
Nervous
System
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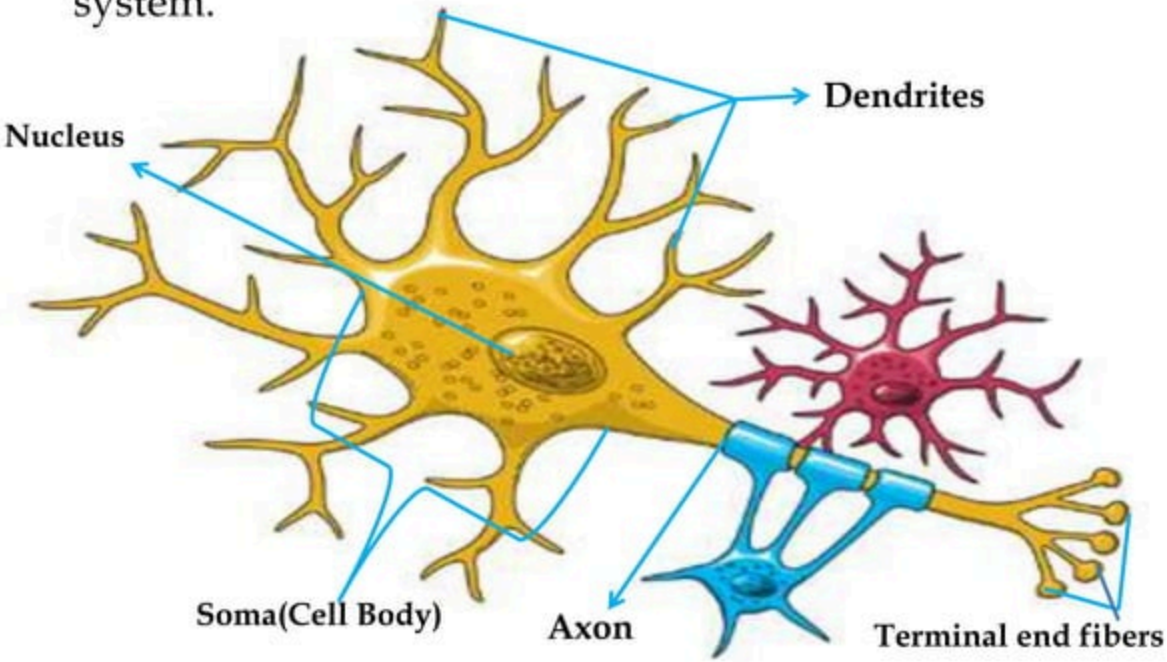
The Nervous System

- The nervous system is very important in helping to maintain the homeostasis (balance) of the human body.
- A series of sensory receptors work with the nervous system to provide information about changes in both the internal and external environments.
- The human nervous system is a complex of interconnected systems in which larger systems are comprised of smaller subsystems each of which have specific structures with specific functions.

Structure and function

Neurons (nerve cells) are the basic elements of the nervous system.

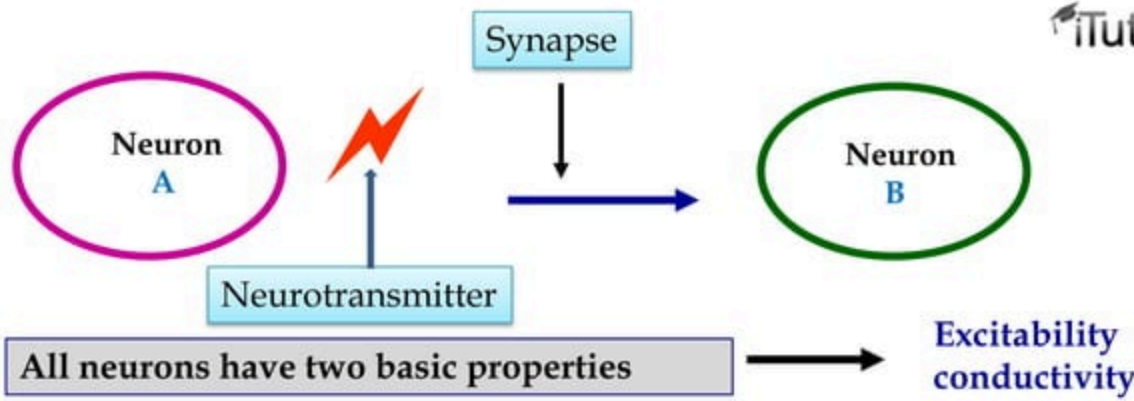


Neurons

- Cell Body
  - The main processing center of the cell.
- Dendrites
  - Thin branching extensions of the cell body that conduct nerve impulses *toward* the cell body.
- Axon
  - A single branch (in most neurons) which conducts nerve impulses *away* from the cell body.
  - **Myelin sheath** and **neurilemma** are coverings.

Neurons

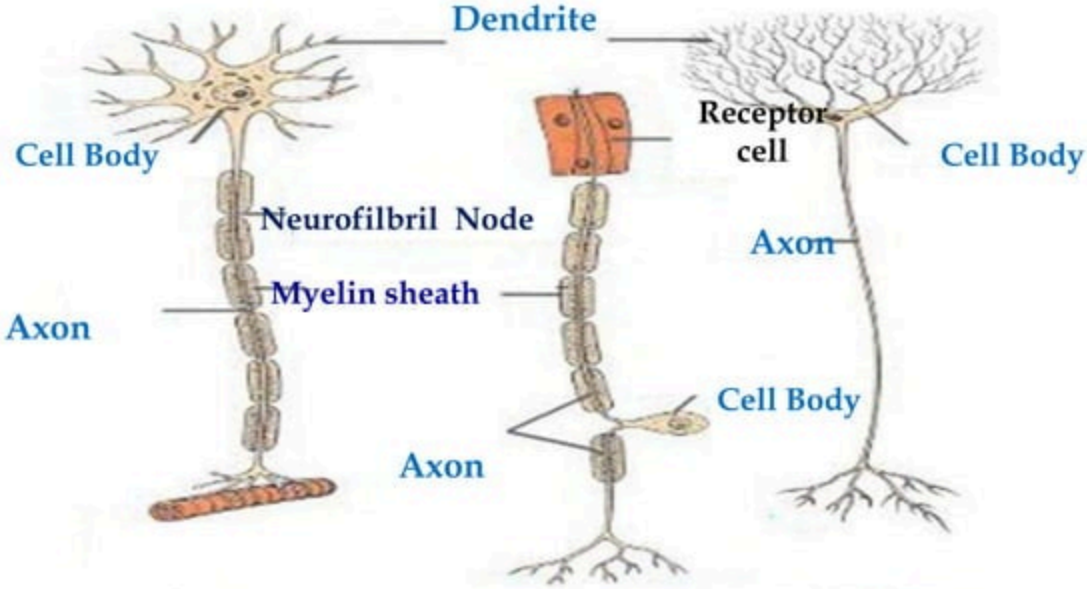
- Impulse Transmission
  - **Terminal end fibers** are located at the ends of the axon and they transmit impulses leaving the neuron across a synapse to the next neuron.



Three Types of Neurons

- Efferent (motor)
  - Conveys information from the CNS to muscles and glands.
- Afferent (sensory)
  - Carry information from sensory receptors to the CNS.
- Interneuron
  - Carry and process sensory information.

Types of Neurons



(i) Efferent (motor) neuron

(ii) Afferent (sensory) neuron

(iii) Interneuron

Neuroglia

- Support, protect, connect and remove debris from the nervous system
- Types of Neuroglial Cells

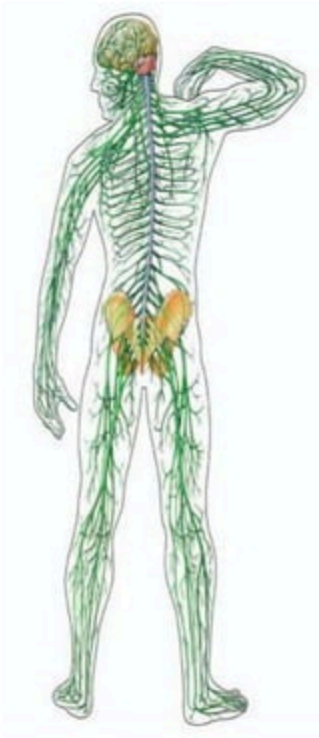
Astrocytes

Oligodendroglia

Microglia

Nervous System

- All bodily activities, voluntary and involuntary, are controlled by the nervous system.
- **Two Major Components**
  - **Central Nervous System (CNS)**
    - Made up of the **brain** and **spinal cord**
  - **Peripheral Nervous System (PNS)**
    - Made up of all the **nerves** that lead into and out of the CNS.



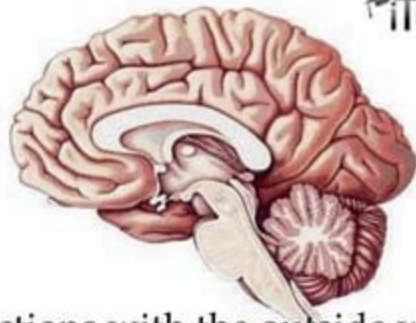
Central Nervous System

- The central nervous system is composed of two major interconnected organs:
  - **The brain**
  - **The spinal cord.**

- These organs work together to integrate and coordinate sensory and motor information for the purpose of controlling the various tissues, organs, and organ systems of the body.

- The central nervous system is responsible for higher neural functions, such as memory, learning, and emotion.

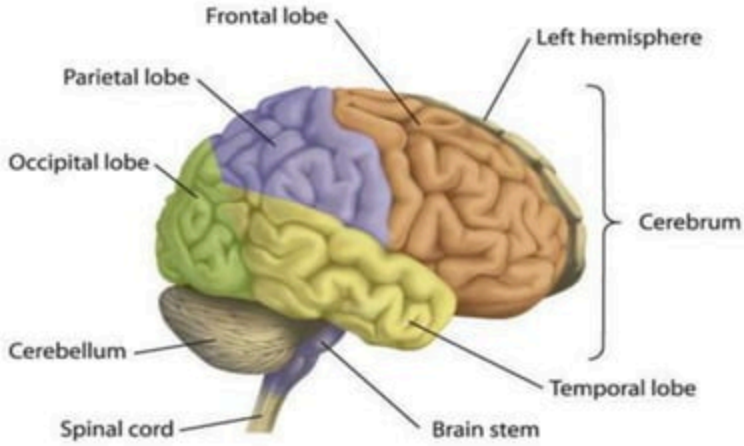
Brain



- Weighs about 3 pounds in adults
- 75% water
- 20% of oxygen
- Contains over 100 billion neurons
- Controls bodily functions and interactions with the outside world

Four Parts:

- **Cerebrum**
- **Diencephalons**
- **Brain stem**
- **Cerebellum**



Brainstem

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- Made up of the midbrain; Pons and the medulla oblongata.

Midbrain : Involved with visual reflexes

Pons:

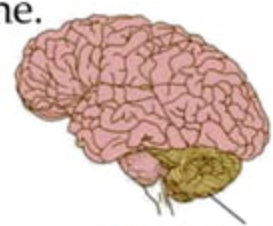
- Located between the midbrain and the medulla oblongata
- Controls certain respiratory functions

Medulla Oblongata:

- Contains centers that regulate heart and lung functioning, swallowing, coughing, vomiting and sneezing

Cerebellum

- Area that coordinates musculoskeletal movement to maintain posture, balance, and muscle tone.
- Inferior to the occipital lobes of the cerebrum.
- Posterior to the pons and medulla oblongata .



Cerebellum

Cerebrum

- Located above the cerebellum.
- Contains two hemispheres with an outer portion called the **cerebral cortex.**
- The two hemispheres are connected by a bridge of nerve fibers that relay information between the two hemispheres called the **corpus callosum.**
- The left and right lobes are each divided into four lobes or parts parietal lobe
  - Frontal lobe
  - Temporal lobe
  - Occipital lobe

Diencephalon: The deep portion of the brain containing:

- Thalamus
- Hypothalamus
- Epithalamus
- Ventral thalamus

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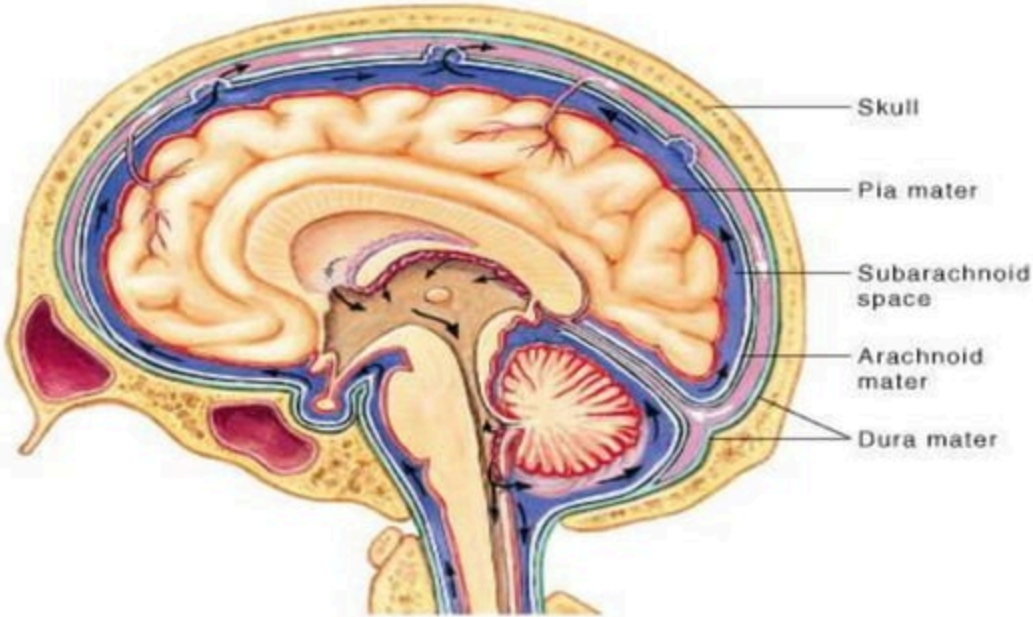
Serves as relay center for sensations like:

- Heart rate
- Blood pressure
- Temperature control
- Behavioral responses
- Digestive functions
- Water and electrolyte balance



Spinal Cord

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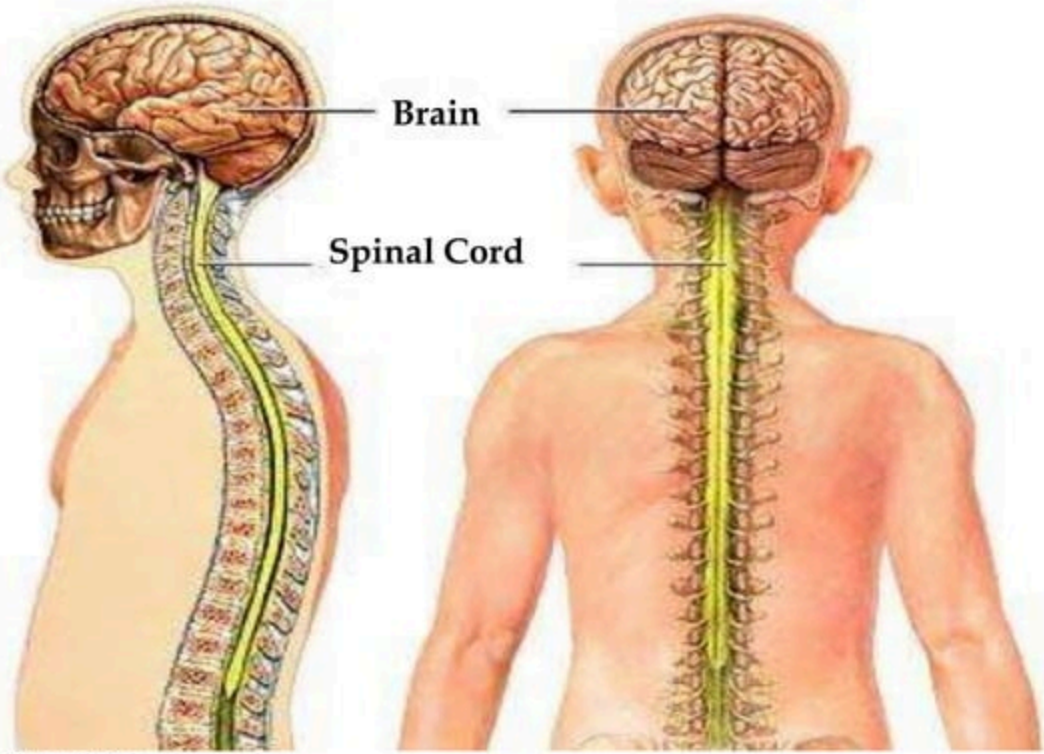
- Extends from the medulla oblongata of the brain to the area around the first lumbar vertebra in the lower back.
- Nerves from the peripheral nervous system extend out from the spinal cord.
- Protected by:
  - Vertebral column
  - Cerebrospinal fluid
  - Meninges
- Meninges are three layers of membranes that cover the brain and spinal cord.

Layers of the meninges

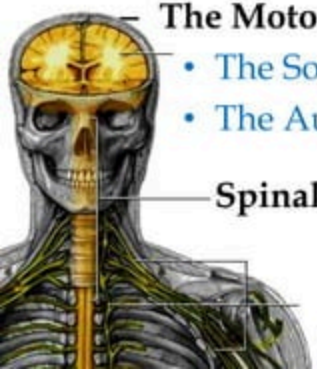
- Dura mater
  - Outer tough fibrous membrane.
- Arachnoid mater
  - Middle weblike membrane containing CSF.
- Pia mater
  - Innermost layer containing several blood vessels.

Central Nervous System



Peripheral Nervous System

- The peripheral nervous system (PNS) is a collection of **peripheral nerves, ganglia** and specialized sensory structures that, as a system, carries sensory and motor information between the central nervous system and all other organs and tissues of the body.
- The peripheral nervous system is functionally divided into two major divisions:
  - **The Sensory or Afferent Division**
  - **The Motor or Efferent Division**
    - The Somatic Nervous System
    - The Autonomic (Visceral) Nervous System.



Peripheral Nervous System

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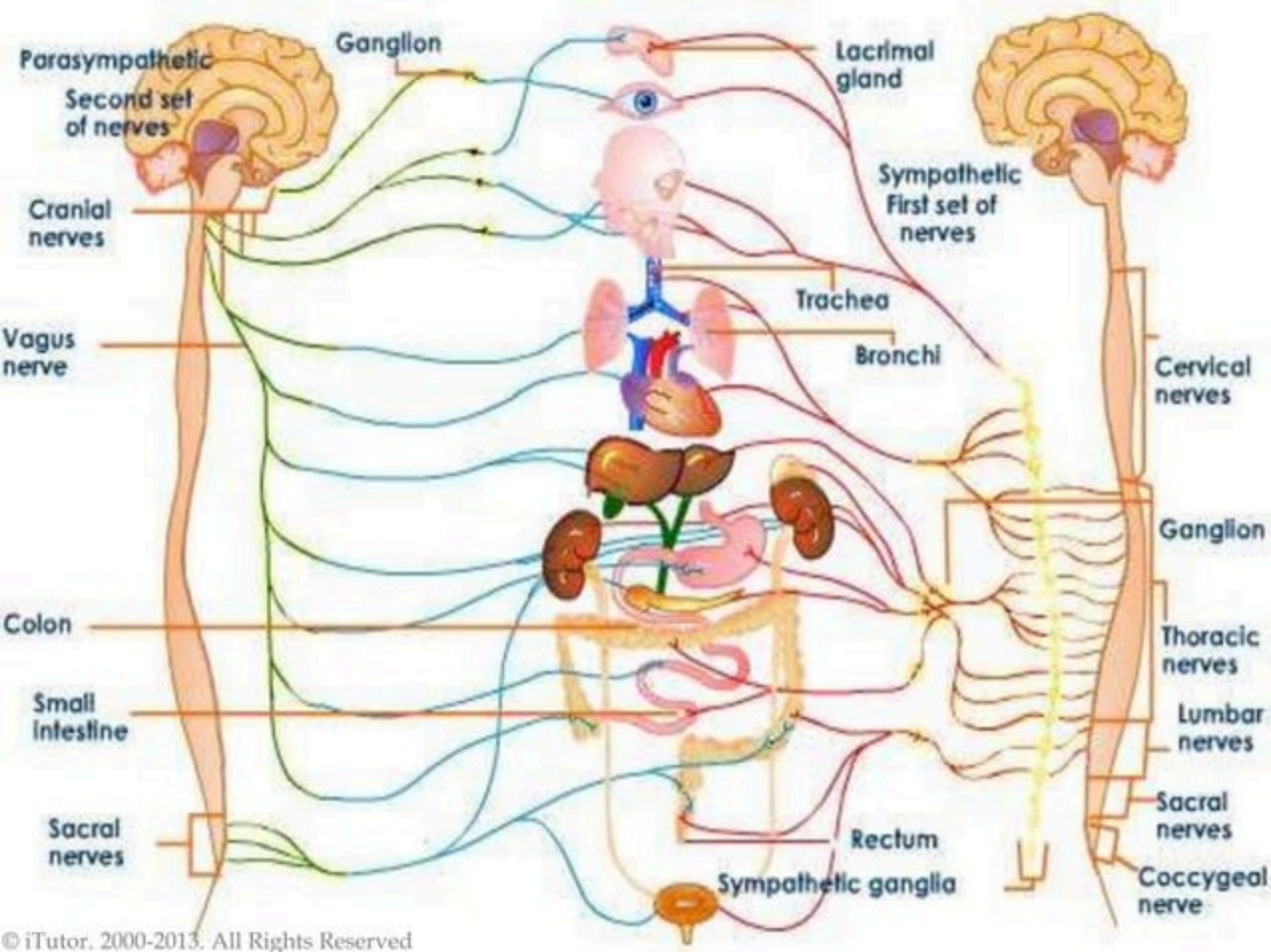
- Consists of 12 pairs of cranial nerves and 31 pairs of spinal nerves

S. No	Cranial Nerves	Function
1	Olfactory	Sense of smell
2	Optic	Sense of vision
3	Oculomotor	Eye movements
4	Trochlear	Aids muscles that move the eyes
5	Trigeminal	Eyes, tear glands,scalp, forehead, teeth, gums, lips, and mouth muscles
6	Abducens	Muscle conditioning
7	Facial	Taste, facial expressions, tear and salivary glands

S. No	Cranial Nerves	Function
8	Vestibulocochlear	Hearing and equilibrium
9	Glossopharyngeal	Pharynx, tonsils tongue and carotid arteries; stimulates salivary glands
10	Vagus	Speech, swallowing, heart muscle, smooth muscle and certain glands
11	Accessory	Muscles of the soft palate, pharynx, larynx and neck
12	Hypoglossal	Tongue movement



Somatic Nervous System

- Responsible for receiving and processing sensory input from the skin, muscles, tendons, joints, eyes, tongue, nose and ears as well as excite the voluntary contraction of skeletal muscles.

Autonomic Nervous System

- Carries impulses from the central nervous system to glands, various smooth muscles, cardiac muscle and various membranes.
- Stimulates organs, glands, and senses.

The End