PTA 106
Unit 1 Lecture 1A

PTA 106 Regional Anatomy and Physiology

Regional Anatomy- Focuses on the anatomical organization of specific areas of the body, such as the head, neck, or trunk. Many advanced courses in anatomy stress a regional approach, because it emphasizes the spatial relationships between structures important to clinical settings.

PTA 106 Regional Anatomy and Physiology

Regional approach for the three units of this class:

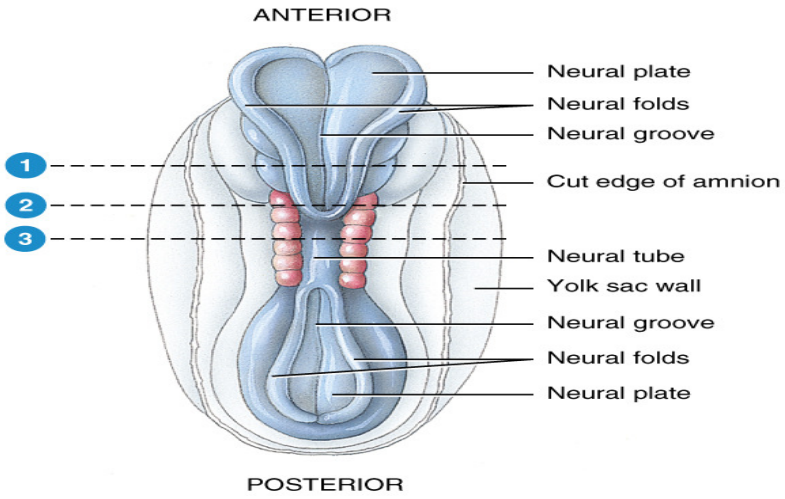
- Head and Neck A&P
- Thoracic and Abdominopelvic A&P
- Upper and Lower Extremities A&P

PTA 106 Regional Anatomy and Physiology

Systems covered regionally:

- Digestive system
- Respiratory system
- Cardiovascular system
- Endocrine system
- Urinary system
- Reproductive system
- Muscles
- Skeletal
- Nervous

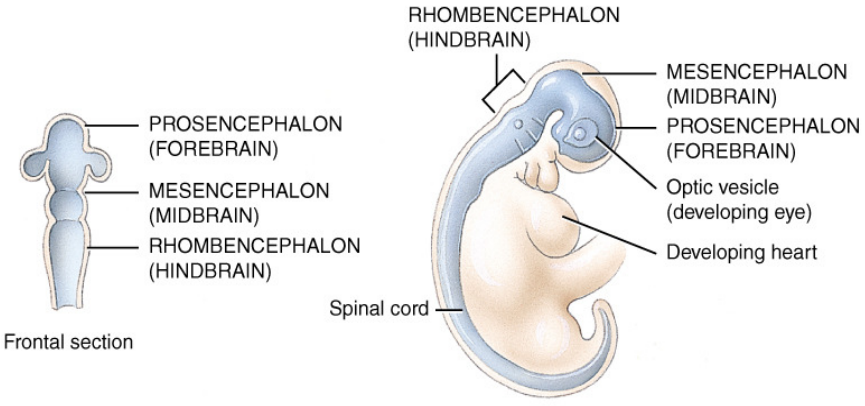
Embryonic Development of the Brain and Spinal Cord



(a) Dorsal view

© John Wiley & Sons, Inc.

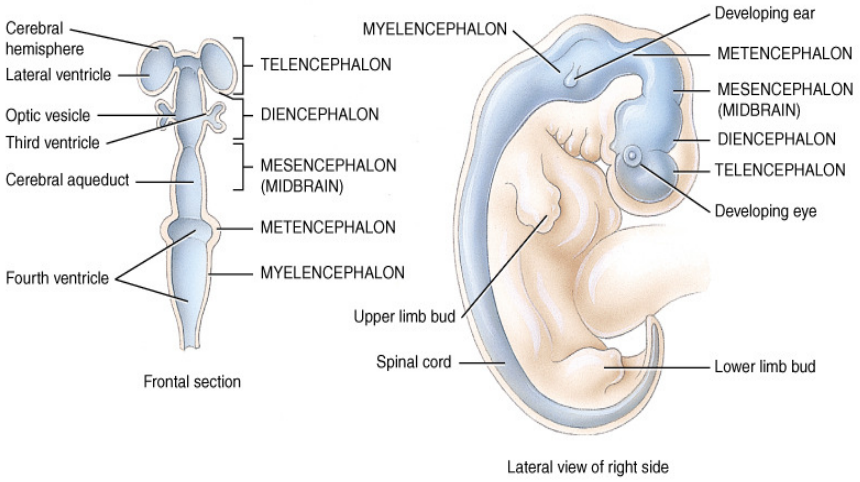
Embryonic Development of the Brain and Spinal Cord, Primary Structures



(a) 3–4 week embryo showing primary brain vesicles

© John Wiley & Sons, Inc.

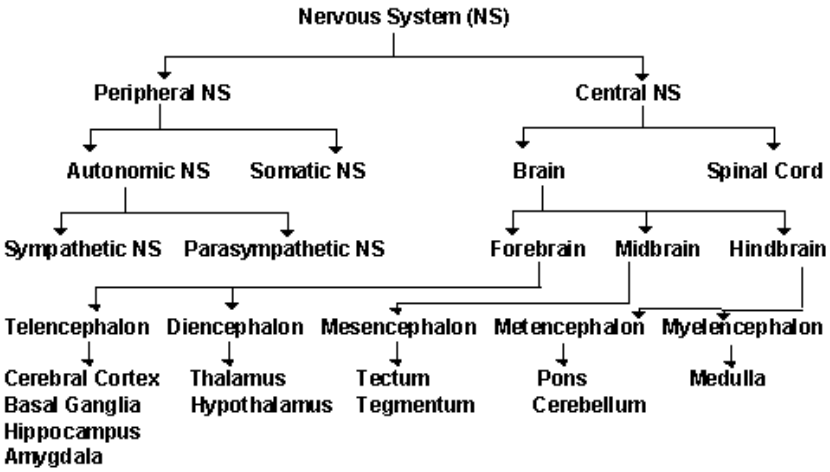
Embryonic Development of the Brain and Spinal Cord, Secondary Structures



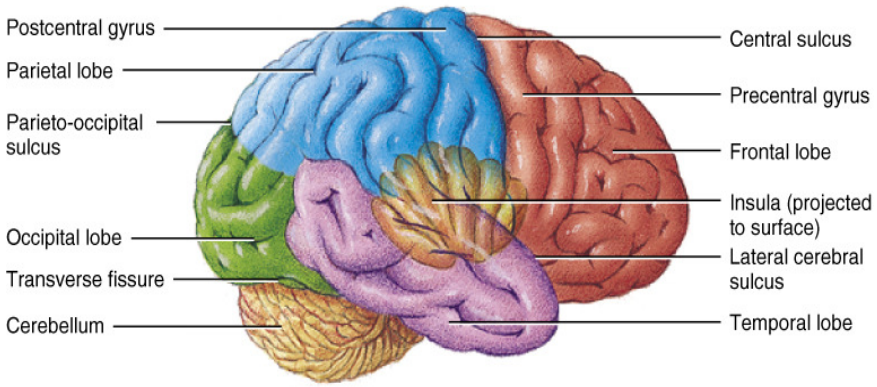
(b) 5–week embryo showing secondary brain vesicles

© John Wiley & Sons, Inc.

Flow Chart for the Nervous System



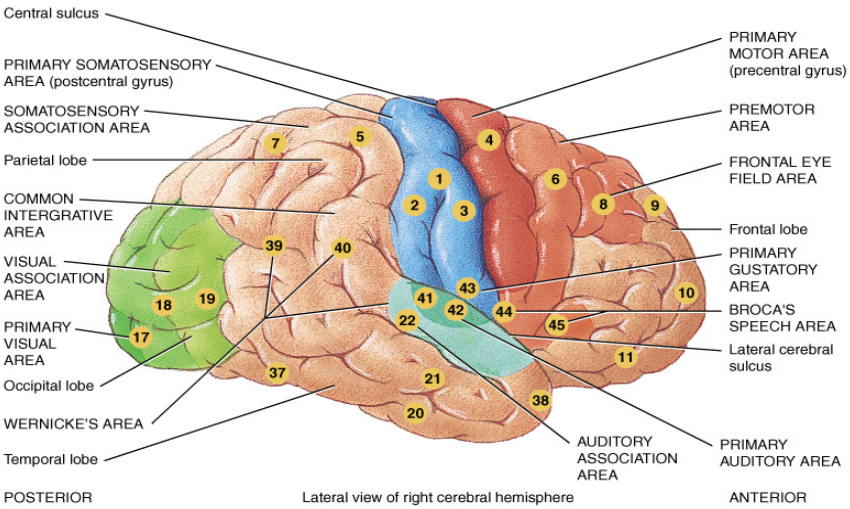
Lobes of the Cerebral Cortex



(b) Right lateral view

© John Wiley & Sons, Inc.

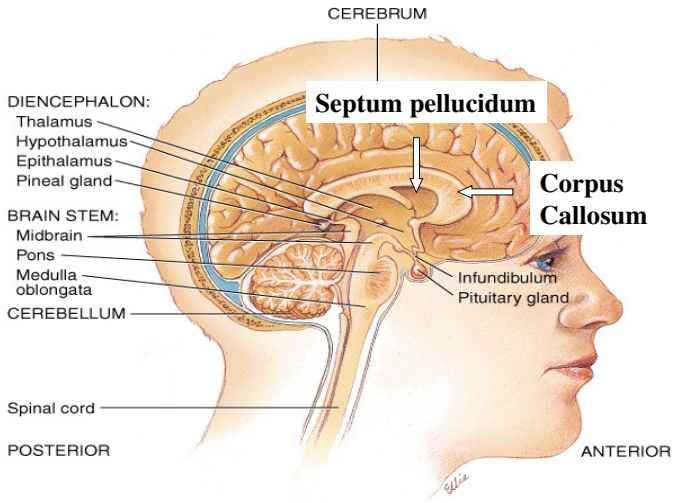
Functional Areas of the Cerebral Cortex



Lateral view of right cerebral hemisphere

© John Wiley & Sons, Inc.

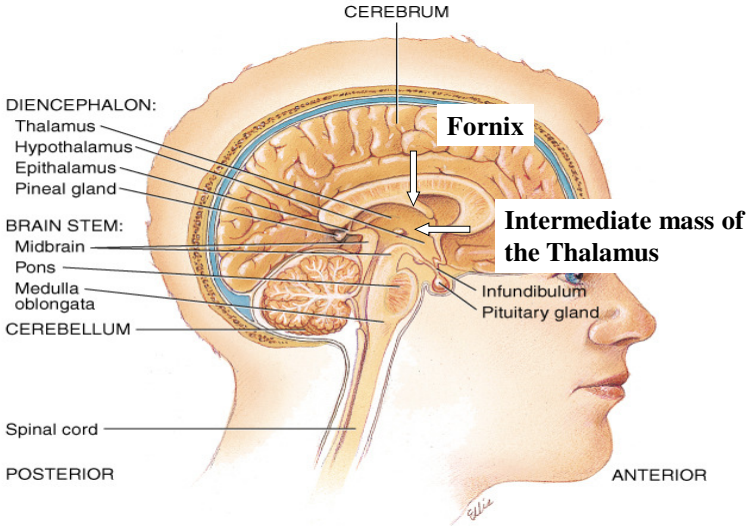
Major Internal Structures of the Brain as seen in mid-sagittal



(a) Sagittal section of brain, medial view

© John Wiley & Sons, Inc.

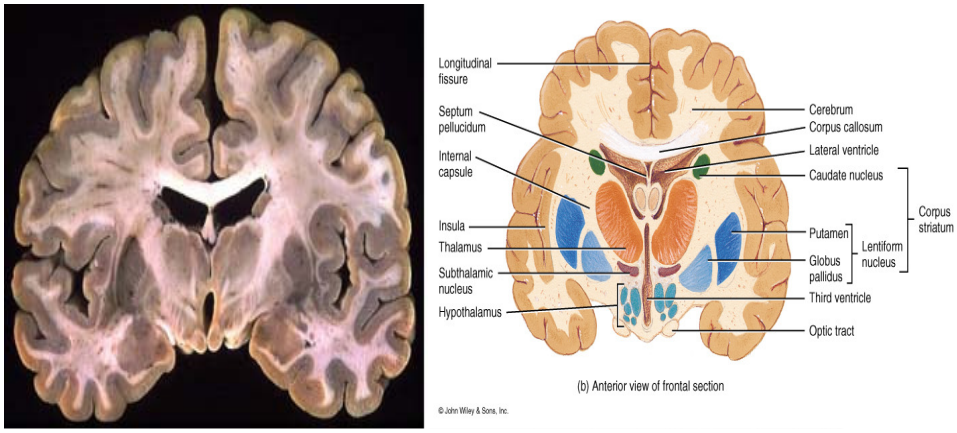
Major Structures of the Brain



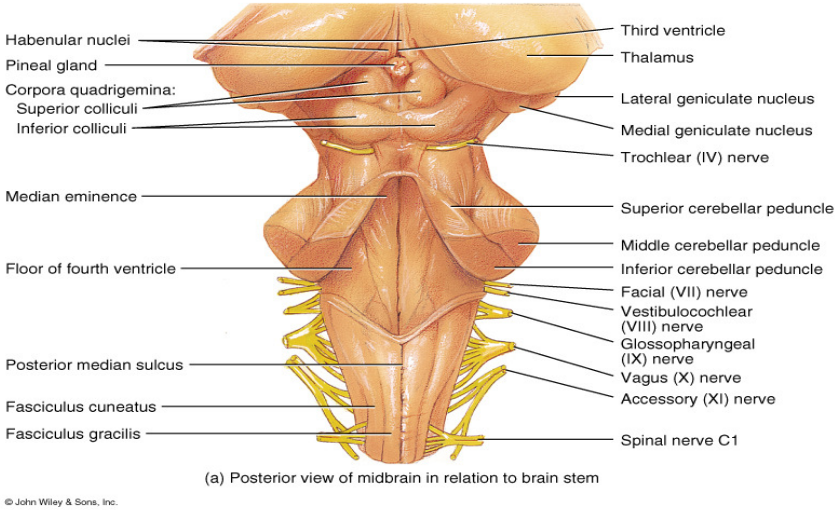
(a) Sagittal section of brain, medial view

© John Wiley & Sons, Inc.

Major Structures of the Brain as seen in Frontal Section



Major Structures of the Brain



Cerebrospinal Fluid "CSF"

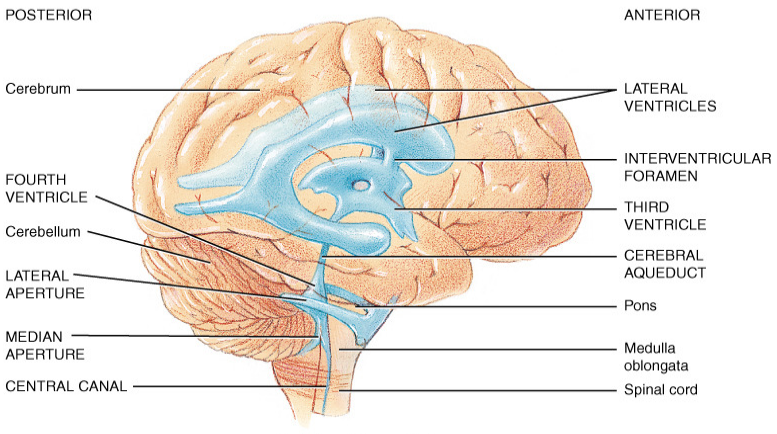
Blood-Brain Barrier: formed by tight junction of the endothelial cells of capillaries, tight junction between ependymal cells and astrocytes. These three tissues are involved in production of CSF.

Total Volume: 80-150 ml
Production rate: 20ml/hr.
Composition: glucose, proteins, lactic acid, urea
cations (Na+, K+, Ca2+, Mg2+)
anions (Cl-, HCO3-)

Functions:

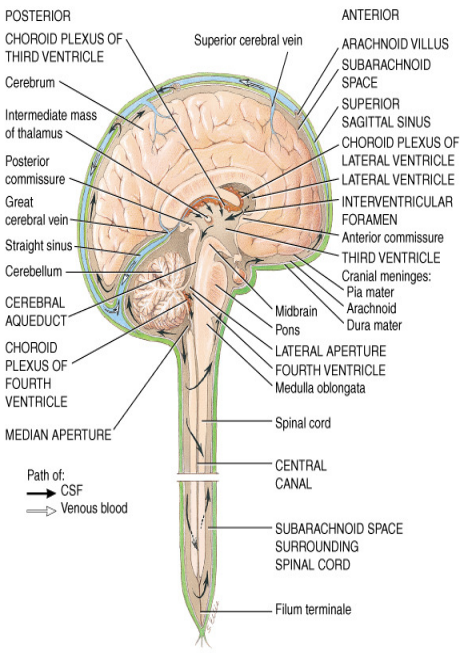
1. Mechanical protection
2. Chemical protection
   hyponatremia, hypernatremia
3. Circulation

Organization of Ventricles of the Brain



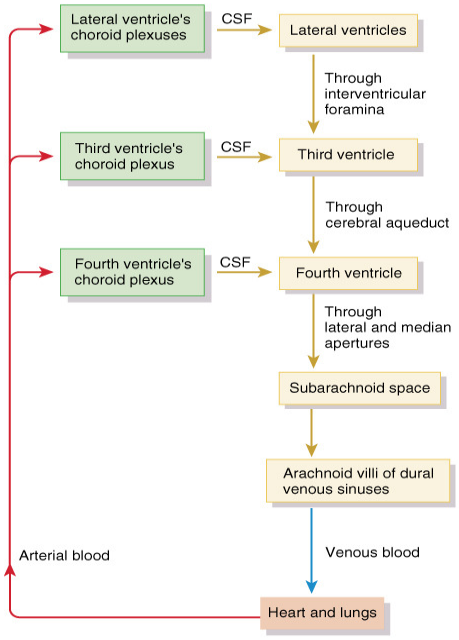
Right lateral view of brain

© John Wiley & Sons, Inc.



(a) Sagittal section of brain and spinal cord

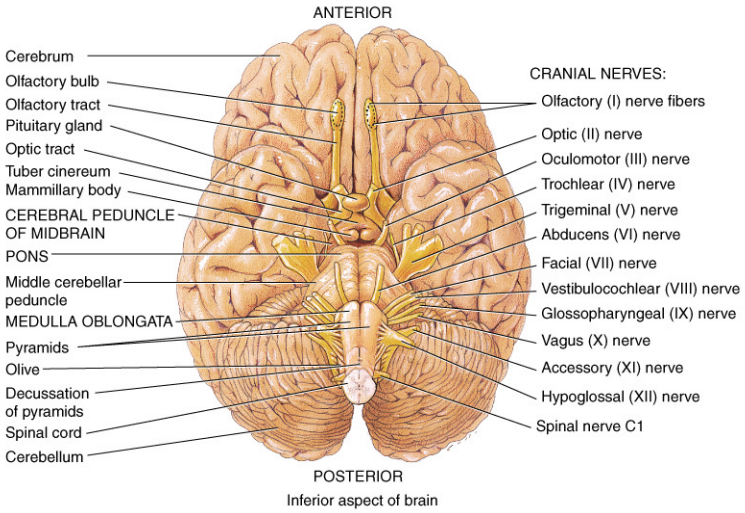
© John Wiley & Sons, Inc.



(c) Summary of the formation, circulation, and absorption of cerebrospinal fluid (CSF)

© John Wiley & Sons, Inc.

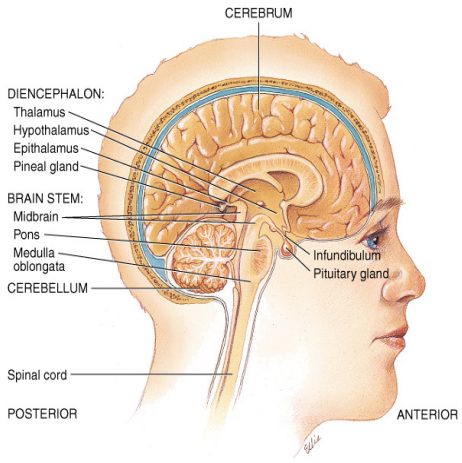
Cranial Nerves- 12 pairs



Inferior aspect of brain

© John Wiley & Sons, Inc.

Structural and Functional areas of the Medulla Oblongata



(a) Sagittal section of brain, medial view

© John Wiley & Sons, Inc.

Cardiovascular Center:

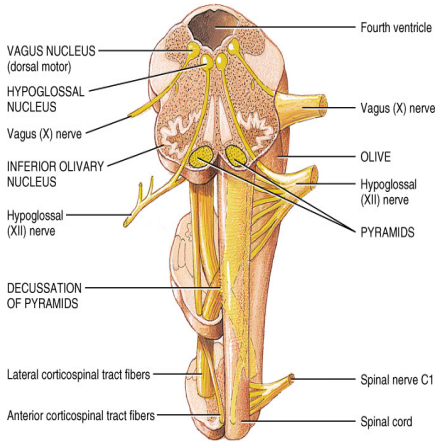
Regulates the rate and force of the heartbeat and the diameter of blood vessels

Medullary Rhythmicity Area:

adjusts the basic rhythm of breathing via inspiratory and expiratory areas.

Other centers for vomiting, coughing, and sneezing

Structural and Functional areas of the Medulla Oblongata



Transverse section and anterior surface of medulla oblongata

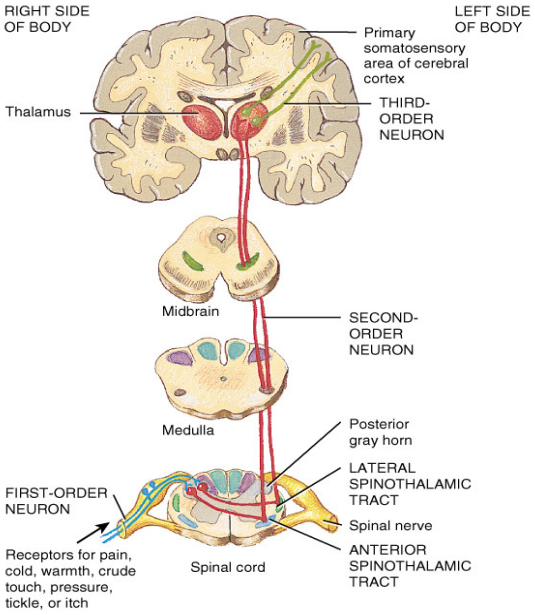
© John Wiley & Sons, Inc.

- **Pyramids:**

  Axons from the largest motor tracts from the cerebrum to the Spinal Cord.
- **Decussation of Pyramids:**

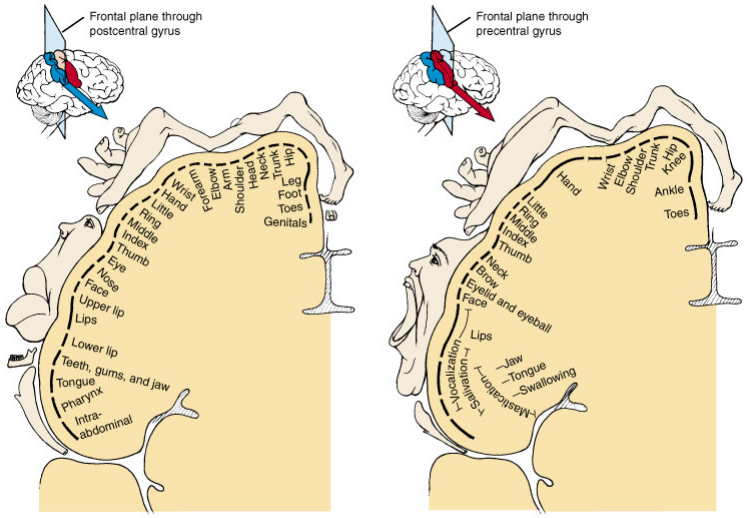
  Crossing of the motor tracts of the pyramids
- **Nucleus Gracilis: Neuron cells bodies of second order neurons (sensory info)**
- **Nucleus Cuneatus: Neuron cells bodies of second order neurons (sensory info)**

Organization of Sensory or Ascending Pathways



(b) Anterolateral (spinothalamic) pathways

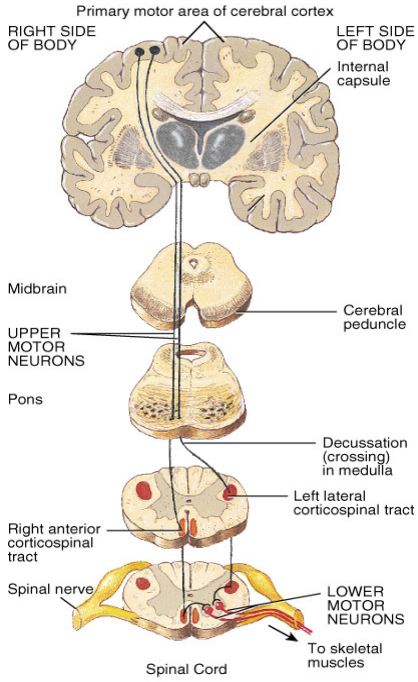
© John Wiley & Sons, Inc.



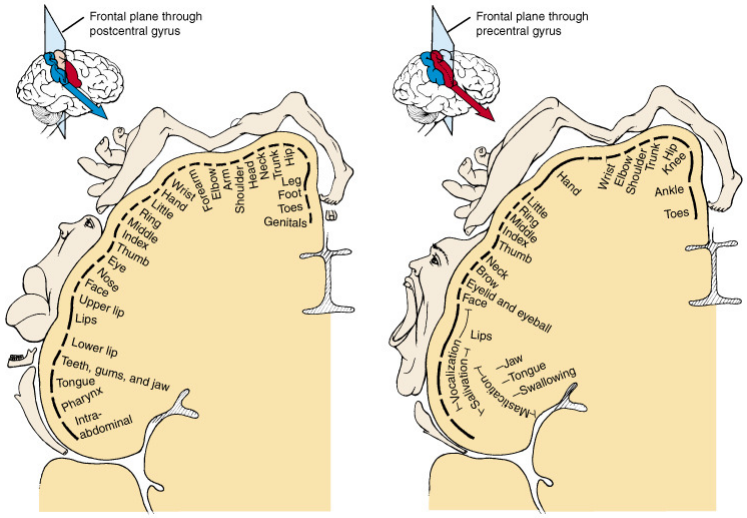
(a) Frontal section of primary somatosensory area in right cerebral hemisphere

(b) Frontal section of primary motor area in right cerebral hemisphere

© John Wiley & Sons, Inc.



© John Wiley & Sons, Inc.

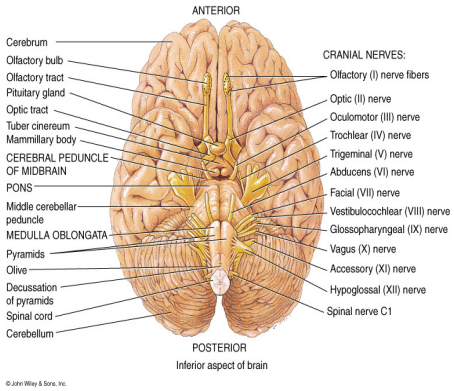


(a) Frontal section of primary somatosensory area in right cerebral hemisphere

(b) Frontal section of primary motor area in right cerebral hemisphere

© John Wiley & Sons, Inc.

Structural and Functional areas of the Medulla Oblongata



- **Contains the Nuclei of five cranial nerves:**

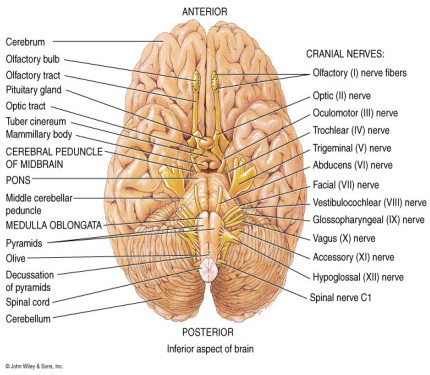
12. **Hypoglossal**

    Origin for impulses that control tongue movement for speech and swallowing

11. **Spinal Accessory**

    Origin for nerve impulses that control swallowing.

Structural and Functional areas of the Medulla Oblongata



- **Contains the Nuclei of five cranial nerves:**

10. **Vagus**

    Sensory and motor impulses for viscera

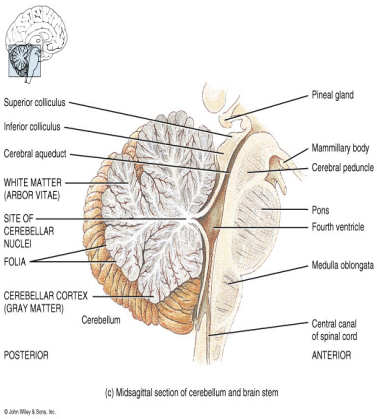
9. **Glossopharyngeal**

    Relay sensory and motor impulses related to taste, swallowing, and salivation

8. **Vestibulocochlear**

    Receive sensory and motor impulses for the cochlea

Structural and Functional areas of the Pons



- **Bridge that connects medulla and superior brain structures**
- **Longitudinal axons of ascending sensory and descending motor tracts**
- **Transverse axons connect the right and left sides of the cerebellum**
- **Pneumotaxic Area:**

  transmits inhibitory impulses to the inspiratory area of the Medullary rhythmicity area