

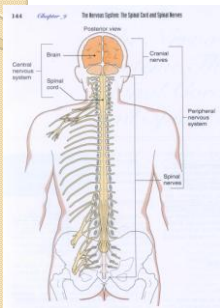
Nervous System

Honors Chapter 9 Notes

I. Functions of Nervous System

- A. Coordinating center for all body systems
- B. Detects and responds to stimuli
- C. Helps body adapt to conditions it encounters

A. Structural Divisions of Nervous System



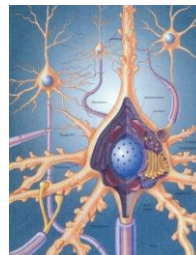
- 1. **Central Nervous System (CNS)** composed of the brain and spinal cord
- 2. **Peripheral Nervous System (PNS)** composed of spinal and cranial nerves

B. Functional Divisions- 2 types

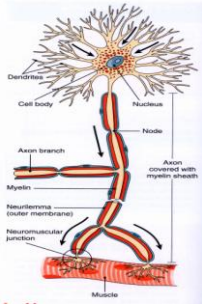
- 1. **SOMATIC Nervous System (SNS)**
 - Voluntary;
 - controls all skeletal muscles
- 2. **AUTONOMIC Nervous System (ANS)**
 - Involuntary;
 - Controls smooth and cardiac muscle, glands

II. Neurons and their Functions

A. Structure of a Neuron



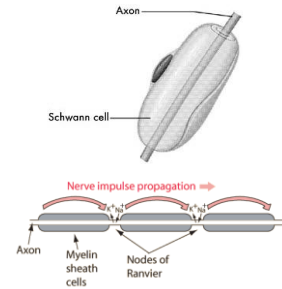
Neuron Structure: Three basic parts



- 1. **Cell Body**: contains the nucleus and other organelles
- 2. **Dendrites** – short extensions that receive signals (impulses) from other neurons
- 3. **Axons** – long fibers that transmit impulses away from cell body to a muscle or other neuron

The Myelin Sheath around the axon

- A. A fatty material that acts as insulation to protect the nerve fiber.
- B. The sheath is made up of Schwann cells, wrapped in layers (like pancakes) along the axon.
- C. The gaps (called **nodes**) between each Schwann cell causes the impulse to travel faster along the axon.

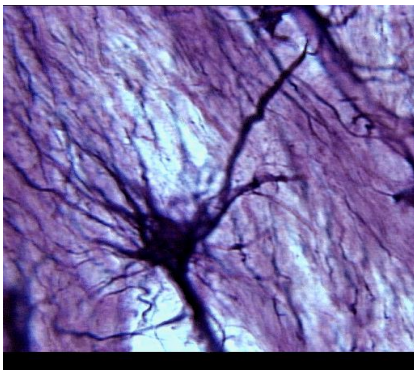


B. Types of Neurons in the PNS

- **Sensory (afferent) Neurons**
 - Carry impulses to the spinal cord from sensory receptors
- **Motor (efferent) Neurons**
 - Carry impulses away from spinal cord to muscles or glands
- **Interneurons** –
 - only found in brain and spinal cord, they act as connectors between neurons

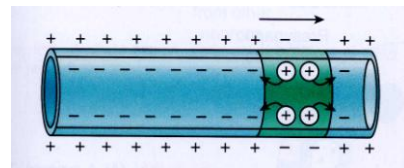
III. Neuroglia

- A. Special connective tissue cells
- B. protect and support neurons
- C. can reproduce, unlike neurons
- D. help repair neurons
- E. regulate fluid around neurons
- F. remove pathogens and impurities



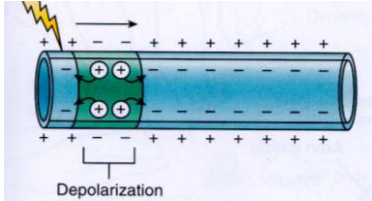
A. How the Nerve Impulse Works

- I. The Resting state of a fiber is polarized; Na^+ ion concentration is higher outside, with K^+ ions on inside .

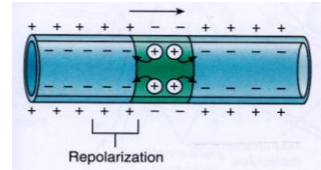


- 2. Depolarization: A stimulus causes the electric charge to change polarity by allowing Na⁺ ions to flow into cell.

The depolarization moving along the membrane is called the *action potential*.



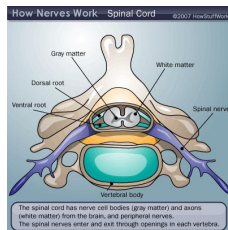
- 3. Repolarization: K⁺ gets pumped out of the cell, causing the charge to return to its original state, ready for the next stimulus.



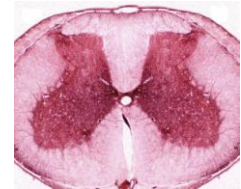
<http://www.youtube.com/watch?v=yrsJ9HlnZ5s>

V. The Spinal Cord

- A. Structure
 - 1. H-shaped unmyelinated gray matter extends vertically in 2 columns called "horns"



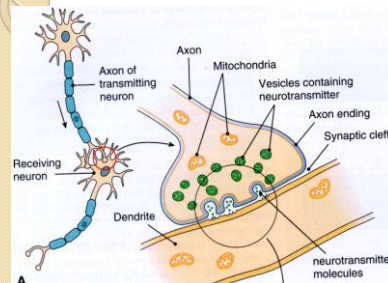
- 2. White matter – myelinated axons -carry impulses to and from the brain
 - Ascending tracts carry sensory impulses TO brain
 - Descending tracts carry motor impulses FROM the brain to PNS



B. The Synapse –The junction for transmitting the nerve impulse .

- 1. The nerve impulse travels to the end of the axon, causing vesicles to release a
- 2. neurotransmitter, which acts as a signal to the next (postsynaptic) cell
- 3. Receptors pick up the signal and respond
- 4. neurotransmitters are chemicals that carry the signals; 3 main ones include:
 - Epinephrine (adrenaline)
 - Norepinephrine (noradrenaline)
 - Acetylcholine

Synapse Diagram

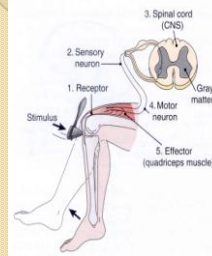


<http://www.youtube.com/watch?v=HXx9qlJetSU>

B. The Reflex Arc

- A complete pathway through the nervous system from stimulus to response.
- Reflex response

Reflex Arc Diagram



- 1. *Receptor* (dendrite) receives a stimulus
- 2. *Sensory neuron* takes impulse to spinal cord
- 3. *CNS* – *interneurons* distribute the response to brain and spinal cord
- 4. *Motor neuron* carries impulse away to effector
- 5. *Effector* is a muscle or gland that responds to stimulus

VI. Autonomic Nervous System

- Regulates the action of the glands, smooth muscles and the heart.
- The action is involuntary (automatic).

Divisions of the Autonomic Nervous System

- **1. Sympathetic**
 - Fibers start in thoracic and lumbar region
 - Effects the body's response to stress, the 'fight-or-flight' response
- **2. Parasympathetic**
 - Fibers start in brain and sacrum
 - Reverses the stress response to provide balance in the body systems