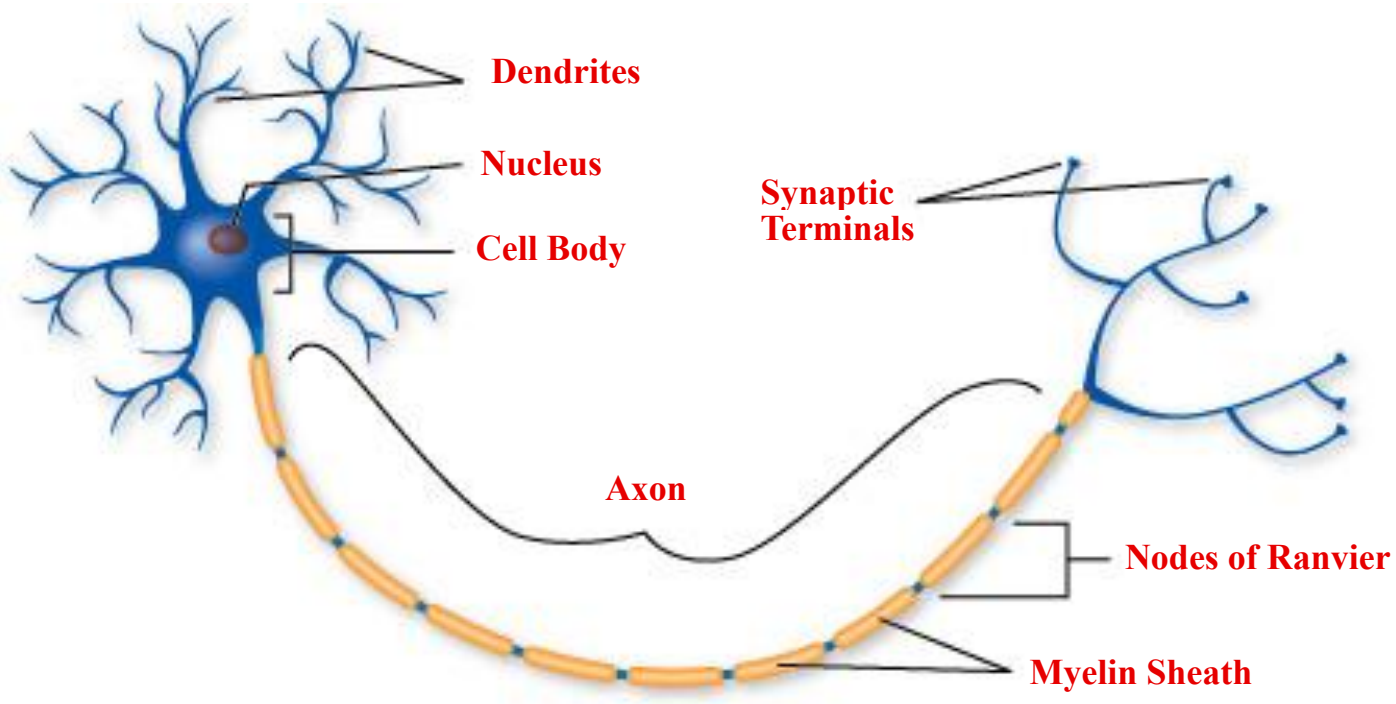
1. Define the following terms:

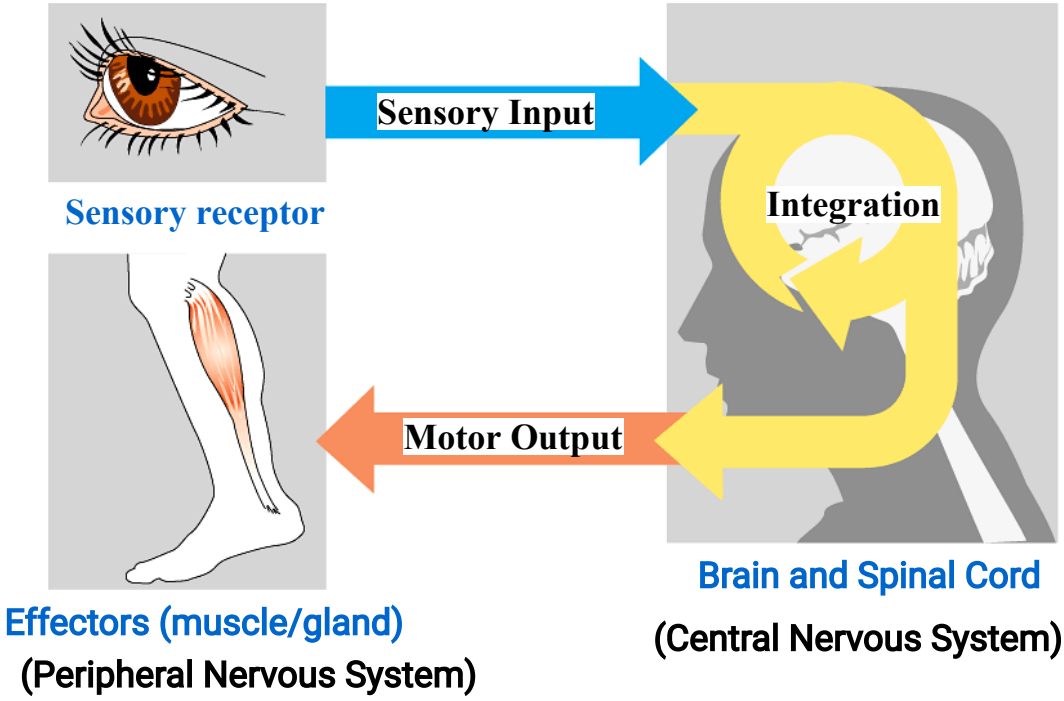
(a) Sensory Receptors – collect information d(etect stimuli = changes in the environment) about the physical world outside of the body as well as processes inside the organism.

(b) Effector Cells – muscles or glands that carry out the body's response to a stimulus.

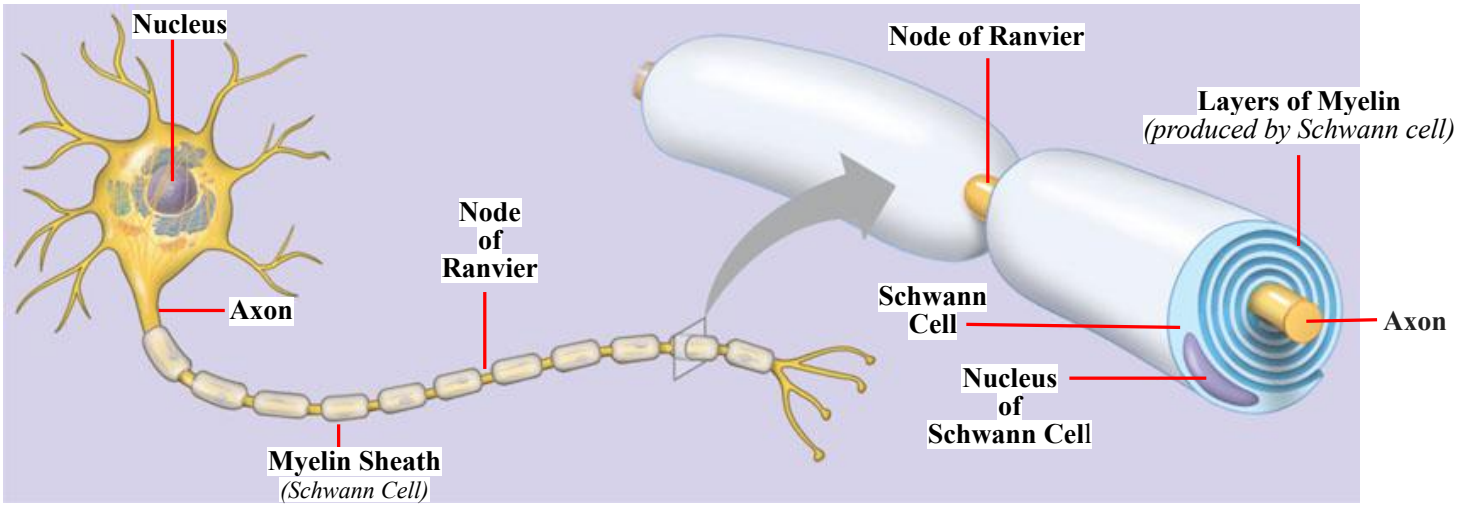
2. Label the diagram of the **neuron** below. *(Figure 48.2)* **(Neuron - 3D Medical Animation)**



3. Label the diagram below representing an overview of the human nervous system. *(Figure 48.1)*



4. Label the diagram below and use it to explain why myelin *(remember Lorenzo's Oil)* is important in nerve conduction? *(Figure 48.5)* **(2-Minute Neuroscience: Neuron Structure)**



(Bozeman: The Neuron)

(Action Potential 3D)

5. Define the following terms related to the conduction of an **electrochemical impulse** along a neuron:

(p.1026) **a. Polarized** - **difference in charge; more negatively charged on one side of the membrane than the other**

(Outside positive [3Na+] / Inside negative or LESS positive [2K+])

(p.1026) **b. Membrane potential** - **the potential difference (difference in charge) across a membrane**

Nothing "Resting" about a resting neuron!!!

(p.1026) **c. Resting potential** - the membrane potential of an unstimulated neuron; when the inside of the cell is more negative than the outside of the cell *due to the action of the Na+/K+ pump*.

(3 Na+ pumped out for every 2K+ pumped in - This creates a [gradient] where the [+ ions] outside the cell is greater than inside the cell.)

(p.1029) **d. Depolarization** - **reduction in voltage across a membrane; when the inside of a cell is made less negative relative to the outside of the cell.**

(This is due to the RUSH of Na+ ions INTO the cell)

(Action Potential 3D)

(nerve impulse)

(p.1030) **e. Action potential** - **the nerve impulse; a rapid change in the membrane potential of an excitable cell caused by the selective opening and closing of voltage sensitive gates in sodium and potassium ion channels -**

(electrochemical message)

(This too is due to the RUSH of Na+ ions INTO the cell)

(p.1027) **6.** How does the **sodium-potassium pump** maintain a membrane potential?
Hint: What gets pumped in and out? **(Animation)**

The sodium-potassium pump maintain a membrane potential (*less negative inside the cell*) by actively transporting (*pumping*) 3 Na+ out of the cell for every 2 K+ inside the cell.

(*saltare* - to leap)

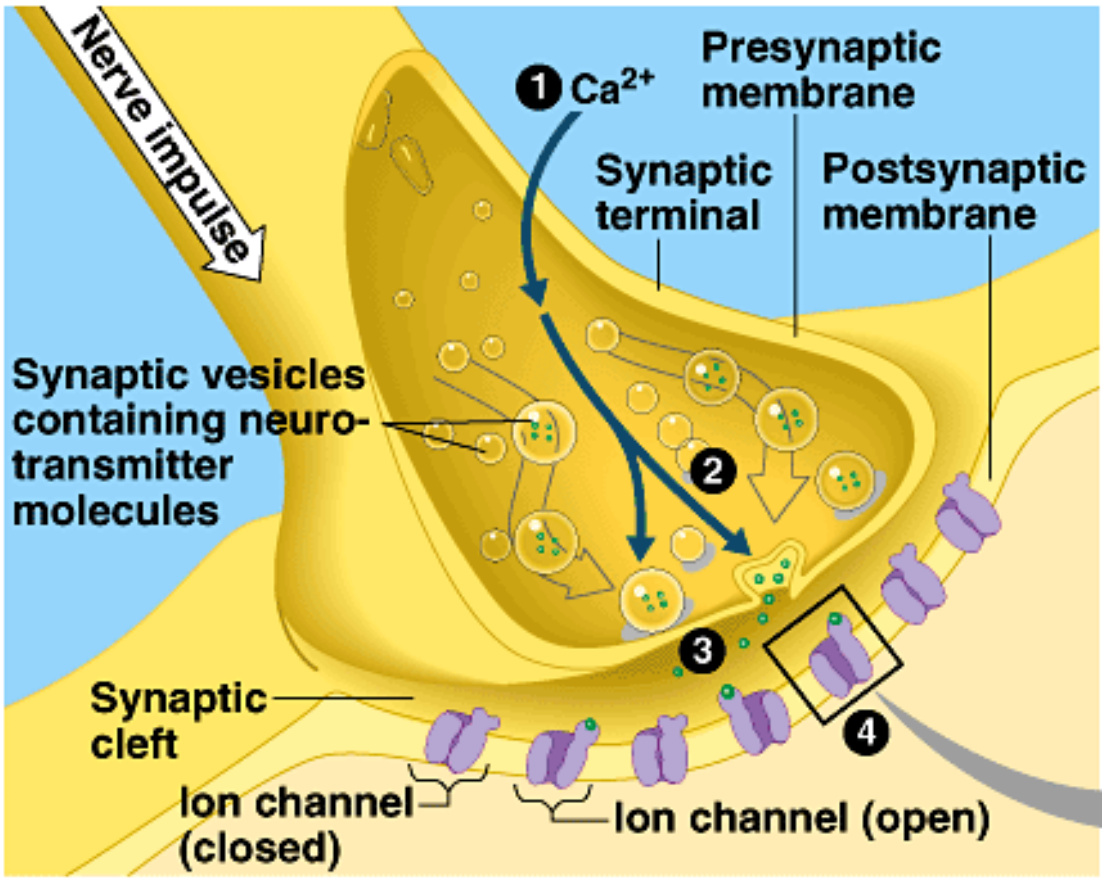
(p.1032) **7.** How does **myelination** and **salutatory conduction** affect the speed of an action potential? (See #4)

Myelination and salutatory conduction affect the speed of an action potential by allowing the action potential to be generated only at the gaps in the myelin called the Nodes of Ranvier thus speeding up the transmission of the impulse by allowing it to jump or "skip" from node to to node.

(2-Minute Neuroscience: Synaptic Transmission)

(HHMI:Chemical Synapse Animation) (Chemical Synapse Animation)

(p.1033) **8.** Use the diagram below to describe the activity of a chemical **synapse**. *(Figure 48.12)*



(1) **Action potential (influx of Na^+) depolarizes the membrane of the synaptic terminal triggering the influx of Ca^+ into the synaptic knob.**

(2) **The influx of Ca+ causes the synaptic vesicles (*containing neurotransmitters*) to fuse with the pre-synaptic membrane (exocytosis).**

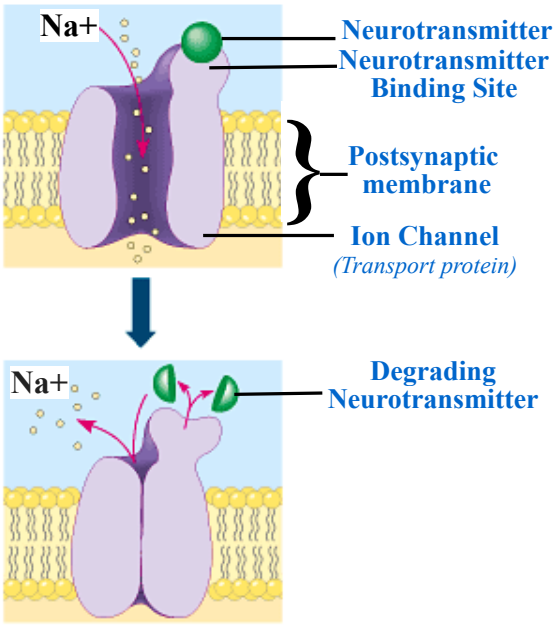
(3) **Vesicles release neurotransmitters into the synaptic cleft. Neurotransmitters bind to receptors of ion channels on the postsynaptic membrane.**

(4) **Binding of neurotransmitters to postsynaptic receptors open ion (Na^+) channels causing depolarization of the postsynaptic membrane.**

(p.1032) **9.** What are **neurotransmitters**?

Neurotransmitters are chemical messengers (proteins with specific a shape) released from the presynaptic membrane into the synaptic cleft that bind to stimulate the postsynaptic neuron.

10. Label the diagram below and use it to describe the activity of a **neurotransmitters** at **chemical synapse**. *(Figure 48.12)*

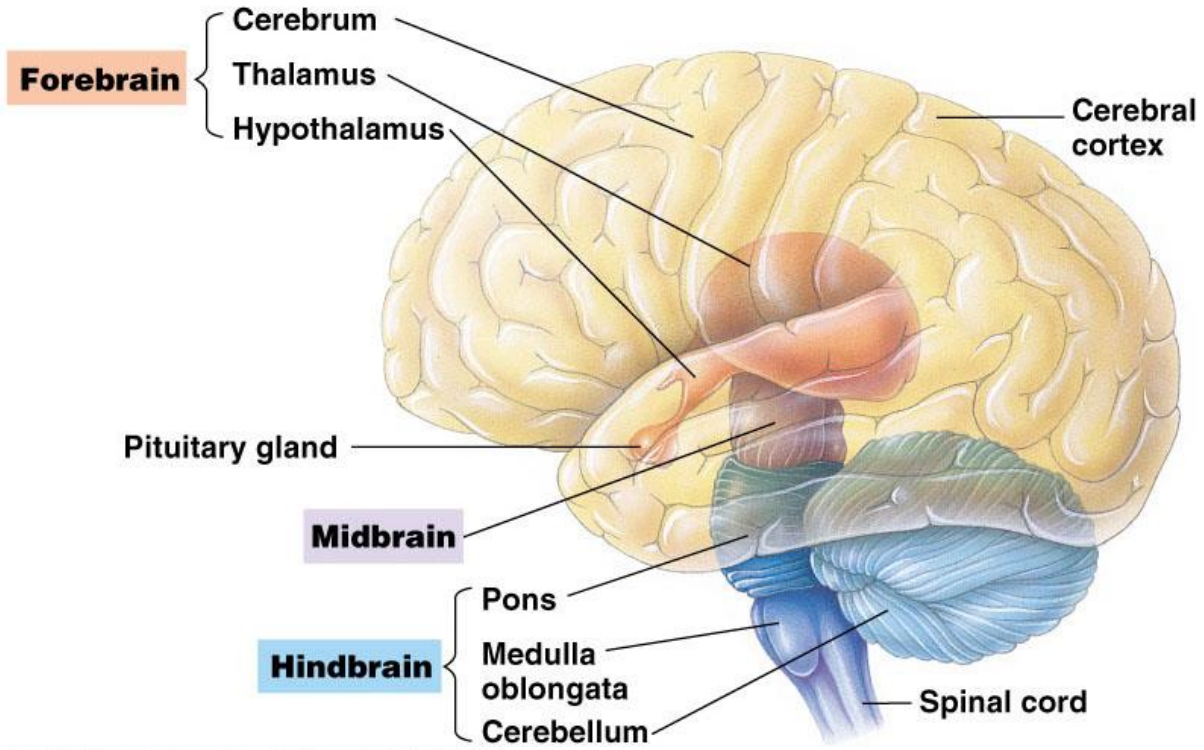


(p.1037) **11.** Neurotransmitters are a special class of protein molecules that enable nerve cells to communicate with one another. One neurotransmitter can trigger a host of different responses depending on the receptors present on the postsynaptic cell. Some responses may be quick (*a few milliseconds*) others may take longer (*due to the signal transduction pathway*). In the table below, describe the major functions of each neurotransmitter.

(Animation: Neurotransmitters)

Neurotansmitter	Function(s)
Acetylcholine (Animation)	• Used by the spinal cord to control muscles. • Used by the brain to regulate memory.
Epinepherine (Adrenaline) (Animation)	• HORMONE - "Flight or Fight Response" - Increases blood flow ot heart and lungs - Decreases blood flow to other organs • NEUROTRANSMITTER - Regulates attention and mental focus.
Norepinepherine (Noradrenaline) (Animation)	• HORMONE - "Flight or Fight Response" • NEUROTRANSMITTER - Regulates normal brain function.
Dopamine (Animation)	• Responsible for feelings of pleasure and happiness - *"Happy Hormone"*.
Serotonin (Animation)	• Stabilizes our mood, feelings of well-being, and happiness.

12. Describe the major functions of the brain in the table located below the diagram. *(Figure 48.20)*



(Animation: Brain Structure / Function)

Part of the Brain	Major Function(s)
Cerebrum	Main THINKING part of the brain.
Thalmus (Animation)	Relays information to and from both sides (left and right) of the cerebrum.
Hypothalmus (Animation)	Major control center for HOMEOSTATIC regulation such as: body temperature, blood [CO_2], hunger and thirst.
(outer section) **Cerebral Cortex**	Responsible for intelligence and other complex, voluntary actions. Ex: Learning
Cerebellum (Animation)	Responsible for maintaining posture, balance and sense of direction and orientation (up/down).
Medulla oblongata (Animation)	Controls vital involuntary actions such as heart rate and breathing.
Pons (Animation)	Works together with the medulla oblongata to serve an especially critical role in generating the respiratory rhythm of breathing.

(Website: Types of Behavior)

Chapter 51: Behavioral Biology

OBJECTIVES:

Introduction to Behavior and Behavioral Ecology

__1. Define behavior.
__2. Distinguish between proximate and ultimate questions about behavior.
__3. Explain how genes and the environment contribute to behavior.
__4. Explain what is unique about innate behavior.
__5. Define fixed action patterns and give examples in fish and humans.
__6. Describe the evolutionary basis for behavioral ecology.
__7. Explain why it is useful to use evolutionary principles as a guide to behavioral research.

Learning

__8. Explain how learning, maturation, and habituation influence behavior.
__9. Define imprinting and explain the importance of the sensitive period. Illustrate these concepts using examples from bird song.
__10. Distinguish between classical conditioning and operant conditioning.
__11. Define play and describe several possible adaptive advantages of this behavior.

Animal Cognition

__12. Describe the ultimate bases of learning.
__13. Describe and illustrate with examples kinesis, taxis, and migration.

Social Behavior and Sociobiology

__14. Relate an animal's mode of communication to its lifestyle.
__15. Explain how honeybees communicate information about the location of sources of food.

KEY TERMS:

associative learning	behavior	behavioral ecology	classical conditioning
cognition courtship	fixed action pattern	foraging	habituation
imprinting	kin selection	kinesis	learning
pheromone	operant conditioning	sensitive period	sign stimulus
signal	social behavior	taxis	

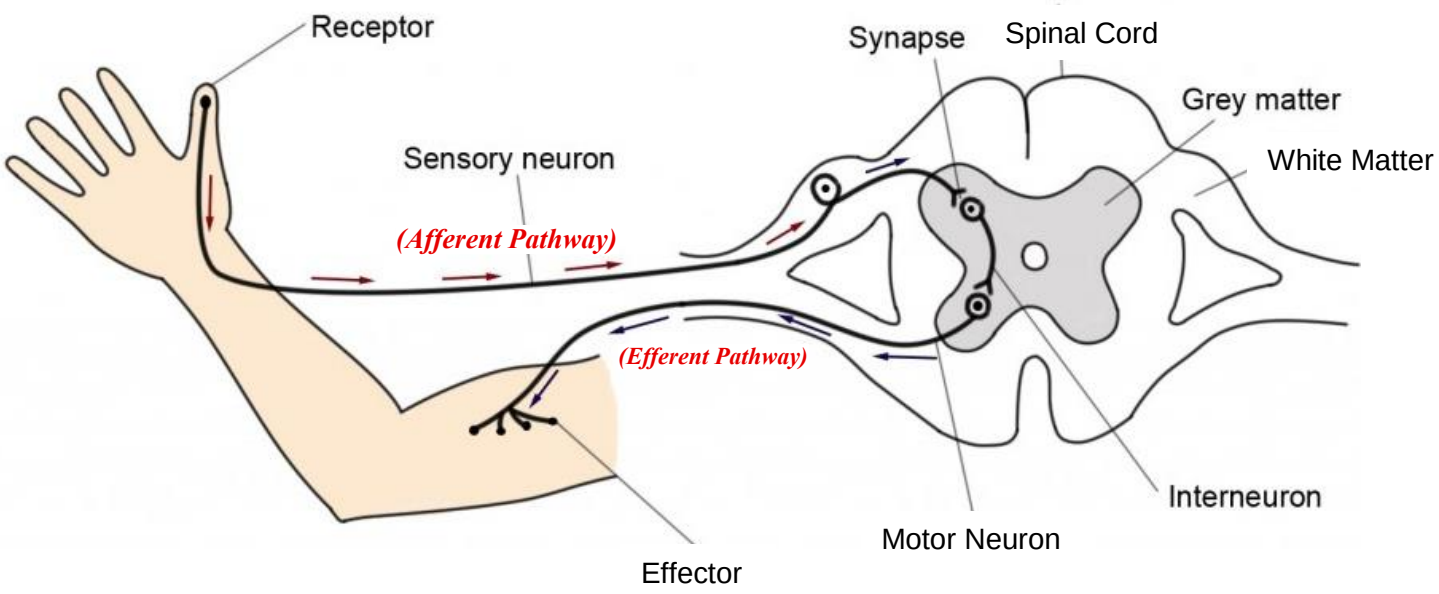
- -

WORD ROOTS:

agon- = a contest (*agonistic behavior*: a type of behavior involving a contest of some kind that determines which competitor gains access to some resource, such as food or mates)
andro- = a man (*polyandry*: a polygamous mating system involving one female and many males)
etho- = custom, habit (*ethology*: the study of animal behavior in natural conditions)
gyno- = a woman (*polygyny*: a polygamous mating system involving one male and many females)
kine- = move (*kinesis*: a change in activity rate in response to a stimulus)
mono- = one; **-gamy** = reproduction (*monogamous*: a type of relationship in which one male mates with just one female)
poly- = many (*polygamous*: a type of relationship in which an individual of one sex mates with several of the other)
socio- = a companion (*sociobiology*: the study of social behavior based on evolutionary theory)

(Animation: Sumanas - Reflex Arc) (Animation: Reflex Arc) (Patella Reflex)

A Simple Reflex Arc



Structure	Function
Receptor	**Detects stimuli (*any change in the environment*).**
Sensory Neuron	**Relays impulses (*action potentials/messages*) from receptors TO the Central Nervous System = Spinal Cord and brain.**
Synapse	**Tiny gap (*space/cleft*) between neurons.**
Spinal Cord	**Relays impulses (*action potentials/messages*) to and from the brain.**
Grey Matter	**Nerve tissue that contains UNmyelinated neurons.**
White Matter *(myelin = fat)*	**Nerve tissue that contains myelinated neurons.**
Interneuron	**Relays impulses (*action potentials/messages*) from a sensory to a motor neuron.**
Motor Neuron	**Relays impulses (*action potentials/messages*) the Central Nervous System (*Spinal Cord and brain*) to an effector (*muscle or gland*).**
Effector	**Muscle (*or gland*) that carries out a response.**