

2.2 Electrical Communication Study Guide by Hisrich

2.2.a How does communication happen within the body?

Electrical Signals → Nervous System	Chemical Signals → Endocrine System
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The nervous system is made up of **neurons**. **Neurons** communicate just like people do, but they send messages using **action potentials** (electricity passing through their **axons**). Each **neuron** picks up signals at its **dendrites**, passes the signals down the **axon**, into the **axon terminals**, and into the **synapses**. The **synapse** then drops **neurotransmitter** into the **synaptic cleft** between the first **neuron's synapse** and the next **neuron's dendrites**. That signals **neuron #2** to pass the message on.

2.2.b What is the basic structure and function of a neuron?

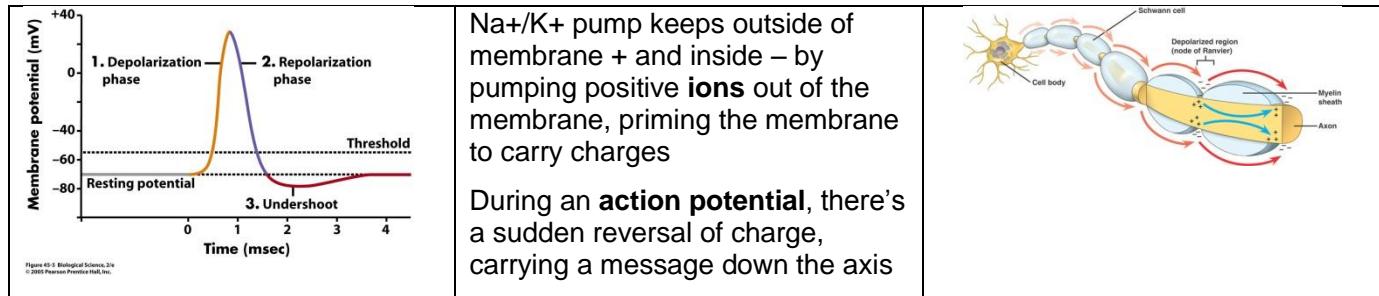
Function	Structure
<p>Sends electrical signals through body</p> <p>Dendrites ("trees")—pick up signal</p> <p>Axon—carry signal long distances (up to 3 ft)</p> <p>Myelin Sheath—insulates axon</p> <p>Nodes ("knots") of Ranvier—allow nutrients in, waste out</p> <p>Axon Terminals ("ends") —branch to meet other neurons</p> <p>Synapses—place one neuron connects to next</p> <p>Synaptic Cleft—joint between neurons</p> <p>Neurotransmitters ("to carry across a nerve") —chemicals that allow neurons to communicate with each other</p>	

2.2.c How do the different types of neurons work together to send and receive signals?

Sensory Neuron	Interneuron	Motor Neuron
Pick up signals through senses (sight, smell, touch, etc)	Connect sensory neurons to motor neurons	Receive signals from CNS, causing movement
<u>Send info from PNS to CNS</u>	Found in CNS	In PNS, <u>receive info from CNS</u>

A Reflex Arc Shows How Neuron Types Work Together.

2.2.d How are electrical impulses created in the human body?



2.2.e How do neurons convey information using both electrical and chemical signals?

Electrical → Action potentials down axis of each neuron (WITHIN each neuron)	Chemical → Neurotransmitters conduct signal BETWEEN neurons
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2.2.f What factors impact our ability to react to a stimulus?

2.2.g How and why does reaction time differ in reflex and voluntary actions?

Reflex—reflex responses simply go to the spinal cord and don't involve the brain, so the reaction time is VERY fast (example: blinking when something comes at you, kicking when hit with reflex hammer)	Voluntary—Voluntary responses must travel to the brain, take longer. The more thought that is required (i.e. doing the OPPOSITE of what asked), the slower the reaction time .
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2.2.h How do errors in communication impact homeostasis in the human body?

Epilepsy	Bursts of electricity cause involuntary responses (seizures, odd smells, etc)
Parkinson's	Cells that make dopamine die (no one knows why). The lack of this neurotransmitter causes problems in communication between neurons in the two brain regions that must communicate to allow smooth, controlled movements
Huntington's	Genetic defect on chromosome 4 (excess CAG repeats) causes synthesis of abnormal protein—the protein disrupts function of certain nerve cells, ultimately leading to their deaths (dead cells can't communicate)
Alzheimer's	Brain cells die (cause unknown) and dead cells can't communicate--communication breaks down, getting worse with time and eventually causing death
Multiple Sclerosis	The immune system attacks the myelin around nerve axes in the brain, spinal cord and optic nerves, causing nerves to be unable to transmit messages due to a buildup of scar tissue (sclerosis).
Amyotrophic lateral sclerosis (Lou Gehrig's)	<i>The name is a (without) myo (muscle) trophic (nourishment) lateral (side) scler (hardening) osis (abnormal condition).</i> Nerve cells waste away or die and can't send messages to the lower motor neurons. Movement becomes less and less controlled. Eventually the lung muscles cannot contract, causing death.

2.2.i How can biomedical professionals help treat, cure and improve the quality of life of those suffering from nervous system disorders?

The main person that treats neurological disorders is a **Neurologist** (one who studies nerves). That's a special kind of doctor that specializes in the nervous system. People with these disorders also rely on Pharmacists to dispense their medication, Nurses to care for them, Pharmacologists to produce new medications, researchers to help understand causes and possible treatments, Brain Surgeons if surgery is possible, Psychiatrists if they are depressed, Physical Therapists to maintain movement, etc.