

The Nervous System

The Reflex Arc

- Reflex – rapid, predictable, and involuntary responses to stimuli
- Reflex arc – direct route from a sensory neuron, to an interneuron, to an effector

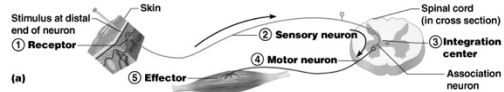


Figure 7.11a

Simple Reflex Arc

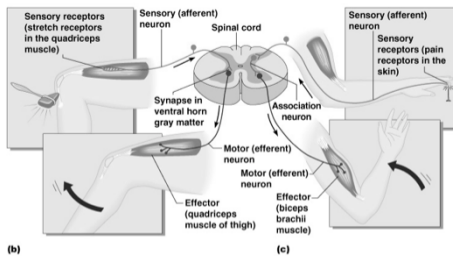


Figure 7.11b-c

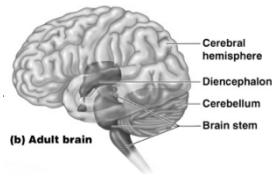
Types of Reflexes and Regulation



- Autonomic reflexes
 - Smooth muscle regulation
 - Heart and blood pressure regulation
 - Regulation of glands
 - Digestive system regulation
- Somatic reflexes
 - Activation of skeletal muscles

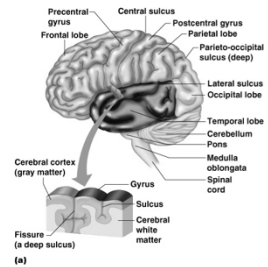
Regions of the Brain

- Cerebral Cortex
- Brain stem
- Cerebellum



(b) Adult brain

Cerebral Hemispheres (Cerebrum)



(a)

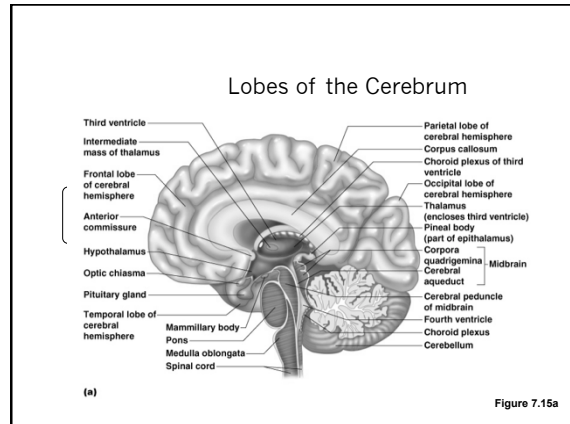
- Paired (left and right) superior parts of the brain
- Include more than half of the brain mass

Figure 7.13a

Lobes of the Cerebrum



- Surface lobes of the cerebrum
 - Frontal lobe
 - Parietal lobe
 - Occipital lobe
 - Temporal lobe

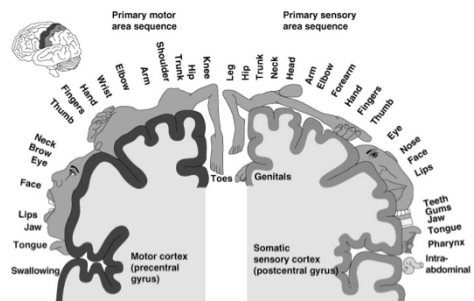


Specialized Areas of the Cerebrum



- Somatic sensory area – receives impulses from the body's sensory receptors
- Primary motor area – sends impulses to skeletal muscles
- Broca's area – involved in our ability to speak

Sensory and Motor Areas of the Cerebral Cortex



Specialized Areas of the Cerebrum

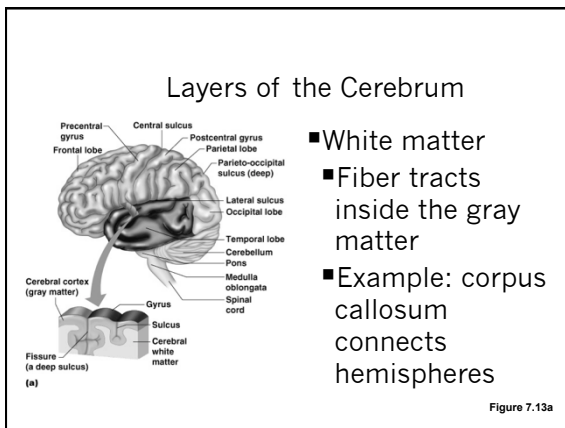
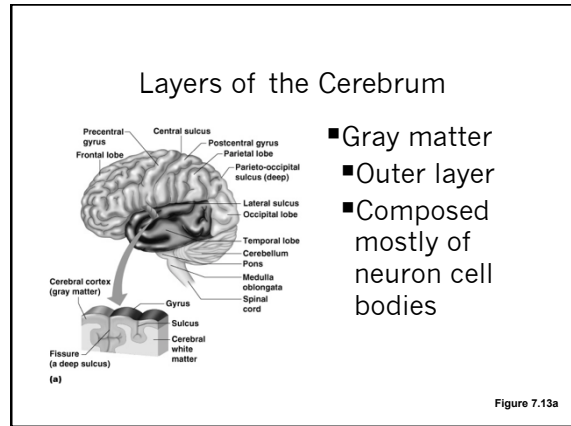
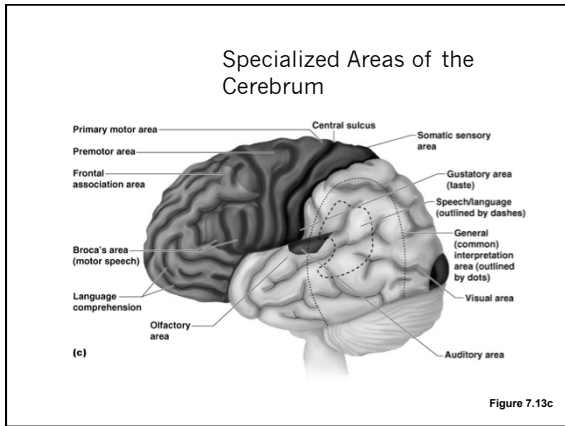


- Cerebral areas involved in special senses
 - Gustatory area (taste)
 - Visual area
 - Auditory area
 - Olfactory area

Specialized Areas of the Cerebrum

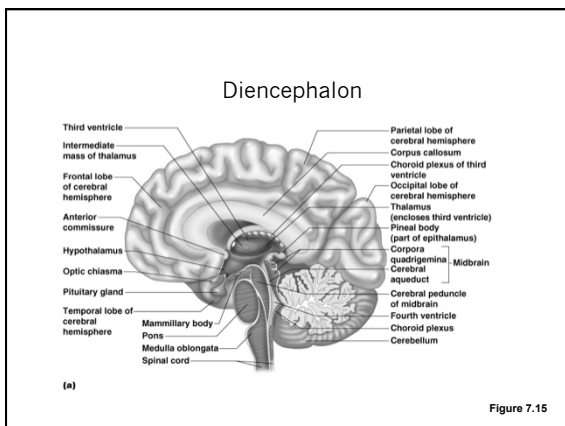


- Interpretation areas of the cerebrum
 - Speech/language region
 - Language comprehension region
 - General interpretation area



Diencephalon

- Sits on top of the brain stem
- Enclosed by the cerebral hemispheres
- Made of three parts
 - Thalamus
 - Hypothalamus



Thalamus

- Surrounds the third ventricle
- The relay station for sensory impulses
- Transfers impulses to the correct part of the cortex for localization and interpretation

Hypothalamus



- Under the thalamus
- Important autonomic nervous system center
 - Helps regulate body temperature
 - Controls water balance
 - Regulates metabolism

Hypothalamus



- An important part of the limbic system (emotions)
- The pituitary gland is attached to the hypothalamus

Brain Stem



- Attaches to the spinal cord
- Parts of the brain stem
 - Midbrain
 - Pons
 - Medulla oblongata

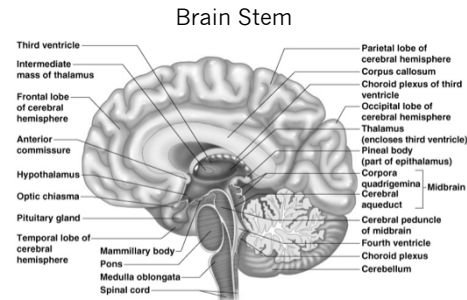


Figure 7.15a

Midbrain



- Mostly composed of tracts of nerve fibers
- Has two bulging fiber tracts – cerebral peduncles
- Has four rounded protrusions – corpora quadrigemina
 - Reflex centers for vision and hearing

Pons



- The bulging center part of the brain stem
- Mostly composed of fiber tracts
- Includes nuclei involved in the control of breathing

Medulla Oblongata



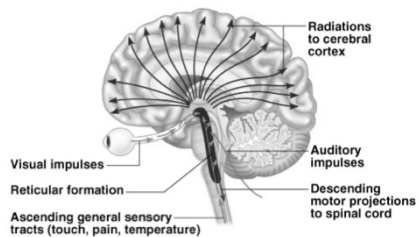
- The lowest part of the brain stem
- Merges into the spinal cord
- Includes important fiber tracts
- Contains important control centers
 - Heart rate control
 - Blood pressure regulation
 - Breathing
 - Swallowing
 - Vomiting

Reticular Formation



- Diffuse mass of gray matter along the brain stem
- Involved in motor control of visceral organs
- Reticular activating system plays a role in awake/sleep cycles and consciousness

Reticular Formation



(b)

Figure 7.15b