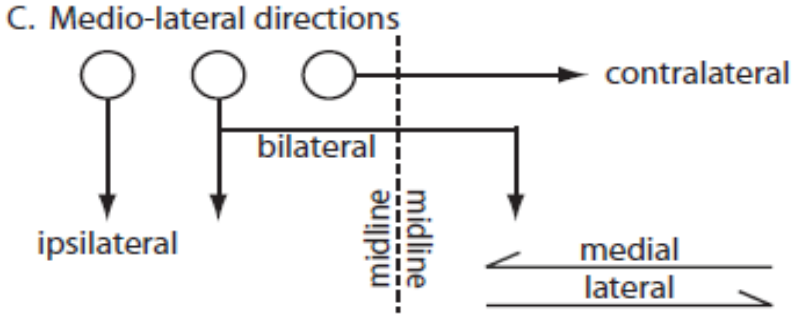


Terminology

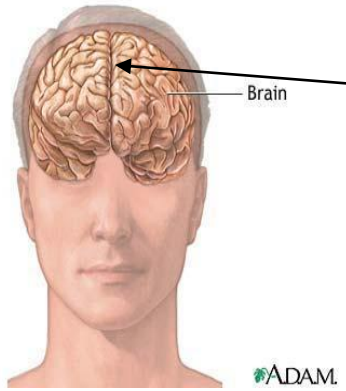




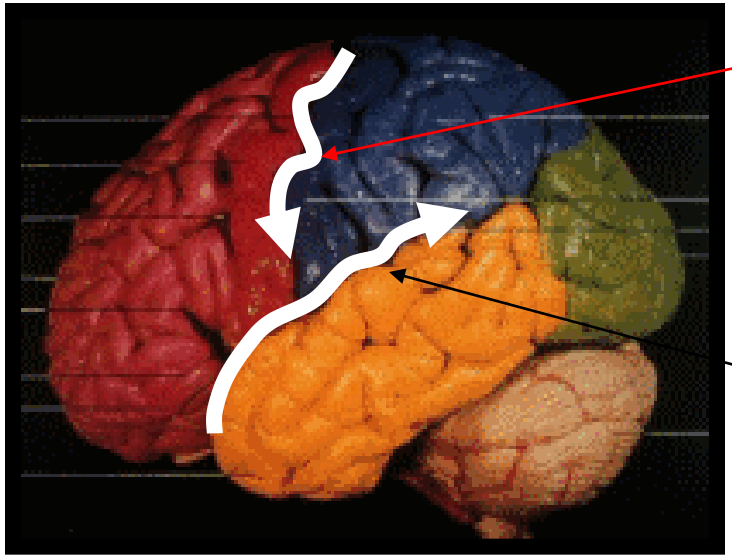




Anatomy of the Brain



- Separated into right and left halves by the *Interhemispheric Fissure*

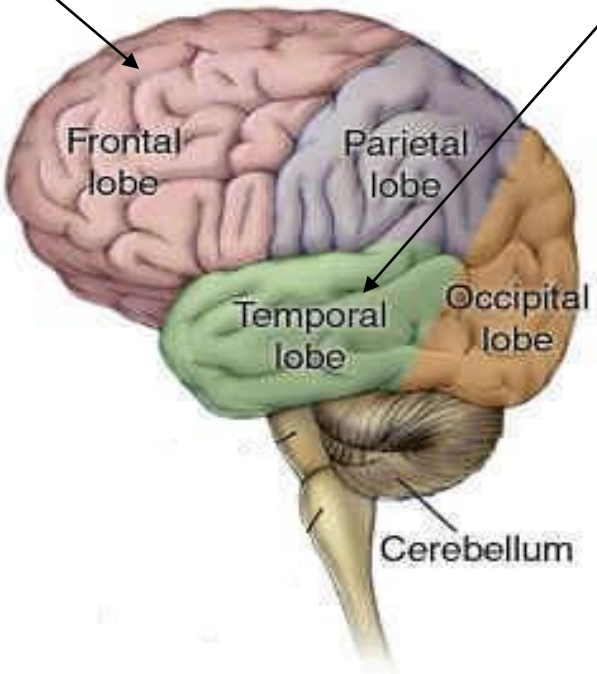


- The *Central Sulcus* runs down & forward
- The *Lateral Fissure* runs backward & up

Frontal and Temporal Lobes

Frontal

1. Thought
2. Voluntary movement
3. Speech motor
4. Covers 1/3rd of area of the brain



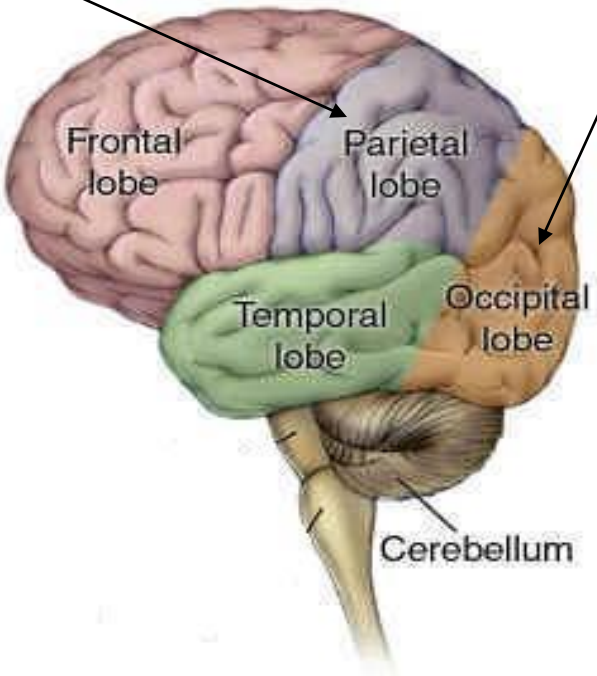
Temporal

1. Memory
2. Auditory function

Parietal and Occipital Lobes

Parietal

- Sensation
  - Touch
  - Pressure
  - Pain
  - Temperature
  - Texture
- Position/spatial orientation



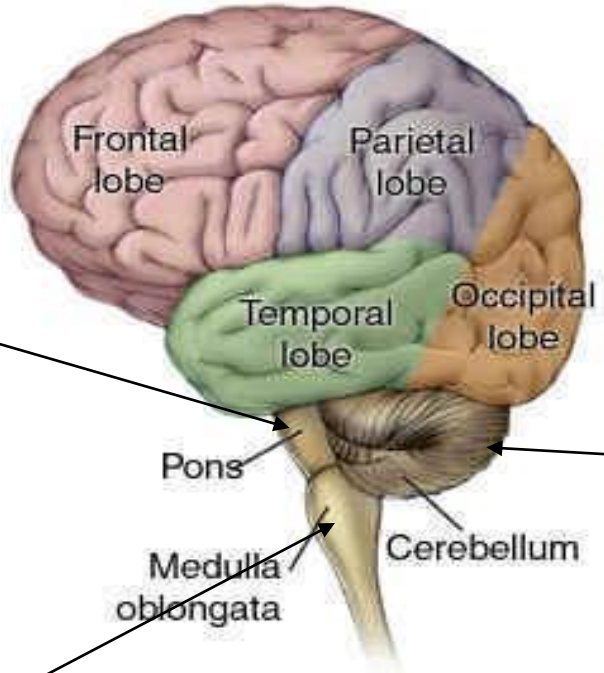
Occipital

1. Vision
2. Visual processes
3. Reading

Medulla Oblongata,Cerebellum, & Pons

Pons

- Relay between the cerebral hemispheres and the cerebellum



Cerebellum

- Large Muscle Coordination
- Balance
  - Walking, Writing

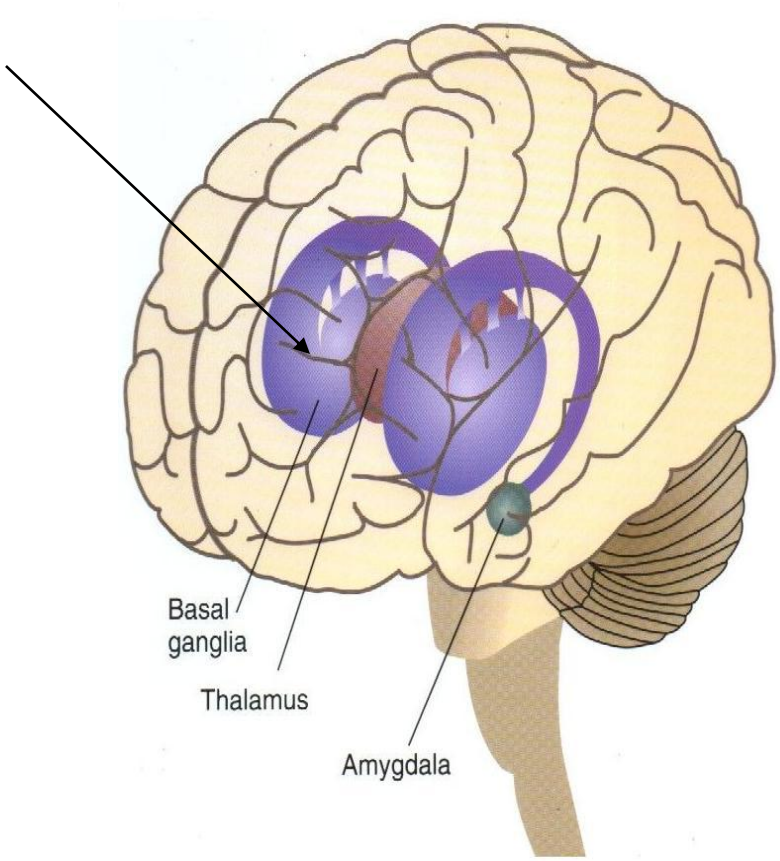
Medulla Oblongata

- Respiration
- Heart rate
- Continuous with the spinal cord (2.5 cm)

Basal Ganglia and Thalamus

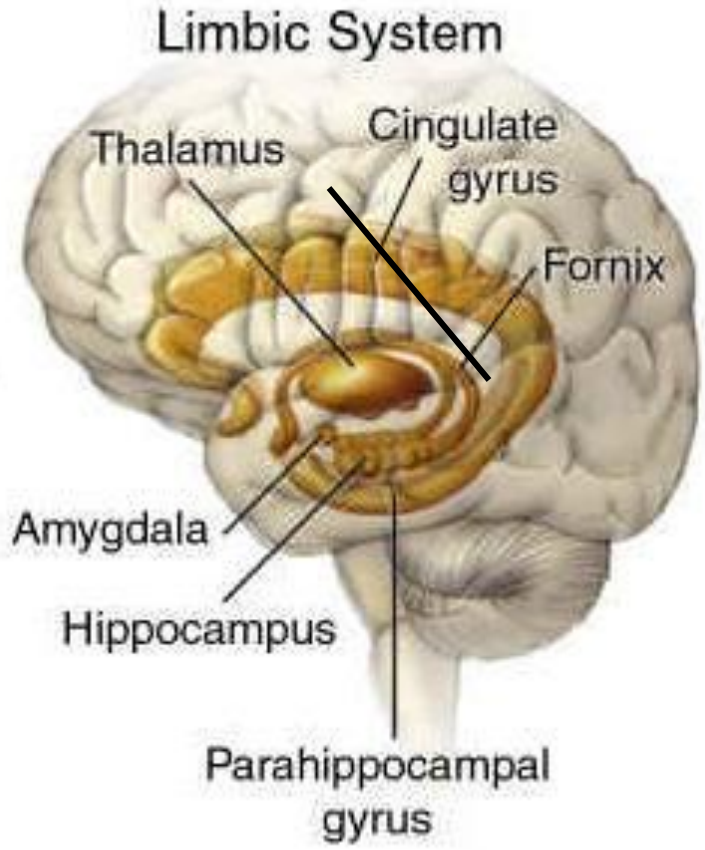
"The Brakes"

- Modifies movement on a minute-to-minute basis
- Inhibits Movement
- Coordination



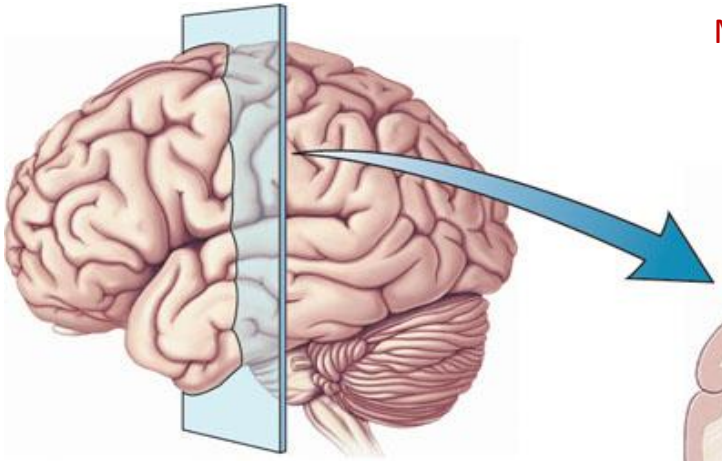
Limbic System

- Attention
- Sensory gateway
- Memory processing
- Rage
- Aggression
- Sexuality
- Appetite/Thirst



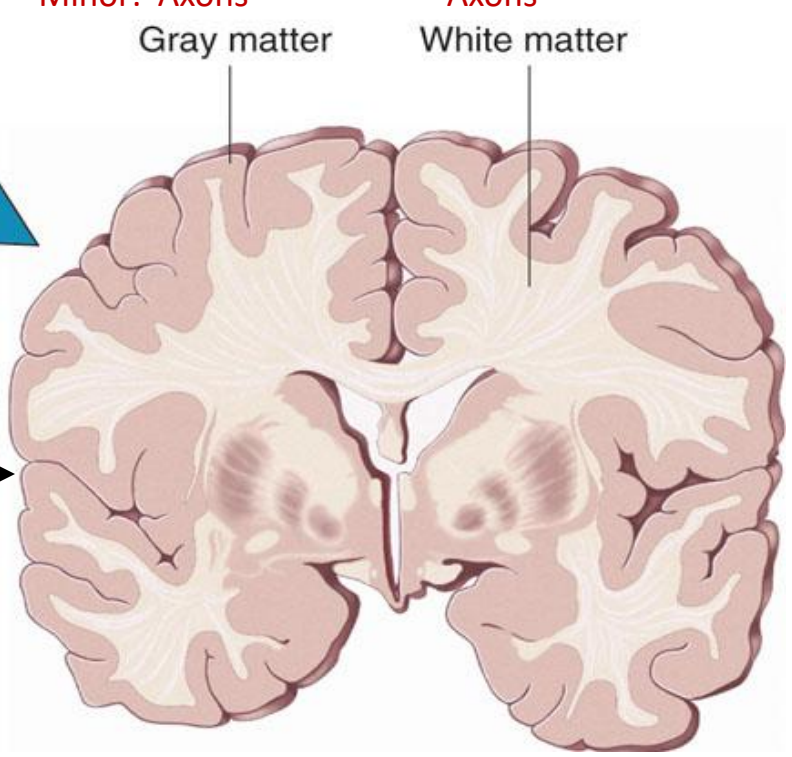
Cerebral Cortex

Cerebral Cortex - The outermost layer of gray matter making up the superficial aspect of the cerebrum.

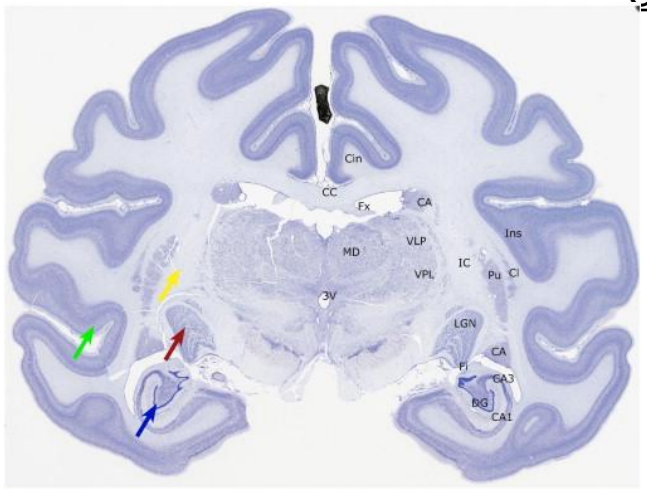


Majority : Cell bodies
Minor: Axons

Axons



Cerebral **Cortex**

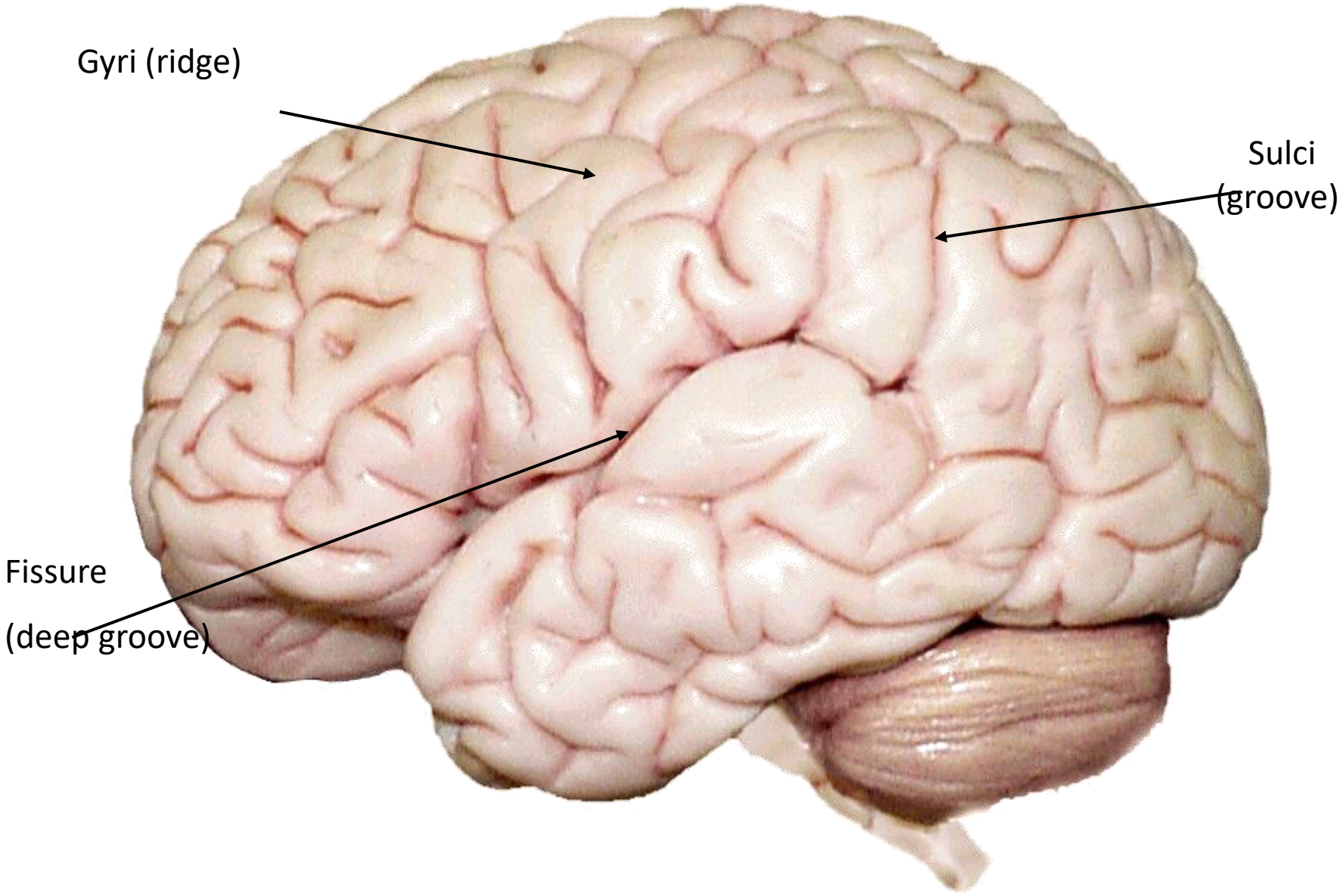


Cerebral Features

1. **Gyri** – Elevated ridges "winding" around the brain. (mountains)

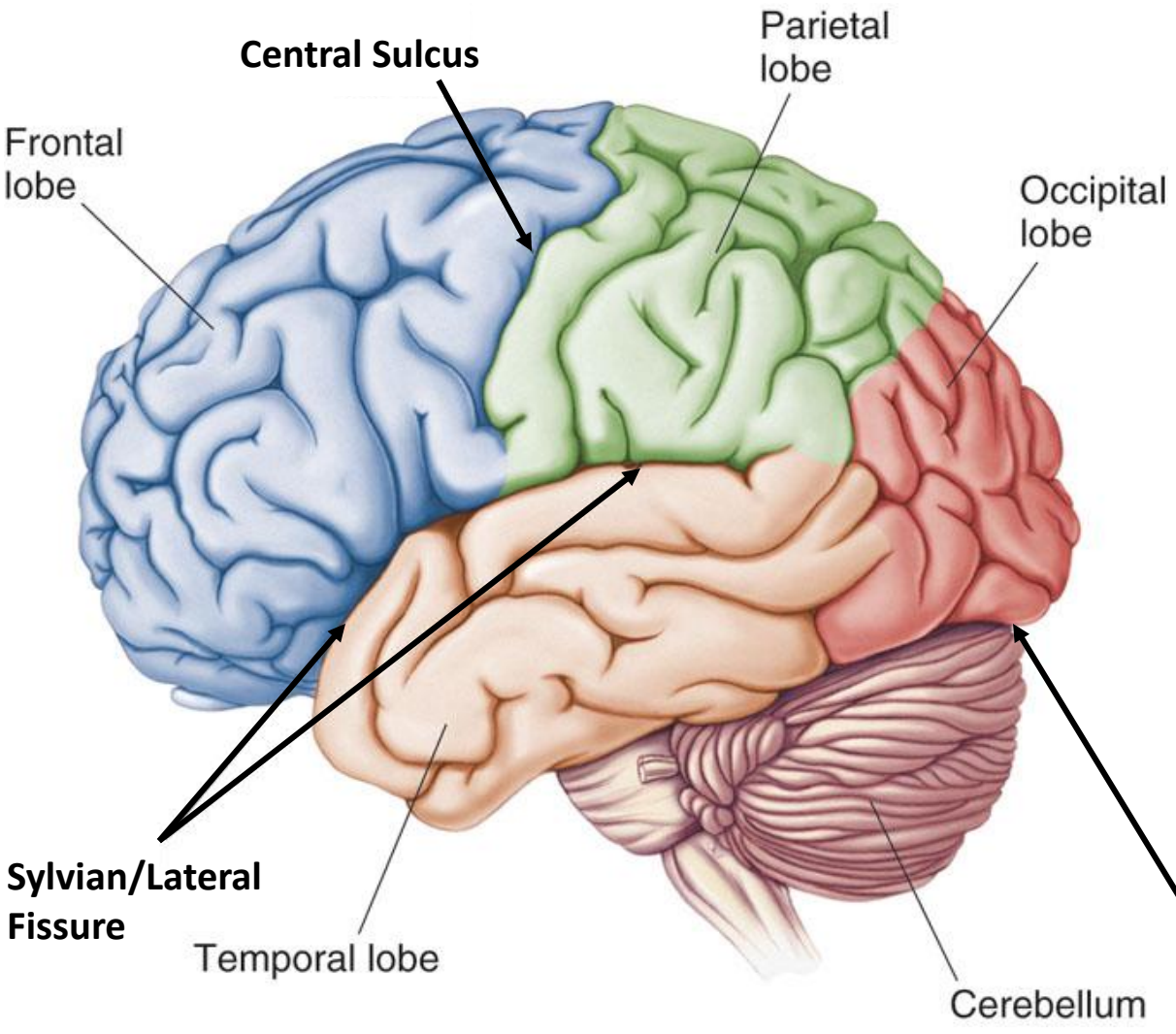
2. **Sulci** – Small grooves dividing the gyri
   - ✓ **Central Sulcus** – Divides the Frontal Lobe from the Parietal Lobe

3. **Fissures** – Deep grooves, generally dividing large regions/lobes of the brain
   - ➢ **Longitudinal Fissure** – Divides the two Cerebral Hemispheres
   - ➢ **Transverse Fissure** – Separates the Cerebrum from the Cerebellum
   - ➢ **Sylvian/Lateral Fissure** – Divides the Temporal Lobe from the Frontal and Parietal Lobes



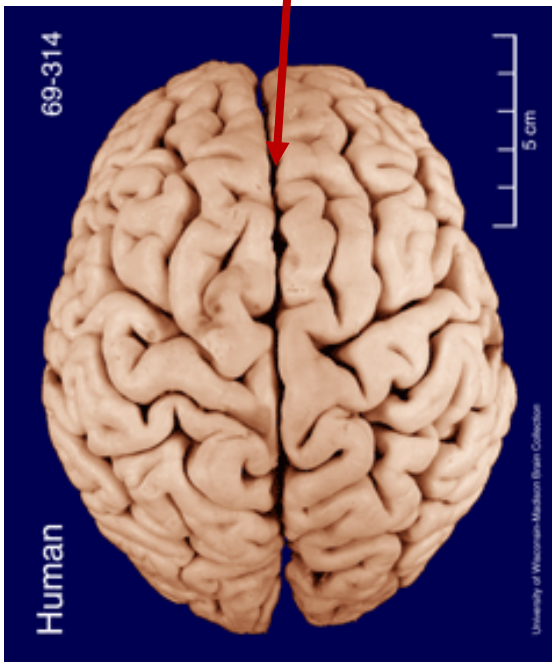
http://williamcalvin.com/BrainForAllSeasons/img/bonoboLH-humanLH-viaTWD.gif

Specific Sulci/Fissures:

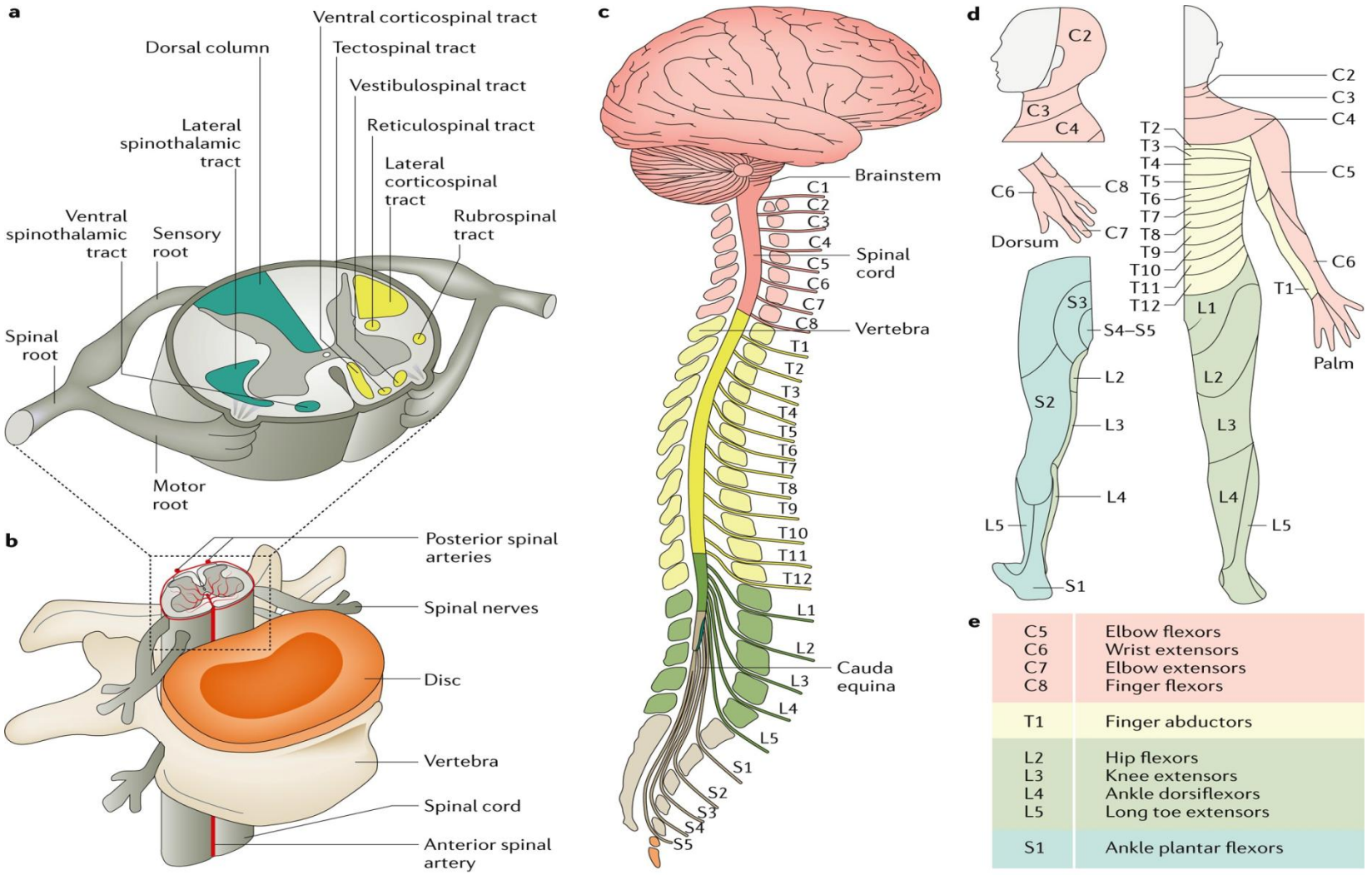


Transverse Fissure

Longitudinal Fissure



Spinal cord



Nature Reviews | Disease Primers

Brain oxygen and glucose delivery– Normal

Normal brain tissue actively metabolizes glucose.

Glucose metabolism provides 95% of the energy required for brain function.

1. Brain is more dependent, than any other tissue, on a constant blood supply. Even though many substances in the blood never actually come in contact with the brain tissue.
2. Brain cannot produce ATP without O_2. Only aerobic metabolism. No anaerobic metabolism even for at least short periods.
3. Scientist recently discovered an O_2 binding protein, Neurogloblin, in the brain.
4. Neurogloblin, which is similar to hemoglobin in RBC, is thought to play a key role in O_2 handling, although its exact function remains to be determined.

Brain oxygen and glucose delivery– Normal

5. Brain normally uses only glucose but does not store any of this nutrient. Most other tissues, which can use other sources of fuel for energy production in absence of glucose,
6. Bços of its high rate of demand for ATP, under resting conditions the brains uses 20% of the O_2 and 50% of the glucose consumed in the body
7. Although it constitutes only 2% of body weight, the brain receives 15% of the blood pumped out by the heart
8. Instead of using glucose during starvation, the brain can resort it using ketone bodied produced by the liver, but this alternate nutrient source also must be delivered by the blood to the brain.
9. Brain get damage, if it is deprived of its critical O_2 supply for more than 4-5 min or if its glucose supply is cut off for more than 10-15 minutes.
10. The most common cause of inadequate blood supply to the brain is a stroke.

Nervous System

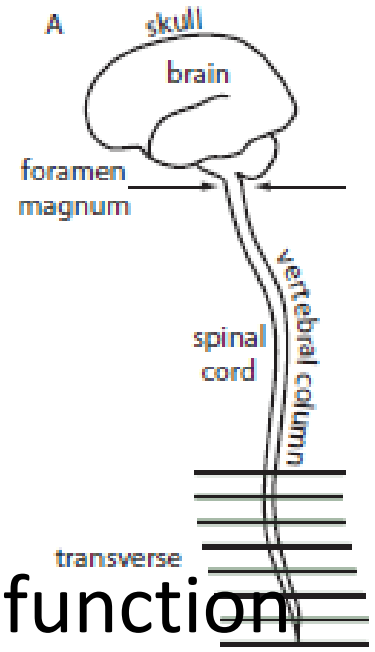
- The nervous system contains two parts:

1. The Central Nervous System (CNS) , comprises those neurons that sit within the protective confines of the dural envelope.
2. The Peripheral Nervous System (PNS), containing neurons with cell bodies outside of the dural envelope

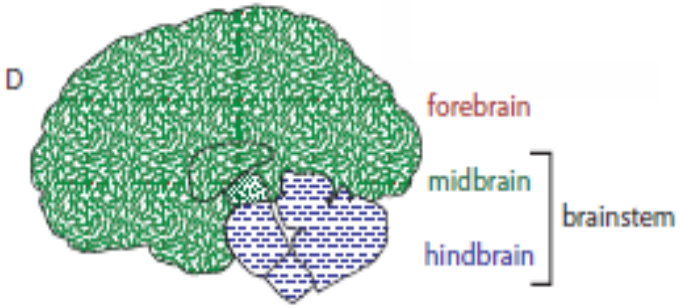
Central Nervous System (CNS)

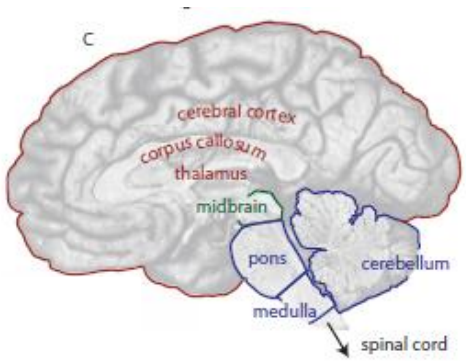
1. Forebrain,
2. Brainstem,
3. Spinal cord

} comprise the CNS



Each contributes differently to normal function

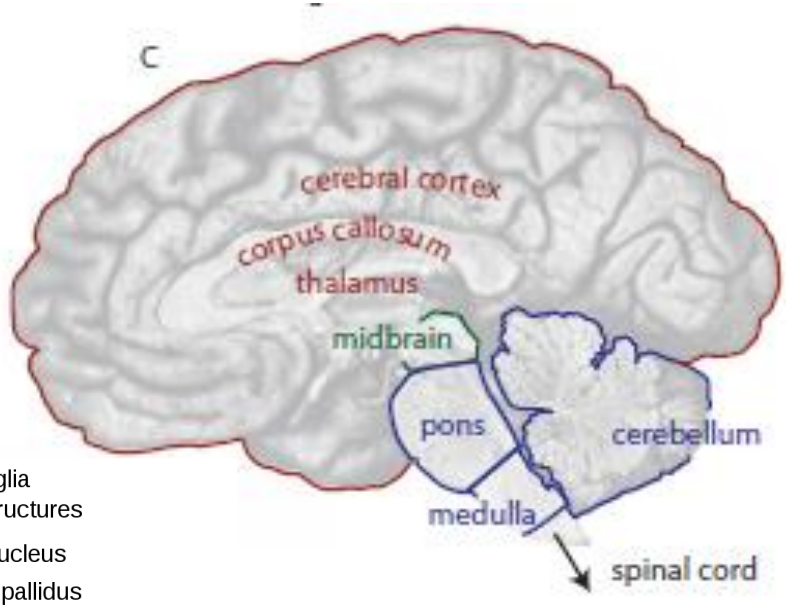


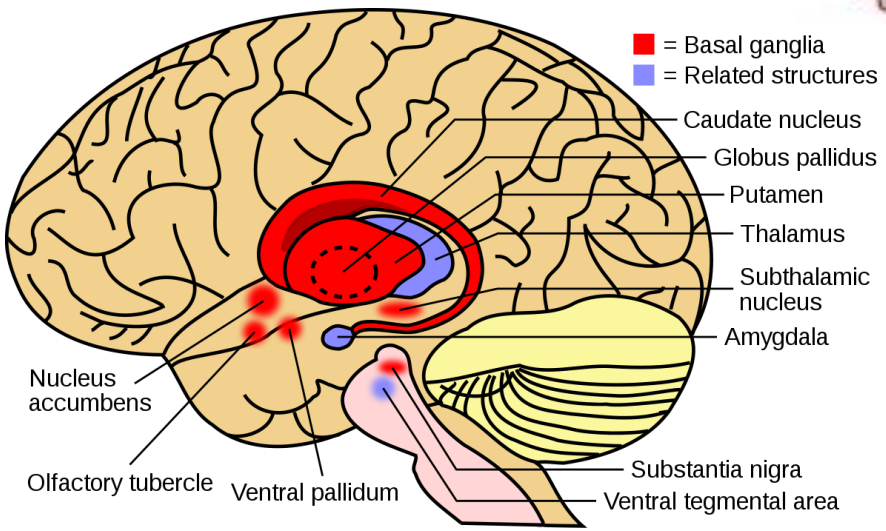


mid-sagittal view,

Forebrain

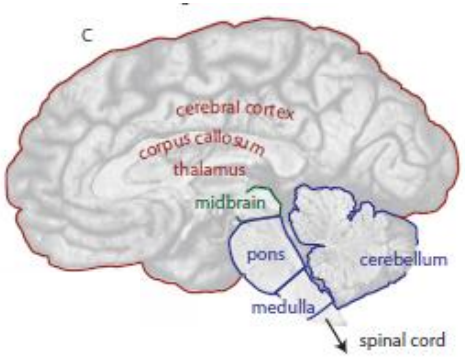
- consisting of the
  1. cerebral cortex ,
  2. basal ganglia , and
  3. thalamus

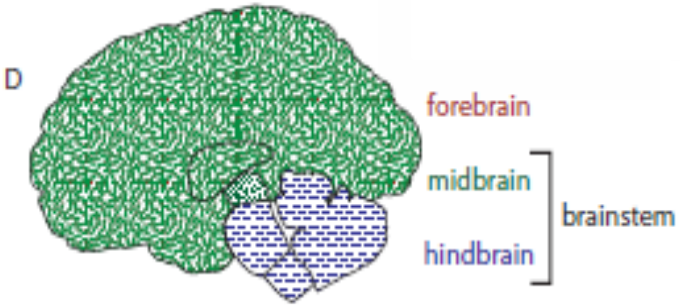




Brainstem

- consisting of the
  1. Midbrain ,
  2. Pons ,
  3. Medulla , and
  4. Cerebellum



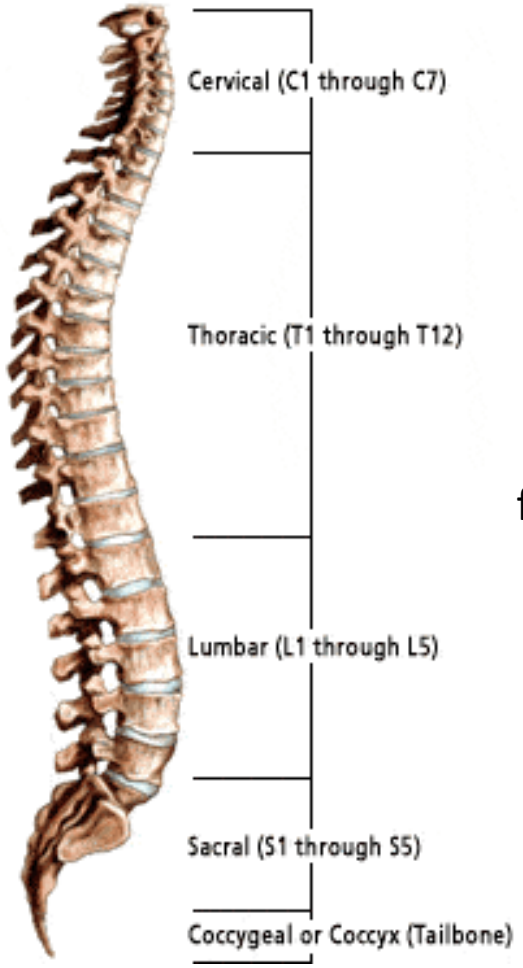


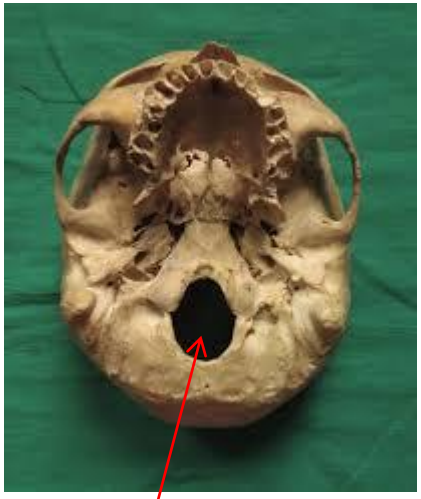
Both the Brainstem and the Forebrain are contained within the skull and are commonly called Brain

Spinal cord

consisting of

1. Cervical,
2. Thoracic,
3. Lumbar and
4. Sacral regions





foramen magnum