Chapter1:

Anatomy and Physiology

This chapter gives a comprehensive overview of the adult nervous system, outlining its key parts and their essential roles. Consult reference works on neuroanatomy if you want to describe anatomical structures with more clarity and detail. Brain-computer interfaces can be used to treat the primary diseases. The encephalon, which is encased in the skull, and the spinal cord are parts of the nervous system (CNS). There are numerous lobes in each of the hemispheres (frontal, parietal, temporal, occipital and insular).

Gray matter makes up the basal ganglia, which are situated at the base of the hemispheres. The telencephalon, diencephalon, and the brain stem itself, which consists of the midbrain, pons, and medulla oblongata, make up the encephalon. Sensitive, optical, auditory, vestibular, and olfactory tracts are additional routes. By characterizing 52 areas based on the tissue and histological makeup of the cerebral cortex (cytoarchitectonic study), Korbin Ian Brodmann created a map of the cerebral cortex, some of which are still in use today. Each area has a particular function and is further divided into subareas. Just in front of the primary motor cortex is the premotor cortex.

Premotor cortex enables the choice of the proper actions required to carry out a desired action. An expressive aphasia can result from damage to Broca's region, which is typically found on the surface of the left hemisphere. The area of the brain that joins the cerebral hemispheres to the brain stem is known as the occipital lobe. It is situated between the associative visual cortex and the main visual cortex (V1). The thalamus, hypothalamus, subthalamus, and epithalamus make up the diencephalon.

Information from the visual, auditory, somatosensory, and vestibular systems is sent by the thalamus. There are anterior, tubular, and posterior areas of the hypothalamus. The endocrine gland epiphysis, which generates melatonin, is in the epithalamus. The striatum is a crucial component in the activation of movement. It is usual to refer to the subthalamic nucleus, also known as the corpus Luysi or Luys' body, as one of the basal ganglia.

The midbrain, pons, and medulla oblongata make up the brain stem. The brain stem is the seat of various reflexive and important functions. The brain stem is where the efferent of the parasympathetic nervous system begin. As the primary coordinating center for balance and muscle tone, the cerebellum is a crucial component of the central nervous system (CNS). The essential component of the body that enables precise voluntary and involuntary movement is the neocerebellum.

This area of the brain would be damaged, resulting in motor problems that would particularly disrupt coordination. When hurt, patients exhibit what is known as an ataxic walk (stumbling, with an enlarged support polygon). The cervical level and the lumbar level are the two areas of the spinal cord that expand. The vegetative fibers in the spinal cord are the focus of reflexive motor activity, which controls the tone of the axial muscles. The center region, the anterior grey column, and the posterior grey column make up grey matter in most people.

According to their size, sensory fibers are categorized into several types. Neuromuscular spindles transmit unconscious proprioceptive sensibility via IA fibers (about 17 m, conduction speed, 70-120 m/s). Efferent motor fibers that originate from the anterior grey column of the spinal cord and an axon make up the PNS. A ventral root and a dorsal root make into a spinal nerve. These form plexuses when they attach to the roots of additional spinal nerves and release muscle, skin, and organ nerves.

Dermatomes, a map of cutaneous regions based on their radicular innervation, can be created. The location of the injured area determines the classification of spinal cord injury. Tetraplegia, Paraplegia,

and Hemiplegia are the three categories for complete (all motor and sensory functions are impaired) and incomplete injuries. A brain stem lesion to the motor circuits leads to locked-in syndrome (LIS). The central motor neurons and peripheral motor neurons are both harmed in the degenerative, progressive condition known as ALS. Peripheral neuropathic syndrome and pyramidal syndrome are linked to it. In addition to phonation and deglutition, the condition also affects the limbs, making it challenging for sufferers to communicate.