

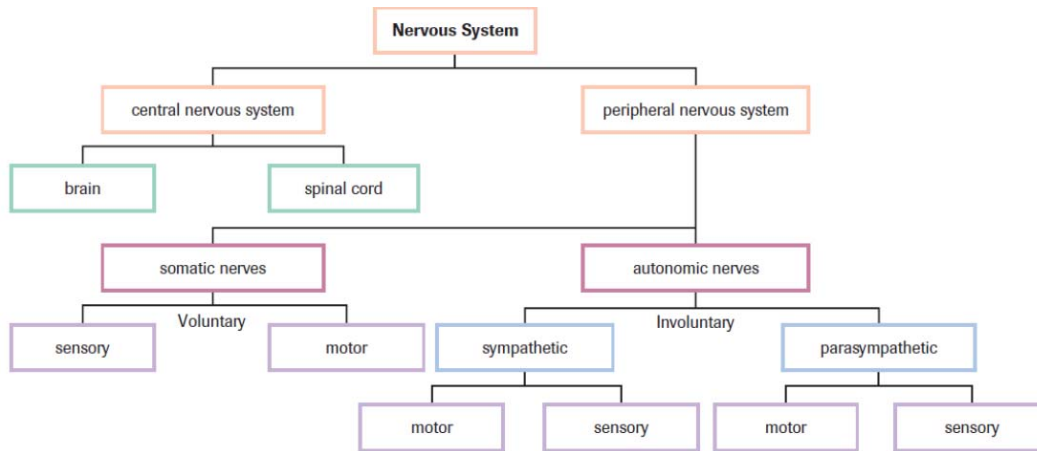
*Topic 1 - The Neuron and Nerve Signals*  
*Class 1 - Structure of the Neuron and the Reflex Arc*  
*Pre Class Reading Assignment*

1. Read pgs 408-410
2. Define the following terms
  - a.Glial cell
  - b.Neuron
  - c.Axon
  - d.Dendrite
  - e.Myelin sheath
  - f.Schwann cells
  - g.nodes of Ranvier
  - h.neurilemma
  - i.sensory neurons
  - j.sensory receptors
  - k.interneurons
  - l.motor neurons
  - m.effectors
3. Differentiate between the peripheral nervous system (PNS) and central nervous system (CNS).
4. Differentiate between sensory nerves and motor nerves.
5. Briefly describe the **function** of the following parts of a neuron: dendrites, myelin sheath, Schwann cells, cell body, and axon.
6. What is the relationship between the speed of a nerve impulse and the size of the axon along which it travels?
7. What is the difference between 'white matter' and 'grey matter'?

**Topic 1 – The Neuron and Nerve Signals**

**Class 1 – Structure of the Neuron and the Reflex Arc**

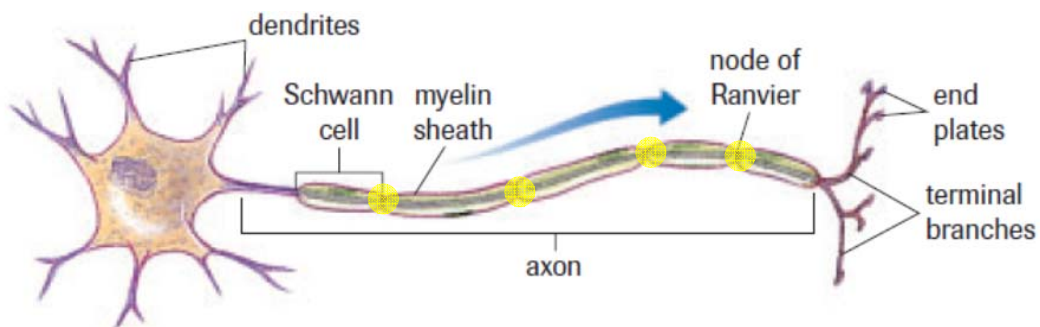
**Notes**



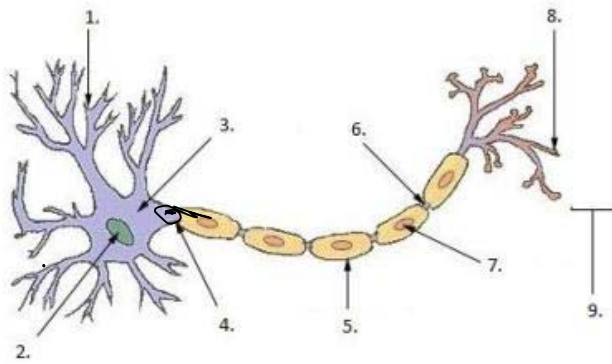
**Figure 1**  
The main divisions of the nervous system

**The Structure of a Neuron**

- **Neurons** are the basic unit of the nervous system
- Neurons are **similar** to other cells in the body because they
  - are surrounded by a cell membrane.
  - have a nucleus that contains genes.
  - contain cytoplasm, mitochondria and other organelles.
  - carry out basic cellular processes such as protein synthesis and energy production
- Neurons are **different** than other cells b/c:
  - Have specialized extensions called dendrites and axons
  - Communicate with each other with an electrochemical process
  - contain specialized structures and chemicals



[https://www.youtube.com/watch?x-yt-cl=84503534&v=p2FLuU5obhM&x-yt-ts=1421914688&feature=player\\_embedded](https://www.youtube.com/watch?x-yt-cl=84503534&v=p2FLuU5obhM&x-yt-ts=1421914688&feature=player_embedded)

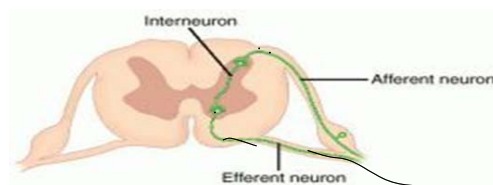
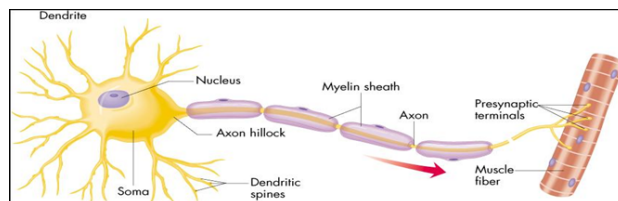
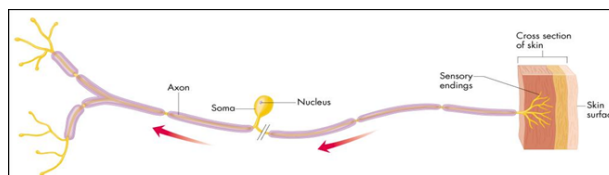
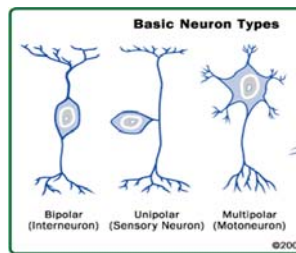


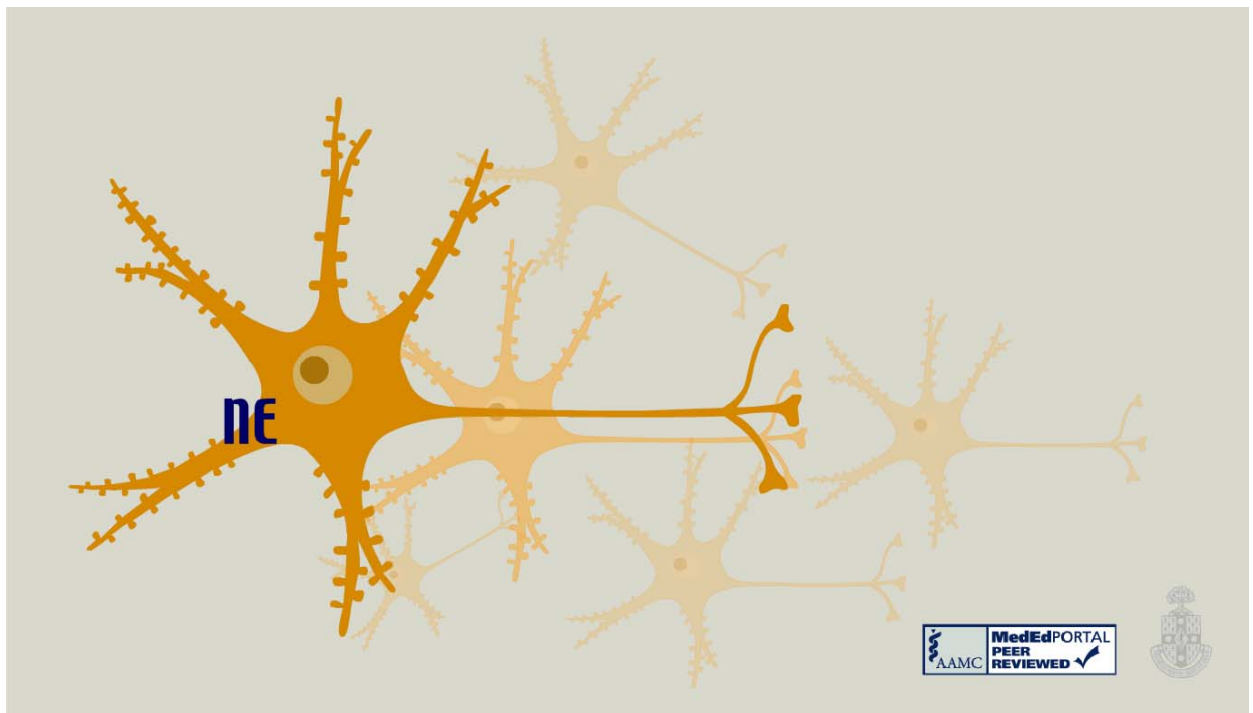
Parts of a Neuron

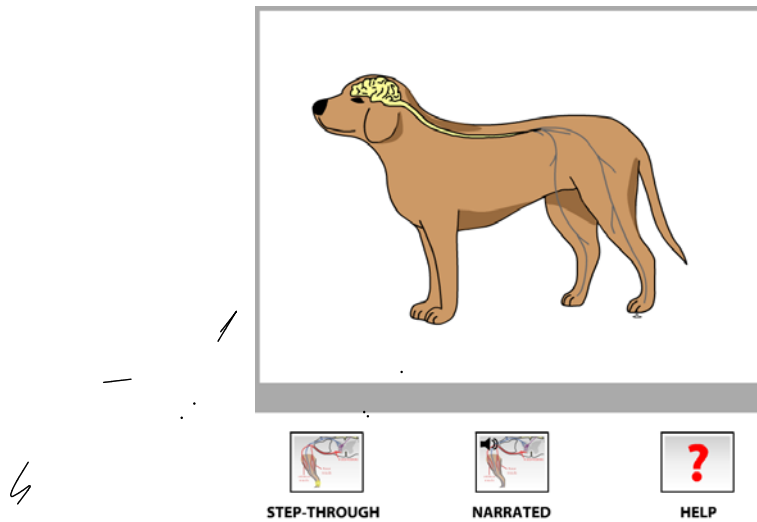
- Dendrites - projections of cell cytoplasm that carry signals towards the cell body
- Cell Body (soma) - holds all of the general parts of a cell as well as the nucleus, which is the control center
- Axon - extension of cytoplasm that carries signal (nerve impulse) away from dendrites and the cell body
- Schwann Cell - cells that produce the myelin sheath
  - A type of Glial cell (talked about later)
    - ↳ helper cell
- Myelin Sheath - fatty covering over the axon
  - Prevents loss of charged ions
- Nodes of Ranvier - areas between sections of the myelin sheath
- Neurilemma - another membrane that surrounds and protects the axon.
  - Helps re-growth and repair.
    - ↳ in PNS
- White matter - neurons that are both myelinated and have a neurilemma
  - all PNS and some CNS
- Gray matter - neurons in the brain and spinal cord that are not myelinated, nor have a neurilemma.

Types of Neurons:

- Motor Neuron - <sup>carry</sup> relay info to effectors (muscles, glands); cell body located in CNS; axons in PNS
- Sensory Neuron - <sup>carry</sup> relay info about environment to CNS (brain)
- Interneuron - connect neurons; only found in CNS

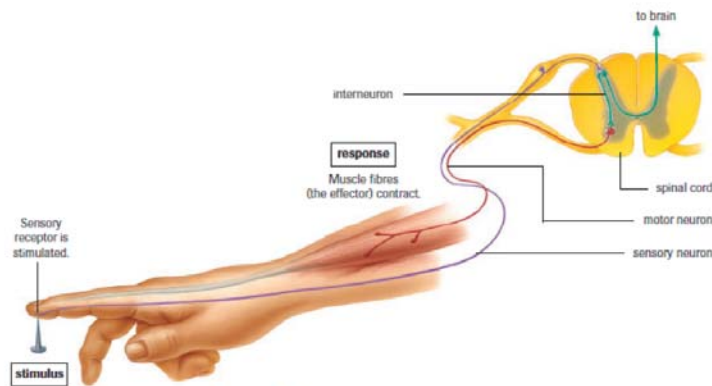






**The Reflex Arc**

- Reflexes are involuntary and often unconscious.
- Reflexes are fast b/c the brain does not have to process incoming info before reacting
- A reflex arc is the neural pathway that mediates a reflex action
- A reflex arc uses very few neurons to transmit messages
- **Steps in a reflex arc:**
  1. Receptors (heat, pain, cold) initiate an impulse in a sensory neuron
  2. Sensory neuron carries impulse to a interneuron in spinal cord
  3. Interneuron passes impulse to motor neuron which acts on a effector (muscle)

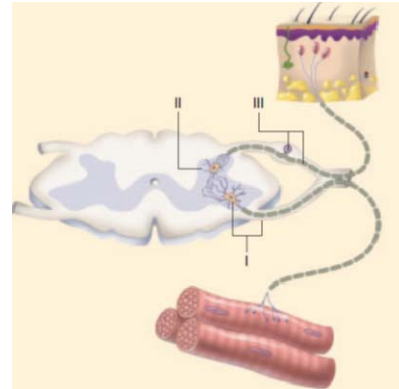


**Figure 5**  
 A reflex arc begins when the touch receptor in the finger senses the tick. Sensory information is relayed from the sensory neuron (purple) to the spinal cord. Interneurons in the spinal cord (green) receive the information from the sensory neuron and relay it to the motor neuron (red). The motor neuron activates the muscle cell (the effector), causing it to contract. The brain also receives sensory information from a sensory neuron, which registers as pain. This step is not part of the reflex arc.

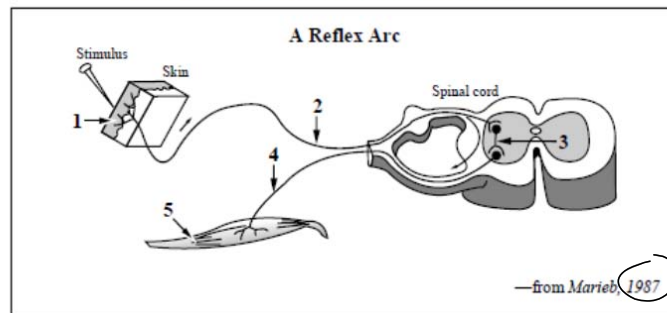
<https://www.edumedia-sciences.com/en/media/571-patellar-reflex>

Topic 1 - Class 1  
Review Sheet

- Name the essential components of a reflex arc and the function of each.
- What would happen if neuron I in the figure was severed?
- Number the following events of the reflex arc in the correct order.  
5 Motor neuron activates the muscle cell to contract.  
3 Sensory information is received by interneurons in the spinal cord.  
4 Sensory information is relayed to the motor neuron.  
2 Sensory information is relayed from the sensory neuron to the spinal cord.  
1 Touch receptor is stimulated.



Use the following diagram to answer the next question.



**Numerical Response**

1. Identify the structure, as numbered above, that performs each of the functions given below.

Structure:	<u>2</u>	<u>1</u>	<u>5</u>	<u>4</u>
Function:	Transmits impulses to the central nervous system	Receives sensory stimulation	Carries out instructions from the central nervous system; is a muscle	Transmits impulses from the central nervous system to the effector

The symptoms of untreated syphilis usually disappear within 12 weeks of the initial infection. However, new symptoms may appear many years later. These include damage to neurons of the central nervous system.  
—from Zabudoff, 1996

- The neurons damaged by syphilis are
- A. interneurons
  - B. sensory neurons
  - C. somatic motor neurons
  - D. autonomic motor neurons

Research has shown that although interneurons in the spinal cord make proteins that inhibit regeneration of damaged axons, peripheral nerve axons can regenerate.

- The structure that allows neurons of peripheral nerves to regenerate is the
- A. axon
  - B. dendrite
  - C. neurilemma
  - D. node of Ranvier



**Numerical Response**

1. Another symptom of MS is an exaggerated pupillary light reflex. Some of the events that occur during this reflex are listed below.

- 1 Motor neuron depolarizes
- 2 Sensory neuron depolarizes
- 3 Interneuron depolarizes
- 4 Light receptors stimulated

The order in which the events listed above occur during a pupillary light reflex is \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

(Record all four digits of your answer in the numerical-response section on the answer sheet.)

