

Nervous System

I. CENTRAL NERVOUS SYSTEM C.N.S.		II. PERIPHERAL NERVOUS SYSTEM P.N.S.	III. AUTONOMIC NERVOUS SYSTEM A.N.S.
<p>It is the part of the nervous system which is protected by bones & bathed in the cerebrospinal fluid (C.S.F.).</p> <p>☒ It can't regenerate if injured.</p> <p>☒ It includes:</p>		<p>It includes:</p> <ol style="list-style-type: none"> 12 pairs of cranial nerves; emerging from brain. 31 pairs of spinal nerves; emerging from spinal cord. Associated ganglia. 	<p>It is responsible for the involuntary control of many structures in the body such as smooth muscles, heart & glands.</p> <p>☒ It is formed of 2 main parts:</p> <ol style="list-style-type: none"> sympathetic system. parasympathetic system. <p>☒ It is distributed partly through C.N.S. & partly through P.N.S.</p>
<p>1. The brain protected by the skull.</p>	<p>2. The spinal cord protected by the vertebral column</p>		
<p>is formed of:</p> <ol style="list-style-type: none"> 1. Cerebrum ☒ formed of 2 cerebral hemispheres with diencephalon (interbrain) in between. 2. Brain stem: Which is formed of : midbrain, pons & medulla oblongata; from above downwards. 3. Cerebellum. 	<p>* It is the downward continuation of the medulla oblongata.</p> <p>* It has a narrow cavity called the central canal.</p> <p>* It is covered with the 3 meninges like the brain.</p> <p>* The SC is made up of an outer layer of white matter.</p> <p>It contains:</p> <ol style="list-style-type: none"> 1. Ascending fibers (sensory tracts) that carry sensations to the brain. 2. Descending tracts (motor tracts) that carry motor orders from the brain. 		
<p>* In cross section, the brain shows:</p> <ol style="list-style-type: none"> 1. Outer layer of grey matter called cerebral cortex. These are dark areas which contain cell bodies. 2. Inner core of white matter. These are light areas which contain nerve fibers (axons). The fibers run inside the CNS as bundles, tracts or fasciculi. <p>* In the brain stem, the grey matter collects into nuclei embedded in the white matter</p> <p>* In the cerebral hemispheres and the cerebellum, part of the grey matter collects into deep nuclei and another part spreads on the surface forming the cortex.</p>	<p>* The inner layer of SC is the grey matter which is H-shaped.</p> <ol style="list-style-type: none"> 1. The 2 anterior limbs → anterior horns. 2. The 2 posterior limbs → posterior horns. 3. The horizontal connecting region → grey commissure through which runs the central canal. 		

Physiological Classification of Nervous System

1. **Somatic** nervous system: which is **voluntary** and includes a motor system and a sensory system.

2. **Autonomic (visceral)**:nervous system which is **involuntary** and includes a sympathetic system and a parasympathetic system.

Embryological Classification of Nervous System

*The neural tube gives the spinal cord and three brain vesicles

1. Forebrain (prosencephalon): which gives:

i. a **median** diencephalon(its cavity is the 3rd ventricle).

ii. 2 telencephalons or cerebral hemispheres (each contains a cavity →the **lateral** ventricle).

2. Midbrain (**mesencephalon**): its cavity is the cerebral aqueduct of Sylvius.

3. Hind brain (**rhombencephalon**):which includes the pons, medulla oblongata and cerebellum. Its cavity is the 4th ventricle.

Structure of Nervous Tissue					
It is formed of 2 types of cells:					
1. Neurons	2. Neuroglia cells				
The neuron is the anatomical, embryological & functional unit of the nervous tissue. It is capable of the transmission of nerve impulses.	: They help in nutrition, support & protection of the neurons. They are unable for the transmission of nerve impulses ** Non-excitabile, supporting, protecting & nourishing cells. ** ½ total volume of CNS.				
It is formed of:					
1. Cell body: contains the nucleus & cell organelles.	2. Processes: <table border="1" data-bbox="391 564 829 958"> <tr> <td>a. axon (nerve fiber):</td> <td>b. Dendrites:</td> </tr> <tr> <td>A single long process which carries nerve impulse away from cell body (conducting outputs).</td> <td>short multiple processes which carry nerve impulses towards cell body (receive inputs)</td> </tr> </table>	a. axon (nerve fiber):	b. Dendrites:	A single long process which carries nerve impulse away from cell body (conducting outputs).	short multiple processes which carry nerve impulses towards cell body (receive inputs)
a. axon (nerve fiber):	b. Dendrites:				
A single long process which carries nerve impulse away from cell body (conducting outputs).	short multiple processes which carry nerve impulses towards cell body (receive inputs)				
** Four types:					
1. Astrocytes	Cells with many branches - main support for nerve cells & nerve fibers -electrical insulators -of 2 types (fibrous & protoplasmic).				
2. Oligodendrocytes	Small cells with few processes - responsible for the formation of the myelin sheath of the nerve fibers of the CNS.				
3. Microglia	The smallest glial cells -the only glial cells of mesodermal origin (while other glial cells are of ectodermal origin) -act as phagocytes in degenerative and inflammatory conditions.				
4. Ependyma	Cuboidal ciliated cells that line the cavities of the brain & spinal cord. They also form the cells of choroid plexus. They assist in the formation of CSF.				
Types of neurons					
** According to the number of processes:	** According to the length of the axon:				
1. Unipolar (pseudounipolar): as in <u>posterior root ganglion.</u> 2. Bipolar : as in the <u>retina, cochlear & vestibular ganglia.</u> 3. Multipolar : as in most parts of the brain & spinal cord.	1. Golgi type I neuron: of long axon as in long tracts of brain & spinal cord (as in <u>pyramidal cells of cerebral cortex, Purkinje cells of cerebellar cortex & motor cells of spinal cord</u>). 2. Golgi type II neuron: of short axon (inhibitory in function) , numerous in all parts of the CNS				

Important Definitions

1. Nucleus	a group of cell bodies in CNS . Cells have the same function.
2. Ganglion	a group of cell bodies in PNS .
3. Tract (fasiculus)	a group of nerve fibers in CNS . They have the same origin, termination & function .
4. Nerve	a group of nerve fibers in PNS .
5. Synapse	it is the site of contact between the axon of one neuron & the dendrites of another neuron. It is also the where a nerve impulse passes from one neuron to another neuron
6. Pathway	A chain of successive tracts having the same function (e.g. carrying pain sensation).
7. Lemniscus	A collection of ascending fibers in the <u>brain stem</u> .
8. Commissure	A band of white or grey matter connecting the right & left sides of the CNS across the midline .
9. Decussation	A point at which an ascending or descending tract crosses the midline.
10. Afferent	Input i.e., going towards a certain structure.
11. Efferent	Output i.e., going away from a certain structure.
12. Meninges	These are the 3 membranes which cover the brain & spinal cord. These are from outside inwards; a. dura matter . outside b. arachnoid matter . c. pia matter . inner * Between pia & arachnoid matter lies subarachnoid space which contains cerebro-spinal fluid (CSF). * Between dura & arachnoid matter lies subdural space.