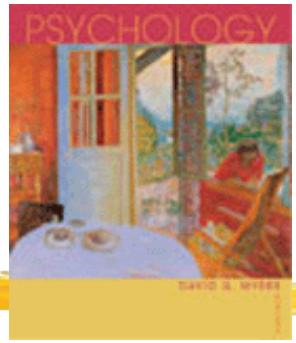
Myers' *PSYCHOLOGY*

(7th Ed)



Read Chapter 2

Neuroscience and Behavior

Psychology:

Neuroscience, the Brain, Genetics and behavior

The Brain

What percentage of our brain do we actually use?

The Brain

We use 100 % of our brain.

Neural Communication

- Biological Psychology
  - branch of psychology concerned with the links between biology and behavior
  - some biological psychologists call themselves:
    - behavioral neuroscientists,
    - neuropsychologists,
    - behavior geneticists,
    - physiological psychologists, or
    - biopsychologists

The Brain

- **Dark Gray** areas of the brain are on the **outer areas** of the brain where more complex thinking takes place

- Complex thinking is a slower process; therefore the neural transmission (a.k.a.- action potentials) move at a slower rate of speed

The Brain

- Light Gray- areas of the brain are on the **inner areas** of the brain

- These light areas are more myelinated

The Brain

- Myelin- is the fatty substance that allows for faster transmission of neural signals
- In these lighter areas of the brain, signals must be transmitted faster
- More myelin equals faster action potentials

The Spinal Cord

- The spinal cord is exactly the opposite of the brain
- In the spinal cord, light areas (with more myelin) are on the outside of the spinal cord
- The reason is because the speed needed for reflexes, or reflex actions, requires fast action potentials

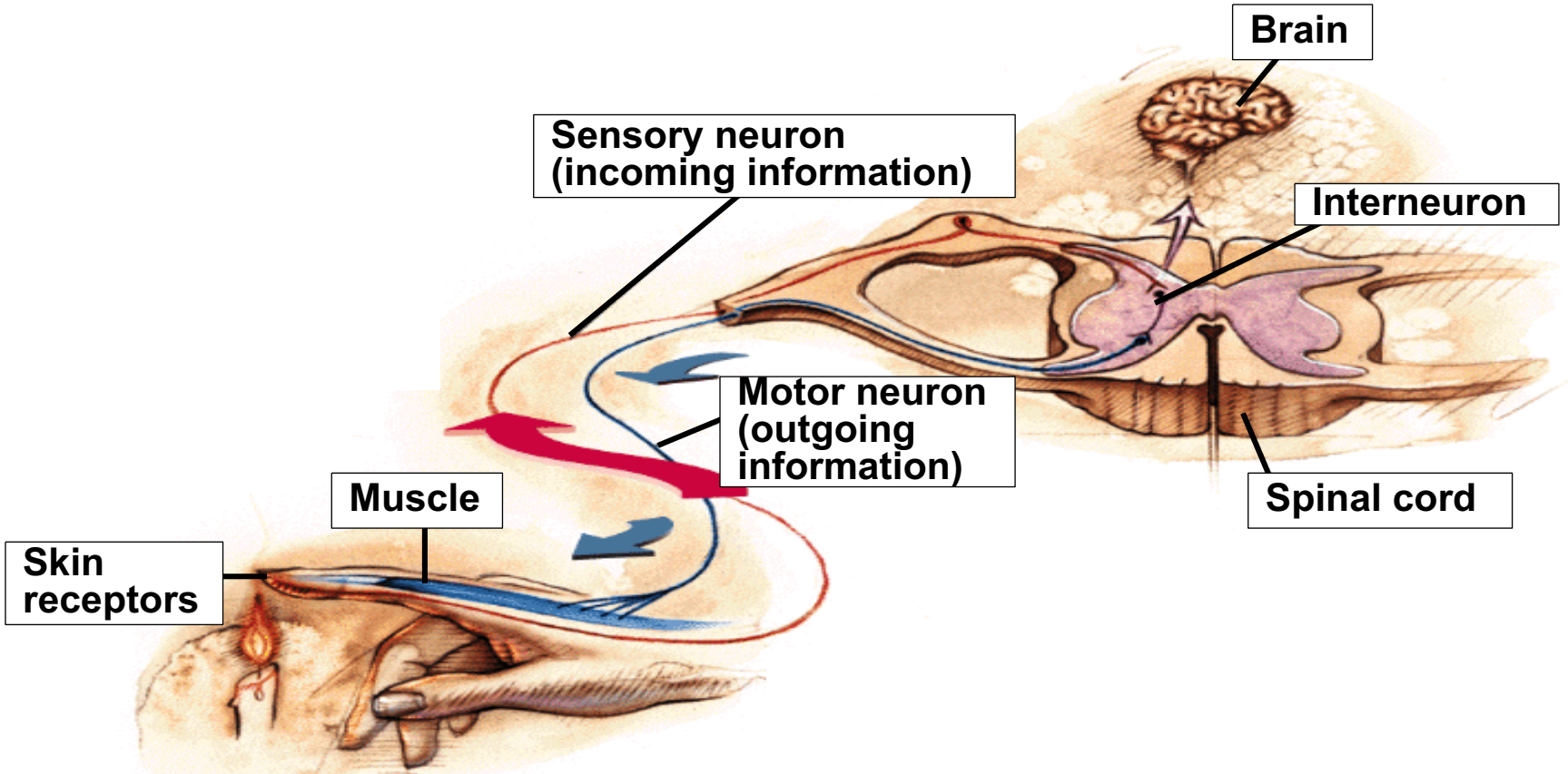
The Spinal Cord

- Responding to a HOT FLAME!!!!!.....

- requires a fast signal to prevent serious injury, or even DEATH

The Nervous System

- Reflex
  - a simple, automatic, inborn response to a sensory stimulus



The Nervous System

ESSENTIAL QUESTION:

What are the primary parts of a neuron, and what functions do those parts perform?

GPS STANDARD:

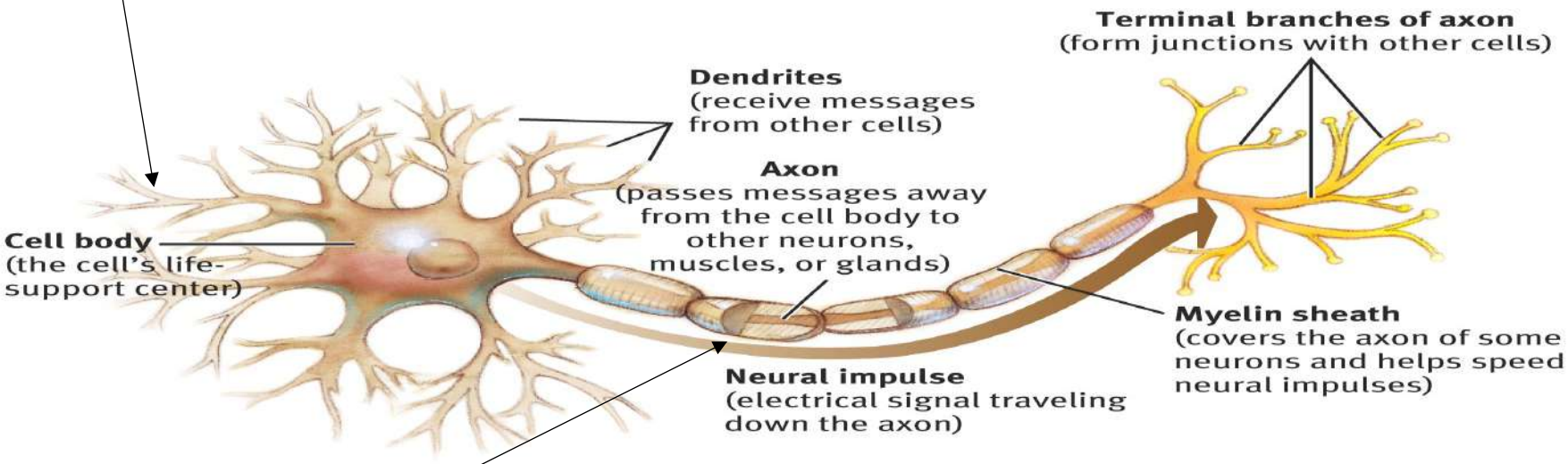
SSPBF1b- identify the components and functions of a neuron.

Neural Communication

- Neuron
  - a nerve cell
  - the basic building block of the nervous system

Neural Communication p. 55

- Dendrite
  - the bushy, branching extensions of a neuron that receive messages and conduct impulses toward the cell body



- Axon
  - the extension of a neuron, ending in branching terminal fibers, through which messages are sent to other neurons or to muscles or glands

The Nervous System

ESSENTIAL QUESTION:

What role does an action potential play in generating a neural impulse?

What are the steps of the neural chain?

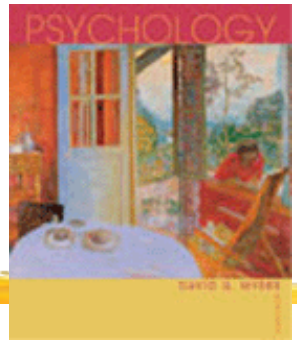
GPS STANDARD:

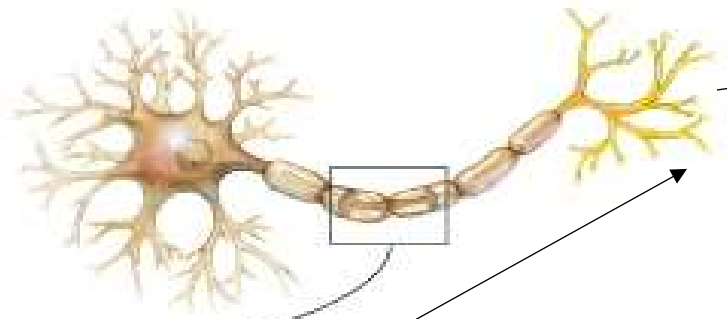
SSPBF1c- explain the process of neurotransmission; include action potentials and synaptic transmission.

Neural Communication

- Action Potential
  - a neural impulse; a brief electrical charge that travels down an axon
  - generated by the movement of positively charged atoms in and out of channels in the axon's membrane
- Threshold
  - the level of stimulation required to trigger a neural impulse

Neural Communication





Axon terminals

Cell body end of axon

Direction of neural impulse: toward axon terminals

The Nervous System

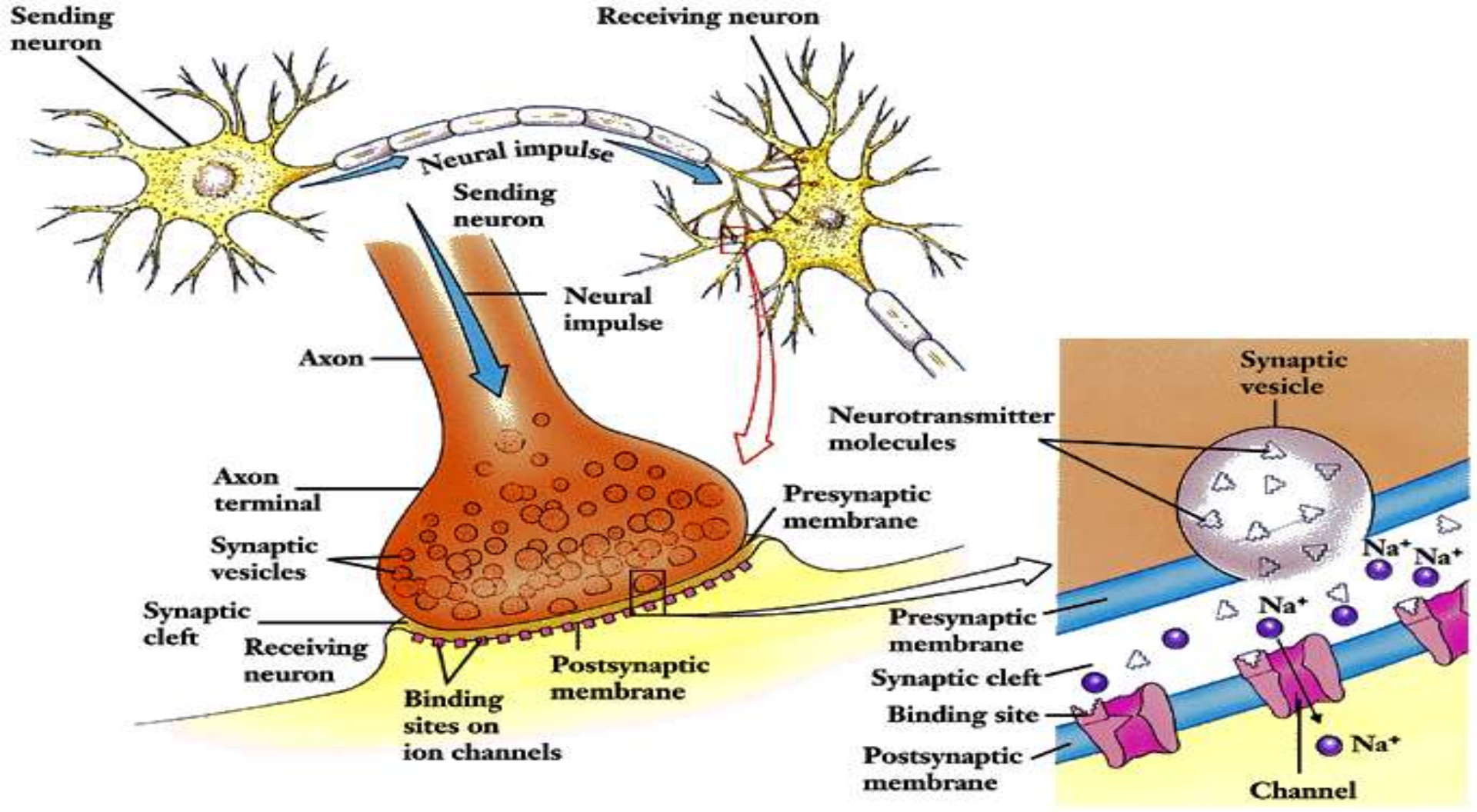
ESSENTIAL QUESTION:

What role do neurotransmitters play in neural communication?

GPS STANDARD:

SSPBF1c- explain the process of neurotransmission; include action potentials and synaptic transmission.

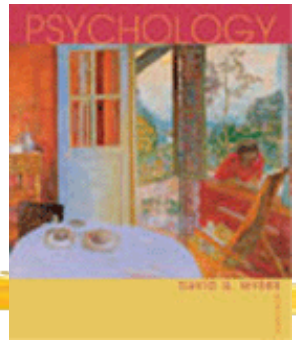
Neural Communication p. 57



Neural Communication

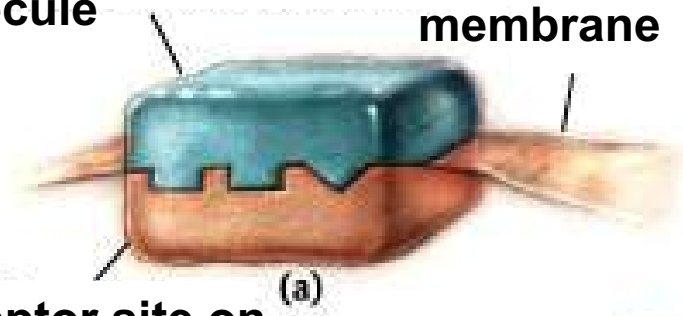
- Synapse [SIN-aps]
  - junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron
  - tiny gap at this junction is called the *synaptic gap* or *cleft*
- Neurotransmitters
  - chemical messengers that traverse the synaptic gaps between neurons
  - when released by the sending neuron, neuro-transmitters travel across the synapse and bind to receptor sites on the receiving neuron, thereby influencing whether it will generate a neural impulse

Neural Communication



Neurotransmitter molecule

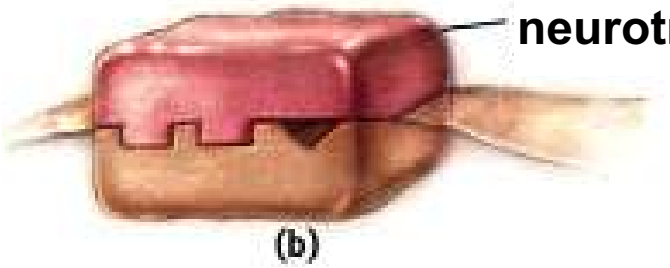
Receiving cell membrane



Receptor site on receiving neuron

This receptor site readily accepts endorphins which are natural. Morphine mimics the action of endorphins and "fools" the neuron into receiving it into the receptor site.

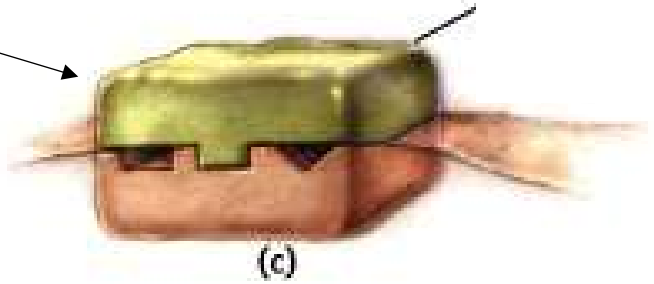
Agonist mimics neurotransmitter



This neurotransmitter molecule fits the receptor site on the receiving neuron much like a key fits a

Poisons sometimes mimic a neurotransmitter like ACh and block its receptor sites so the person is paralyzed.

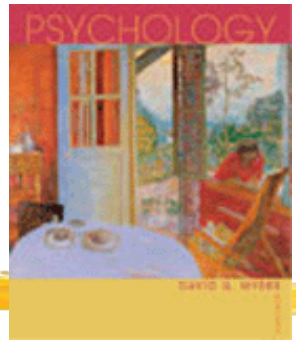
Antagonist blocks neurotransmitter



Neural Communication

- Endorphins [en-DOR-fins]
  - "morphine within"
  - natural, opiatelike neurotransmitters
  - linked to pain control and to pleasure
  - Runner's often experience "runner's high" as the effects of the vigorous exercise makes them feel exhilarated

Neural Communication



- Acetylcholine [ah-seat-el-KO-leen]
  - allows memory and learning
  - a neurotransmitter that, among its functions, triggers muscle contraction

Neural Communication p. 58

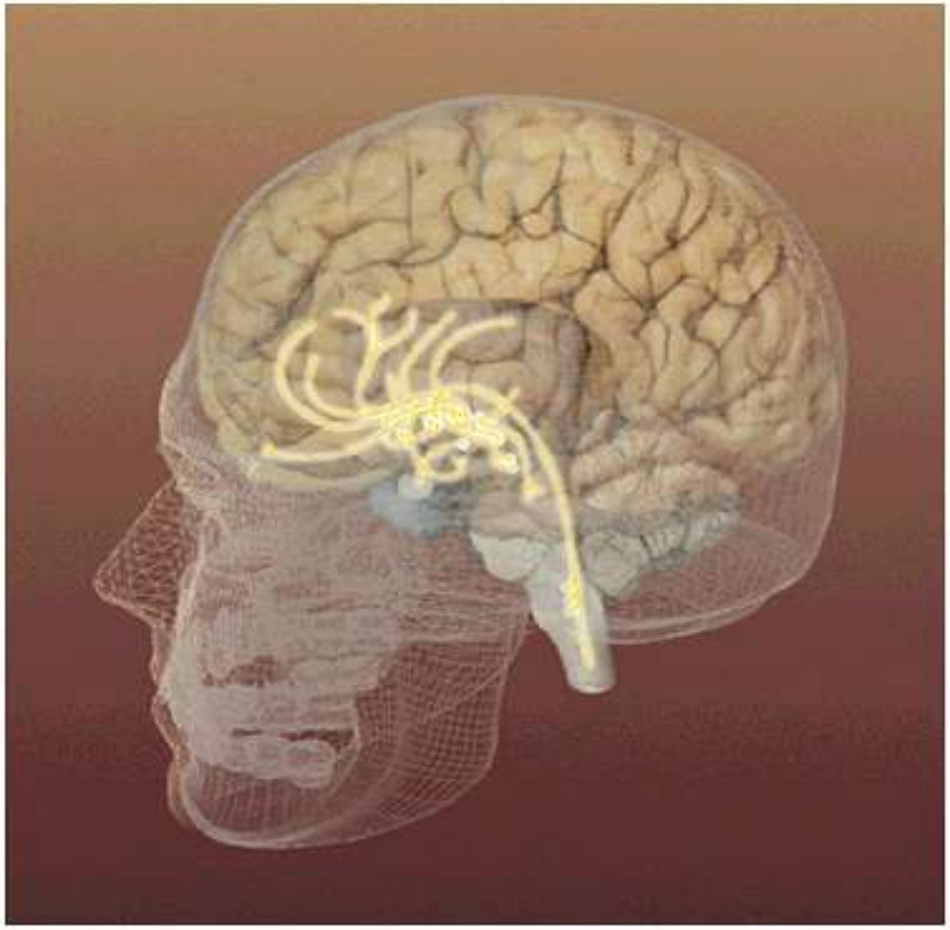
TABLE 2.1

SOME NEUROTRANSMITTERS AND THEIR FUNCTIONS

Neurotransmitter	Function	Examples of Malfunctions
Acetylcholine (ACh)	Enables muscle action, learning, and memory	Undersupply, as ACh-producing neurons deteriorate, marks Alzheimer's disease
Dopamine	Influences movement, learning, attention, and emotion	Excess dopamine receptor activity linked to schizophrenia; starved of dopamine, the brain produces the tremors and decreased mobility of Parkinson's disease
Serotonin	Affects mood, hunger, sleep, and arousal	Undersupply linked to depression; Prozac and some other antidepressant drugs raise serotonin levels
Norepinephrine	Helps control alertness and arousal	Undersupply can depress mood
GABA (gamma-aminobutyric acid)	A major inhibitory neurotransmitter	Undersupply linked to seizures, tremors, and insomnia
Glutamate	A major excitatory neurotransmitter; involved in memory	Oversupply can overstimulate brain, producing migraines or seizures (which is why some people avoid MSG, monosodium glutamate, in food)

Neural Communication

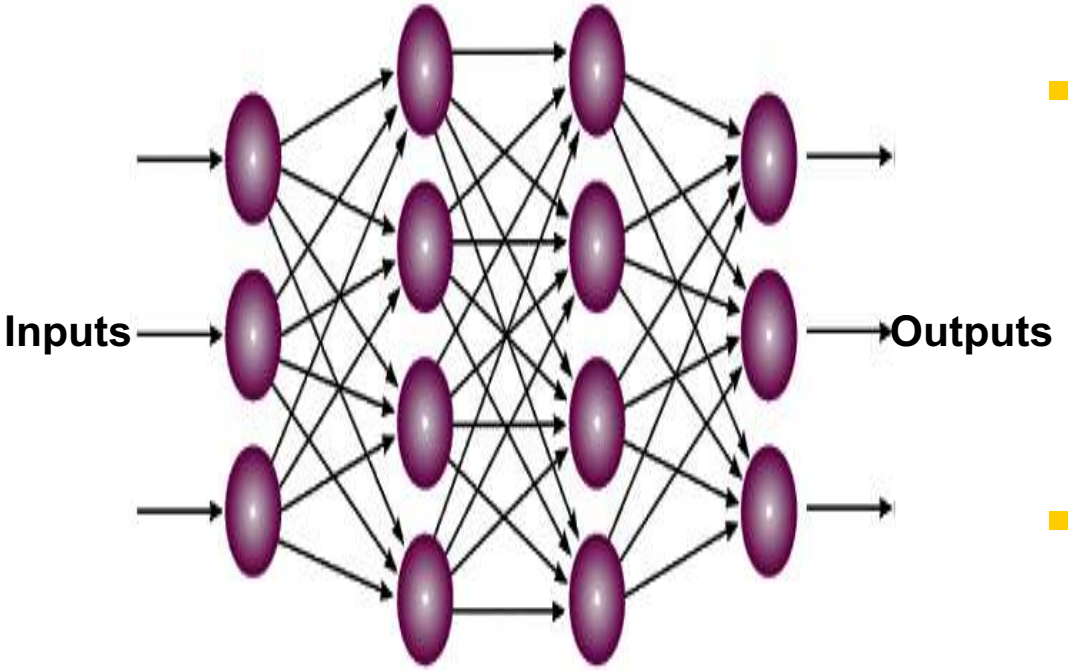
Serotonin Pathways



Dopamine Pathways

The Nervous System

Neurons in the brain connect with one another to form networks



The brain learns by modifying certain connections in response to feedback

- Neural Networks
  - interconnected neural cells
  - with experience, networks can learn, as feedback strengthens or inhibits connections that produce certain results
  - computer simulations of neural networks show analogous learning

The Nervous System

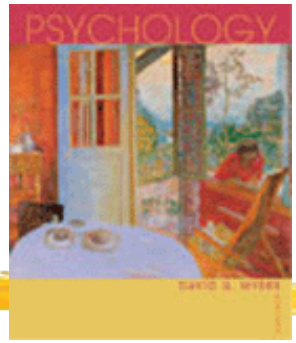
ESSENTIAL QUESTION:

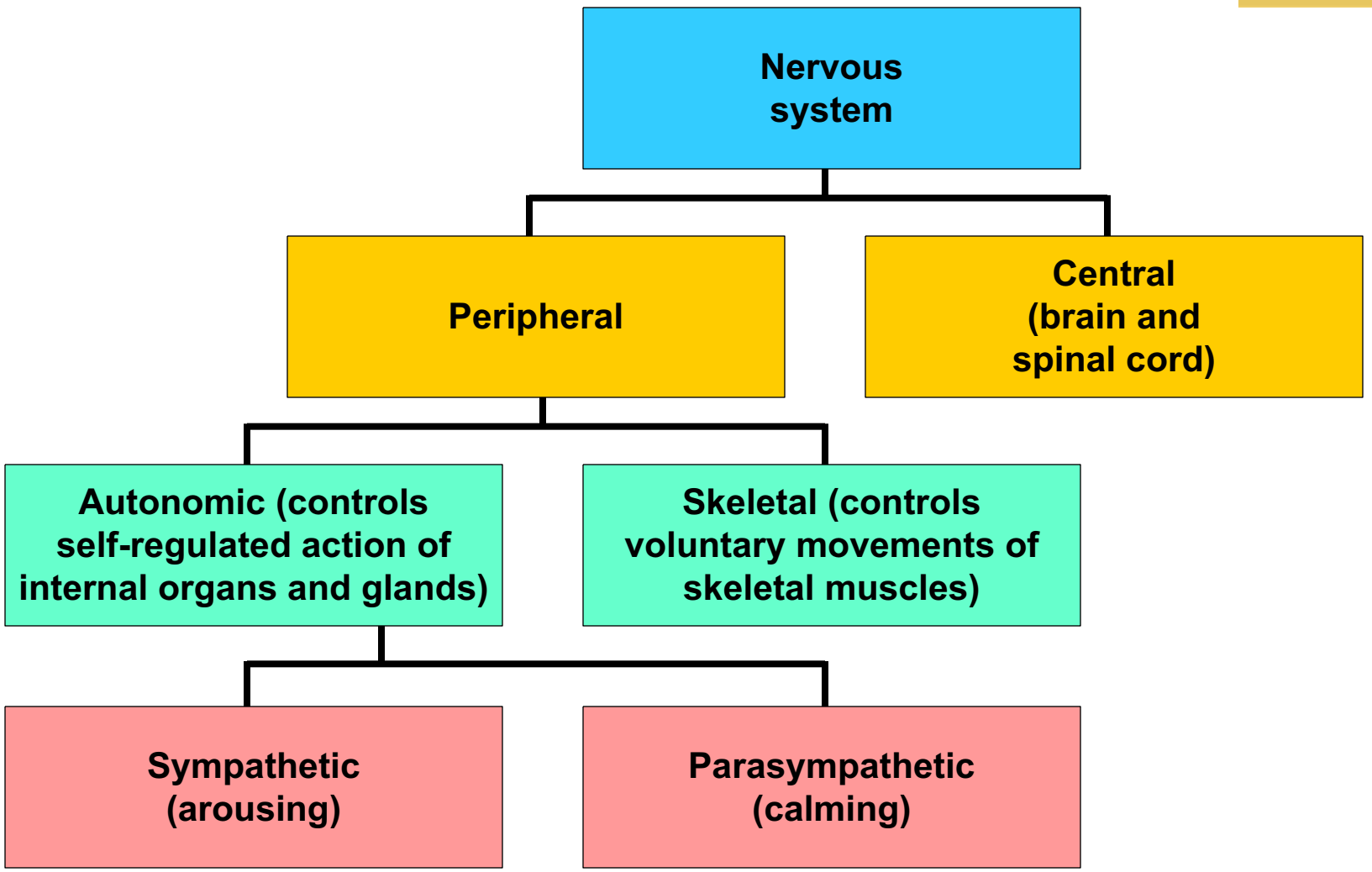
What are the various divisions of the nervous system, and what is the function of each of these subsystems?

GPS STANDARD:

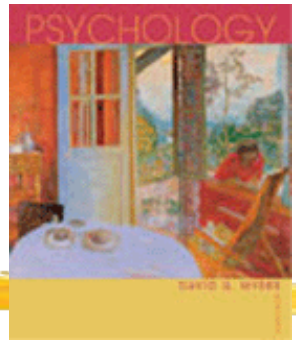
SSPBF1a- discuss the major divisions and subdivisions of the nervous system and their role in behavior.

The Nervous System



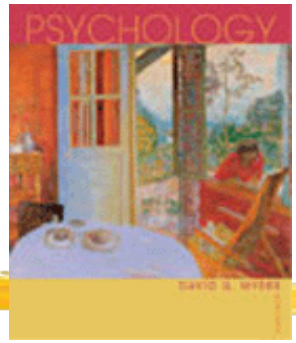


The Nervous System



- Nervous System
  - the body's speedy, electrochemical communication system
  - consists of all the nerve cells of the peripheral and central nervous systems
- Central Nervous System (CNS)
  - the brain and spinal cord
- Peripheral Nervous System (PNS)
  - the sensory and motor neurons that connect the central nervous system (CNS) to the rest of the body

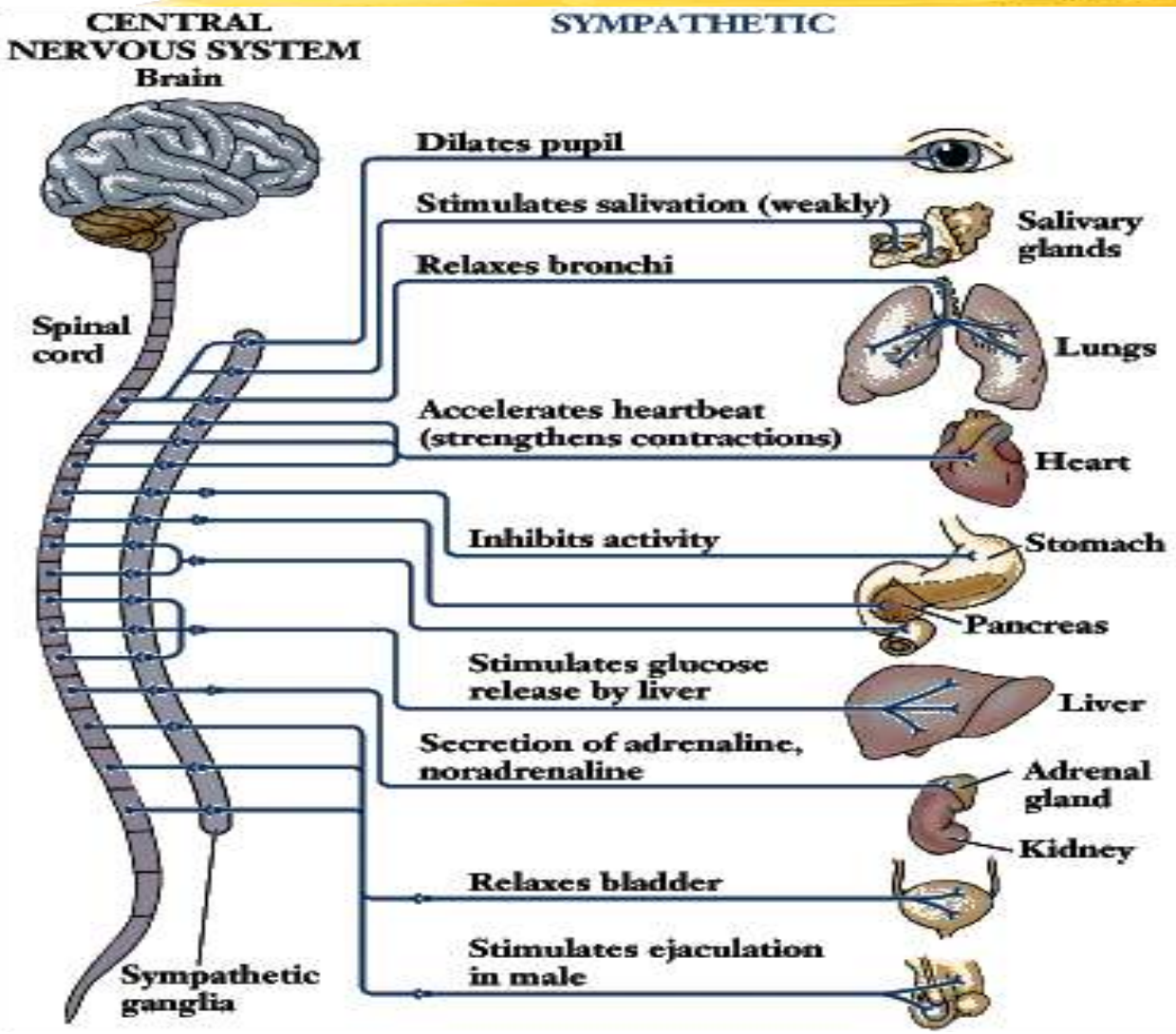
The Nervous System



- Autonomic Nervous System
  - the part of the peripheral nervous system that controls the glands and the muscles of the internal organs (such as the heart)
- Sympathetic Nervous System
  - division of the autonomic nervous system that arouses the body, mobilizing its energy in stressful situations
- Parasympathetic Nervous System
  - division of the autonomic nervous system that calms the body, conserving its energy

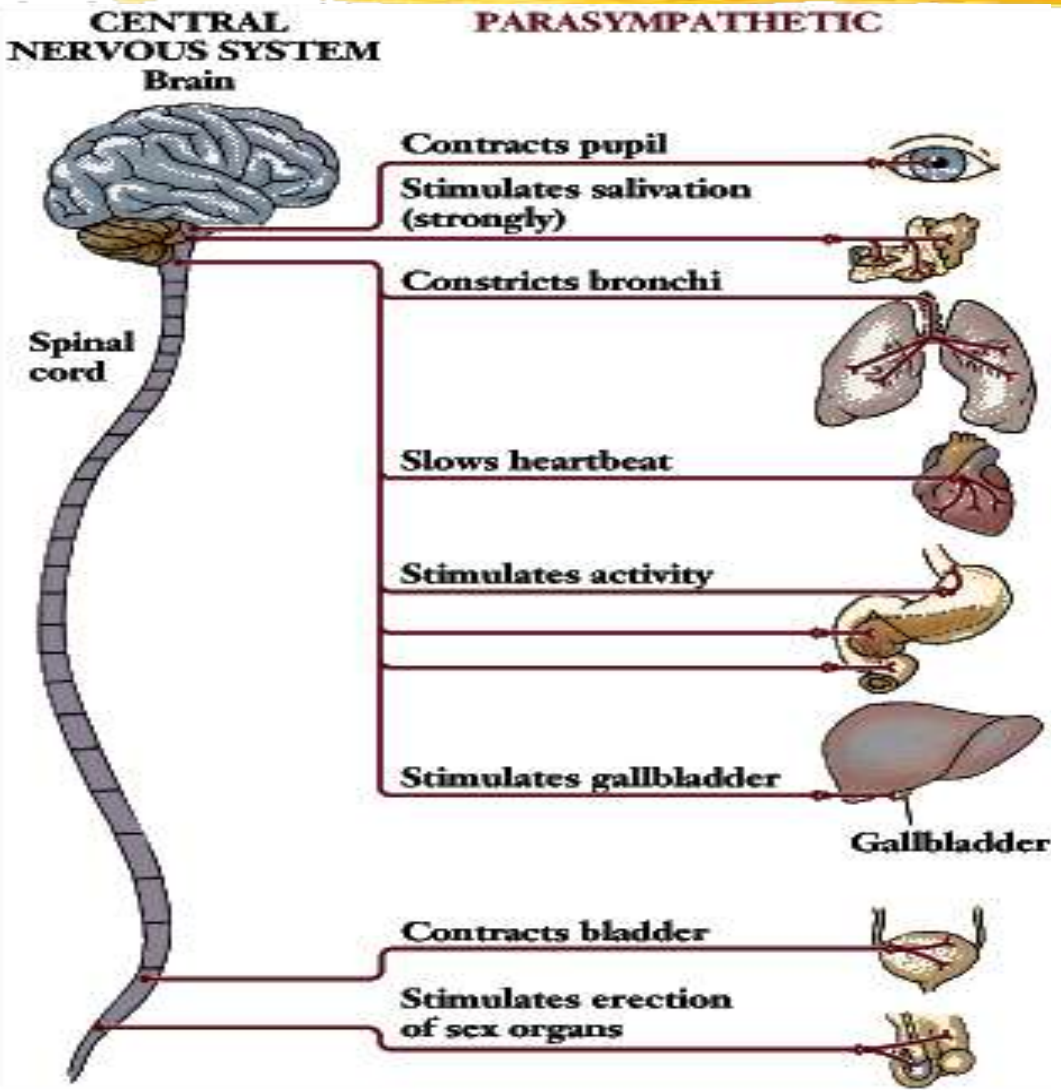
Sympathetic Nervous System

division of the autonomic nervous system that arouses the body, mobilizing its energy in stressful situations

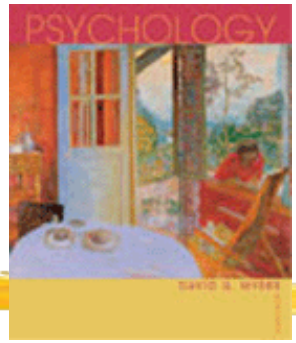


Parasympathetic Nervous System

division of the autonomic nervous system that calms the body, conserving its energy

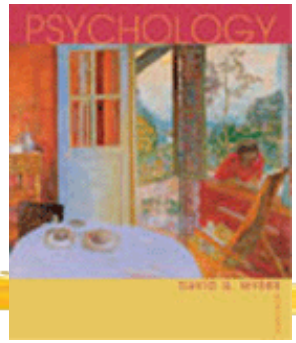


The Nervous System



- Nerves
  - neural "cables" containing many axons
  - part of the peripheral nervous system
  - connect the central nervous system with muscles, glands, and sense organs
- Sensory Neurons
  - neurons that carry incoming information from the sense receptors to the central nervous system

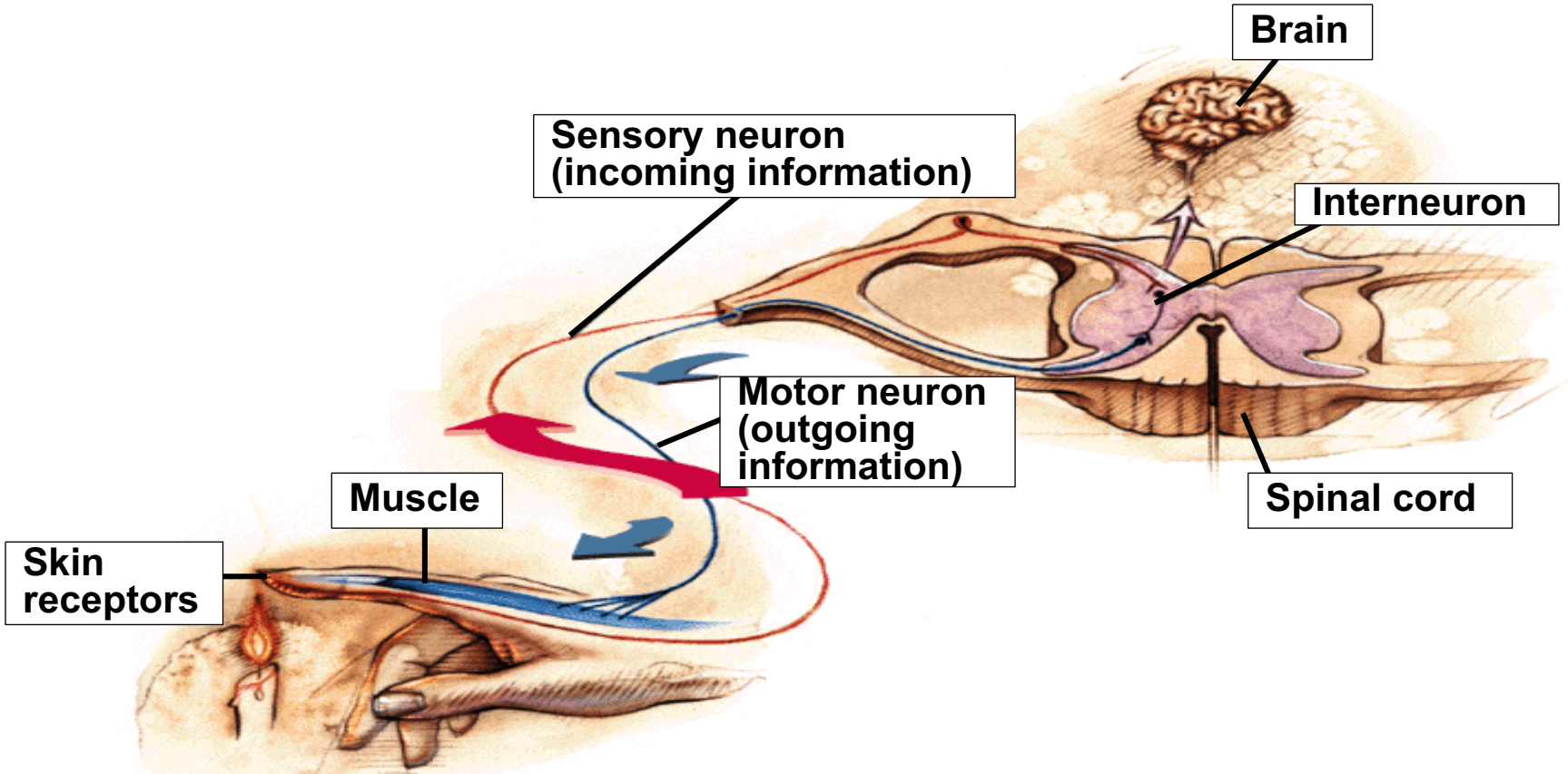
The Nervous System



- Interneurons
  - CNS neurons that internally communicate and intervene between the sensory inputs and motor outputs
- Motor Neurons
  - carry outgoing information from the CNS to muscles and glands
- Somatic Nervous System
  - the division of the peripheral nervous system that controls the body's skeletal muscles

The Nervous System

- Reflex
  - a simple, automatic, inborn response to a sensory stimulus



The Endocrine System

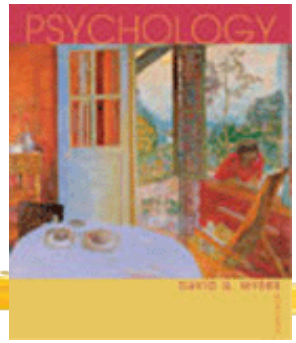
ESSENTIAL QUESTION:

How does the way the endocrine system communicates differ from the way the nervous system communicates?

GPS STANDARD:

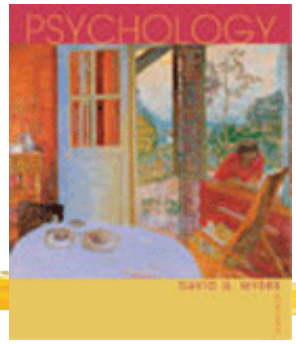
SSPBF1- the student will explain the development, structure, and function of biological systems and their role in behavior, cognition, and emotion.

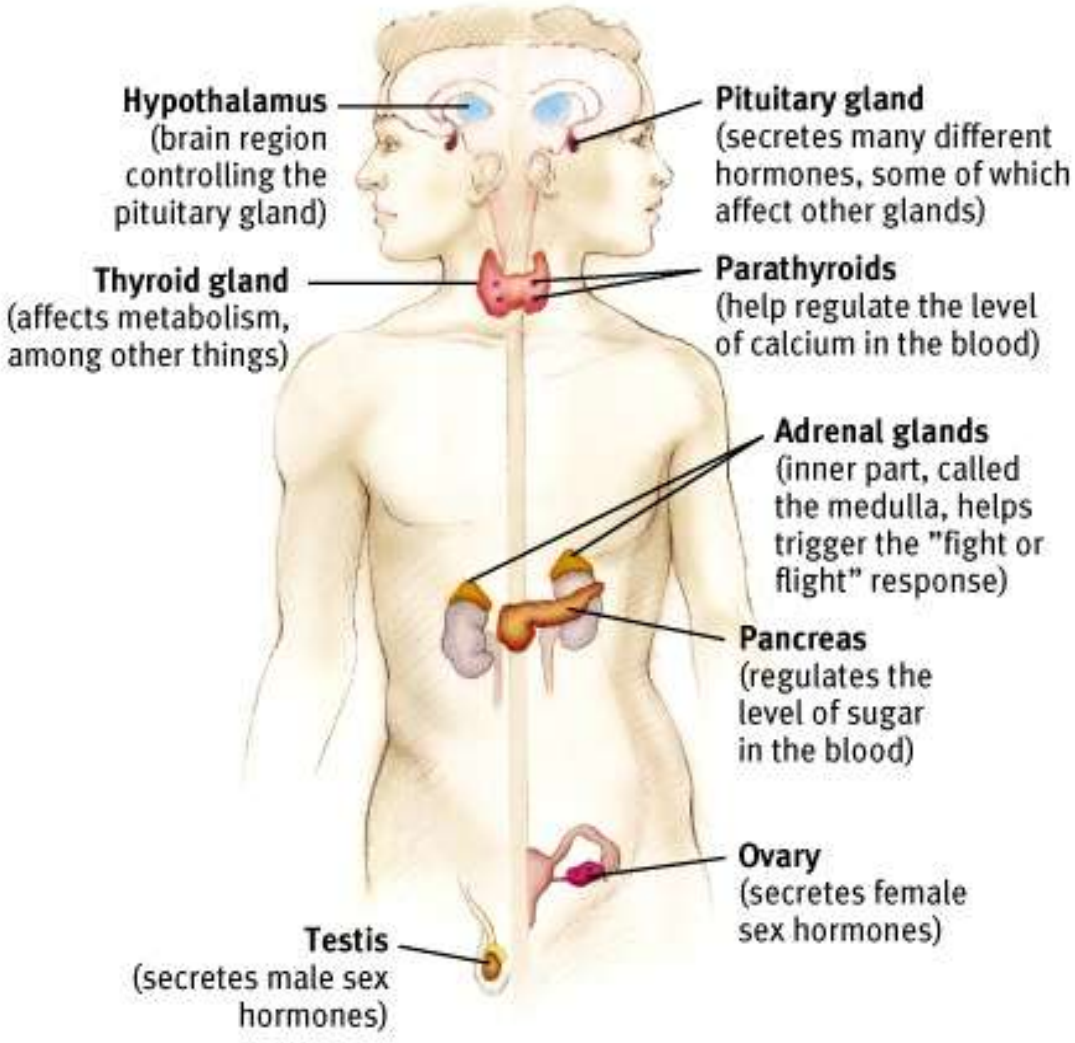
Neural and Hormonal Systems



- Hormones
  - chemical messengers, mostly those manufactured by the endocrine glands, that are produced in one tissue and affect another
- Adrenal [ah-DREEN-el] Glands
  - a pair of endocrine glands just above the kidneys
  - secrete the hormones epinephrine (adrenaline) and norepinephrine (noradrenaline), which help to arouse the body in times of stress
- Pituitary Gland
  - under the influence of the hypothalamus, the pituitary regulates growth and controls other endocrine glands

The Endocrine System





- Endocrine System
  - the body's "slow" chemical communication system
  - a set of glands that secrete hormones into the bloodstream

Awakenings video notes

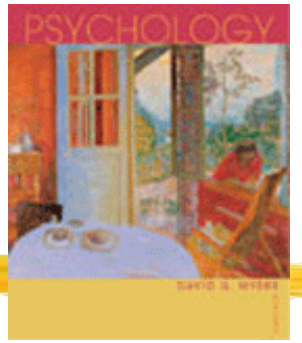
ESSENTIAL QUESTION:

What are the major structures and functions of the brain?

GPS STANDARD:

SSPBF1d- identify the major structures and functions of the brain.

The Brain



The Brain

ESSENTIAL QUESTION:

What are the parts of the brainstem, and what are their major functions?

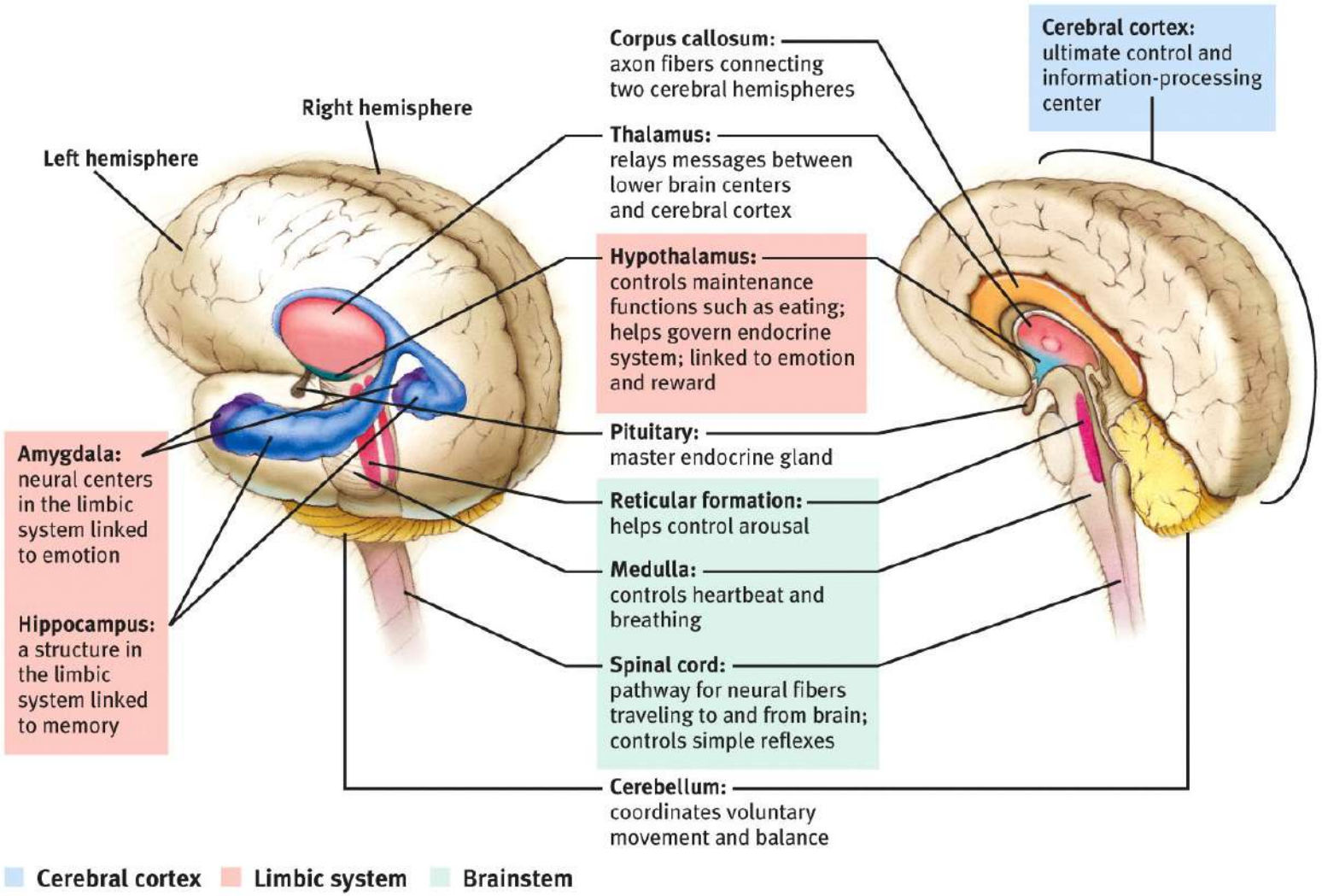
What is the function of the thalamus?

What is the function of the cerebellum?

GPS STANDARD:

SSPBF1d- identify the major structures and functions of the brain.

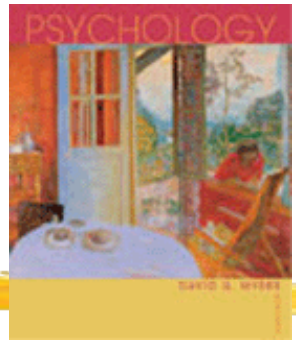
Brain Structures and their Functions

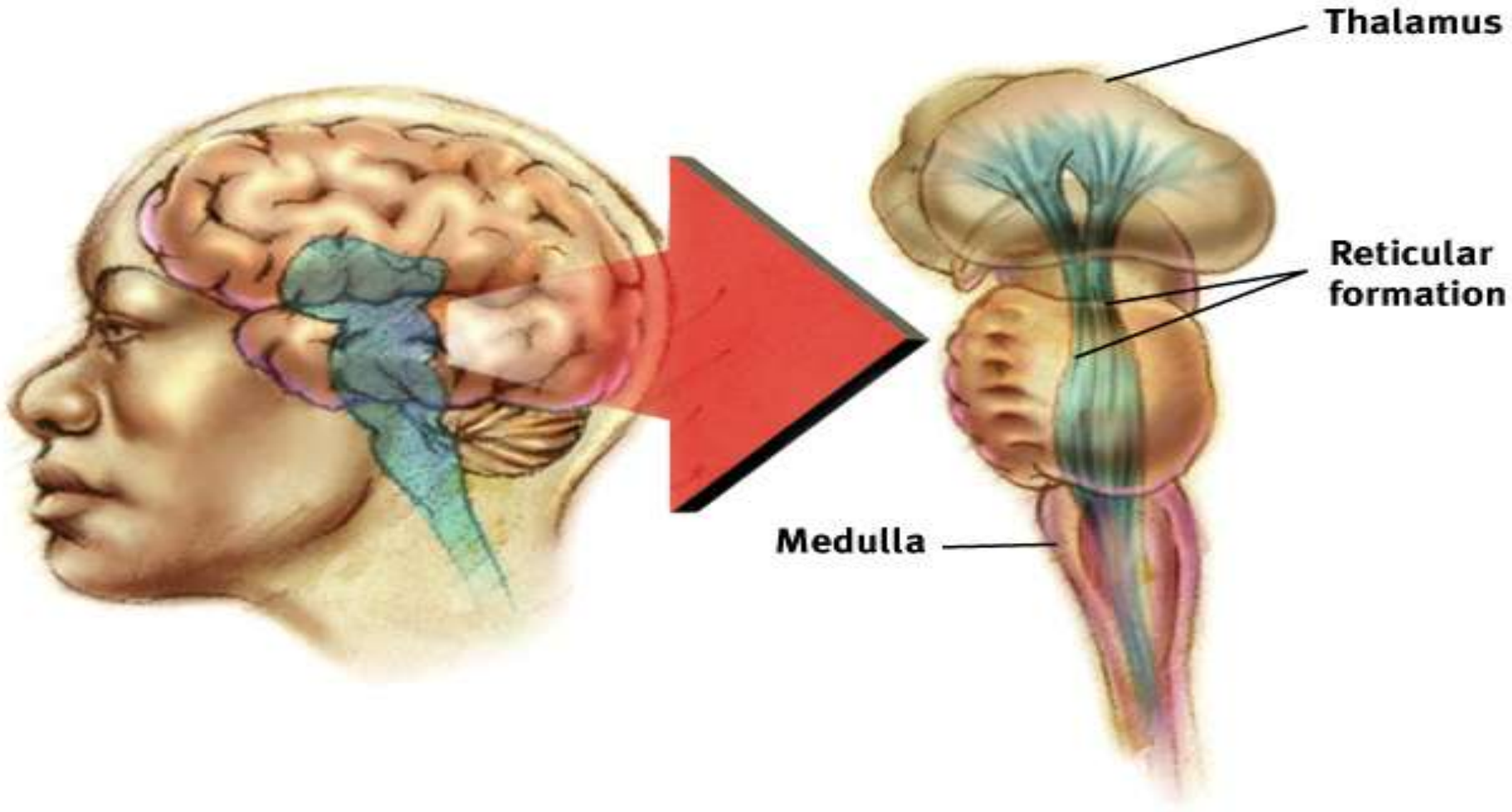


Brainstem

the oldest part and central core of the brain, beginning where the spinal cord swells as it enters the skull

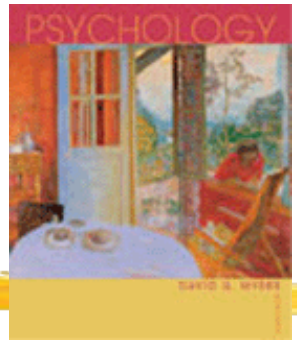
responsible for automatic survival functions

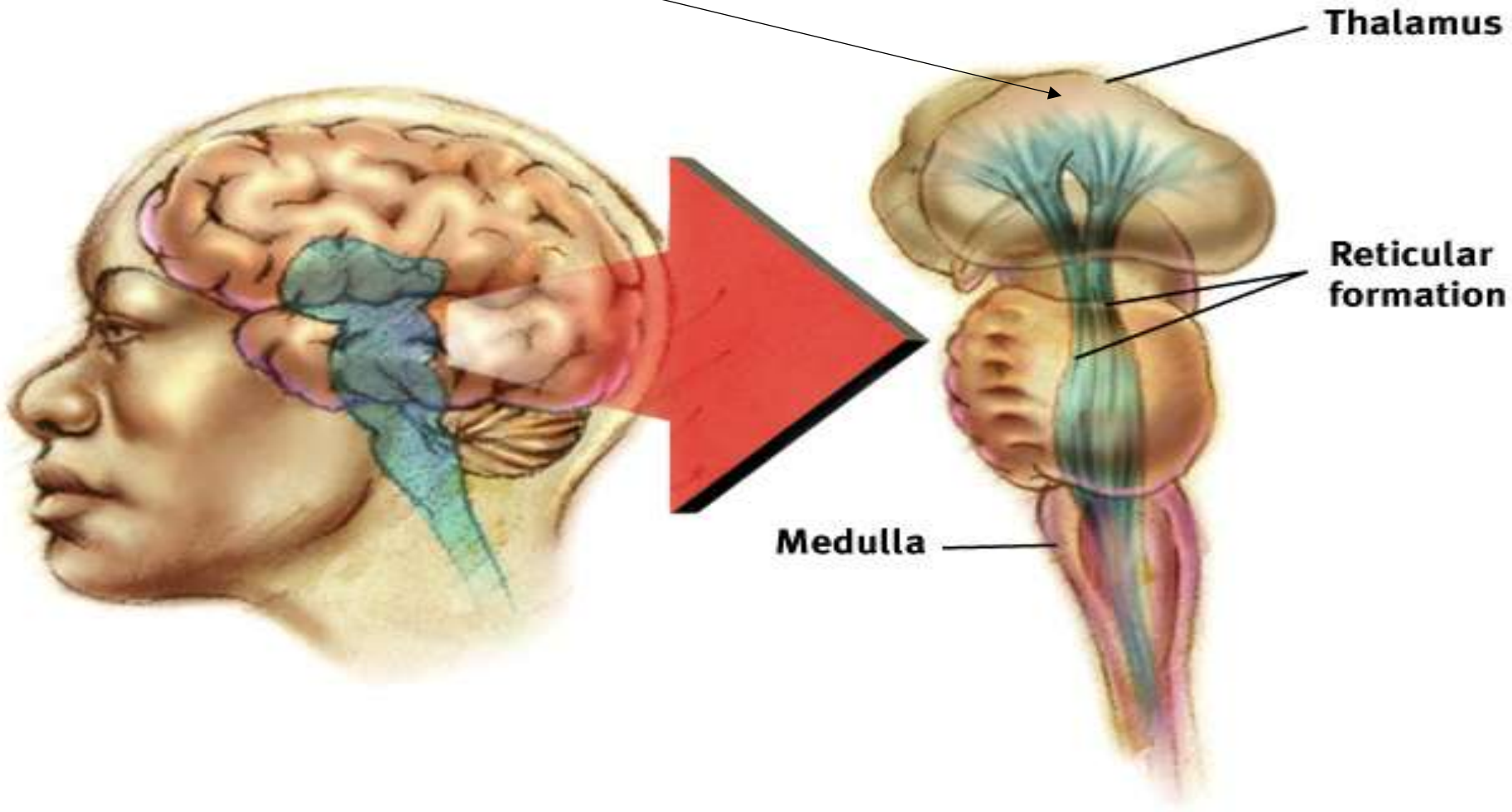




Thalamus [THAL-uh-muss]

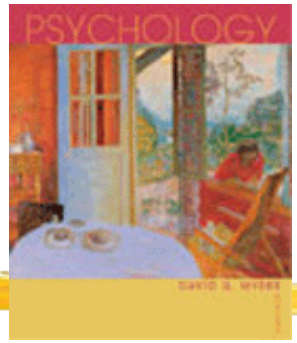
the brain's sensory switchboard, located on top of the brainstem; it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla

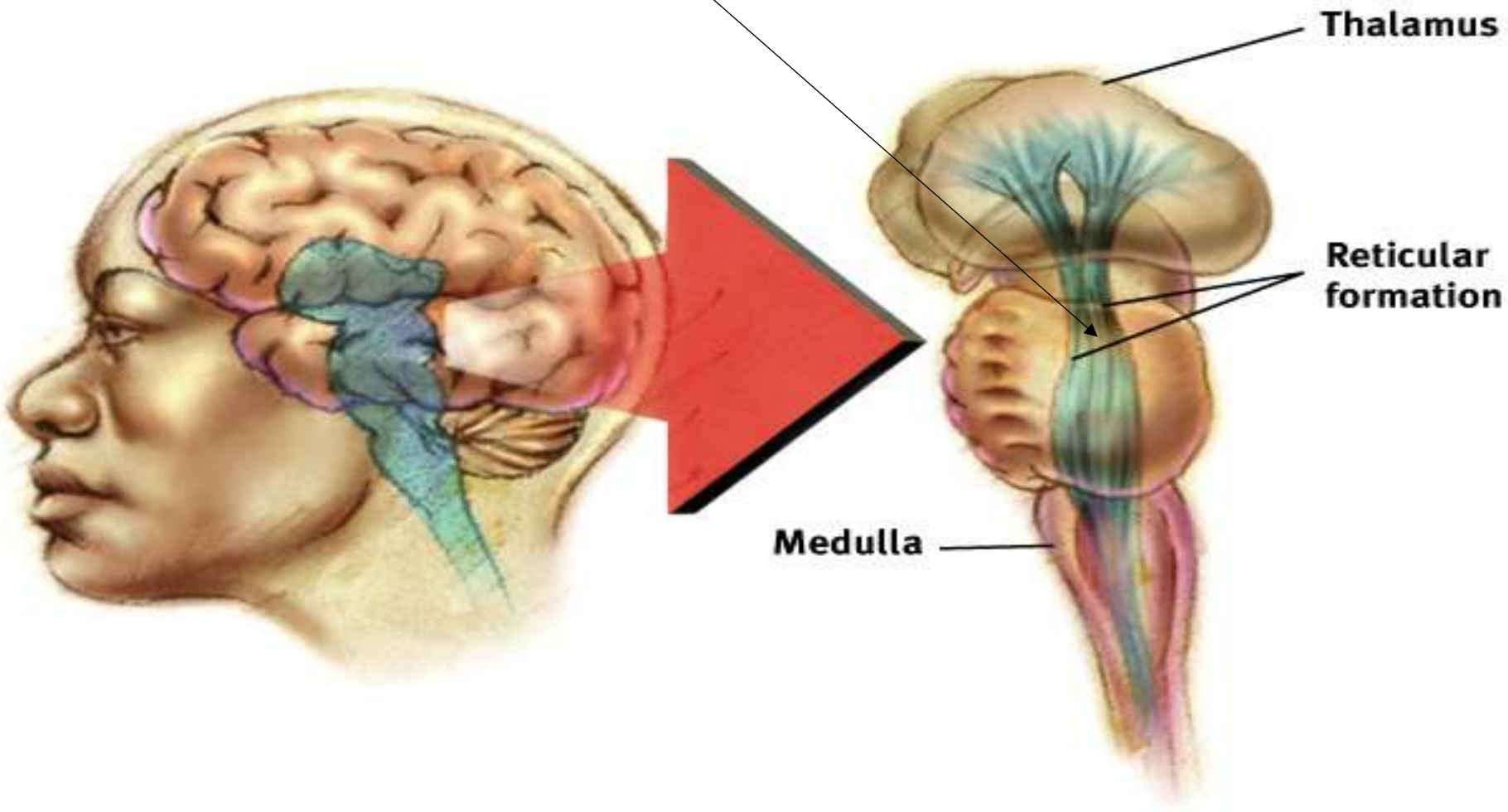




Reticular Formation

a nerve network in the brainstem that plays an important role in controlling arousal

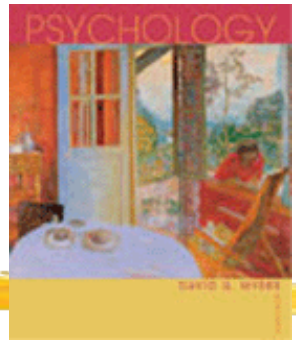


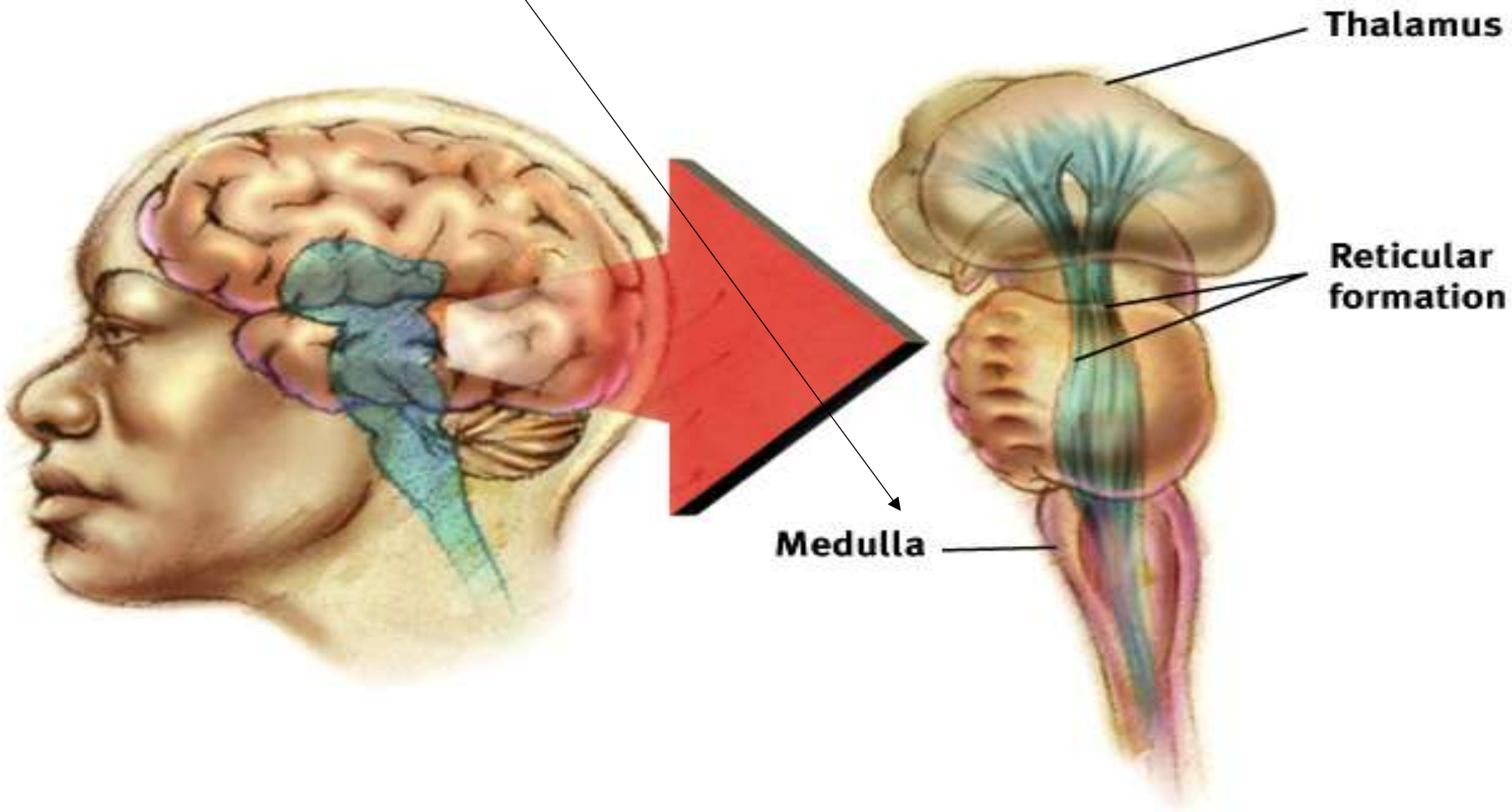


Medulla [muh-DUL-uh]

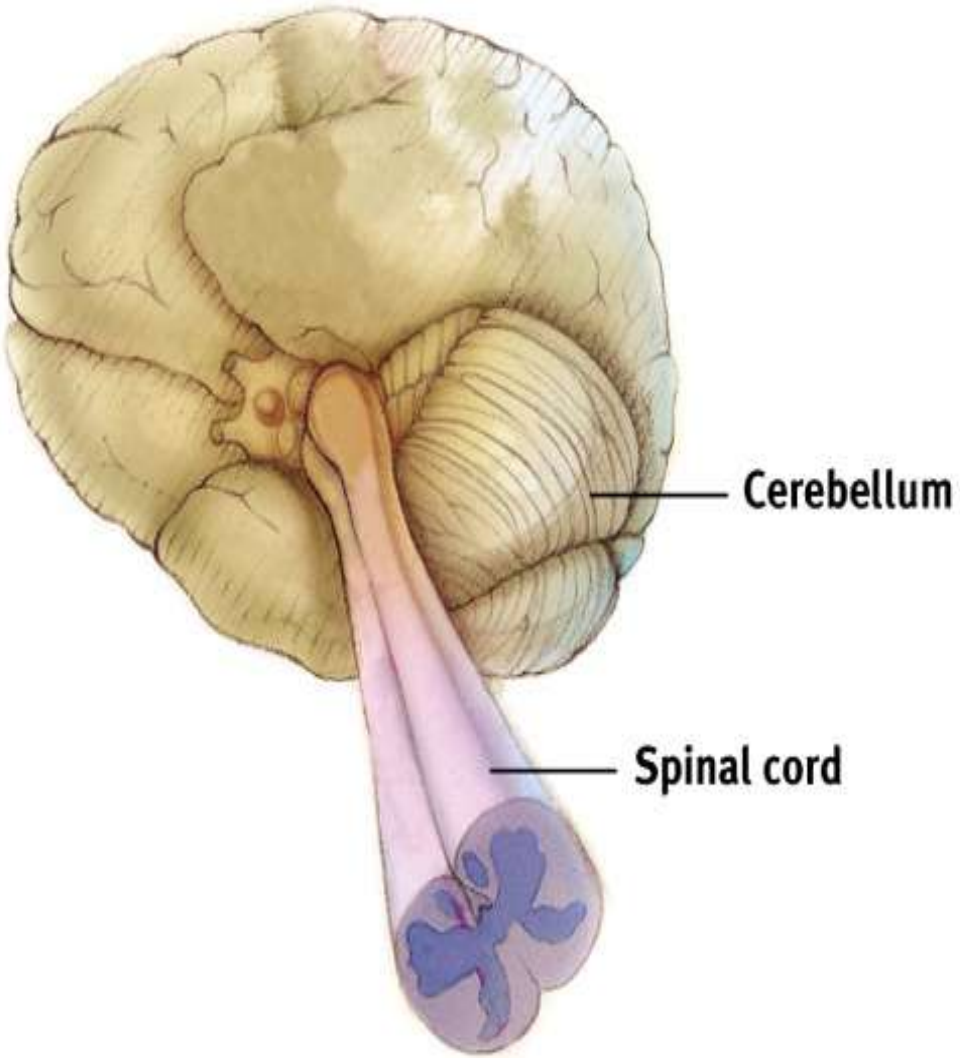
base of the brainstem

controls heartbeat and breathing





The Cerebellum



- Cerebellum [sehr-uh-BELL-um]
  - the "little brain" attached to the rear of the brainstem
  - it helps coordinate voluntary movement and balance

The Brain

ESSENTIAL QUESTION:

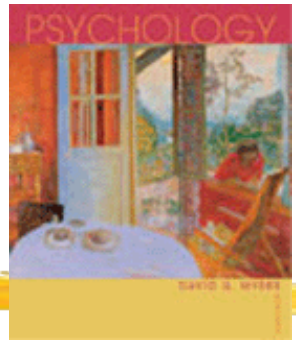
What are the parts of the limbic system, and what are their functions?

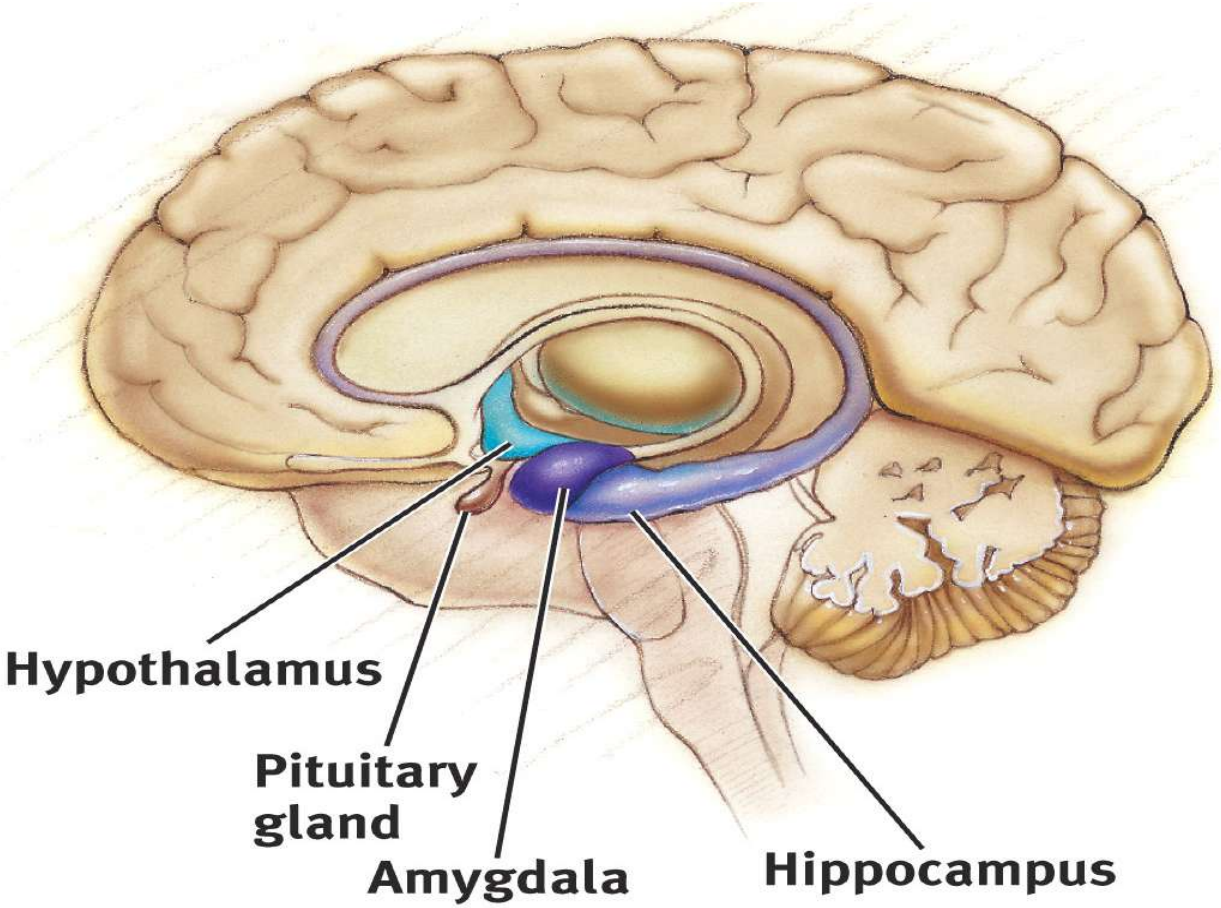
GPS STANDARD:

SSPBF1d- identify the major structures and functions of the brain.

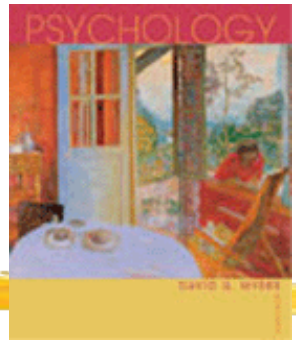
Limbic System

a doughnut-shaped system of neural structures at the border of the brainstem and cerebral hemispheres associated with emotions such as fear and aggression and drives such as those for food and sex includes the hippocampus, amygdala, and hypothalamus.

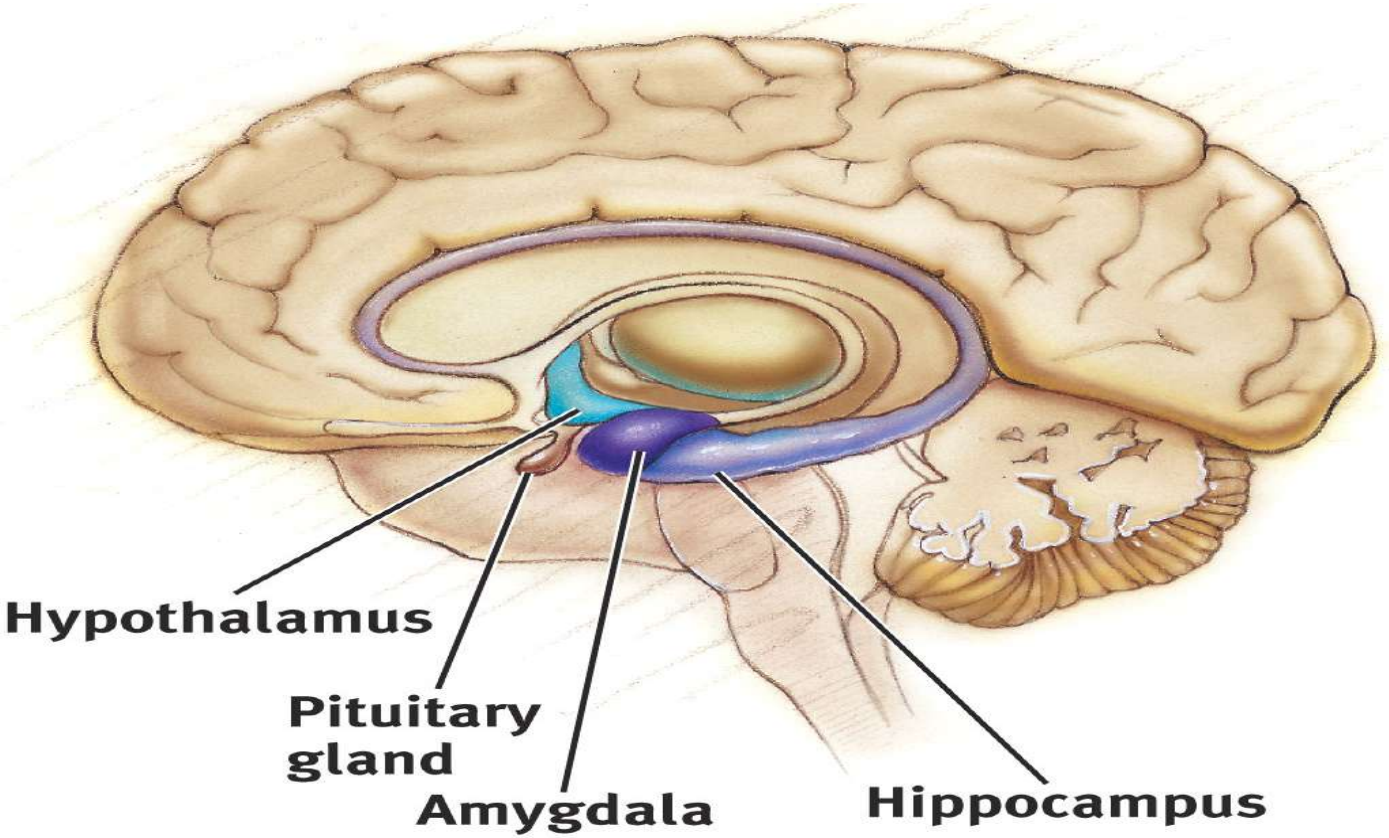




Hypothalamus

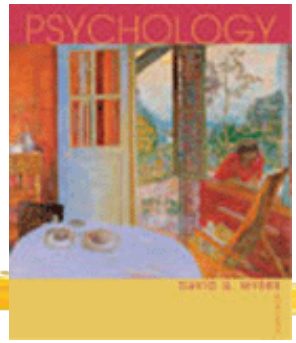


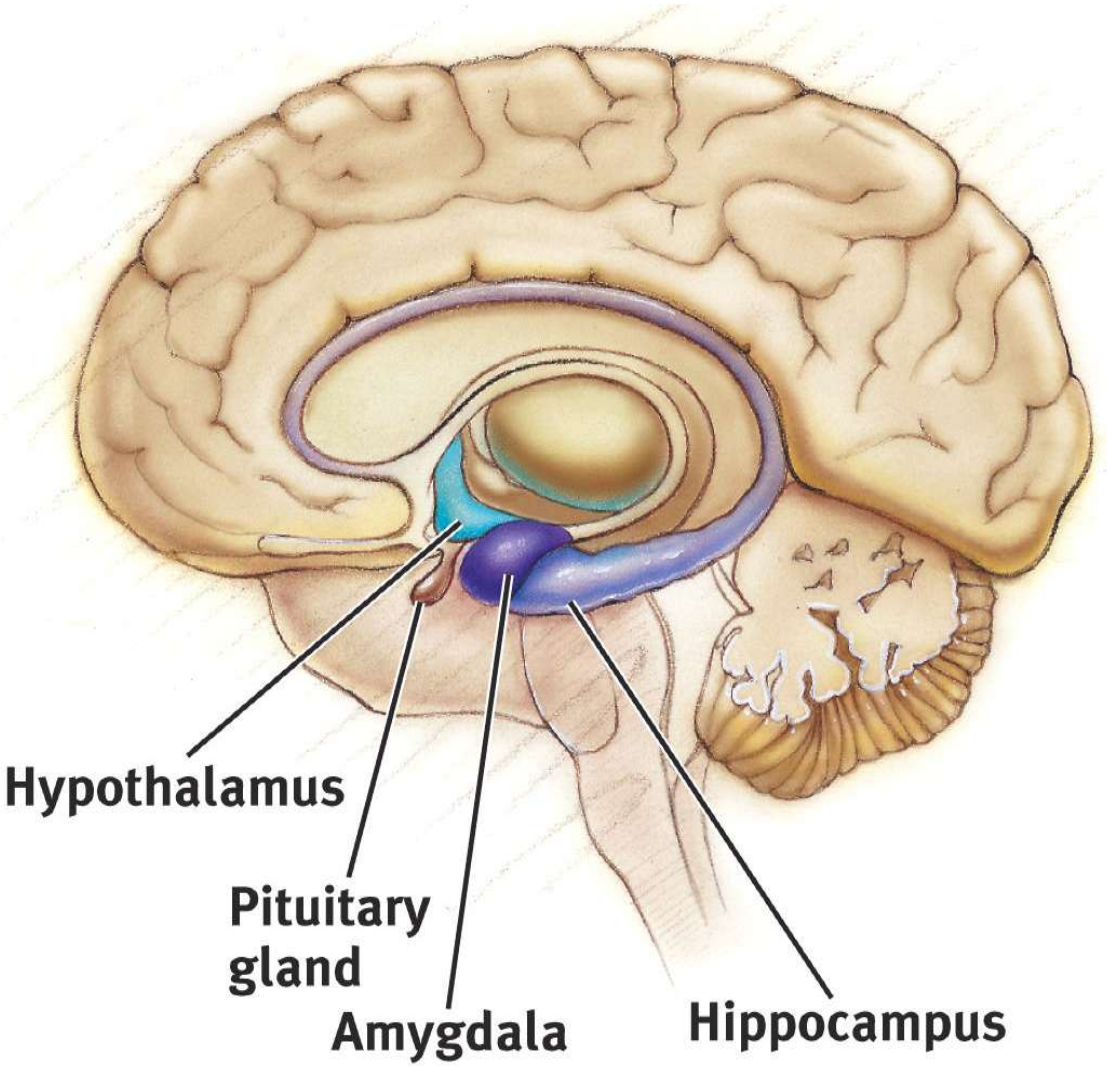
neural structure lying below (*hypo*) the thalamus; directs several maintenance activities:
eating
drinking
body temperature
body weight
sexual desire

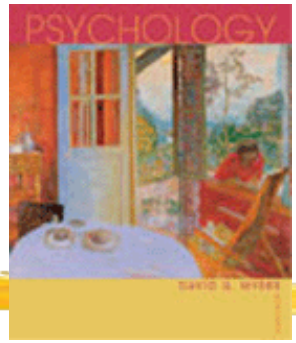


Pituitary Gland

under the influence of the hypothalamus, the pituitary regulates growth and controls other endocrine glands

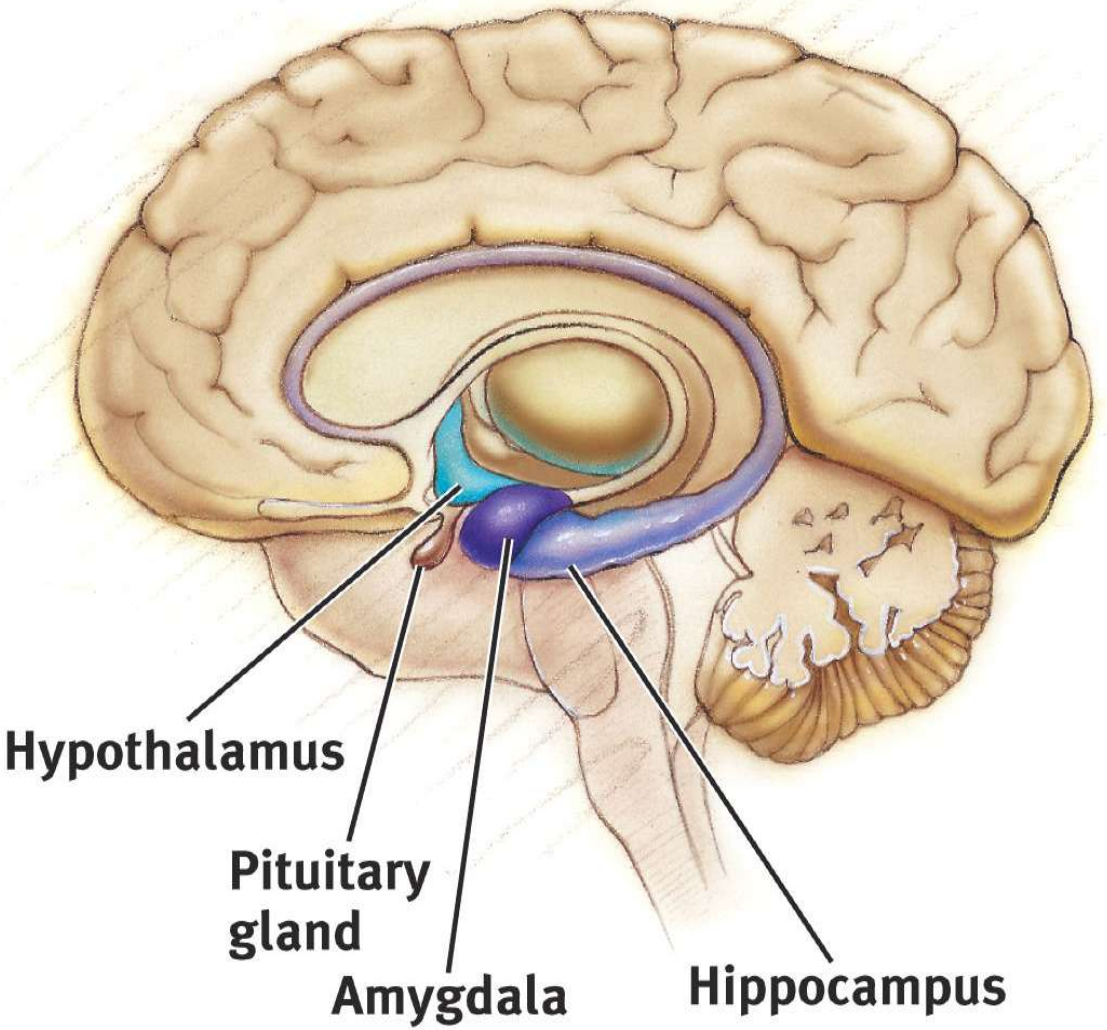






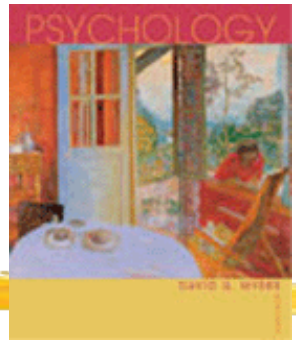
Amygdala [ah-MIG-dah-la]

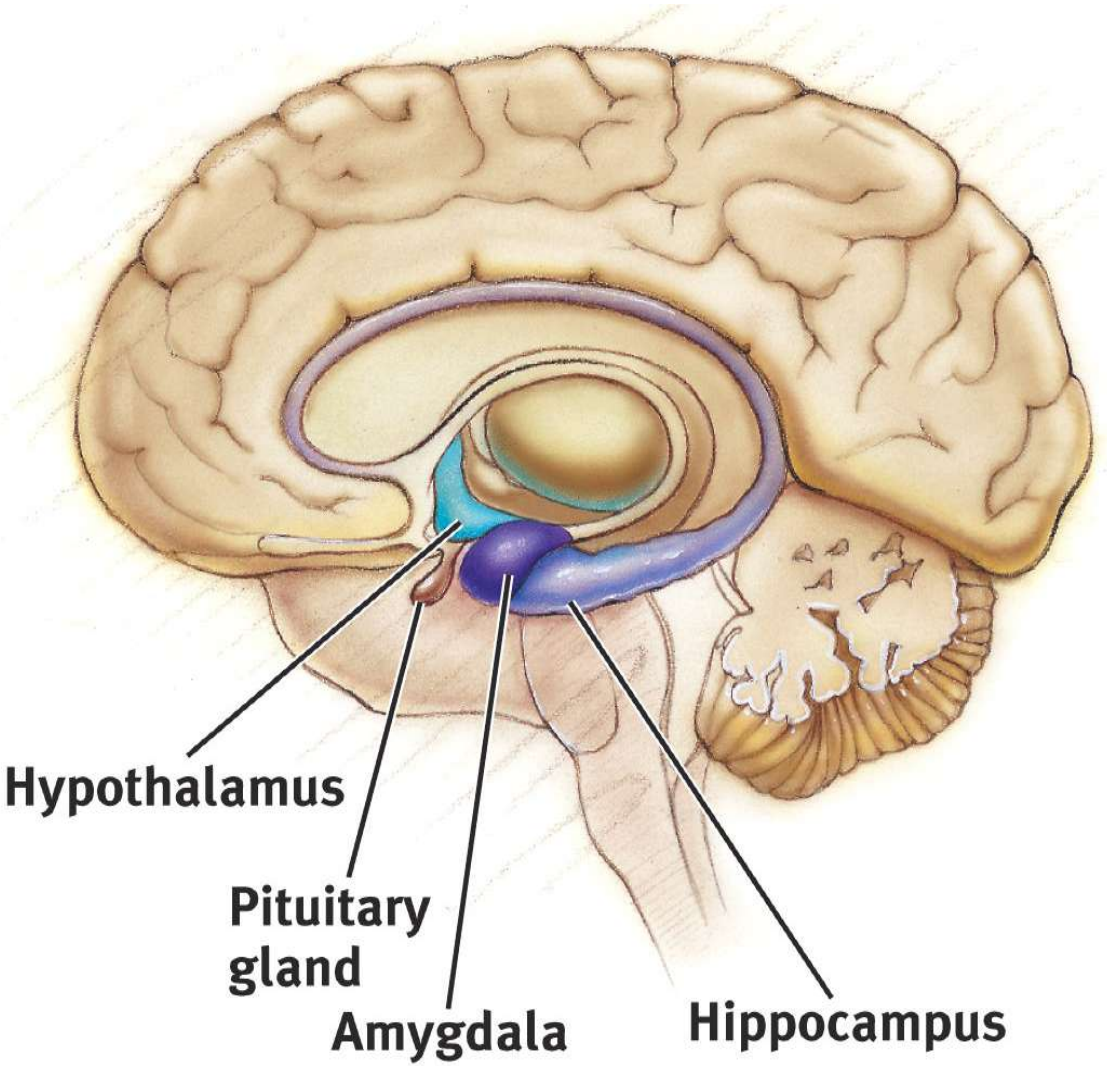
two almond-shaped neural clusters that are components of the limbic system and are linked to fear and emotion



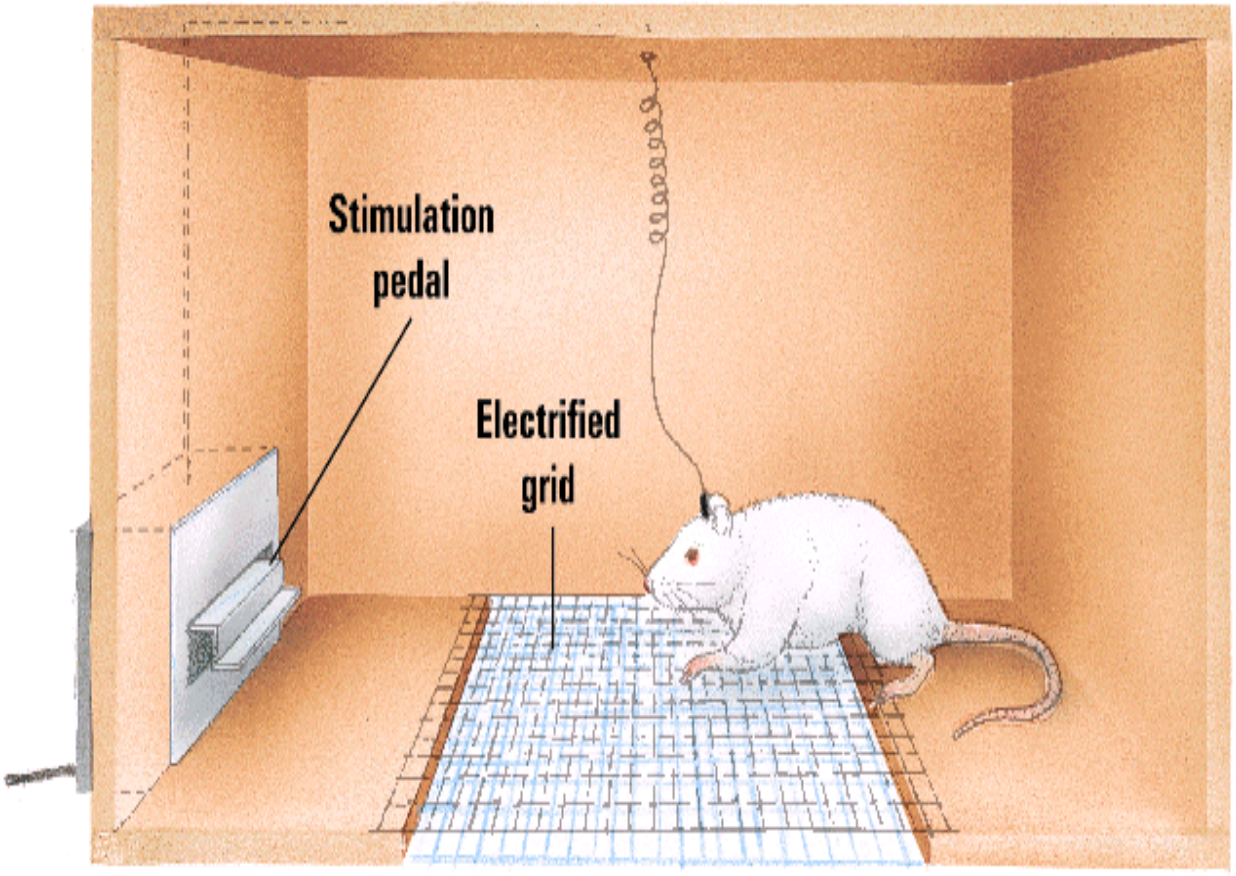
Hippocampus

a structure in the limbic system linked to memory





The Limbic System



- Electrode implanted in reward center

The Brain

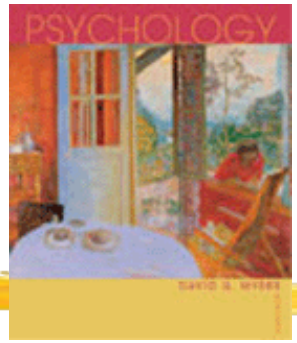
ESSENTIAL QUESTION:

What are the major regions of the cerebral cortex?

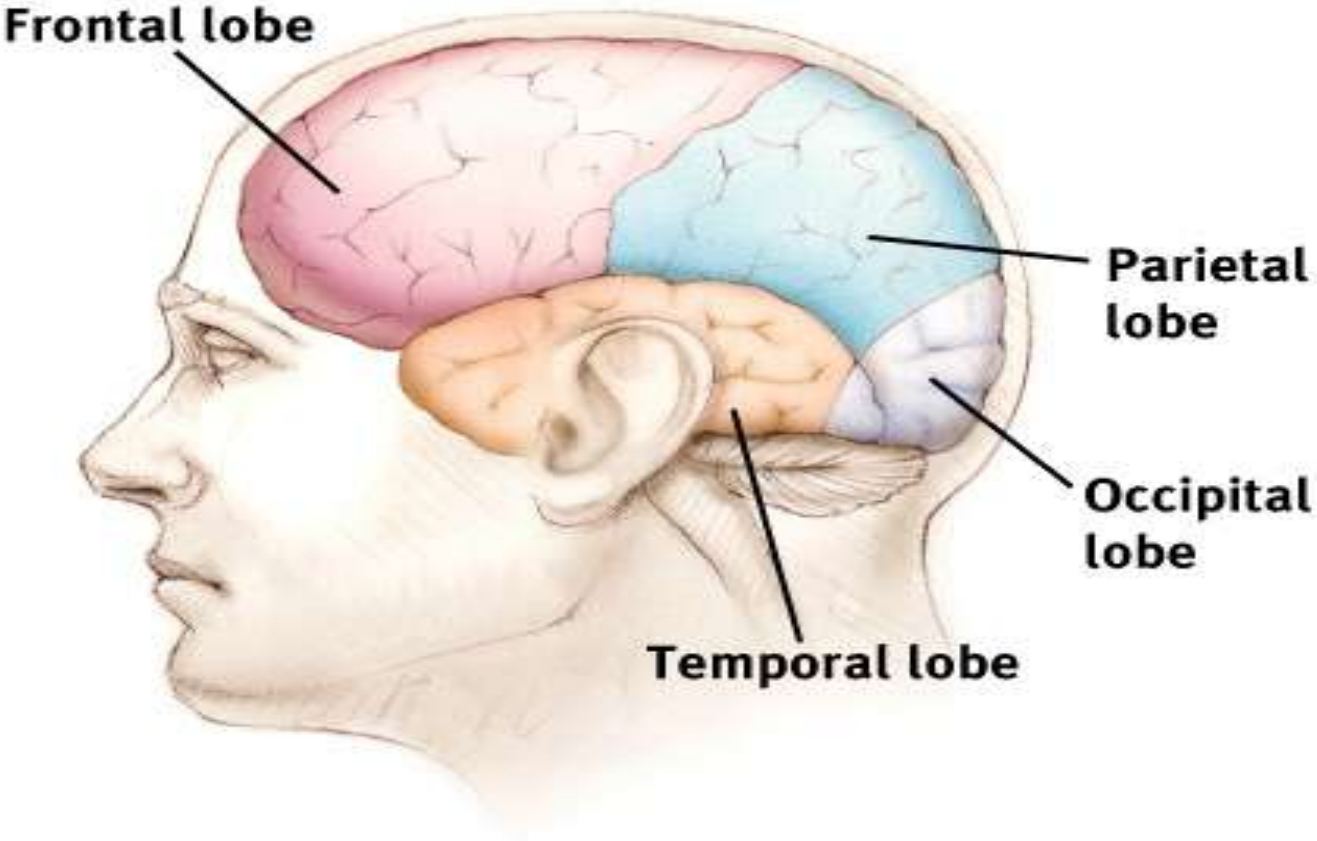
GPS STANDARD:

SSPBF1d- identify the major structures and functions of the brain.

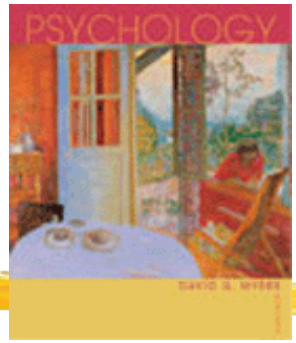
Cerebral Cortex

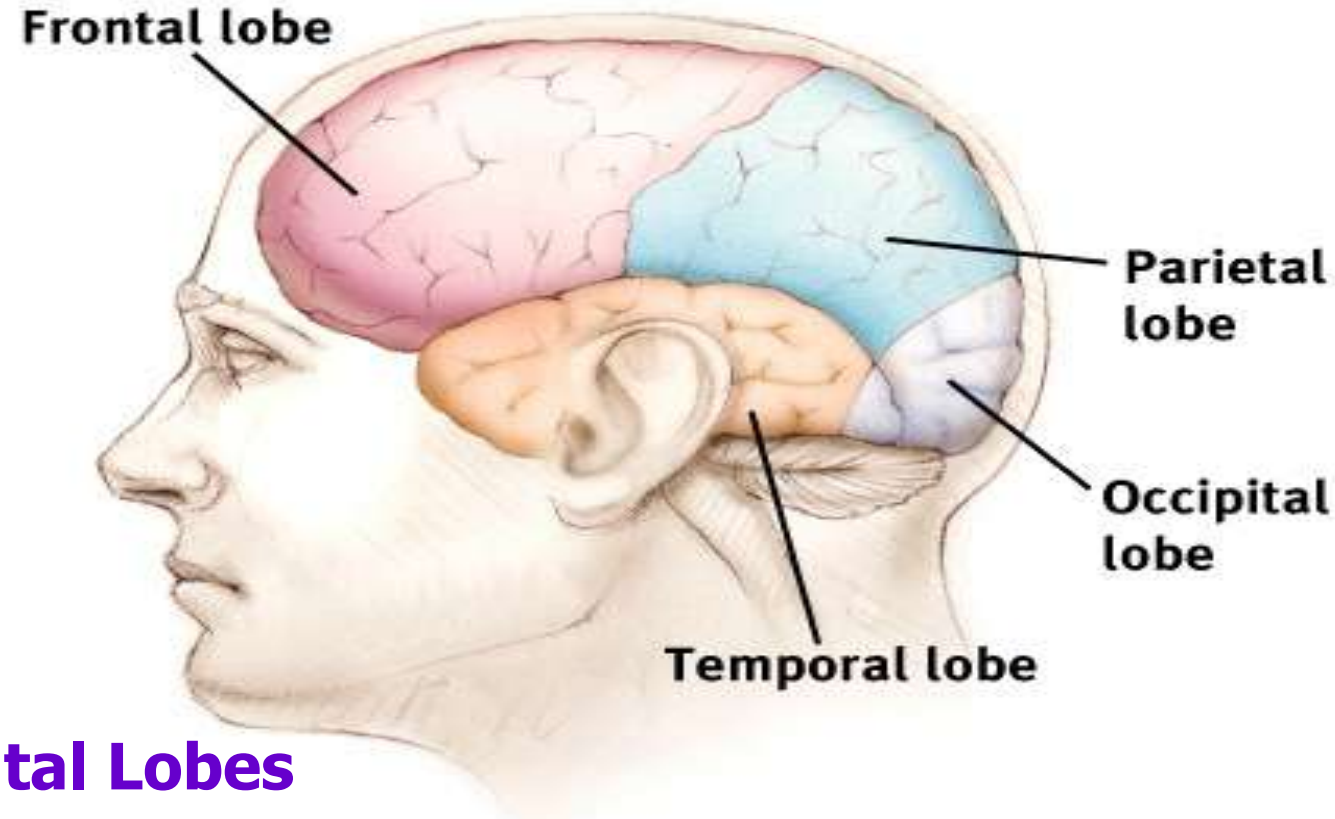


the intricate fabric of interconnected neural cells that covers the cerebral hemispheres
the body's ultimate control and information processing center



The Cerebral Cortex

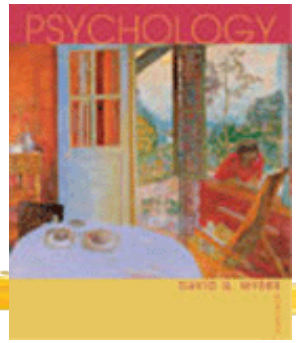


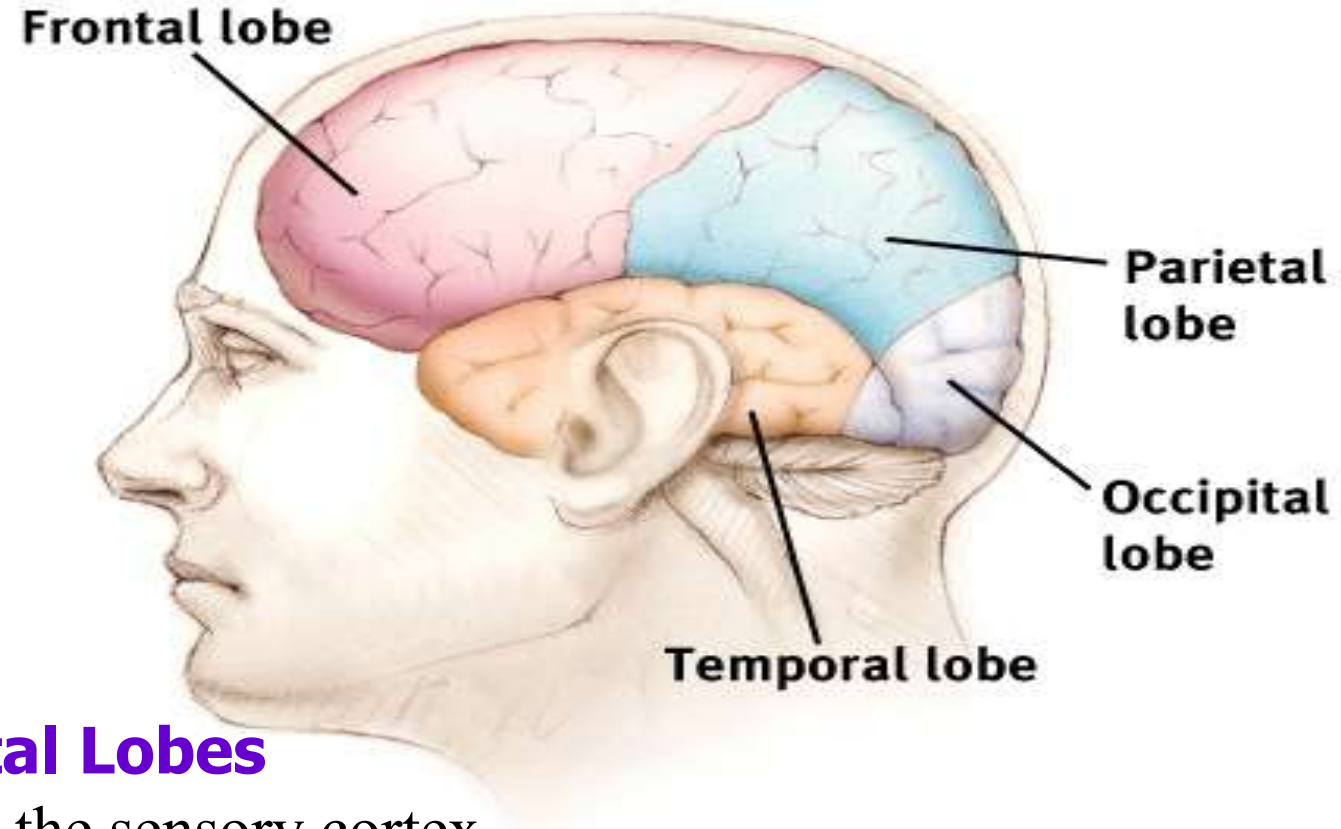


Frontal Lobes

involved in speaking and muscle movements and in making plans and judgments

The Cerebral Cortex

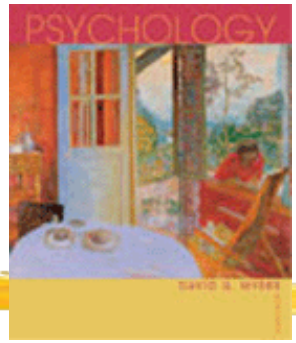


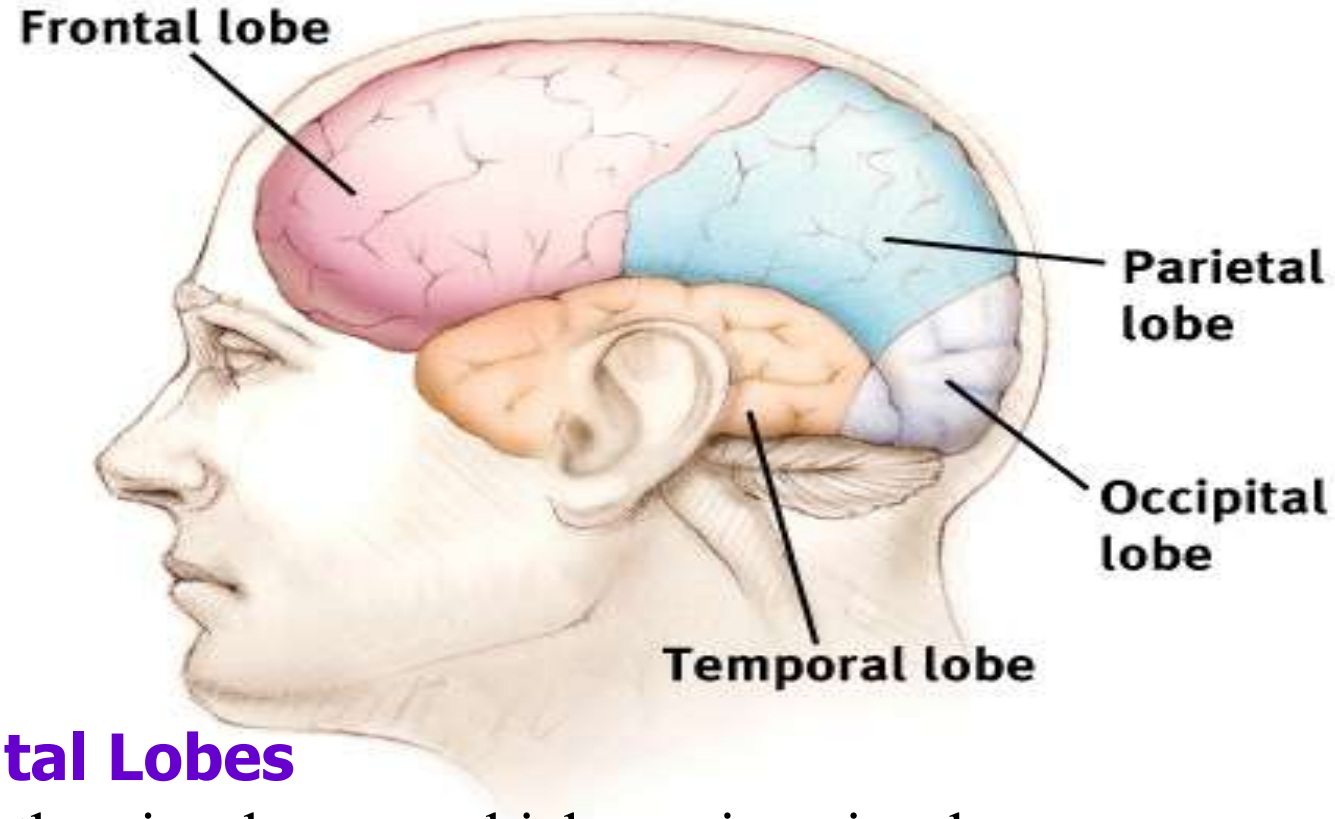


Parietal Lobes

include the sensory cortex

The Cerebral Cortex

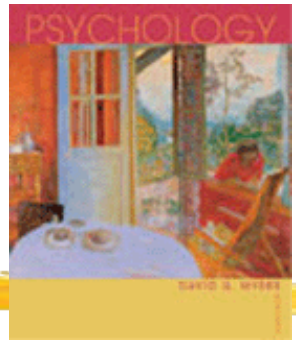


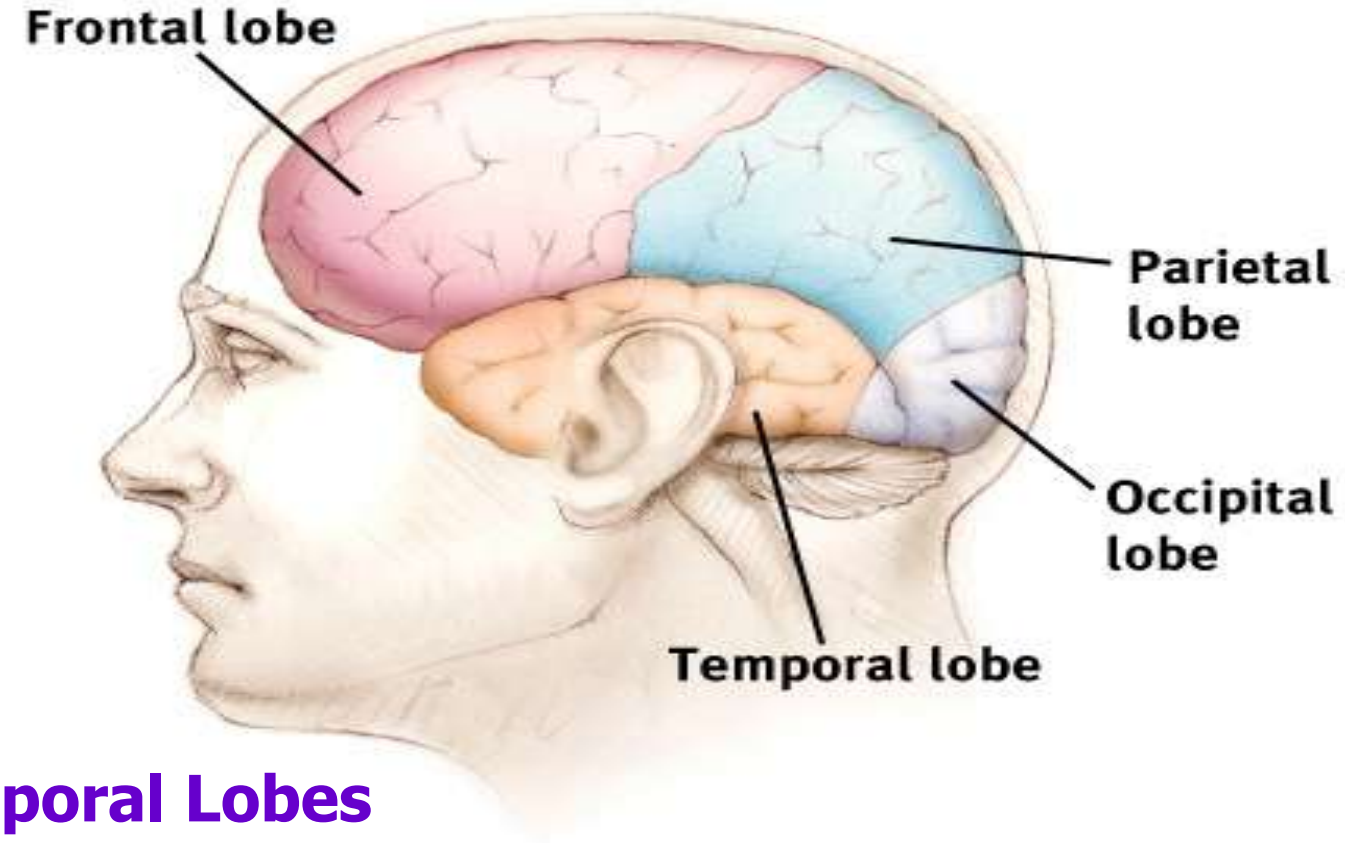


Occipital Lobes

include the visual areas, which receive visual information from the opposite visual field

The Cerebral Cortex





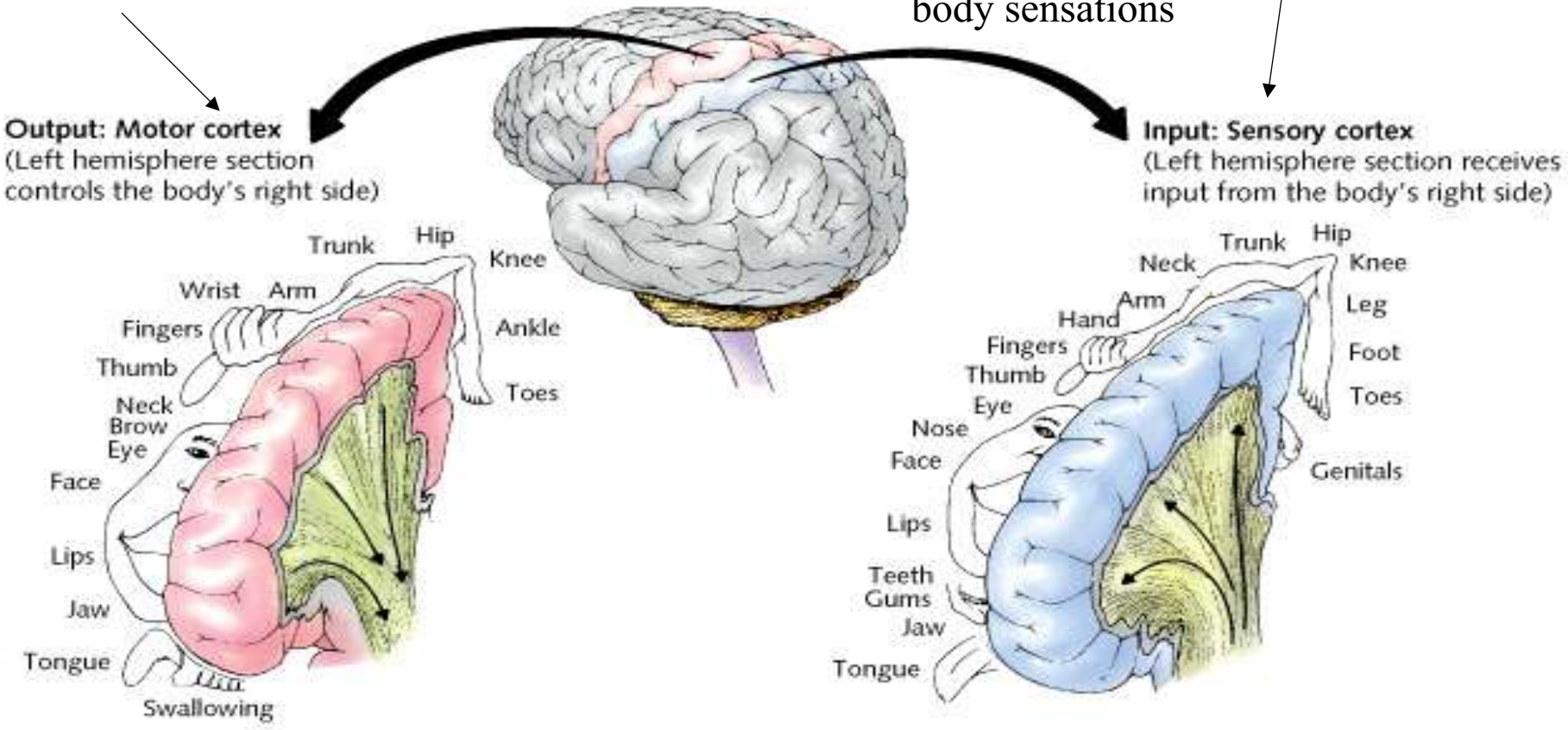
Temporal Lobes

include the auditory areas

The Cerebral Cortex

Motor Cortex
area at the rear of the frontal lobes that controls voluntary movements

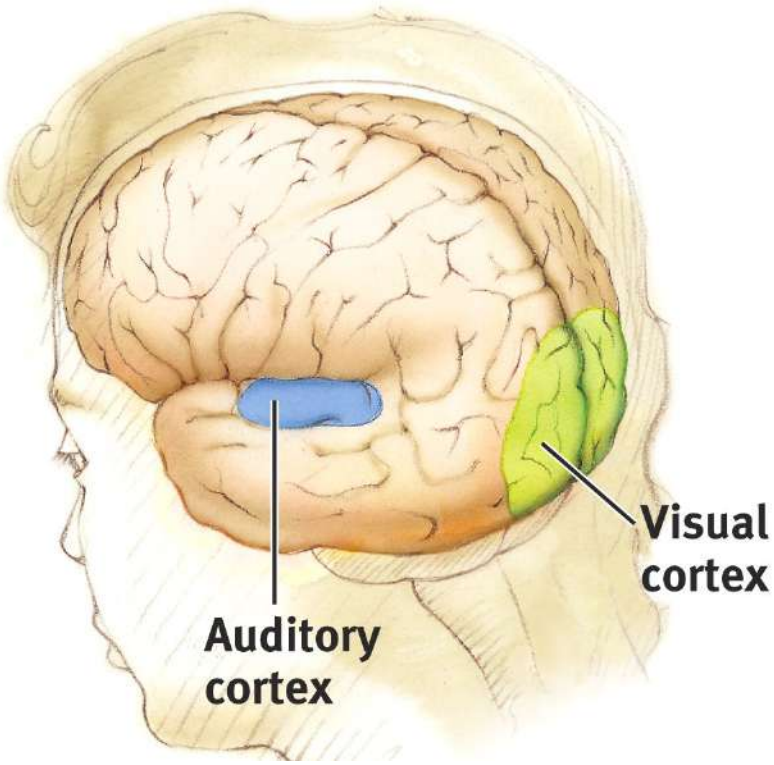
Sensory Cortex
area at the front of the parietal lobes that registers and processes body sensations



Visual & Auditory Cortex

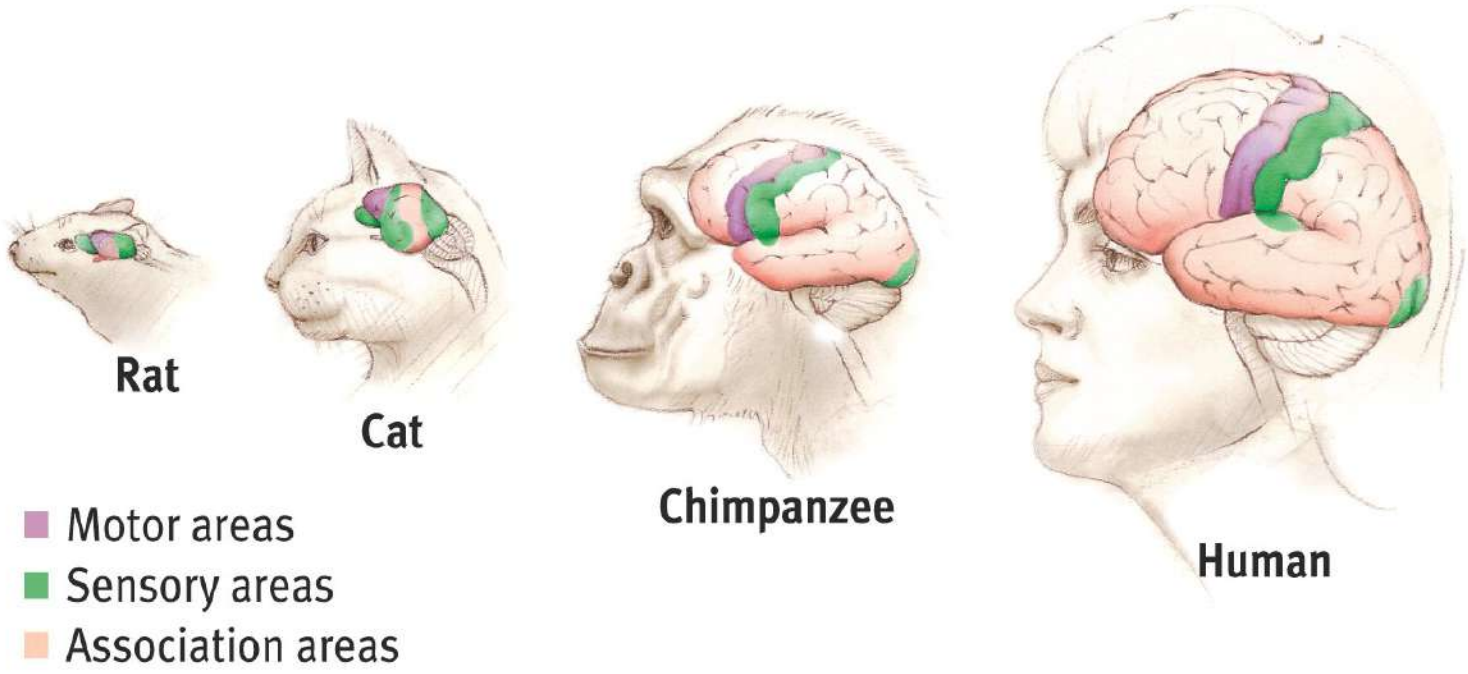
- **Visual Cortex** this area receives input from the eyes; in schizophrenics the functional MRI scan shows the visual cortex is active in patients who have visual hallucinations

- **Auditory Cortex** this area receives input from the ears; in schizophrenics the functional MRI scan shows the auditory cortex is active in patients who have auditory hallucinations



Association Areas

- More intelligent animals have increased "uncommitted" or association areas of the cortex
- The pink areas in the brain pictures below are responsible for integrating and acting on information- the larger cerebral cortex allows more complex thinking in higher animals



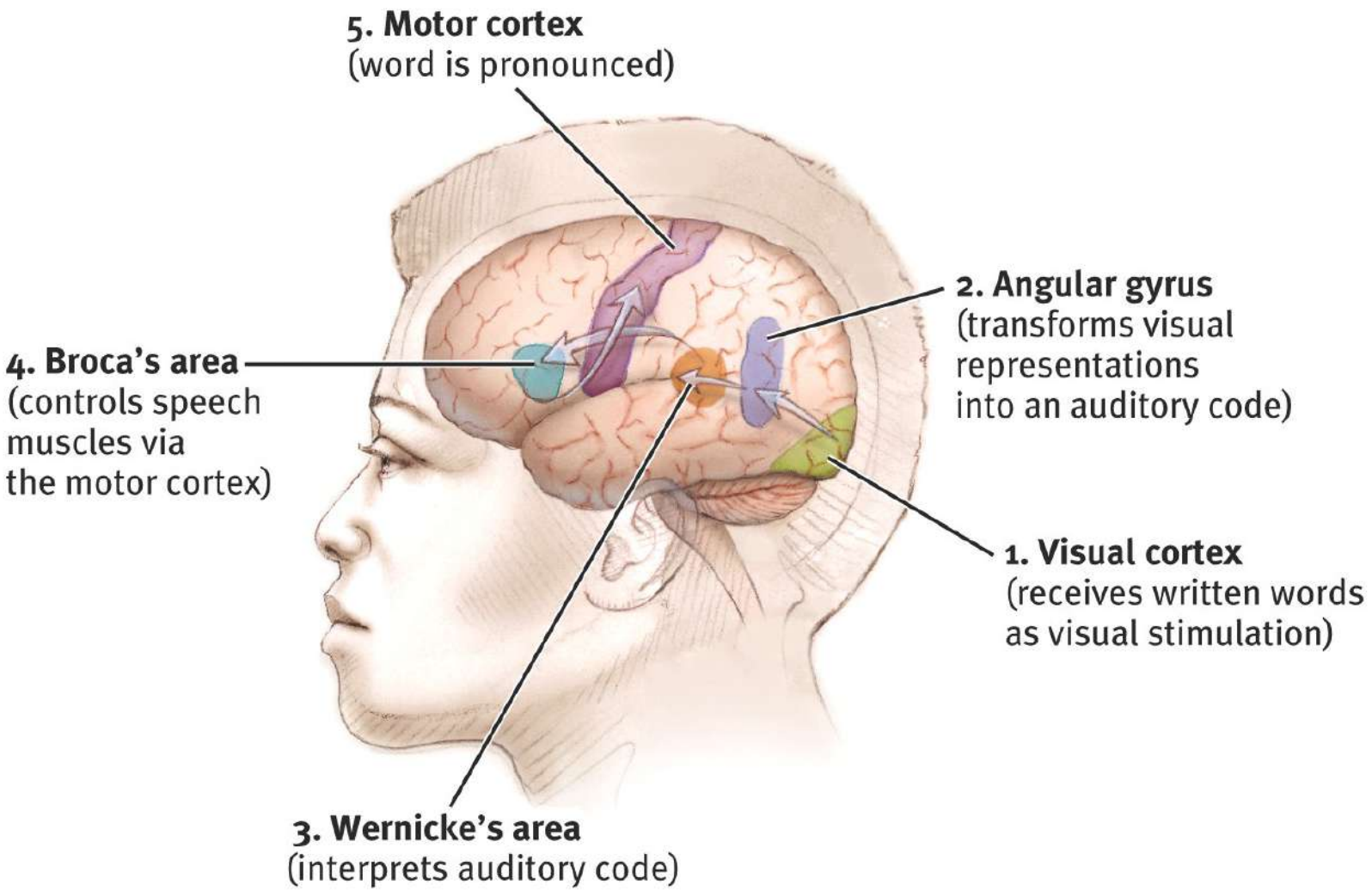
The Brain

ESSENTIAL QUESTION:

What are the left hemisphere's two specialized language areas, and how do they differ?

GPS STANDARD:
SSPBF1d- identify the major structures and functions of the brain.

Specialization and Integration



The Cerebral Cortex

- Broca's Area (B comes first in the alphabet and is in the front of the head near the mouth. Broca's area helps us produce speech)
  - an area of the left frontal lobe that directs the muscle movements involved in speech
- Wernicke's Area (W comes later in the alphabet and is in the back of the head. Wernicke's area helps us understand speech)
  - an area of the left temporal lobe involved in language comprehension and expression

The Cerebral Cortex

- Aphasia
  - impairment of language, usually caused by left hemisphere damage either to Broca's area (impairing speaking) or to Wernicke's area (impairing understanding)

The Brain

ESSENTIAL QUESTION:

What technologies have been developed to scan the brain?

GPS STANDARD:
SSPBF1e- describe the methods used to analyze neural form and function; include the MRI, fMRI, PET, CAT, and EEG scans.

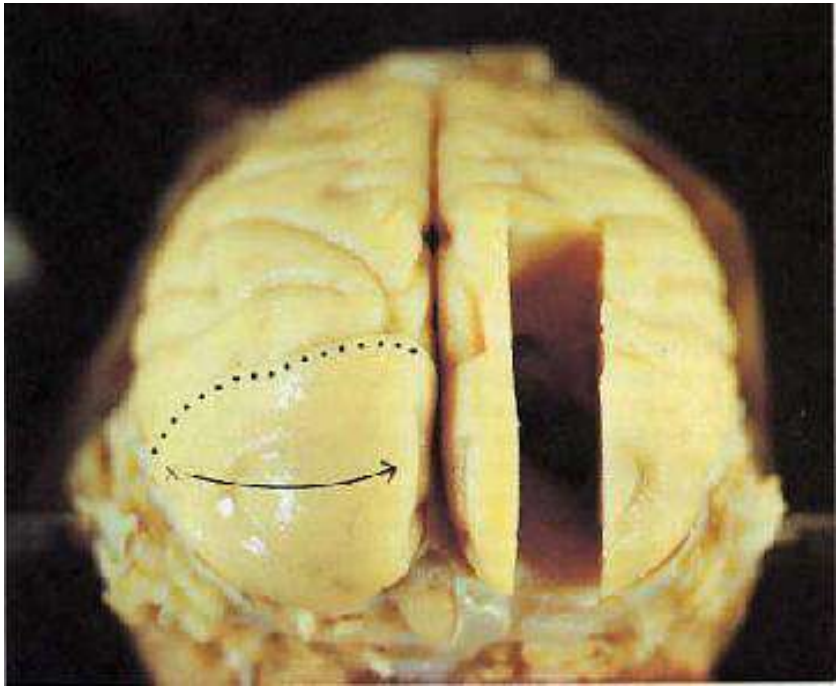
The Brain

- Lesion
  - tissue destruction
  - a brain lesion is a naturally or experimentally caused destruction of brain tissue

The Brain

Techniques to Study the Brain

A brain lesion experimentally destroys brain tissue to study animal behaviors after such destruction.



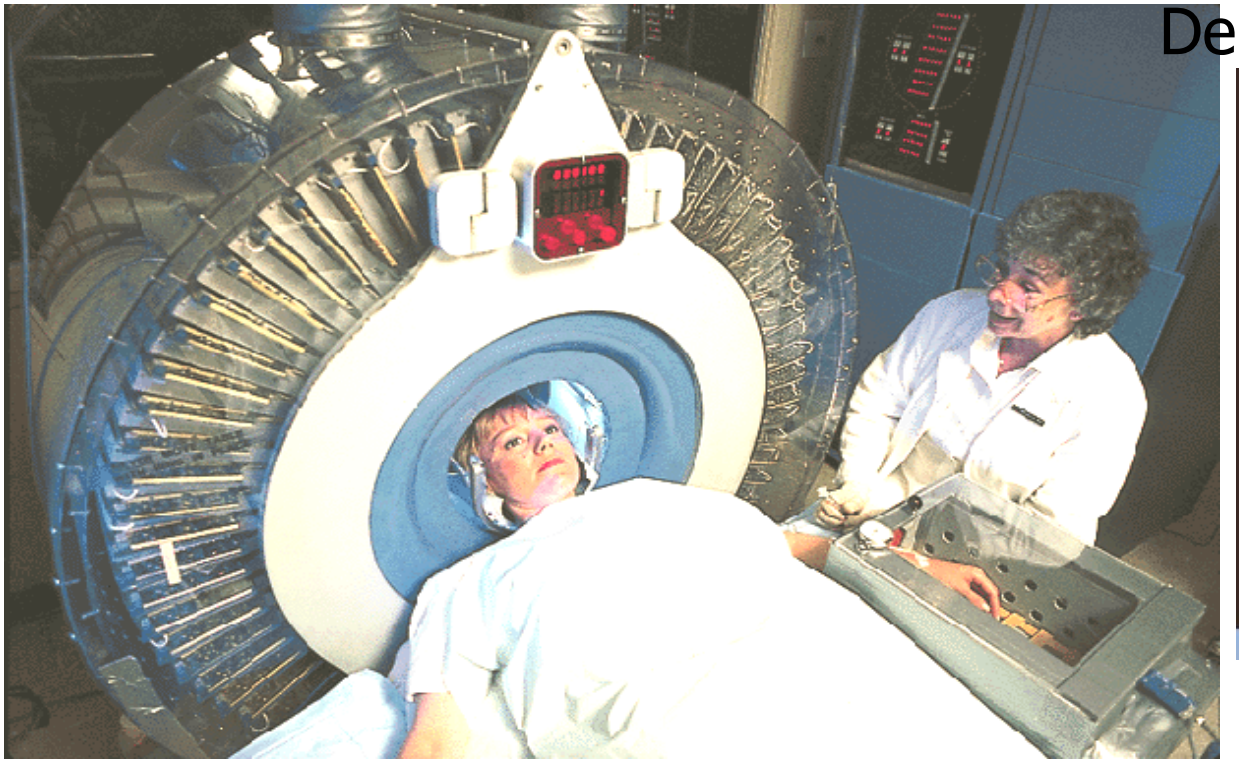
Hubel (1990)

Electroencephalogram (EEG)

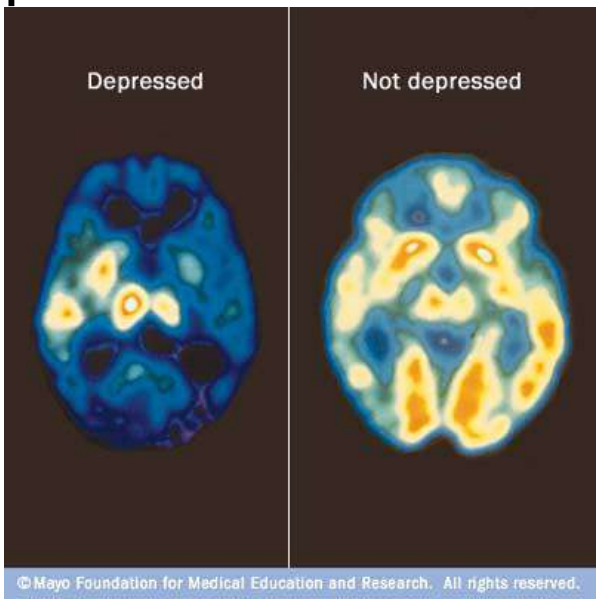
- an amplified recording of the waves of electrical activity that sweep across the brain's surface
- these waves are measured by electrodes placed on the scalp

PET Scan (positron emission tomography)

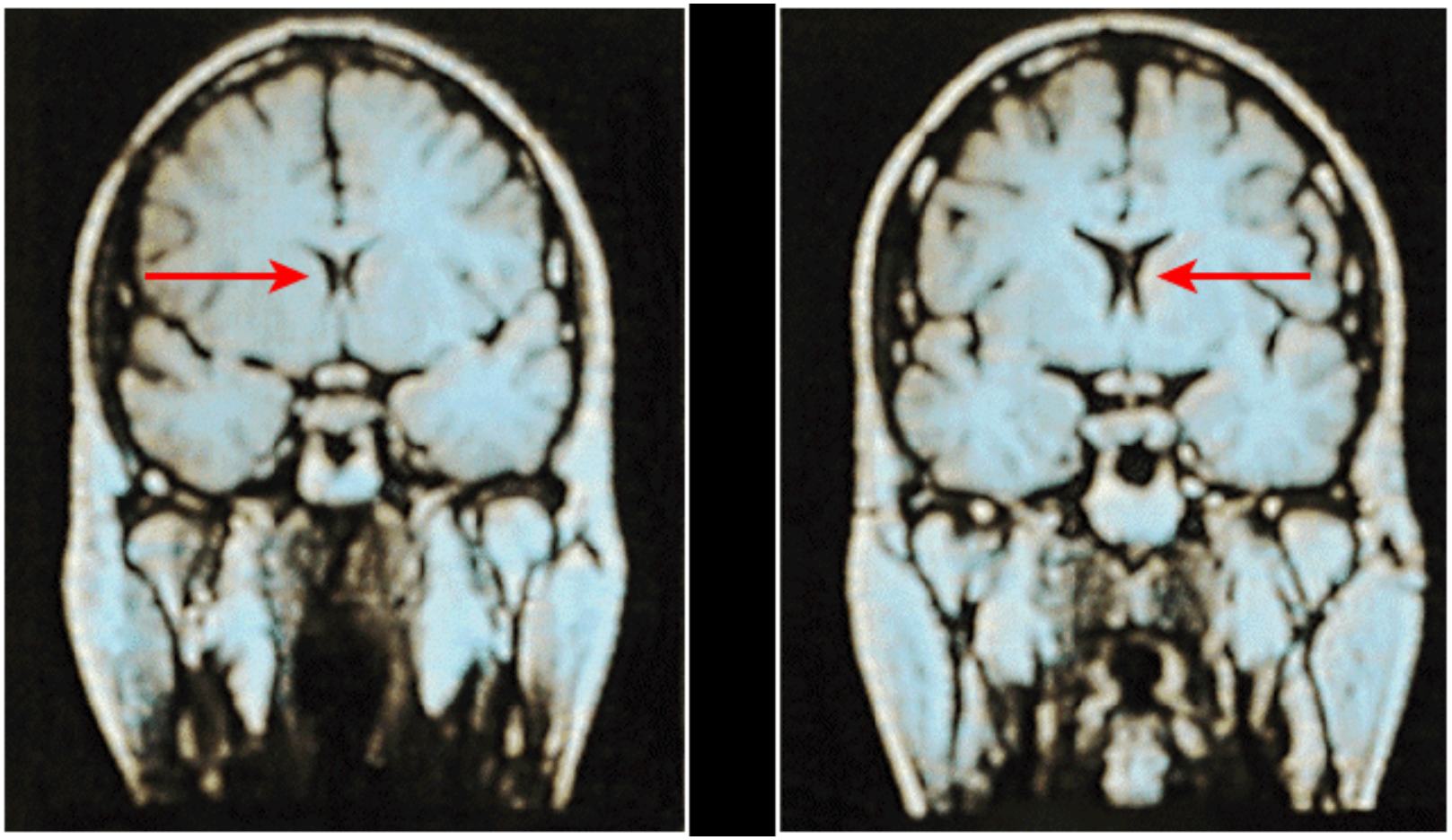
a visual display of brain activity that detects where a radioactive form of glucose goes while the brain performs a given task



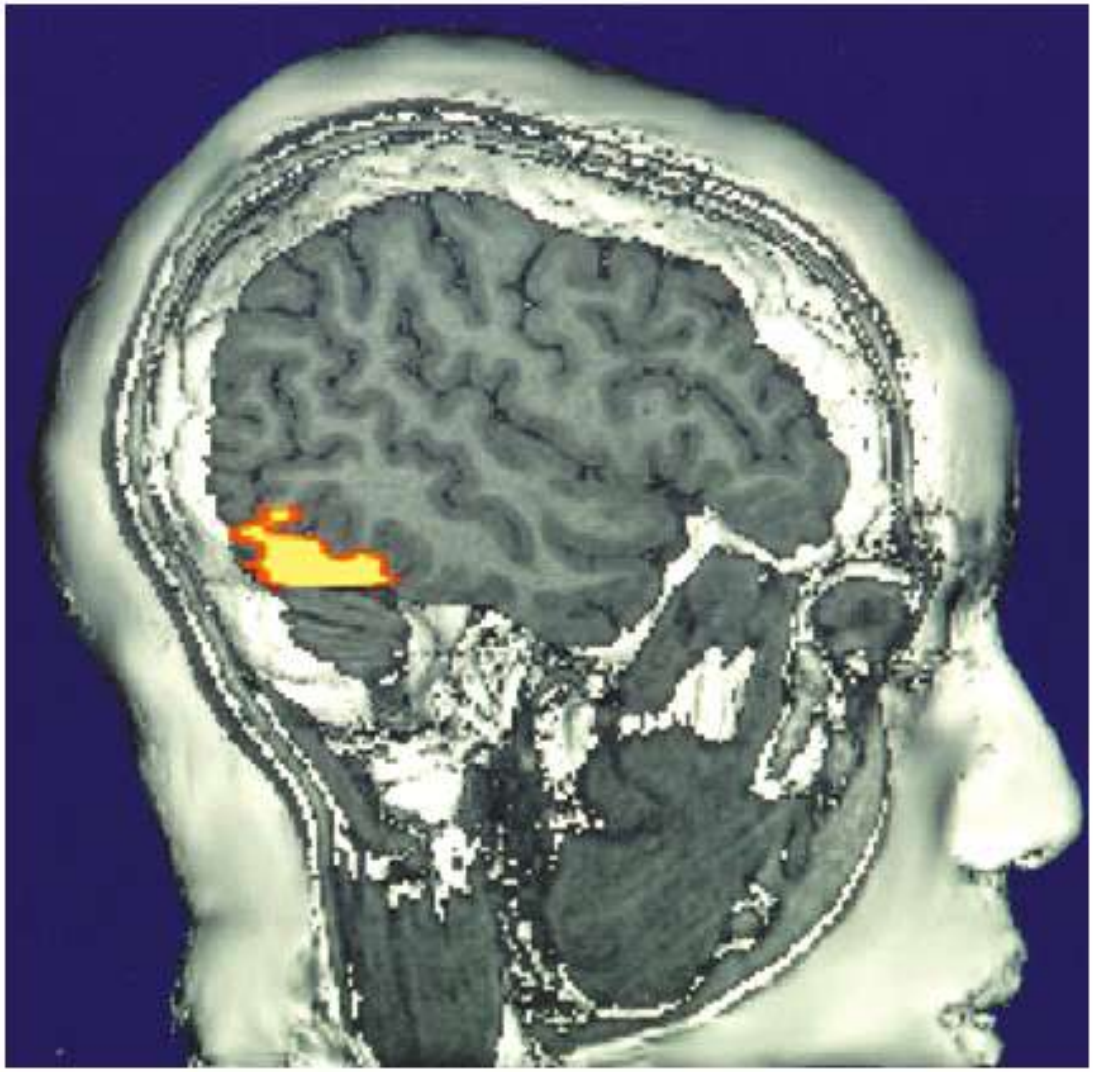
Depressed Not Depressed



MRI ScanMRI (magnetic resonance imaging)
a technique that uses magnetic fields and radio waves to produce computer-generated images that distinguish among different types of soft tissue; allows us to see structures within the brain



Functional MRI



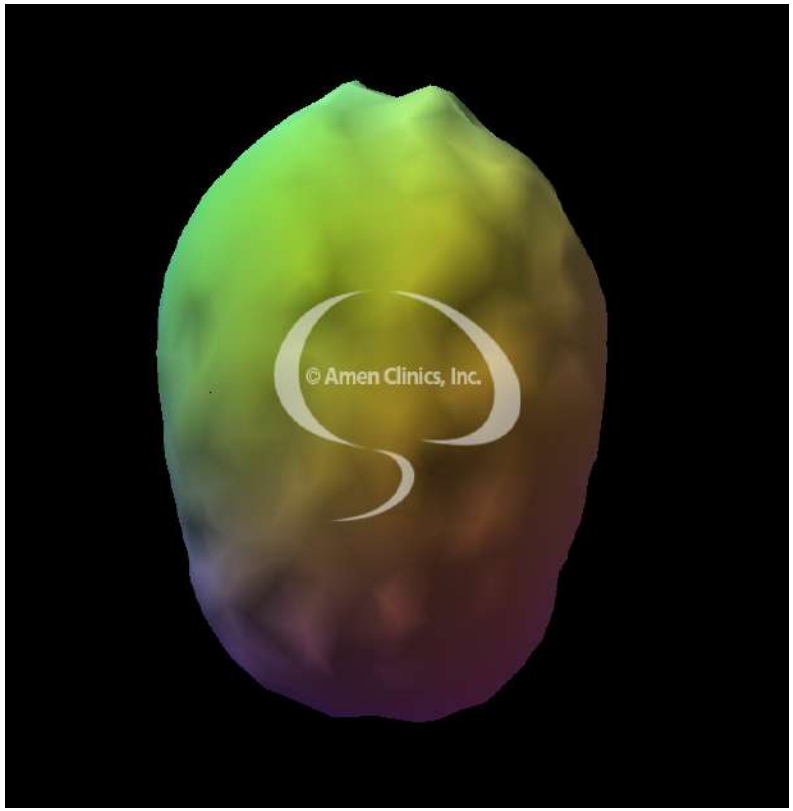
- Functional MRI scan shows the visual cortex activated as the subject looks at faces

The Brain

- CT (computed tomography) Scan
  - a series of x-ray photographs taken from different angles and combined by computer into a composite representation of a slice through the body; also called CAT scan

SPECT Scan-

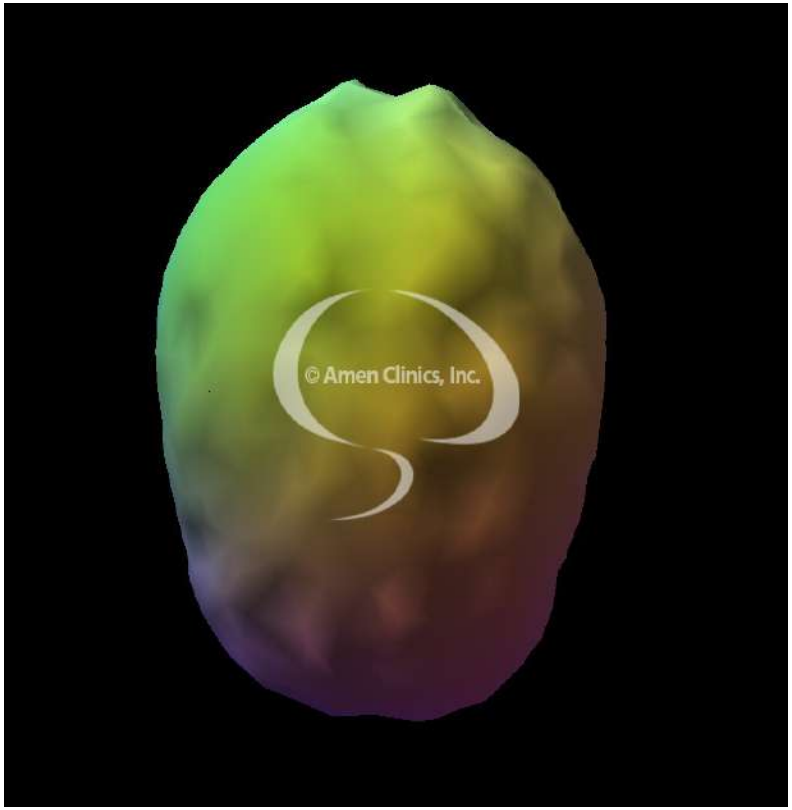
Single Photon Emission Computerized Tomography



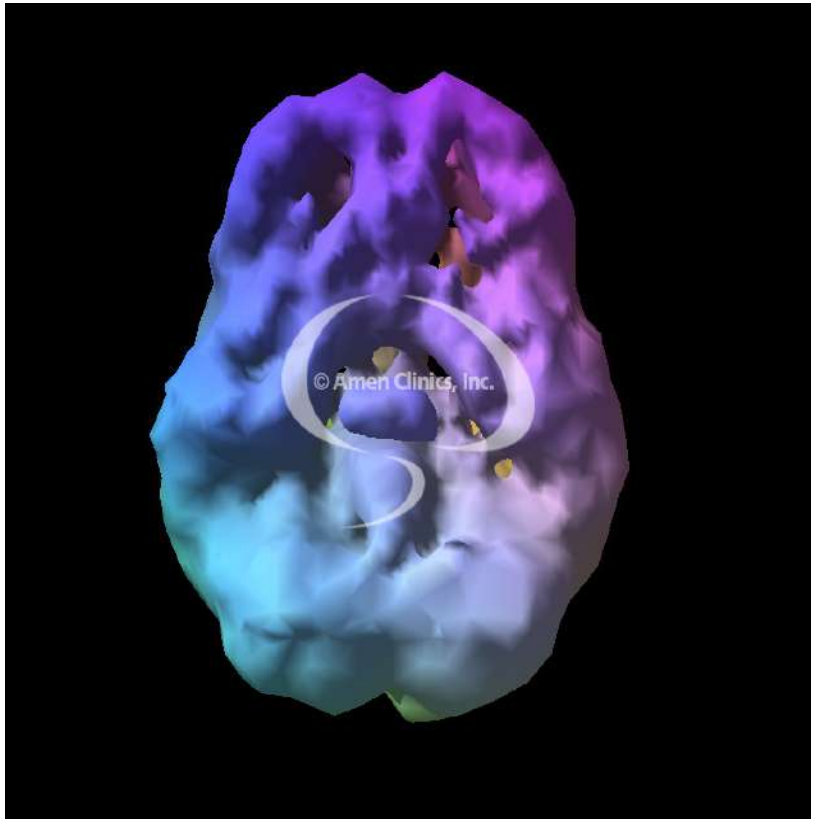
- **SPECT Scan**
  - an acronym for single photon emission tomography
  - It is a sophisticated nuclear medicine study that "looks" directly at cerebral blood flow and indirectly at brain activity, or metabolism

Brain on Hallucinogens: Marijuana

Normal Brain



Marijuana



The Brain

ESSENTIAL QUESTION:

What is brain plasticity?

GPS STANDARD:

SSPBF1d- identify the major structures and functions of the brain.

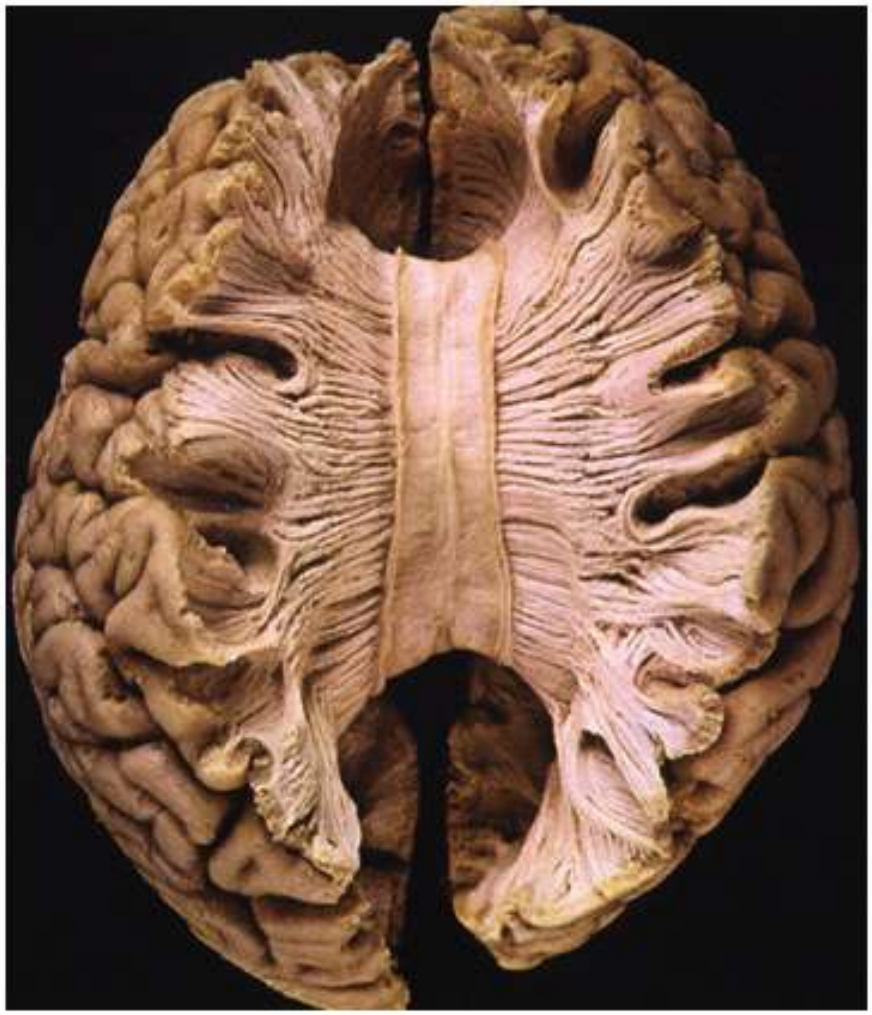
Brain Reorganization

- Plasticity
  - the brain's capacity for modification, as evident in brain reorganization following damage (especially in children) and in experiments on the effects of experience on brain development

Our Divided Brain

- Corpus Callosum
  - large band of neural fibers
  - connects the two brain hemispheres
  - carries messages between the hemispheres

Split Brain



- a condition in which the two hemispheres of the brain are isolated by cutting the connecting fibers (mainly those of the corpus callosum) between them

Split Brain

"Look at the dot."

Two words separated by a dot are momentarily projected.

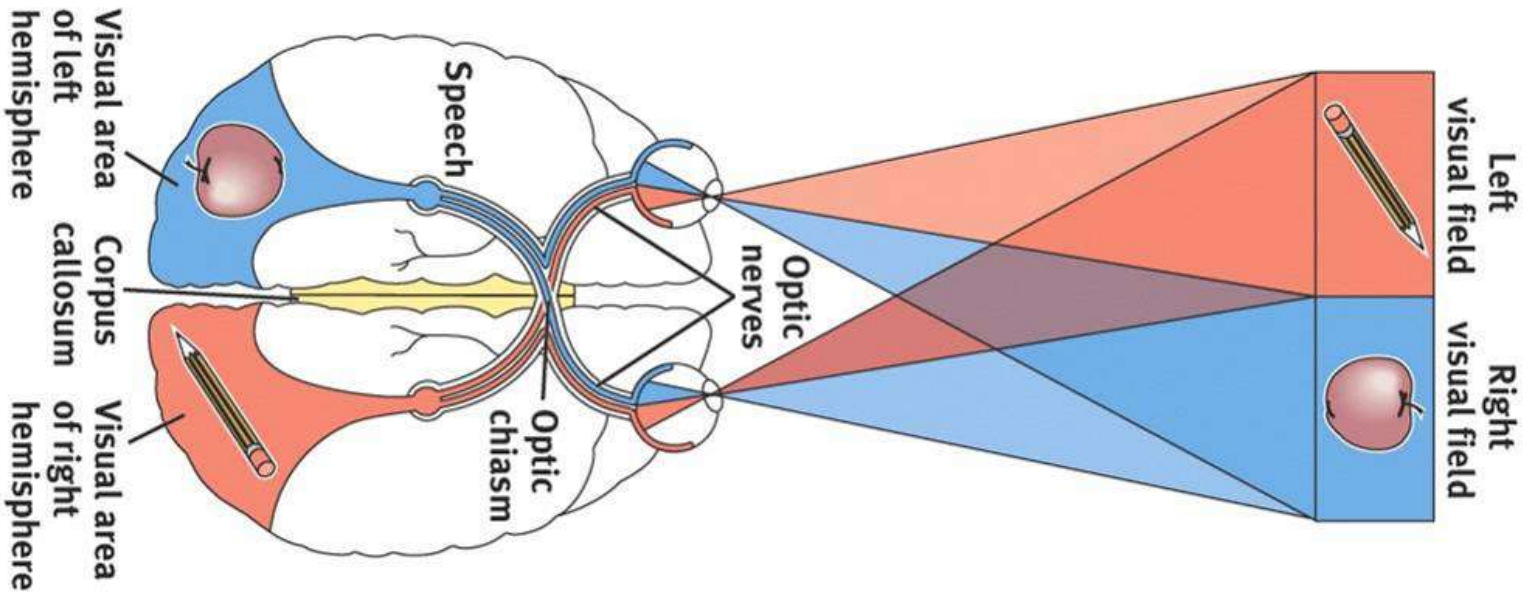
"What word did you see?"

or

"Point with your left hand to the word you saw."

Split Brain Patients

With the corpus callosum severed, objects (apple) presented in the right visual field can be named. Objects (pencil) in the left visual field cannot.



Chapter 2 Test Review

In terms of brain evolution/adaptation, the sequence of brain regions from oldest to newest is:

a. cerebral cortex; brain stem; limbic system
b. brainstem; limbic system; cerebral cortex
c. limbic system; brain stem; cerebral cortex
d. limbic system; cerebral cortex; brainstem

Chapter 2 Test Review

In terms of brain evolution/adaptation, the sequence of brain regions from oldest to newest is:

b. brainstem; limbic system; cerebral cortex

Chapter 2 Test Review

Which brain structure receives information from all of the senses except smell?

a. Amygdala
b. Thalamus
c. Medulla
d. Hippocampus

Chapter 2 Test Review

Which brain structure receives information from all of the senses except smell?

b. Thalamus

Chapter 2 Test Review

The reticular formation is located in the:

a. brain stem
b. limbic system
c. motor cortex
d. somatosensory cortex

Chapter 2 Test Review

The reticular formation is located in the:

a. brain stem

Chapter 2 Test Review

The part of the brainstem that controls heartbeat and breathing is called the:

a. cerebellum
b. reticular formation
c. medulla
d. thalamus

Chapter 2 Test Review

The part of the brainstem that controls heartbeat and breathing is called the:

c. medulla

Chapter 2 Test Review

Which brain structure relays information from the eyes to the visual cortex?

a. amygdala

b. cerebellum

c. hippocampus

d. thalamus

Chapter 2 Test Review

Which brain structure relays information from the eyes to the visual cortex?

d. thalamus

Chapter 2 Test Review

After Greg's serious motorcycle accident, doctors detected damage to his cerebellum. Greg is most likely to have difficulty:

a. experiencing intense emotions

b. reading a book

c. playing his guitar

d. understanding what others are saying

Chapter 2 Test Review

After Greg's serious motorcycle accident, doctors detected damage to his cerebellum. Greg is most likely to have difficulty:

c. playing his guitar

Chapter 2 Test Review

The technique that uses magnetic fields and radio waves to produce computer images of structures within the brain is called:

a. CAT scan

b. PET scan

c. MRI scan

d. EEG

Chapter 2 Test Review

The technique that uses magnetic fields and radio waves to produce computer images of structures within the brain is called:

c. MRI scan

Chapter 2 Test Review

The brain research technique that involves monitoring the brain's usage of glucose is called:

a. CAT scan

b. PET scan

c. MRI scan

d. EEG

Chapter 2 Test Review

The brain research technique that involves monitoring the brain's usage of glucose is called:

b. PET scan

Which component of the limbic system plays an essential role in the formation of new memories?

a. Hippocampus
b. Amygdala
c. Hypothalamus
d. Thalamus

Which component of the limbic system plays an essential role in the formation of new memories?

a. Hippocampus

A brain tumor caused extensive damage to Mr. Thorndike's hypothalamus. It is most likely that he will suffer a loss of:

a. language comprehension
b. muscular coordination
c. sexual motivation
d. visual perception

A brain tumor caused extensive damage to Mr. Thorndike's hypothalamus. It is most likely that he will suffer a loss of:

c. sexual motivation

The long crack in the cerebral cortex between the right and left hemisphere is called the:

a. hypothalamus

b. medulla

c. longitudinal fissure

d. reticular formation

The long crack in the cerebral cortex between the right and left hemisphere is called the:

c. longitudinal fissure

To demonstrate that brain stimulation can make a rat violently aggressive, Professor Brown should electrically stimulate the rat's:

a. Reticular formation
b. Medulla
c. Cerebellum
d. Amygdala

To demonstrate that brain stimulation can make a rat violently aggressive, Professor Brown should electrically stimulate the rat's:

d. Amygdala

The corpus callosum is a band of neural fibers that:

a. Controls the glands and muscles of the internal organs
b. Directs the muscle movements involved in speech
c. Enables the left hemisphere to control the right side of the body
d. Transmits information between the cerebral hemispheres

The corpus callosum is a band of neural fibers that:

d. Transmits information between the cerebral hemispheres

The motor cortex is located in the _____ lobes.

a. Parietal
b. Occipital
c. Temporal
d. Frontal

The motor cortex is located in the _____ lobes.

d. Frontal

Auditory stimulation is first processed in the:

a. Parietal
b. Occipital
c. Temporal
d. Frontal

Auditory stimulation is first processed in the:

c. Temporal

The surgical removal of a large tumor from Allen's occipital lobe resulted in extensive loss of brain tissue. Allen is most likely to suffer from some loss of:

a. language comprehension
b. muscular coordination
c. speaking ability
d. vision

The surgical removal of a large tumor from Allen's occipital lobe resulted in extensive loss of brain tissue. Allen is most likely to suffer from some loss of:

d. vision

The part of the left frontal lobe that directs the muscle movements involved in speech is known as:

a. Wernicke's area
b. The amygdala
c. The reticular formation
d. Broca's area

The part of the left frontal lobe that directs the muscle movements involved in speech is known as:

d. Broca's area

The somatosensory cortex is most critical for our sense of:

a. Hearing
b. Sight
c. Taste
d. Touch

The somatosensory cortex is most critical for our sense of:

d. Touch

The two language regions in the left hemisphere are called:

a. Gazzaginga's and Sperry's areas
b. Broca's and Wernicke's areas
c. hippocampus and amygdala
d. medulla and thalamus

The two language regions in the left hemisphere are called:

b. Broca's and Wernicke's areas

The current popular idea that some people are right-brained and some are left-brained:

a. Has no basis in psychology research

b. Is an exaggeration of research on brain hemispheres

c. Is completely accurate

d. Makes no sense because the brain is not divided

The current popular idea that some people are right-brained and some are left-brained:

b. Is an exaggeration of research on brain hemispheres

One of the clear differences between the functions of the left and right hemispheres of the brain involves:

a. computer use

b. judgment

c. moral reasoning

d. spoken language

One of the clear differences between the functions of the left and right hemispheres of the brain involves:

d. spoken language

Which of the brain lobes receives the input that enables you to feel someone scratching your back?

a. Frontal
b. Occipital
c. Parietal
d. Temporal

Which of the brain lobes receives the input that enables you to feel someone scratching your back?

c. Parietal

A patient with damage to the Broca's area of the brain would probably have difficulty:

a. Expressing spoken language
b. Expressing written language
c. recognizing a family member's face
d. Understanding what someone else says

A patient with damage to the Broca's area of the brain would probably have difficulty:

a. Expressing spoken language

The capacity of one brain area to take over the functions of another damaged brain area is known as brain:

a. evolution

b. plasticity

c. lobotomy

d. organization

The capacity of one brain area to take over the functions of another damaged brain area is known as brain:

b. plasticity

After Paul's serious snow-skiing accident, doctors detected damage to his Wernicke's area in the left temporal lobe. Because of this, Paul will have difficulty:

a. pronouncing words correctly
b. recognizing familiar faces
c. Remembering past events
d. understanding what others are saying

After Paul's serious snow-skiing accident, doctors detected damage to his Wernicke's area in the left temporal lobe. Because of this, Paul will have difficulty:

d. understanding what others are saying

Which of the following individual's brains would have the most plasticity (the most ability to take on new functions)?

a. a 17 year old musician

b. a 34 year old psychology teacher

c. a 50 year old judge

d. a 3 year old toddler

Which of the following individual's brains would have the most plasticity (the most ability to take on new functions)?

d. a 3 year old toddler

A brief electrical charge that travels down the axon of a neuron is called:

a. Threshold
b. Synapse
c. Refractory period
d. Action potential

A brief electrical charge that travels down the axon of a neuron is called:

d. Action potential

Which of the following hormones would have helped Little Red Riding Hood the most in her efforts to run away from the Big Bad Wolf?

a. thyroxin
b. Insulin
c. Estrogen
d. Epinephrine

Which of the following hormones would have helped Little Red Riding Hood the most in her efforts to run away from the Big Bad Wolf?

d. Epinephrine

Information is carried from the central nervous system to the muscle tissues by:

a. The limbic system
b. Sensory neurons
c. Motor neurons
d. Interneurons

Information is carried from the central nervous system to the muscle tissues by:

c. Motor neurons

Because of its function in directing the other glands, the pituitary gland is sometimes called:

a. hypothalamus

b. directing gland

c. master gland

d. central nervous system

Because of its function in directing the other glands, the pituitary gland is sometimes called:

c. master gland

The thyroid gland helps to:

a. encourage sleep

b. regulate energy level

c. produces adrenaline

d. directs the other glands

The thyroid gland helps to:

b. regulate energy level

Transferring messages from a motor neuron to a leg muscle requires the neurotransmitter known as:

a. insulin

b. GABA

c. acetylcholine

d. serotonin

Transferring messages from a motor neuron to a leg muscle requires the neurotransmitter known as:

c. acetylcholine

You come home one night to find a burglar in your house. Your heart starts racing and you begin to sweat. These physical reactions are triggered by the:

a. limbic system

b. parasympathetic nervous system

c. Somatic nervous system

d. Sympathetic nervous system

You come home one night to find a burglar in your house. Your heart starts racing and you begin to sweat. These physical reactions are triggered by the:

d. Sympathetic nervous system

The central nervous system consists of:

a. the brain & the spinal cord
b. sympathetic & parasympathetic branches
c. somatic & autonomic subsystems
d. sensory & motor neurons

The central nervous system consists of:

a. the brain & the spinal cord

Schizophrenia is most closely linked with excess activity at receptor sites for the neurotransmitter:

a. dopamine

b. acetylcholine

c. epinephrine

d. Serotonin

Schizophrenia is most closely linked with excess activity at receptor sites for the neurotransmitter:

a. dopamine

Which is the correct sequence in the transmission of a neural impulse?

a. axon-dendrite-cell body-synapse

b. dendrite-axon-cell body-synapse

c. dendrite-cell body-axon-synapse

d. synapse-axon-dendrite-cell body

Which is the correct sequence in the transmission of a neural impulse?

c. dendrite-cell body-axon-synapse

The function of dendrites is to:

a. release neurotransmitters to other neurons
b. receive incoming signals from other neurons
c. coordinate the sympathetic nervous system
d. control pain by releasing opiates

The function of dendrites is to:

b. receive incoming signals from other neurons

In order for you to experience the pain of a sprained ankle, _____ must first relay messages from your ankle to your central nervous system.

a. hormones

b. motor neurons

c. sensory nerves

d. the limbic system

In order for you to experience the pain of a sprained ankle, _____ must first relay messages from your ankle to your central nervous system.

C. sensory nerves

If you stubbed your toe, the pain message would speed up your leg through a neuron with a particularly long:

a. dendrite

b. cell body

c. motor neuron

d. axon

If you stubbed your toe, the pain message would speed up your leg through a neuron with a particularly long:

d. axon

Chemical messengers produced by endocrine glands are called:

a. neurotransmitters

b. hormones

c. enzymes

d. agonists

Chemical messengers produced by endocrine glands are called:

b. hormones

If a poison was developed that blocked dopamine from being used by the brain, which of the following neural structures would most likely be affected by the poison?

a. synapse

b. receptor site

c. cell body

d. axon

If a poison was developed that blocked dopamine from being used by the brain, which of the following neural structures would most likely be affected by the poison?

b. receptor site

A synapse is a(n):

a. automatic response to sensory input

b. chemical messengers that triggers muscle contractions

c. gap/junction between a sending neuron and a receiving neuron

d. neural cable containing many axons

A synapse is a(n):

c. gap/junction between a sending neuron and a receiving neuron

Which of the following glands release epinephrine and norepinephrine when needed, as in emergency situations?

a. thyroid

b. pituitary

c. endocrine

d. adrenal

Which of the following glands release epinephrine and norepinephrine when needed, as in emergency situations?

d. adrenal