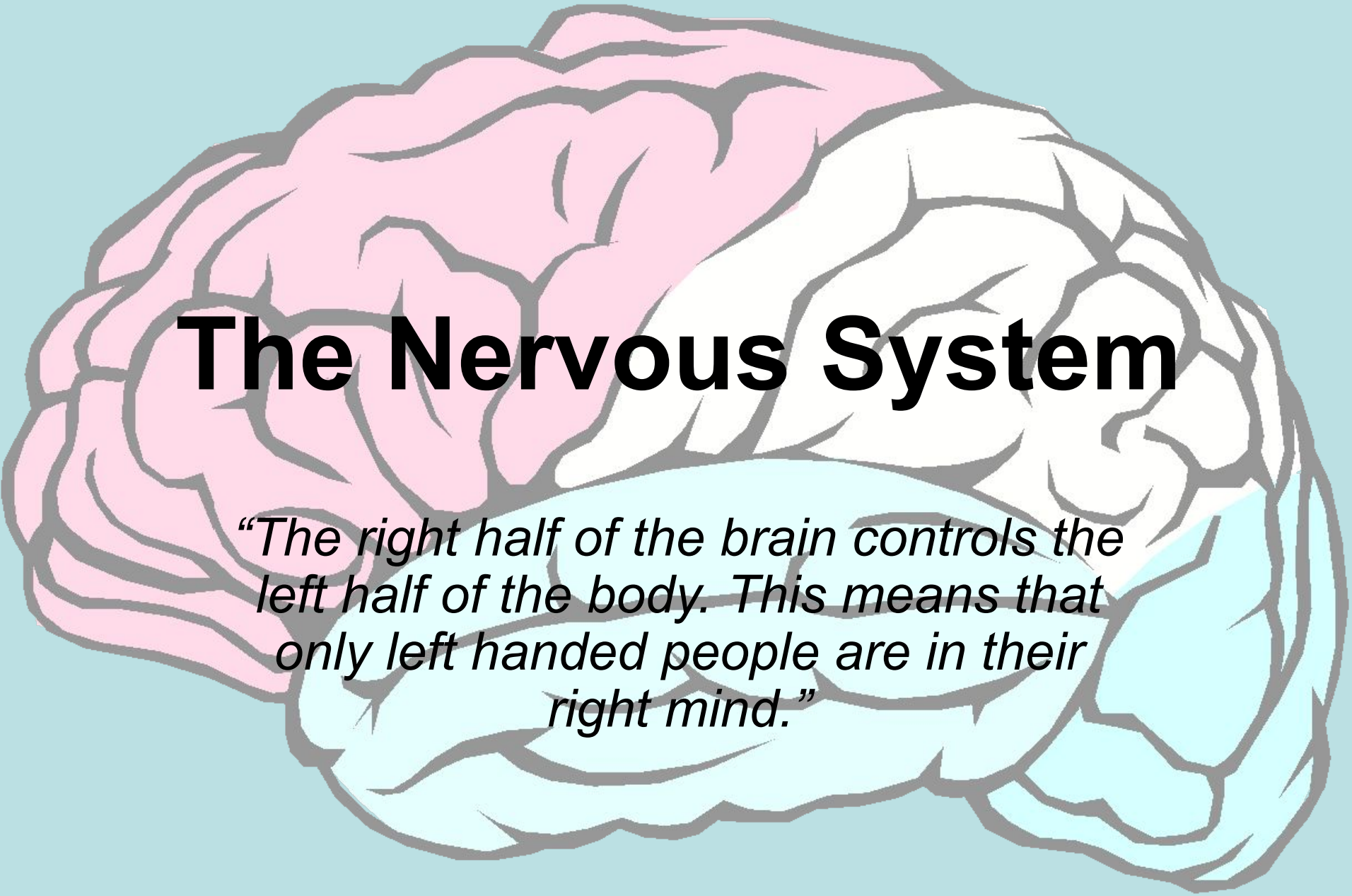
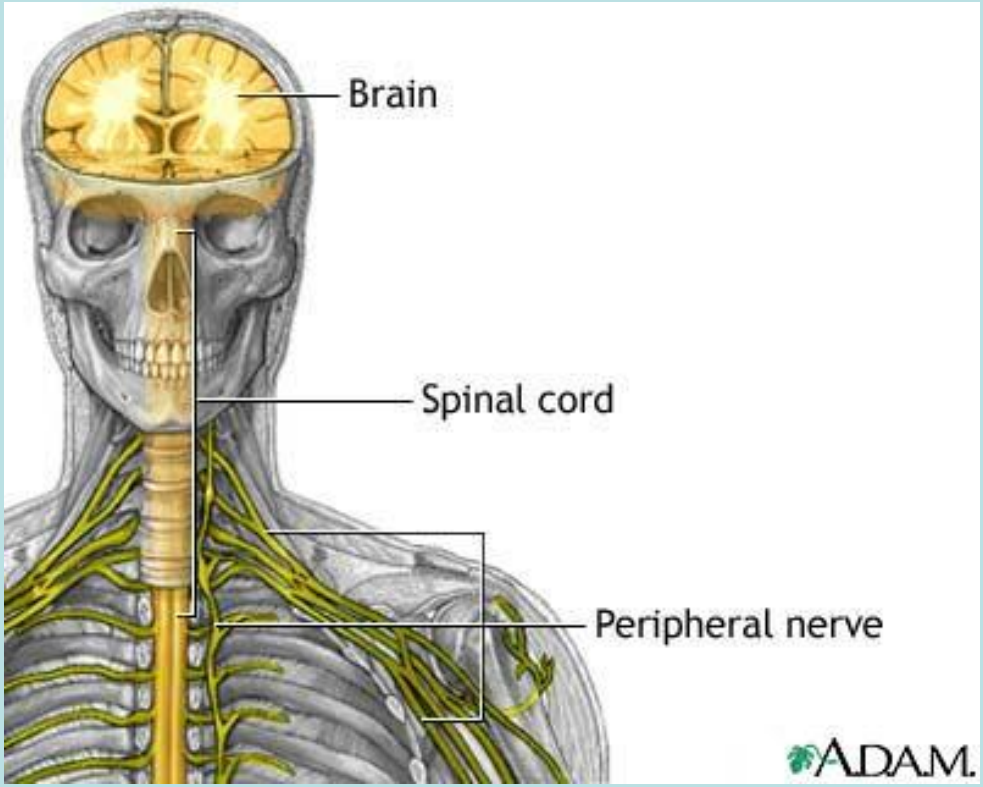


The Nervous System

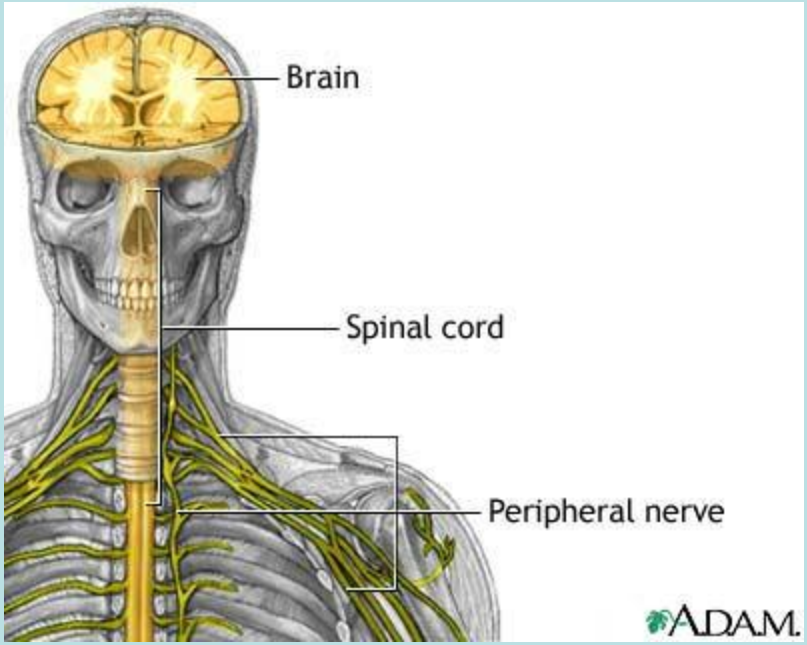
"The right half of the brain controls the left half of the body. This means that only left handed people are in their right mind."

Central Nervous System



- Made up of brain and spinal cord
- Acts as body's control center, coordinates body's activities
  - Impulses travel through the neurons in your body to reach the brain
- Central Nervous System is yellow in this diagram.

Peripheral Nervous System

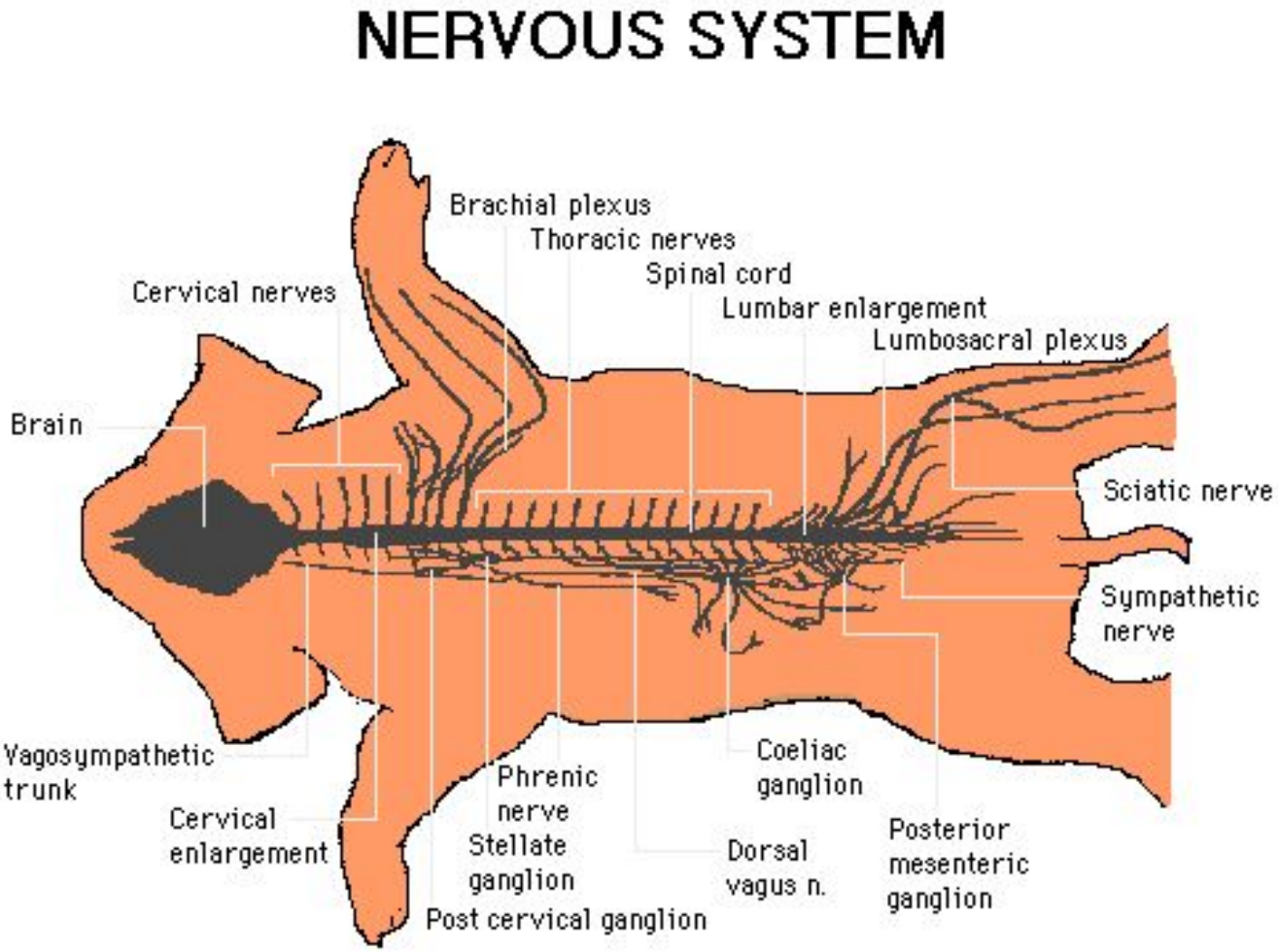


- Made up of all the nerves that carry messages to and from the central nervous system.
  - Similar to telephone wires that connect all of our houses in the community
- Central Nervous System and Peripheral Nervous System work together to make rapid changes in your body in response to stimuli.
- Peripheral Nervous System is green in this diagram.

Peripheral Nervous System: 2 parts

- Somatic Nervous System
  - Relay information between skin, skeletal muscles and central nervous system
  - You consciously control this pathway by deciding whether or not to move muscles (except reflexes)
  - Reflexes: Automatic response to stimulus
- Autonomic Nervous System
  - Relay information from central nervous system to organs
  - Involuntary: You do not consciously control these
  - Sympathetic Nervous System: controls in times of stress, such as the flight or fight response
  - Parasympathetic Nervous System: controls body in times of rest

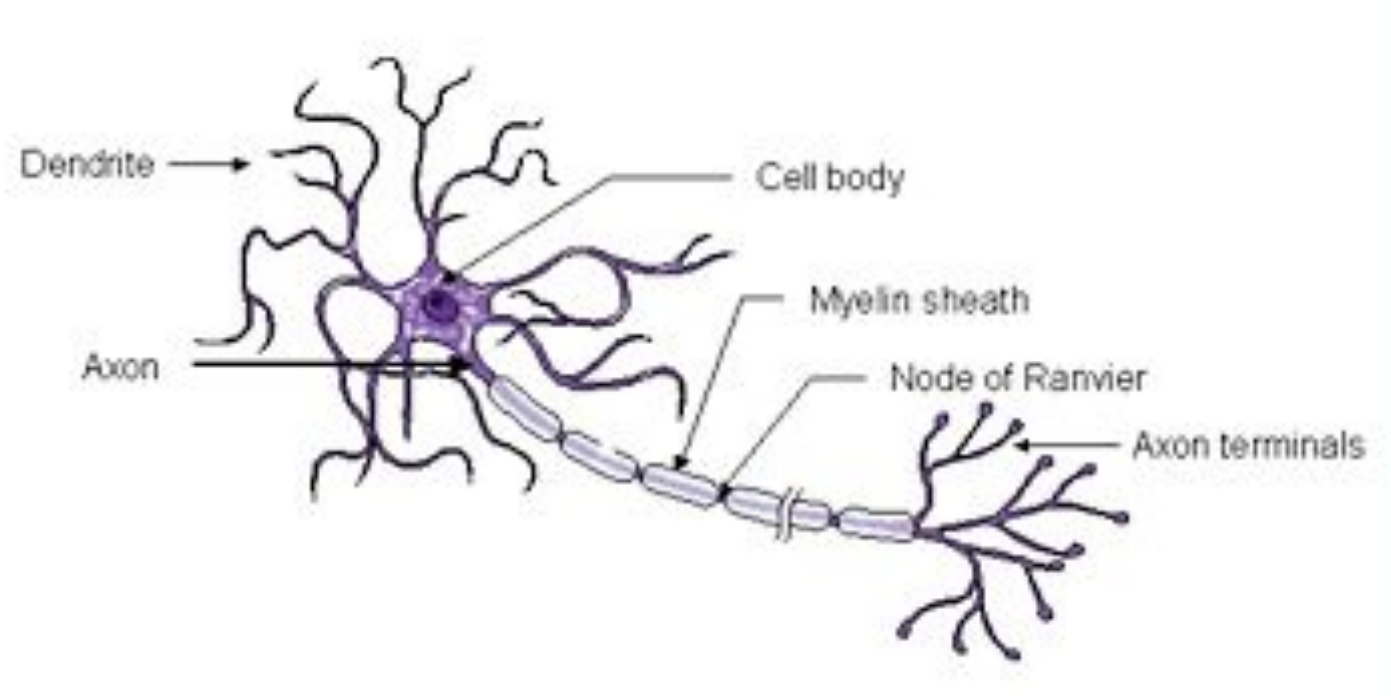
Animal Nervous System



Fetal Pig Nervous System

Neurons

- The basic unit of structure and function in the nervous system
- Cells that conduct impulses.
  - Made up of dendrites, cell body and an axon



Neurons

- Dendrites: branch-like extensions that receive impulses and carry them toward cell body.
- Axon: single extension of the neuron that carries impulses away from the cell body.
- The axon branches out at ending to send impulses to many different neurons. Dendrites receive impulses from many other axons.

In other words, there's a lot of traffic going on in the neurons of your Central Nervous System.

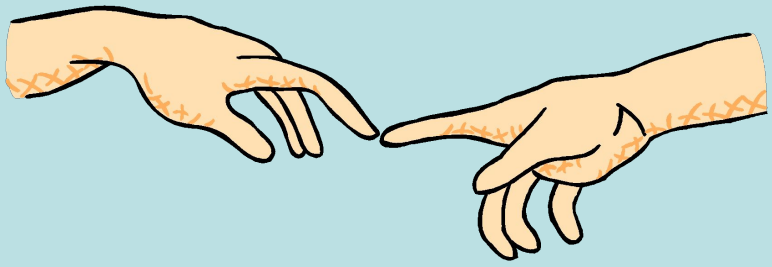
Beware of a traffic jam

3 types of neurons

- Sensory Neurons: carry impulses from inside and outside the body to brain and spinal cord.
- Interneurons: found within brain and spinal cord, process incoming impulses and pass them on to motor neurons.
- Motor Neurons: carry impulses away from the brain and spinal cord.

So how do these neurons work if someone taps you on the shoulder . . .

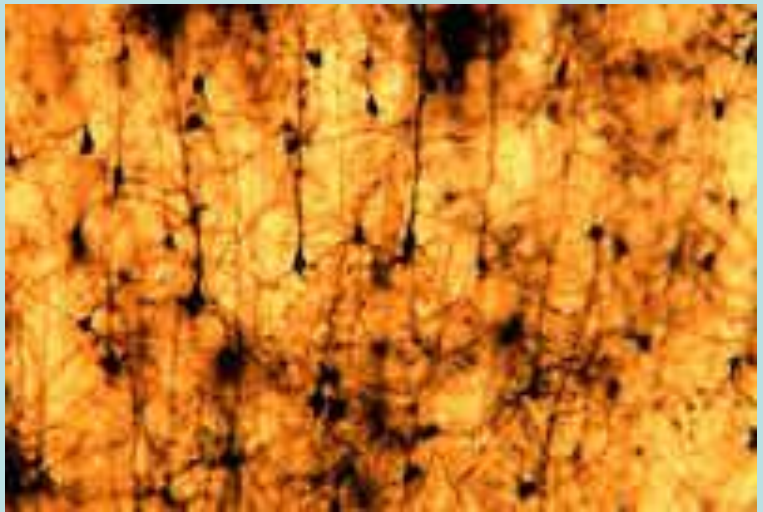
1. Receptors in the skin sense touch or other stimuli.
2. Sensory neurons transmit the touch message.
3. Information is sorted and interpreted in the brain. A response in determined by interneurons.
4. Motor neurons transmit a response message to the shoulder muscles.
5. The shoulder muscles are activated, causing the head to turn.



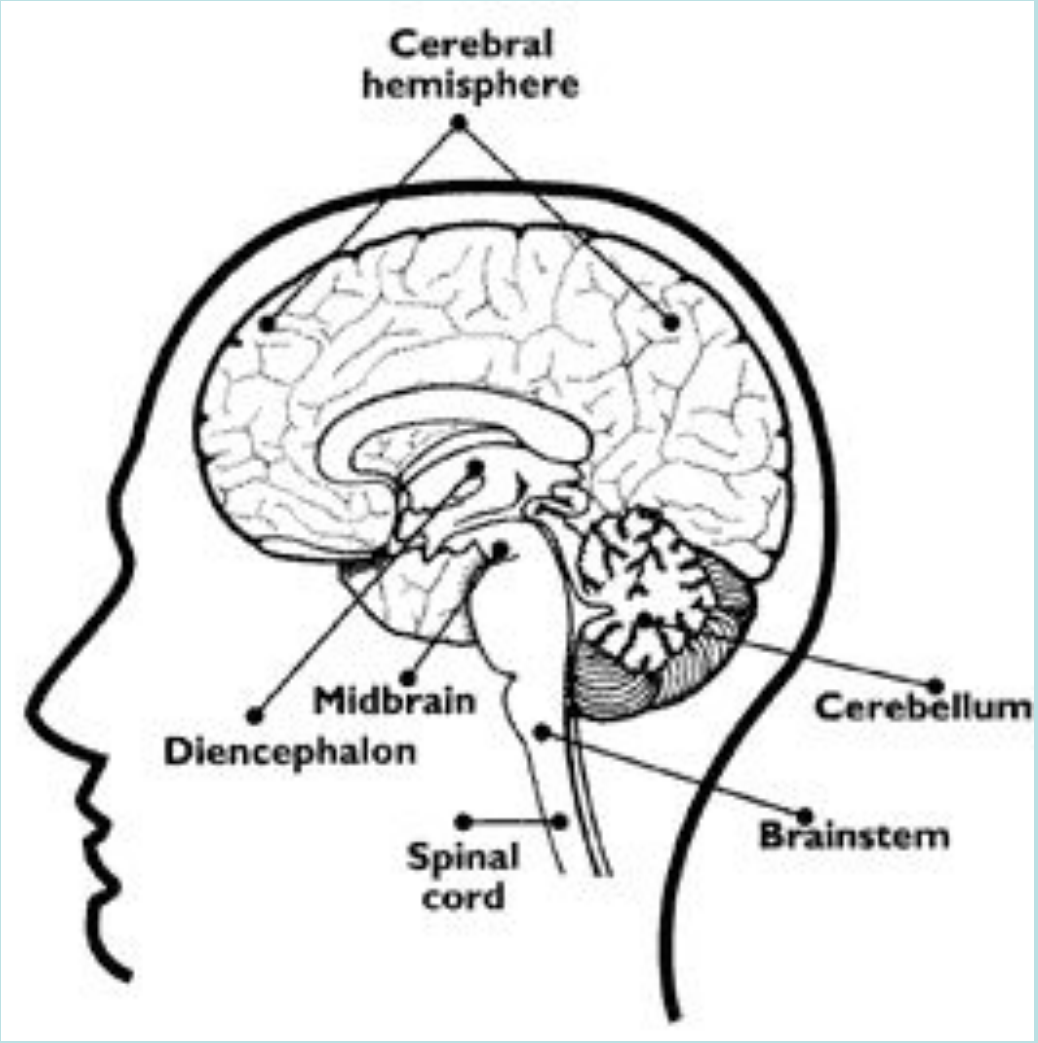
How is an impulse transmitted?

1. Stimulus excites sensory neuron.
2. Depolarization (a change in charge due to sodium ions) creates a wave of changing charges down the axon.
3. Impulse moves across synapse (tiny space between one neuron's axon and another's dendrites) with the help of neurotransmitters

This is an image of neurons located in the cerebral cortex of a hamster.



The Brain

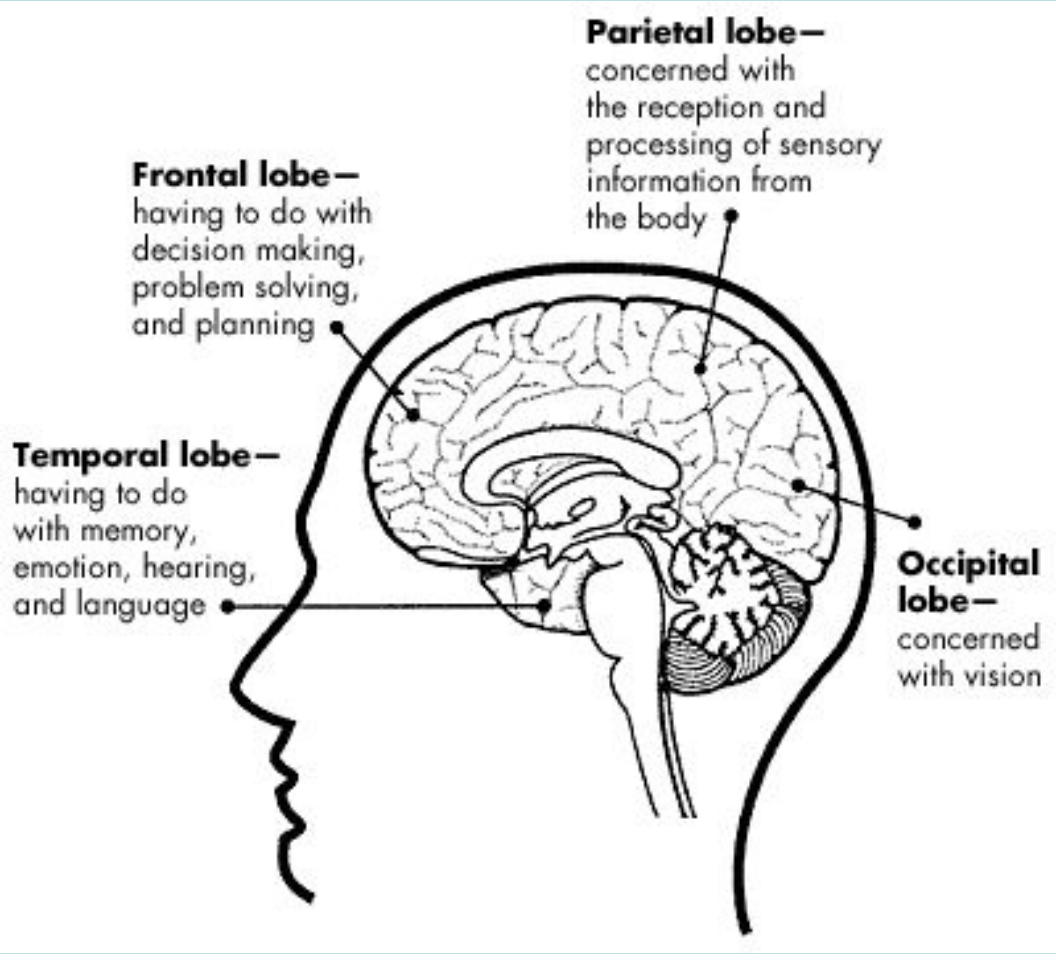


Three main sections

- Cerebrum
  - 2 hemispheres
  - Controls memory, intelligence, muscles
- Cerebellum
  - Controls balance, posture and coordination
- Brainstem
  - Controls involuntary activities such as breathing

The Cerebrum

- Controls conscious activities, intelligence, memory, language, muscles.
- Wrinkled with countless folds and grooves and covered with an outer layer of gray matter called the cerebral cortex.
- Divided into 4 lobes



The Cerebellum

- Muscle coordination is developed here as well as the memory of physical skills.
- If the cerebellum is injured, your movements become jerky.
- When you see an amazing athlete perform, you are watching a well-trained cerebellum at work.

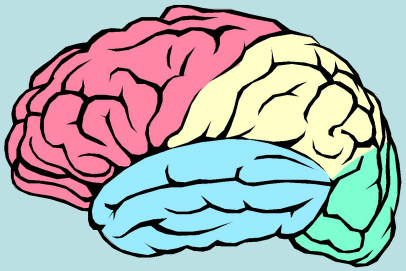
The Brainstem

- Made up of the medulla oblongata, pons and midbrain.
  - Medulla oblongata controls involuntary activities such as heart rate and breathing
  - Pons and midbrain act as pathways connecting various part of the brain with each other.
- Sometimes called the reptilian brain, because it resembles the entire brain of a reptile.

Show what you know!

1. The Central Nervous System consists of what two parts?

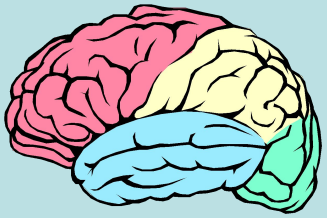
2. What does the Central Nervous System help coordinate?



Show what you know!

3. The Peripheral Nervous System consists of what?

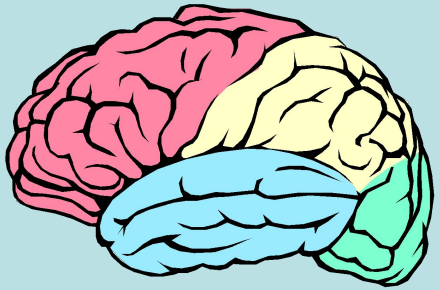
4. What is the difference between the somatic and autonomic nervous systems?



Show what you know!

5. Draw a neuron and label the axon, dendrite and cell body.

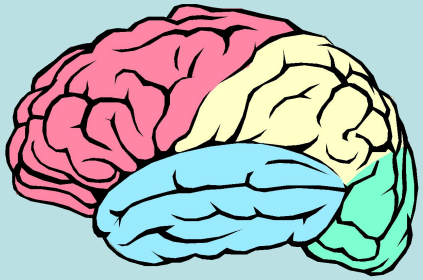
6. Describe what roles the dendrites and axons play in a neuron's transmission of impulses.



Show what you know!

7. What are the three types of neurons?

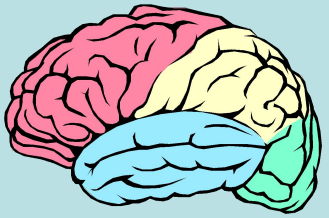
8. What is the sequence of events when someone taps you on the shoulder? (5 steps)



Show what you know!

9. What does the cerebrum enable us to do?

10. Compare and contrast the roles of the cerebellum and brain stem.



Major Nervous System Diseases		
Disease	**Number of Cases**	**Cost per year**
Chronic Pain	97,000,000	$100 billion
Hearing Loss	28,000,000	$56 billion
Depression Disorders	18,700,000	$30.4 billion
Alzheimer's Disease	4,000,000	$90 billion
Stroke	3,800,000	$40 billion
Epilepsy	2,500,000	$3.5 billion
Traumatic Head Injury	2,000,000	$25 billion
Schizophrenia	2,000,000	$32.5 billion
Parkinson's Disease	1,000,000 to 2,000,000	$25 billion
Multiple Sclerosis	350,000	$2.5 billion
Traumatic Spinal Cord Injury	250,000	$5 billion