

Chapter 13: Nervous System

The nervous system allows for communication between cells through sensory input, integration of data, and motor output.

2 nervous divisions:

- Central nervous system (CNS): Brain and spinal cord
 - Both are protected by
 - Bones – skull and vertebral column
 - Meninges – 3 protective membranes that wrap around CNS
 - Cerebral spinal fluid (CSF) – space between meninges is filled with this fluid that cushions and protects the CNS
 - Both are made up of 2 types of nervous tissue.
 - Gray matter – contains cell bodies and non-myelinated fibers
 - White matter – contains myelinated axons

Spinal Cord

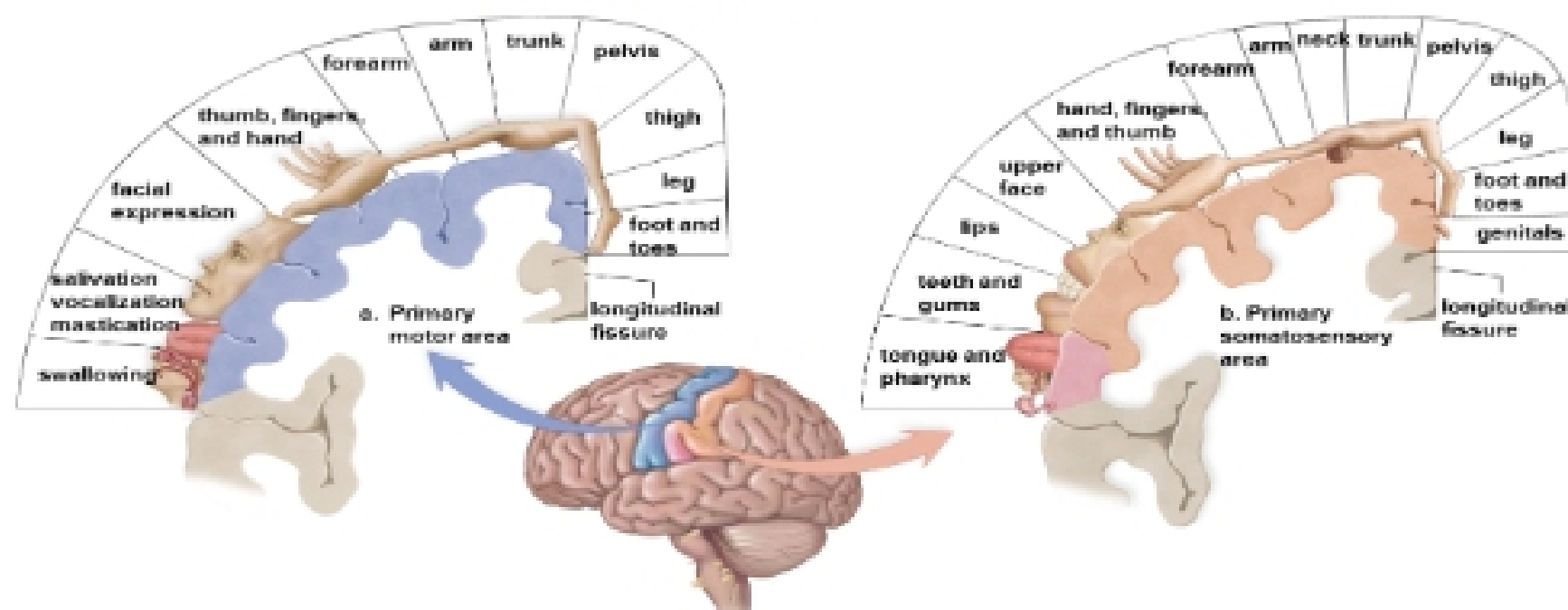
- It extends from the base of the brain and along the length of the vertebral canal formed by the vertebrae.
- The spinal cord functions to provide communication between the brain and most of the body.
- It is the center for reflex arcs.
- Gray matter in the center is a butterfly / 'H' shape.
- White matter surrounds the gray matter.

The Brain

- 4 major parts
 - Cerebrum (largest portion of the brain)
 - o Cerebral hemispheres
 - Divided into 4 lobes
 - o Frontal lobe: primary motor area and conscious thought
 - o Temporal lobe: primary auditory, smell, and speech area
 - o Parietal lobe: primary somatosensory and taste area
 - o Occipital lobe: primary visual area
 - o Cerebral cortex (thin, outer layer of gray matter)
 - Primary motor area: voluntary control of skeletal muscle.
 - Primary somatosensory area: for sensory information from skeletal muscle and skin.

These two primary areas have:

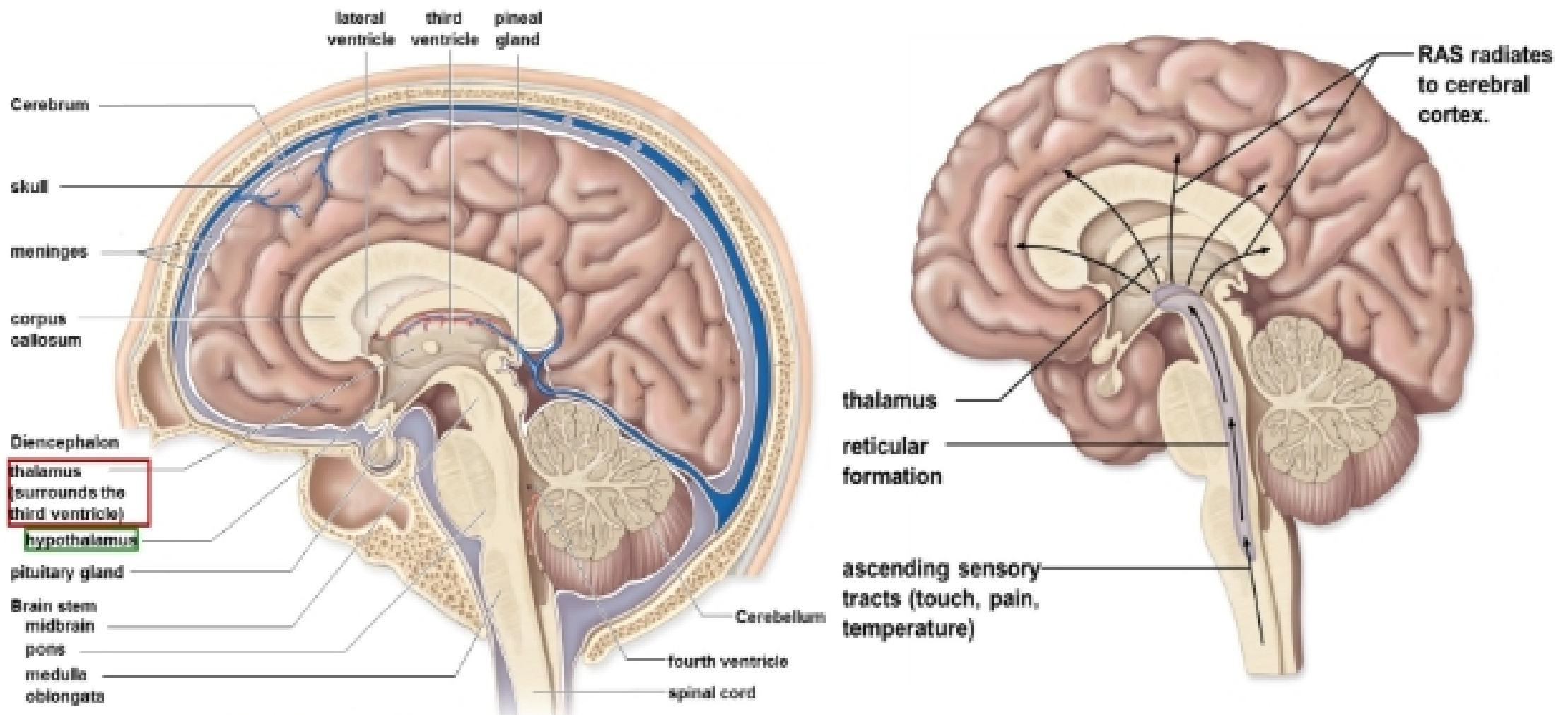
- ✓ Association areas: integration occurs here.
- ✓ Processing centers: perform higher level analytical functions (in frontal lobe - thinking, planning, solving, cognition) including Wernicke's & Broca's areas, both involved in speech.
- ✓ Central white matter



➤ Diencephalon (dream)

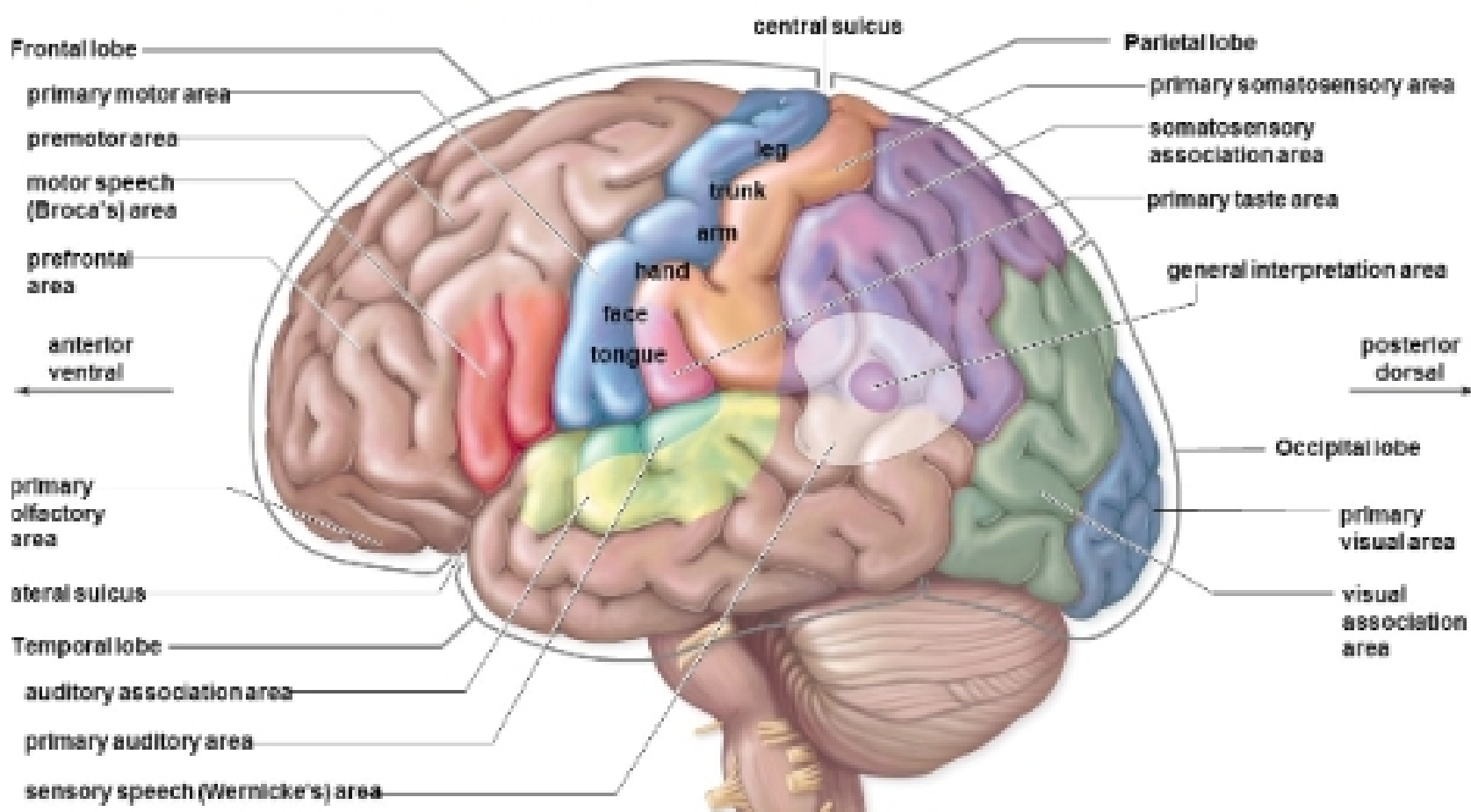
▪ Includes:

- ✓ Hypothalamus – helps maintain homeostasis (hunger, sleep, thirst, body temperature, and water balance) and controls pituitary gland. (Below thalamus)
- ✓ Thalamus – 2 masses of gray matter that receive all sensory input except smell; involved in memory and emotions. (classifies and sends inputs to their areas)
- ✓ Pineal gland – secretes melatonin that controls our daily rhythms



➤ Cerebellum

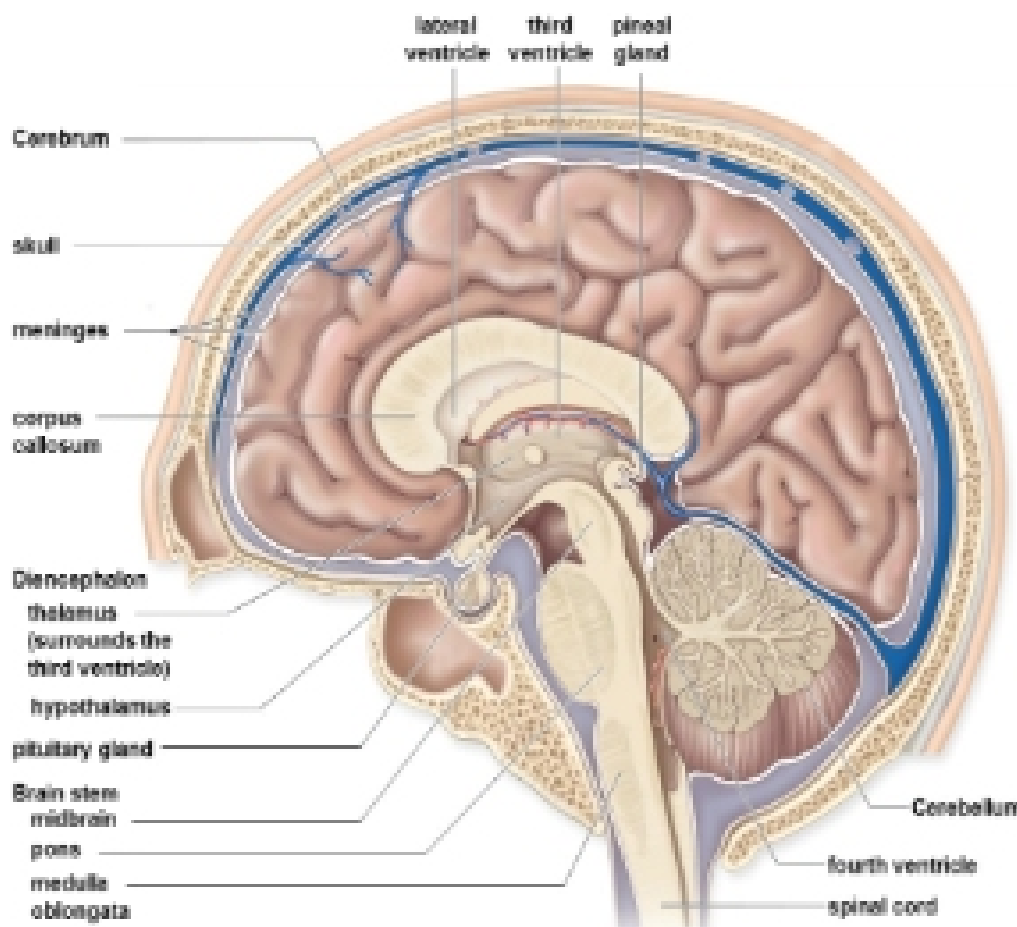
- Receives and integrates sensory input from the eyes, ears, joints, and muscles about the current position of the body. (Is located in the back of the brain)
- Functions
 - ✓ Maintains posture
 - ✓ Coordinates voluntary movement
 - ✓ Allows learning of new motor skills (i.e., playing the piano or hitting a baseball)
 - ✓ Brain stem



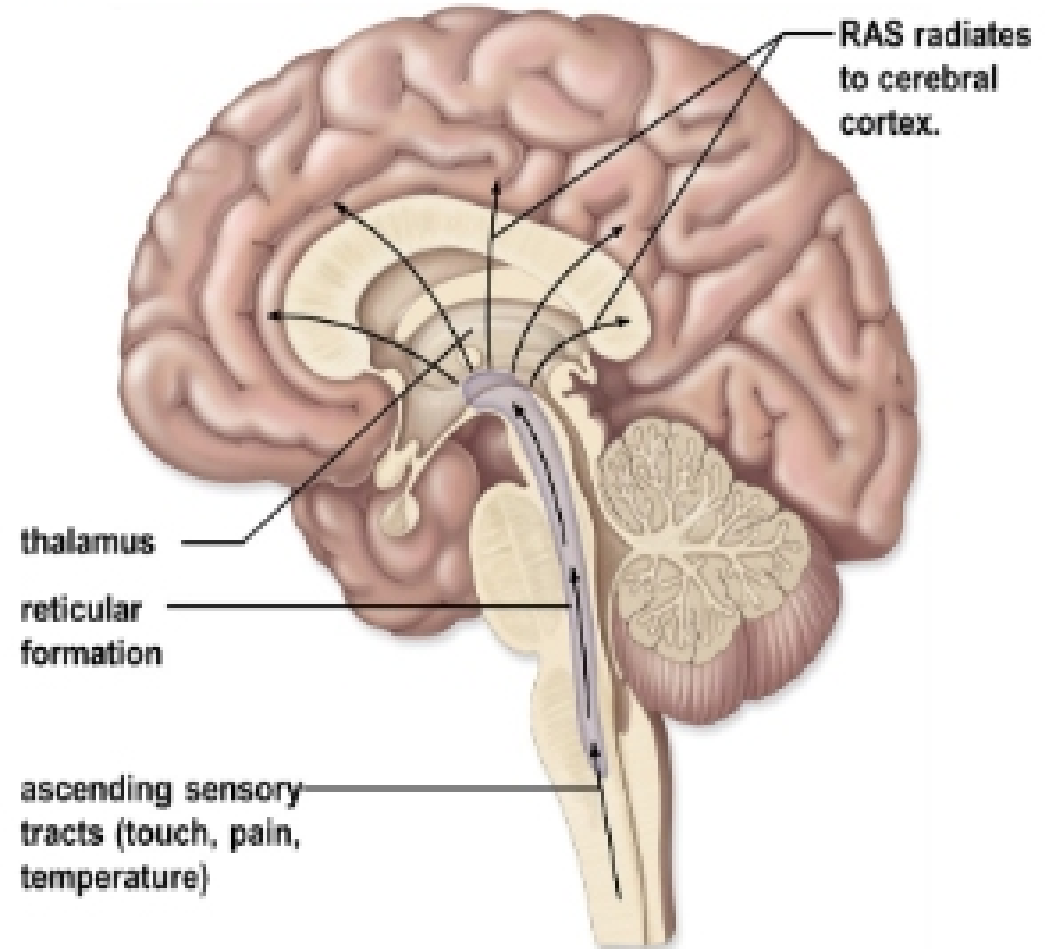
➤ Brain stem:

Includes

- ✓ Midbrain – relay station between the cerebrum and spinal cord or cerebellum; reflex center
- ✓ Pons – a bridge between cerebellum and the CNS; regulates breathing rate; reflex center for head movements
- ✓ Medulla oblongata – contains reflex centers for regulating breathing, heartbeat, and blood pressure
- ✓ Reticular formation – major component of the reticular activating system (RAS) that regulates alertness. (Makes the brain ready to receive information through activation of different centers of the brain. They're not activated when we're asleep)



a. Parts of brain



Limbic System: (oldest structure) (Responsible for emotions)

- ✓ Joins primitive emotions (i.e., fear, pleasure) with higher functions such as reasoning.
- ✓ Can cause strong emotional reactions to situations but conscious thought can override & direct our behavior.
- ✓ Includes

- Amygdala – imparts emotional overtones
- Hippocampus – important to learning and memory

Higher mental functions:

➤ Learning – what happens when we recall and use past memories to gain new information

- Memory – ability to hold a thought or to recall past events
- Short-term memory – retention of information for only a few minutes
- Long-term memory – retention of information for more than a few minutes and includes the following
 - o Episodic memory – people and events
 - o Semantic memory – numbers and words
- Skill memory – performing skilled motor activities (i.e., riding a bike)
- Language – depends on semantic memory

