The objectives

1-Understand how the nervous system is divided and the types of cells that are found in nervous tissue

2-Know the anatomy of a neuron and the structural and functional types of neurons

3- Classify the neuron according to the number of processes extending from the cell body

4- Numerate the spinal cord parts?

4-Nervous Tissue:

Nervous tissue is a specialized tissue in the body that forms the brain, spinal cord, and nerves. It is responsible for transmitting electrical and chemical signals throughout the body, enabling rapid communication and coordination of bodily functions. The nervous system is divided into two main parts:

- Central nervous system (CNS) , consisting of the brain and spinal cord
- Peripheral nervous system (PNS), composed of the cranial, spinal, and peripheral nerves conducting impulses to and from the CNS (sensory and motor nerves, respectively) and ganglia that are small groups of nerve cells outside the CNS.

Functions of Nervous Tissue:

Sensory Input: Detecting changes in the internal and external environment.

Integration: Processing and interpreting sensory information.

Motor Output: Sending commands to muscles and glands.

Homeostasis: Regulating internal conditions to maintain stability.

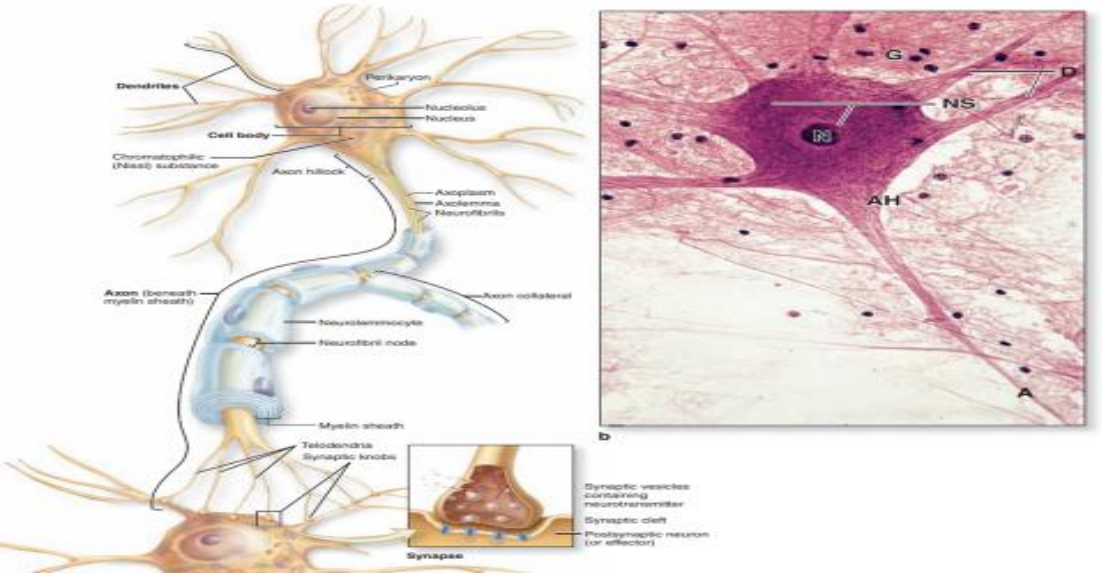
Mental Activity: Enabling thought processes, memory, and emotions.

Cells of Nerve Tissue :The nervous tissue develops from the outer embryonic layer, The two major classes of cells that make up the nervous tissue are nerve cells **neurons (**the functional and structural units) which usually show numerous long processes and supporting cells **glia** which have short processes, support and protect neurons, and participate in many neural activities, neural nutrition, and defense of cells in the CNS.

1-NEURONS The functional unit in both the CNS and PNS is the neuron or nerve cell. Some neuronal components have special names, such as "neurolemma" for the cell membrane. It contains the nucleus and surrounding cytoplasm ,most nerve cells have a spherical, unusually large, with a prominent nucleolus, Bi-nuclear nerve cells are sometimes seen in sympathetic and sensory ganglia.

Most neurons consist of three main parts:

1-The cell body, or perikaryon, which contains the nucleus and most of the cell's organelles. Cell bodies often contain a highly developed rough ER organized into aggregates of parallel cisternae. In the cytoplasm between the cisternae are numerous polyribosomes, suggesting that these cells synthesize both structural proteins and proteins for transport and secretion. RER and free ribosomes appear under the light microscope as clumps of basophilic material called chromatophilic substance (often called Nissl bodies)



2- The dendrites, which are the numerous elongated processes extending from the perikaryon and specialized to receive stimuli from other neurons at unique sites called synapses.

3-The axon (Gr. axon, axis), which is a single long process ending at synapses specialized to generate and conduct nerve impulses to other cells (nerve, muscle, and gland cells). Axons may also receive information from other neurons. Neurons and their processes are extremely variable in size and shape. Cell bodies can be very large, measuring up to 150 μm in diameter.

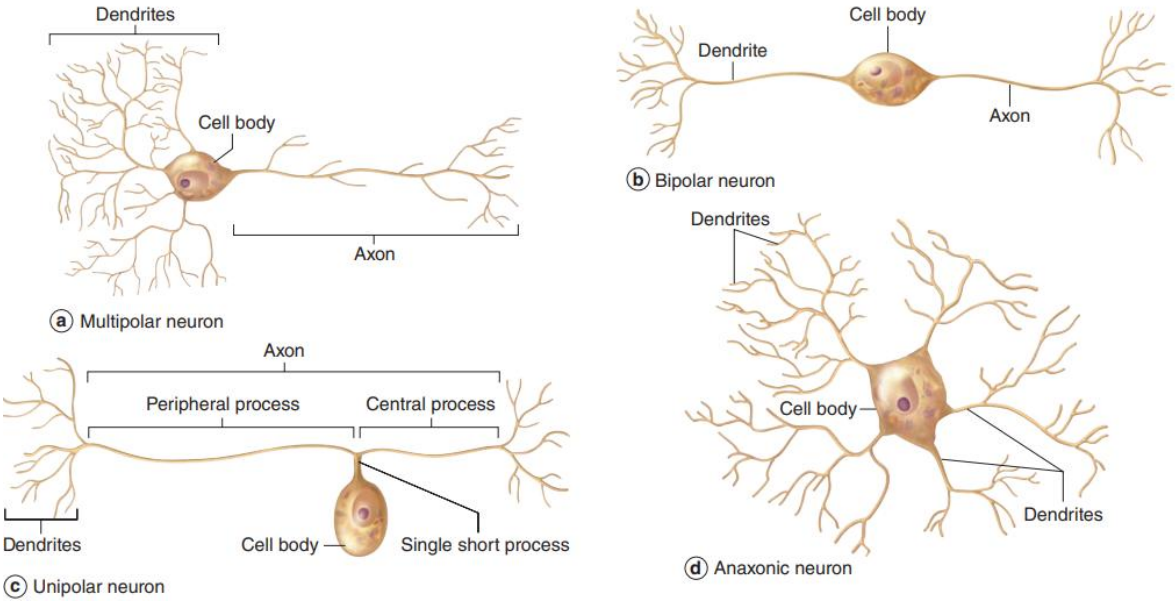
Neurons can be classified according to the number of processes extending from the cell body to:

■ Multipolar neurons, which have one axon and two or more dendrites

■ Bipolar neurons, with one dendrite and one axon

■ Unipolar or pseudounipolar neurons, which have a single process that bifurcates close to the perikaryon, with the longer branch extending to a peripheral ending and the other toward the CNS.

■ Anaxonic neurons, with many dendrites but no true axon, do not produce action potentials, but regulate electrical changes of adjacent neurons.



2-*Glial cells** : support neuronal survival and activities, and are ten times more abundant in the mammalian brain than the neurons. Like neurons, most glial cells develop ***from progenitor cells of the embryonic neural plate. In the CNS glial cells surround both the neuronal cell bodies, which are often larger than glial cells, and the processes of axons and dendrites occupying the spaces between neurons. Glial cells substitute for cells of connective tissue in some respects, ***supporting neurons and creating a microenvironment immediately around those cells that is optimal for neuronal activity.***

Types of glial cells include:

Astrocytes: Provide structural support, regulate blood flow, and contribute to the blood-brain barrier.

Oligodendrocytes: Form myelin sheaths around axons in the CNS, facilitating rapid signal transmission.

Microglia: Act as the immune cells of the CNS, removing debris and responding to injury.

Ependymal Cells: Line the ventricles of the brain and the central canal of the spinal cord, producing and circulating cerebrospinal fluid.

Schwann Cells: Similar to oligodendrocytes but located in the PNS, they form myelin sheaths around peripheral axons.

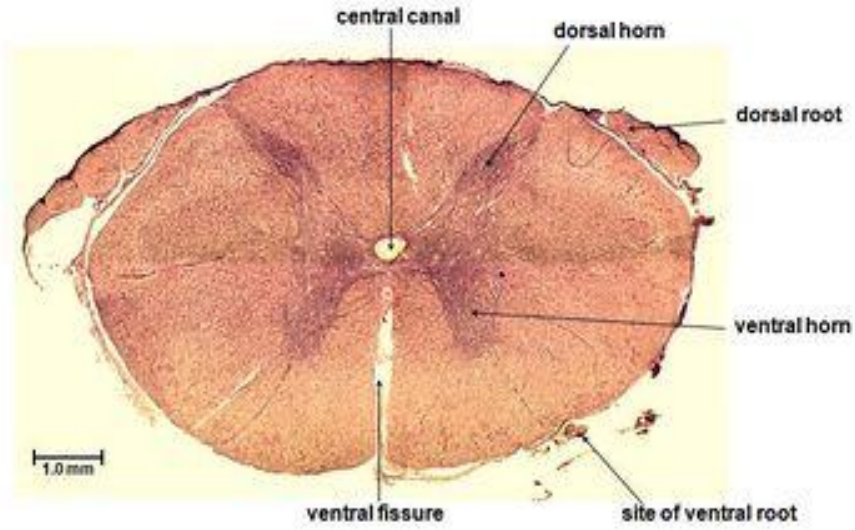
Satellite Cells: Surround neuron cell bodies in the PNS and regulate the chemical environment.

Spinal Cord:

The spinal cord is composed of two discrete parts; the white matter, which is the outer part of the cord and the grey matter, which is the inner portion of the cord. The white matter is given this name due to its appearance in unfixed histological specimens in which the white nature of the tissue is caused by the myelination of ascending and descending nerve fibers. The grey matter is also named after its unfixed histological appearance and contains the cell bodies of neurons as well as nerve fibers.

Within the spinal cord the grey matter forms an H-shape where the ***ventral horns of the H are broader than the dorsal horns. The ventral horns of the grey matter contain the cell bodies of motor neurons whilst the dorsal horns***

contain sensory neurons where the cell bodies are found in the dorsal root ganglia.



MEDICAL APPLICATION

Disorders of nervous tissue can lead to various neurological conditions, such as:

Multiple Sclerosis: A disease where the immune system attacks myelin in the CNS.

Guillain-Barré Syndrome: An autoimmune disorder affecting the PNS.

Neurodegenerative Diseases: Conditions like Alzheimer's and Parkinson's disease.

Traumatic Injuries: Damage to the brain or spinal cord leading to loss of function.