

Chapter 9 Nervous System

General Functions of the Nervous System:

The nervous system is composed of neurons and neuroglia. _____ at the ends of peripheral nerves gather information and convert it into nerve impulses.

What are the three general functions of the nervous system?

The Central Nervous System is made up of the _____ and _____.

The Peripheral Nervous System is made up of the _____ and _____ nerves.

Neuroglial Cells

Neuroglia fill spaces, support neurons, provide structural frameworks, produce myelin, and carry on phagocytosis. Four types are found in the _____ and the last in the _____.

_____ cells are small cells that phagocytize bacterial cells and cellular debris.

_____ form myelin in the central nervous system.

_____ are near blood vessels and support structures, aid in metabolism, and respond to brain injury by filling in spaces.

_____ cover the inside of ventricles and form choroid plexuses within the ventricles.

_____ cells are the myelin-producing neuroglia of the peripheral nervous system.

Neurons:

Structure: A neuron has a _____ with mitochondria, lysosomes, a Golgi apparatus, chromatophilic substance (Nissl bodies) containing rough endoplasmic reticulum, and neurofibrils.

Nerve fibers include a solitary out going _____ and numerous _____ which bring in the impulses from the receptors.

Larger axons in the PNS are enclosed by sheaths of _____ provided by _____ cells.

The outer layer of covering in myelinated peripheral neurons is called _____.

What is its function?

Narrow gaps in the myelin sheath are called _____ of _____.

Neuron Types

By Structure: Name the three types of neurons as classified by structure. How do they differ?

By function: _____ neurons (afferent neurons) conduct impulses from peripheral body parts to the CNS and are usually what type? (Although some are bipolar neurons.)

_____ are multipolar neurons lying within the CNS that form links between other neurons.

_____ neurons are multipolar neurons that conduct impulses from the CNS to effectors.

Synapse:

The junction between two communicating neurons is called a _____; There exists a _____ between them across which the impulse must be conveyed.

Synaptic Transmission is the process by which the impulse in the presynaptic neuron is transmitted across the synaptic cleft to the postsynaptic neuron.

When an impulse reaches the synaptic knob of an axon, synaptic _____ release chemicals called _____ into the synaptic _____.

These chemicals react with specific receptors on the postsynaptic membrane.

Cell Membrane Potential:

A cell membrane is usually polarized, due to an unequal distribution of positive and negative _____ across the membrane; polarization is important to the conduction of nerve impulses.

The distribution of ions is determined by the membrane _____ that are selective for certain ions.

_____ ions pass through the membrane more readily than do _____ ions, making the former a major contributor to membrane polarization.

Resting Potential = Polarized:

Due to active transport, the cell maintains a greater concentration of _____ ions outside and a greater concentration of _____ ions inside the membrane.

The difference in electrical charge between two regions is called a _____.

Potential changes:

Because neurons can respond to changes in their surroundings they are _____.

If a resting potential decreases the membrane becomes _____

_____ are graded. This means the magnitude of change is proportional to the intensity of the stimulus.

What is a threshold potential doing to the membrane? What is the result?

Nerve Impulses:

_____ fibers conduct impulses over their entire membrane surface.

_____ fibers conduct impulses from node of Ranvier to node of Ranvier, a phenomenon called _____ conduction. This conduction is many times faster.

What is found at a node of Ranvier?

The greater the diameter of an axon, the _____ the impulse.

All-or-None Response:

A(n) _____ is not graded, therefore it is an all-or-none response. A greater intensity of stimulation does not produce a stronger response, rather it produces _____.

Neurotransmitters:

Neurotransmitters that increase postsynaptic membrane permeability to sodium ions may trigger impulses and are thus _____.

Other neurotransmitters may decrease membrane permeability to sodium ions, reducing the chance that it will reach threshold, and are thus _____.

The effect on the postsynaptic neuron depends on which presynaptic knobs are activated.

Synaptic Transmission:

When an action potential reaches the synaptic knob, _____ ions rush inward and, in response, some synaptic vesicles fuse with the membrane and release their contents into the synaptic cleft.

_____ in some synaptic clefts and on postsynaptic membranes rapidly decompose the neurotransmitters after their release. Destruction or removal of neurotransmitter prevents continuous stimulation of the postsynaptic neuron.

Impulse Processing:

How impulses are processed is dependent upon how neurons are organized in the CNS.

Pools: Neurons within the CNS are organized into neuronal pools with varying numbers of cells.

These groups of neurons make synaptic connections with each other to perform a common function.

Facilitation: A particular neuron of a pool may receive excitatory or inhibitory stimulation; If the net effect is excitatory but _____ the neuron becomes more excitable to incoming stimulation (a condition called facilitation).

A single neuron within a pool may receive impulses from two or more fibers. This is called _____, and makes it possible for the neuron to summate impulses from different sources.

Impulses leaving a neuron in a pool may be passed into several output fibers. This is called _____ and serves to amplify an impulse.

Nerve Types :

Nerves are bundles of _____.

Neuron processes that bring sensory information into the CNS are _____.

_____ carry impulses from the CNS.

Nerve Pathways:

A reflex arc includes a _____ neuron, one or more _____ neurons, and a _____ whose axons pass out of the CNS.

_____ are automatic, subconscious responses to stimuli that help maintain homeostasis.

Meninges:

The brain and spinal cord are surrounded by membranes called meninges that lie between the bone and the soft tissues. The outermost layer is made up of tough, white dense connective tissue, contains many blood vessels, and is called the _____.

The sheath around the spinal cord is separated from the vertebrae by a/an _____ space.

The middle layer, the _____, is thin and lacks blood vessels and looks like a spider web. Between these two layers is a _____ space containing _____ fluid.

The innermost layer, the _____, is thin and contains many blood vessels and nerves.

Spinal Cord:

Gray matter: Where is it located in the spinal cord?

White matter: White matter, made up of bundles of _____ nerve fibers (nerve tracts), surrounds a butterfly-shaped core of gray matter.

Central canal: A central canal contains _____ fluid.

Spinal Cord Function:

Conducting nerve impulses: Tracts carrying sensory information are called _____. Those that conduct motor impulses from the brain are called _____.

Spinal Reflexes: recall how reflexes work and the parts of a reflex mechanism.

Brain:

The brain is the largest, most complex portion of the nervous system, containing about 100 billion multipolar neurons.

What are the four major divisions of the brain?

Cerebrum is the largest portion of the brain. It is divided into two _____.

A broad flat bundle of nerve fibers called the _____ connects the two halves.

The surface of the brain is marked by ridges, called _____, shallow grooves, called _____ and deep grooves called _____.

The lobes of the brain are named according to the bones they underlie. What are the names of the lobes.

A thin layer of gray matter, the cerebral _____, lies on the outside of the cerebrum and contains 75% of the cell bodies in the nervous system.

Cerebral Functions: Describe the following cerebral functions:

Sensory:

Motor:

Association:

Hemisphere Dominance:

Both cerebral hemispheres function in receiving and analyzing sensory input and sending motor impulses to the opposite side of the body. Most people exhibit hemisphere dominance for the language-related activities of speech, writing, and reading.

Which hemisphere is dominant in 90% of the population?

What does the non-dominant hemisphere specialize in?

What are the basal ganglia?

Ventricles and Cerebrospinal Fluid:

The ventricles are a series of _____ within the cerebral hemispheres and brain stem. How many ventricles are there?

The ventricles are continuous with the central canal of the spinal cord, and are filled with _____ fluid.

_____ plexuses, specialized capillaries from the pia mater, secrete the CSF. What is the function of this fluid?

Diencephalon:

The _____ functions in sorting and directing sensory information arriving from other parts of the nervous system, performing the services of both messenger and editor. It acts like an executive secretary for the cerebrum.

The _____ maintains homeostasis by regulating a wide variety of visceral activities and by linking the endocrine system with the nervous system. List its other activities it regulates.

Limbic system: The limbic system, in the area of the diencephalon, controls emotional experience and expression. By generating pleasant or unpleasant feelings about experiences.

Brainstem:

The brain stem, consisting of the _____, the _____, and the _____. The brain stem lies at the base of the cerebrum, and connects the brain to the spinal cord.

Midbrain: What are its functions?

Why can we say it is like a doorman to the cerebrum?

Pons: What are its functions?

Medulla oblongata: What are its functions?

Why do they say someone is “brain dead” if they only have a functioning medulla oblongata?

Reticular Formation: Where is it found? Decreased activity in the reticular formation results in sleep; increased activity results in wakefulness.

Cerebellum:

Like the cerebrum, the cerebellum is divided into two _____.

How does it resemble the cerebrum in reference to its gray and white matter?

What are the functions of the cerebellum?

Peripheral Nervous System

The peripheral nervous system (PNS) consists of the cranial and spinal nerves that arise from the central nervous system and travel to the remainder of the body.

What is the function of the somatic nervous system?

What is the function of the autonomic nervous system?

Cranial nerves: How many are there?

A mnemonic to remember their names: On Old Olympus Towering Tops, A Finn Visiting Germany Viewed A Hop.

Can you list them in order? Most of the cranial nerves are _____ nerves because they have sensory and motor components.

Spinal nerves:

How many are they? How are they named?

The root that contains the sensory neurons is the _____ root. The motor neurons arise in the _____ root.

All spinal nerves are _____ nerves.

The main branches from the spinal nerves combine to form _____. Name and locate them.

Autonomic Nervous System:

What is its function? What are the two divisions called?

In the autonomic motor system, motor pathways include two fibers:

A _____ fiber that leaves the CNS, and a _____ fiber that innervates the effector.

In what structure is the cell of the second neuron located?

Sympathetic N.S.:

Fibers in the sympathetic division arise from the _____ and _____ regions of the spinal cord, and synapse in _____ ganglia close to the vertebral column.

Parasympathetic N.S.:

Fibers in the parasympathetic division arise from the _____ and _____ region of the spinal cord, and synapse in ganglia close to the effector organ.

Neurotransmitters of the ANS: Preganglionic fibers of both sympathetic and parasympathetic divisions release _____.

Parasympathetic postganglionic fibers are cholinergic fibers and release _____.

Sympathetic postganglionic fibers are adrenergic and release _____.

Control of Autonomic Activity: The autonomic nervous system is largely controlled by reflex centers in the brain and spinal cord.

The _____ System and _____ cortex alter the reactions of the autonomic nervous system through emotional influence.