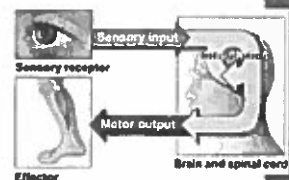


Unit 6: The Nervous System

As always, it is highly recommended that you take notes over more than just the missing words from the PowerPoint

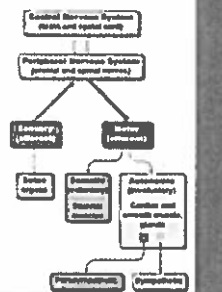
Functions of the Nervous System

- Sensory input**—gathering information
 - To monitor changes occurring inside and outside the body
 - Change = stimuli
- Integration**
 - To process and interpret sensory input and decide whether action is needed
- Motor output**
 - A response to integrated stimuli
 - The response activates muscles or glands



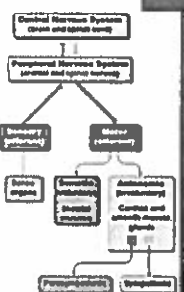
Structural Classification of the Nervous System

- Central nervous system (CNS)**
 - Organs
 - Brain
 - Spinal cord
 - Function
 - Integration; command center
 - Interpret incoming sensory information
 - Issue outgoing instructions
- Peripheral nervous system (PNS)**
 - Nerves extending from the brain and spinal cord
 - Spinal nerves—carry impulses to and from the spinal cord
 - Cranial nerves—carry impulses to and from the brain
 - Functions
 - Serve as communication lines among sensory organs, the brain and spinal cord, and glands or muscles



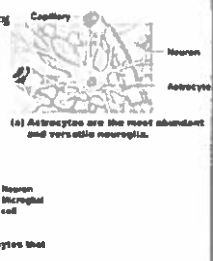
Functional Classification of the Peripheral Nervous System

- Sensory (afferent) division**
 - Nerve fibers that carry information to the central nervous system
 - Somatic sensory fibers carry information from the skin, skeletal muscles, and joints
 - Visceral sensory fibers carry information from visceral organs
- Motor (efferent) division**
 - Nerve fibers that carry impulses away from the central nervous system organs
 - Two subdivisions
 - Somatic nervous system** = voluntary
 - Consciously controls skeletal muscles
 - Autonomic nervous system** = involuntary
 - Automatically controls smooth and cardiac muscles and glands
 - Further divided into the sympathetic and parasympathetic nervous systems



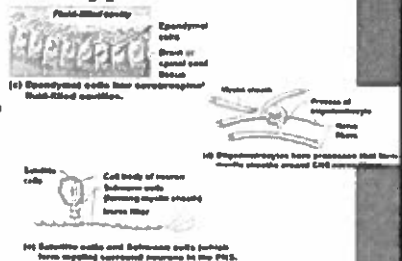
Nervous Tissue: Support Cells

- Support cells in the CNS are grouped together as **neuroglia**
- CNS glial cells: astrocytes**
 - Abundant, star-shaped cells
 - Brace neurons
 - Form barrier between capillaries and neurons
 - Control the chemical environment of the brain
- CNS glial cells: microglia**
 - Spiderlike phagocytes
 - Dispose of debris



Nervous Tissue: Support Cells

- CNS glial cells: ependymal cells**
 - Line cavities of the brain and spinal cord
 - Cilia assist with circulation of cerebrospinal fluid
- CNS glial cells: oligodendrocytes**
 - Wrap around nerve fibers in the central nervous system
 - Produce myelin sheaths
- PNS glial cells**
 - Satellite cells**
 - Protect neuron cell bodies
 - Schwann cells**
 - Form myelin sheath in the peripheral nervous system



Nervous Tissue: Neurons

- Neurons = nerve cells
- Cells specialized to transmit messages
- Major regions of neurons
 - Cell body—nucleus and metabolic center of the cell
 - Processes—fibers that extend from the cell body
- Cell body
 - Nissl bodies
 - Specialized rough endoplasmic reticulum
 - Neurofibrils
 - Intermediate cytoskeleton
 - Maintains cell shape
 - Nucleus with large nucleolus
- Processes outside the cell body
 - Dendrites—conduct impulses toward the cell body
 - Neurons may have hundreds of dendrites
 - Axons—conduct impulses away from the cell body
 - Neurons have only one axon arising from the cell body at the axon hillock

Nervous Tissue: Neurons

- Axons
 - End in axon terminals
 - Axon terminals contain vesicles with neurotransmitters
 - Axon terminals are separated from the next neuron by a
 - Synaptic cleft—gap between adjacent neurons
 - Synapse—junction between nerve
- Myelin sheath—whitish, fatty material covering axons
 - Schwann cells—produce myelin sheaths in jelly roll-like fashion around axons (PNS)
 - Nodes of Ranvier—gaps in myelin sheath along the axon
 - Oligodendrocytes—produce myelin sheaths around axons of the CNS
- Myelin sheaths speed up the nerve impulse transmission

Nervous Tissue: Neurons

- Tracts —bundles of nerve fibers in the CNS
- Nerves —bundles of nerve fibers in the PNS
- White matter —collections of myelinated fibers (tracts)
- Gray matter —collections of mostly unmyelinated fibers and cell bodies

Structural Classification of Neurons

- Structural classification is based on number of processes extending from the cell body
- Multipolar neurons—many extensions from the cell body
 - All motor and interneurons are multipolar
 - Most common
- Bipolar neurons—one axon and one dendrite
 - Located in special sense organs, such as nose and eye
 - Rare in adults
- Unipolar neurons—have a short single process leaving the cell body
 - Sensory neurons found in PNS ganglia
 - Conduct impulses both forward and away from the cell body