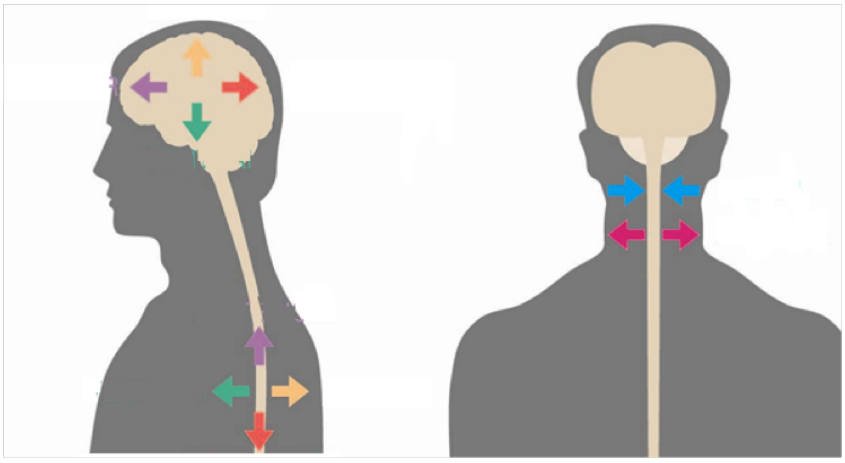
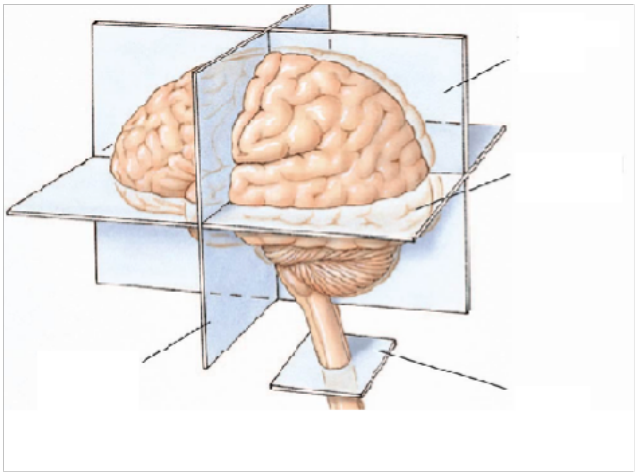
Notes: Organization

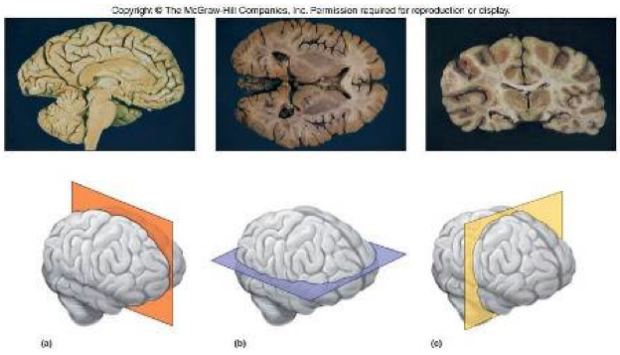
Version:
8/4/13 - adapted from Hans Peterson's notes
10/30/12 - original version

Anatomical Directions in Humans

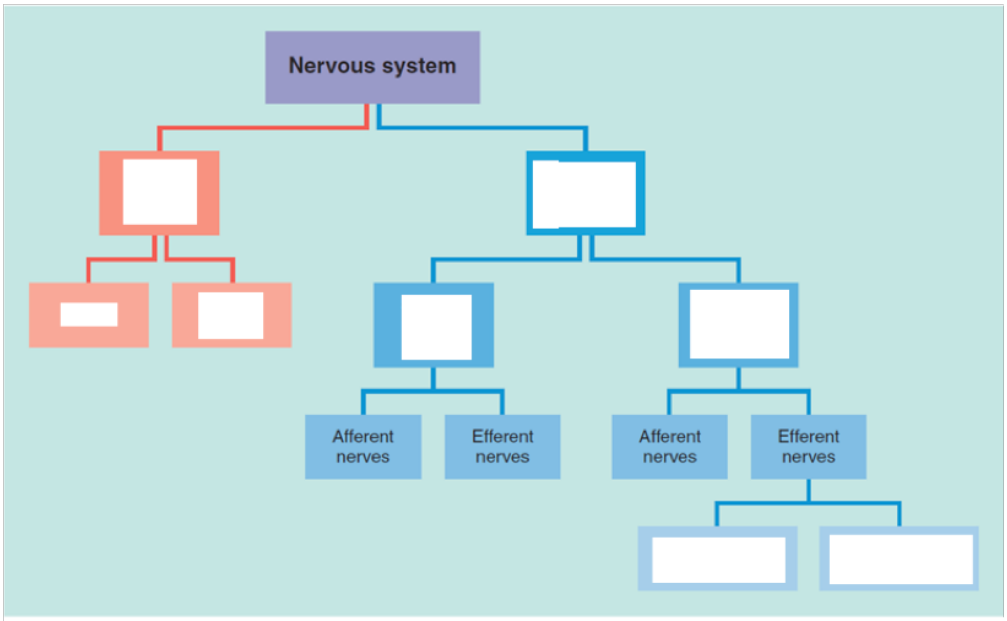


Planes of the Brain





Anatomy of the Nervous System



Responsibilities:

- _____ and _____ information from the body
- _____ the activity of the body

Peripheral Nervous System

_____ neurons - carry sensory signals from the body that arrive in the brain
_____ neurons - carry motor signals to the body that exit the brain

Somatic System

_____ control of body movements

Autonomic System

controls visceral functions, largely outside of _____

Sympathetic

Engages the body's _____, increase/decrease energy expenditures
Heart Rate: Digestion: Respiratory Rate: Perspiration:

Parasympathetic

Engage the body's _____, increase/decrease energy expenditures

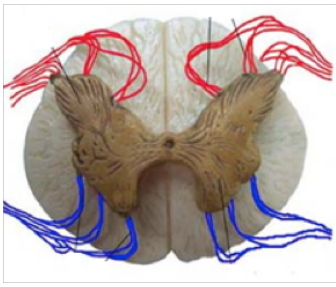
Central Nervous System

Consists of the _____ and _____

Spinal Cord

Primary functions:

1. Conduct _____ information from the brain to the muscles
2. Conduct _____ information from the body to the brain
3. Contain circuits for _____ and pattern generation



_____ – makes up the outside of the spinal cord, consisting of highly myelinated axons that carry information either up or down the spinal cord

_____ – the inner component of the spinal cord, primarily composed of cell bodies and _____, which allow motor and sensory neurons to communicate

_____ side - afferent/efferent (sensory neurons)

_____ side - afferent/efferent (motor neurons)

Protecting the Brain

The _____ provides protection against impact and force.
Underneath the skull is the _____, which act like a wrapper.

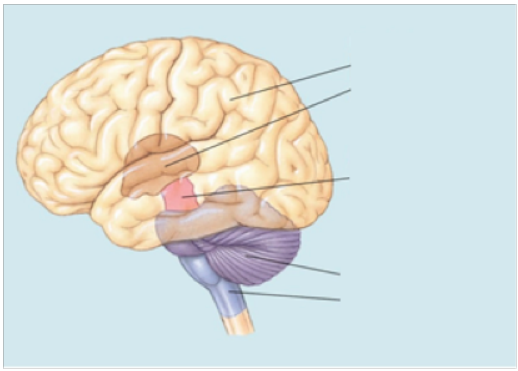
_____ provides cushioning and is involved in the healthy exchange of molecules.

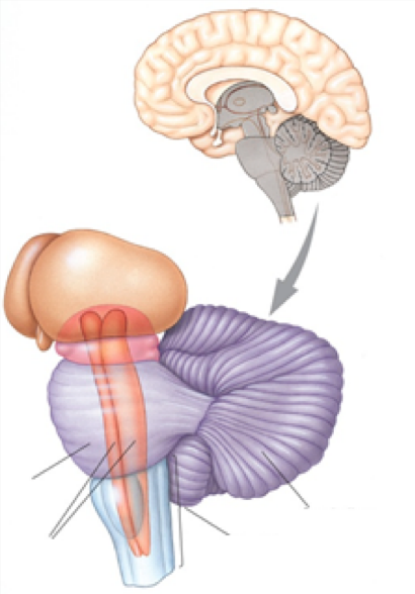
produced in the _____, which are several large hollow cavities throughout the brain.

Chemical Protection

The brain is protected by foreign chemicals by the _____, a tightly-packed system of cells wrapped around blood vessels walls that prevent many molecules from entering the brain.
Advantages – Protects from foreign bodies, and thus brain infection is quite rare
Disadvantages – Because the blood brain barrier prevents many molecules from reaching the brain, it is difficult to develop pharmaceuticals that can act upon the brain.

Brain Subdivisions





Myel-encephalon

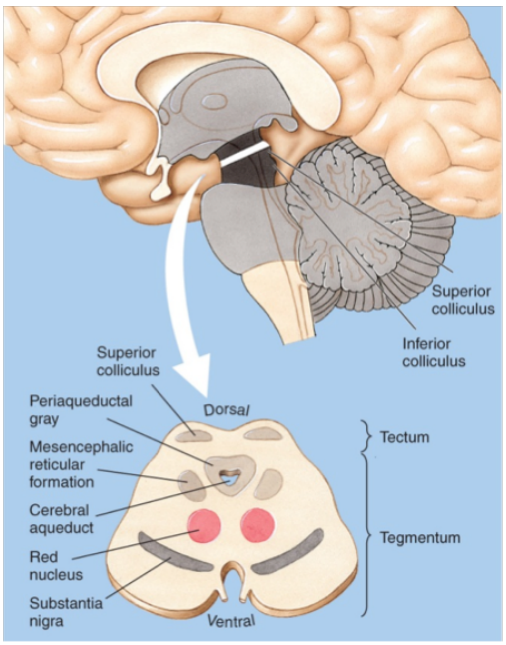
_____ Involved in various autonomic processes in the body, including respiratory and cardiac functioning.

_____ Involved in sleep-wake cycle and habituation.

Met-encephalon

_____ Also autonomic functioning such as regulating breathing

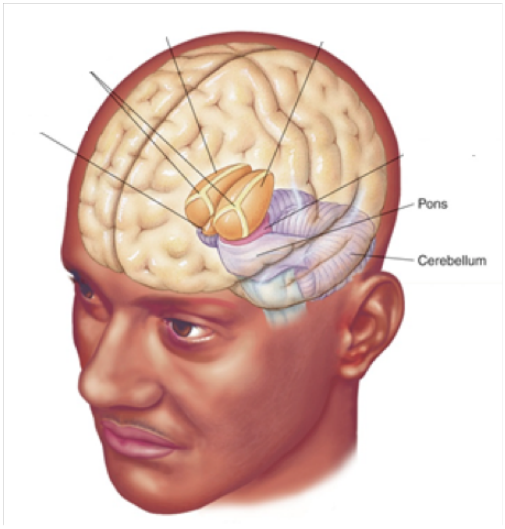
_____ motor behavior, balance, movement and coordination



Mes-encephalon

Mid brain

- preliminary vision & auditory processing
- rich in dopaminergic neurons - movement and reward
- motor coordination and communicating with the cerebellum and motor cortex
- processing pain



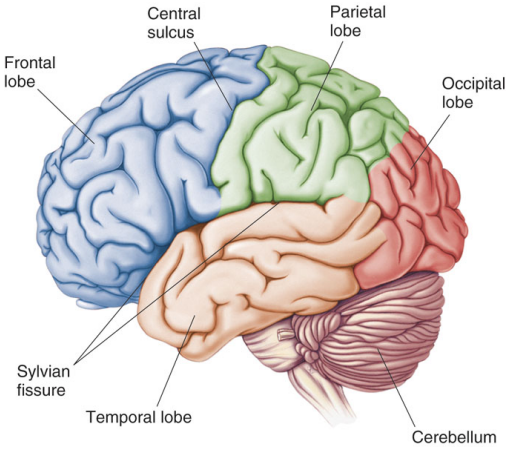
Di-encephalon

_____

- regulatory gateway
- all sensory input goes through the thalamus
  - visual input in Lateral Geniculate Nucleus (LGN)
  - auditory input in Medial Geniculate Nucleus (MGN)

_____

- links the nervous system to the endocrine system via the pituitary gland
- regulates body temp, hunger, thirst, and other autonomic process



Tel-encephalon

- Evolutionarily the most recent part of the brain
- Our complex behavior such as voluntary movement, sensory input, speaking, memory, problem solving, and other executive functions are developed here. There are two parts that comprise the telencephalon, the _____ and _____.

_____ – groove in cerebral cortex

_____ – ridge or wrinkle in cerebral cortex

_____ – deep groove in cerebral cortex

_____ – divides right and left hemisphere

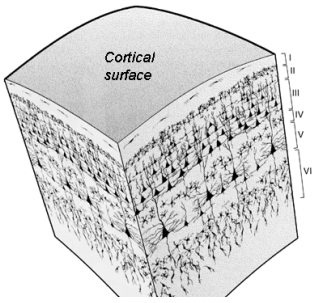
_____ – divides frontal lobe and parietal lobe

_____ – divides frontal lobe and parietal lobe from temporal lobe

_____ – intercortical structure that allows right and left hemisphere to communicate with one another

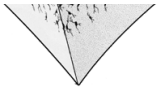
Cerebral cortex

Cortical layers



2-4 mm thick with white matter underneath
cortex has layers that differ in neuron organization
some layers consist mostly of:

_____ from _____neurons__
signals arriving from other areas of the brain (_____)



_____

densely packed neurons with many synapses (_____)

_____ of neurons whose
axons project to other cortical areas (_____)

_____ cells
one of the main types of neurons in the cortex
large multipolar (many extensions) neurons
many dendrites extending up towards surface of cortex
large axon that extends down and then to other areas of the cortex
these axons are what make up the white matter
integrates signals and communicates to other areas of the brain

Occipital Lobe

dedicated to processing _____ input
information proceeds from _____ to _____ processing
cells sensitive to edges, color, shapes, orientation
specialized areas for _____ and _____
Ventral vs dorsal stream
information flowing along dorsal stream processes _____ objects are
information flowing along ventral stream processes _____ objects are

Parietal Lobe

_____ cortex - receives sensory input from body

_____ cortex
integrating vision (dorsal stream) / hearing / touch
attention
sense of space and our bodies relation to space

Temporal Lobe

superior temporal gyrus (top) - _____ and _____

inferior temporal gyrus (bottom) - "what" or ventral stream of _____

medial temporal lobe (inside) - hippocampus, declarative _____

Frontal Lobe

primary motor cortex (_____ movement control)

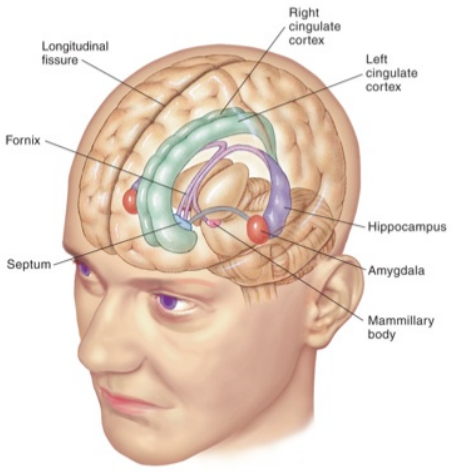
secondary motor areas (_____ movement control)

prefrontal cortex - advanced _____ functions, _____
"pre" meaning before or in front of

Subcortical Structures

"subcortical" is everything under the cortex (the very outer surface)
includes areas introduced above: thalamus, hypothalamus, medulla, pons, cerebellum
includes the limbic system & basal ganglia

Limbic system



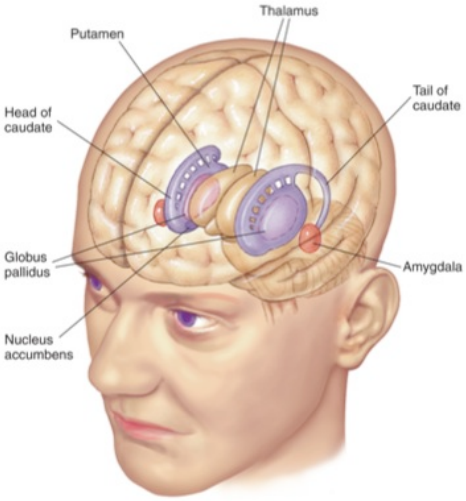
circles the thalamus (limbic is Greek for ring)
regulates the four Fs of behavior:
fighting, fleeing, feeding, and _____

Areas

_____
declarative memory
knowledge that can be declared as oppose to procedural memory

_____
(Greek: almond)
emotional learning, fear & aggressive behaviors

Basal ganglia



Serves as the _____ for selecting movement

It is as though the cortex is "proposing" many different actions and the basal ganglia selects only one

May also select _____ and _____ decisions

Consists of:

- caudate (dorsal striatum)
- putamen (ventral striatum)
- globus pallidus
- subthalamic nuclei