Brain - Outline

• Cerebrum
  • Cerebral cortex
  • Hippocampus
  • Amygdala

• Thalamus

• Hypothalamus

• Cerebellum

• Brain stem
  • Midbrain, pons, medulla oblongata

• Pineal gland & Pituitary glands - Endocrine
Brain

- Control center
- Cerebrum – 3 parts
  - Cerebral cortex
    - Thinking
  - Conscious part of the brain
  - Hippocampus
  - Amygdala

Cerebrum

- Contains sensory areas for skin senses, vision, hearing, olfaction
- Motor areas for voluntary control of movement
- Association areas for interpreting sensations, language, thinking, self-awareness, creativity, and storage of memories

Corpus callosum

- Allows left and right cerebral hemispheres to communicate with one another
Cerebrum – Cerebral cortex

- Thin outer layer of the cerebrum
- Most of the higher thinking and processing takes place
  - Sensory areas (post-central gyrus)
  - Motor areas (pre-central gyrus)
  - Prefrontal \( \rightarrow \) decision making

Cerebrum

- Functions
  - Sensory area for touch, vision, hearing and olfaction
  - Association area for interpreting sensations, language, thinking, decision making, self-awareness, creativity, storing memories
Cerebrum – Corpus callosum

- Beneath the cortex is white matter
- Corpus callosum
  - Band of white matter that connects the 2 cerebral hemispheres
Gray matter consists of interneurons, cell bodies, and unmyelinated axons that integrate information.

White matter consists of myelinated axons that allow communication over long distances.

The corpus callosum is a band of white matter that allows communication between the cerebral hemispheres.

Cerebral Lateralization

- Hippocampus
  - Long term memory
- Amygdala
  - Remembering fear and responding to it

Split Brain Video

- [https://www.youtube.com/watch?v=ZMLzP1VCAN0](https://www.youtube.com/watch?v=ZMLzP1VCAN0)
Limbic System – The “Emotional Brain”

- processes strong emotions
- activates physiological responses via the hypothalamus and ANS
- involved in long-term memory

Brain - Thalamus

- Processes sensory information (except smell)
- Relays it to other areas of the brain

Brain - Hypothalamus

- 3 Functions
  - Maintains homeostasis
  - Regulates drives
  - Controls pituitary gland secretions
The Brain

**Hypothalamus**
- Controls heart rate, blood pressure, breathing rate, body temperature, food intake
- Is a center for emotions
- Serves as “master biological clock”

**Thalamus**
- Processes all sensory information (except olfaction)
- Relays information to appropriate higher brain centers

The Diencephalon Brain
- Cerebellum
  - Balance and coordination
  - Refines motor skills
  - New motor skills

Cerebellum
- Coordinates sensory-motor activity
- Stores memory of learned motor patterns

https://www.youtube.com/watch?v=Dox3_ox8C2U
Brain – Brain Stem

- 3 parts
  - Medulla oblongata
  - Midbrain
  - Pons

Functional Areas of the Brain Stem

- The medulla oblongata contains respiratory and cardiovascular control centers
- The pons also contains respiratory centers that interact with the primary centers in the medulla.

Brain Stem – Medulla oblongata

- Controls many vital involuntary functions
  - Breathing
  - Heartbeat
  - Blood pressure
- Where the crossing over point is for many neural tracks
  - https://www.youtube.com/watch?v=cu7A8LbI1o
Descending (Motor) Tracts in the CNS

Brain Stem - Pons
- Assists the medulla oblongata to control involuntary breathing
- Relays messages between the spinal cord and the cerebellum with the cerebrum, thalamus and hypothalamus

Brain Stem - Midbrain
- Important in voluntary muscle control
- Relay station for auditory and visual information
- Relays information between the cerebellum or spinal cord and the cerebrum
- Controls eye movement

The Brain
- Relays information between higher and lower brain centers.
- Combines autonomic centers for heart rate and digestion activities.
- Relays sensory information to cerebrum.
CNS: Neural Tissue – Metabolic Needs

- **Oxygen**
  - Passes freely across blood–brain barrier
  - Brain receives 15% of blood pumped by heart

- **Glucose**
  - Membrane transporters move glucose from plasma into the brain interstitial fluid
  - Brain responsible for about half of body’s glucose consumption
  - Progressive hypoglycemia leads to confusion, unconsciousness, and death.

**Review Questions**

- What region of the brain is the region where the most of the higher thinking and processing takes place?
  a) Amygdala
  b) Hippocampus
  c) Cerebral cortex
  d) Hypothalamus

- What region of the brain is the region important in long term memory?
  a) Amygdala
  b) Hippocampus
  c) Cerebral cortex
  d) Hypothalamus
Review Questions

• What region of the brain regulates drives including hunger, maintains homeostasis, controls the pituitary gland?
  a) Amygdala
  b) Hippocampus
  c) Cerebral cortex
  d) Hypothalamus

Review Questions

• What region of the brain is important in remembering fear and responding to it?
  a) Amygdala
  b) Hippocampus
  c) Cerebral cortex
  d) Hypothalamus

Important Concepts

• Major regions of the brain and their functions:
  Cerebrum (including the cerebral cortex, hippocampus, and amygdala), Hypothalamus, Thalamus, Cerebellum, Brain stem (including the midbrain, pons, and medulla oblongata)

• What parts of the brain are in the cerebrum and in the brain stem

• What is the corpus callosum and what is its function?

Important Concepts

• What are split brains and how does that effect a person

• Where are the primary motor and somatosensory areas of the cortex

• How are body parts represented on the cortex

• What are 2 essential metabolic requirements for brain function?
Definitions

• Long term memory
• Somatic nervous system
• Autonomic nervous system
• Voluntary
• Involuntary
• Reflex arc

• Constrict
• Dilate
• Inhibits
• Accelerates
• Facilitates
• Stimulates
• Relaxes
• White matter

• Grey matter
• Prefrontal region