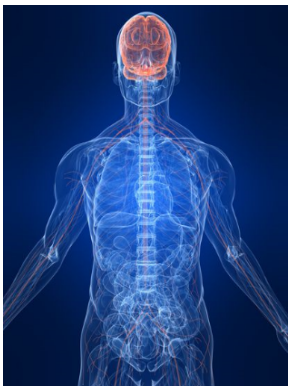
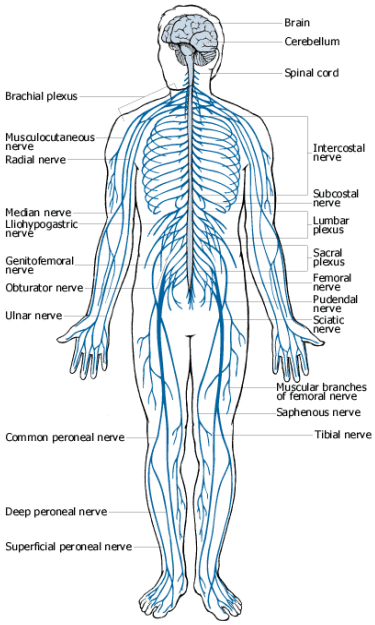
35-2 The Nervous System

- The nervous system *controls* and *coordinates* functions throughout the body, and responds to internal and external **stimuli**.

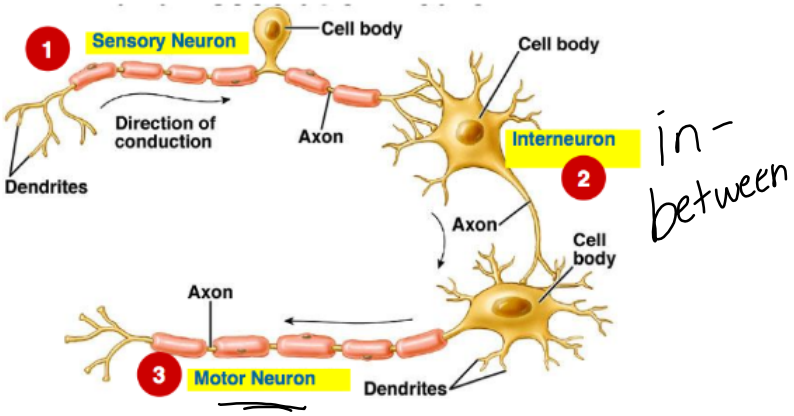




Neurons

Three major types:

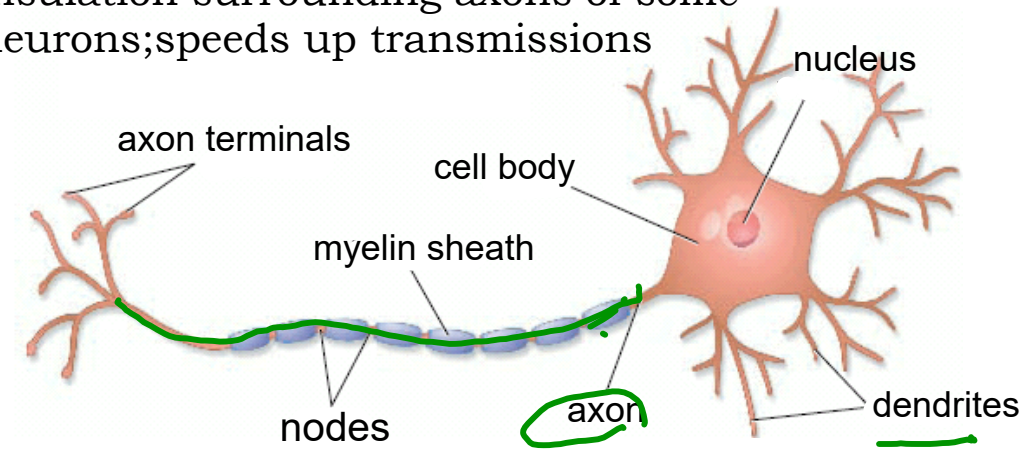
- **Sensory** - respond to light, heat, pressure, chemicals; carry impulses from the sense organs to the spinal cord and brain (receives messages)
- **Motor** - carry impulses from the brain and spinal cord to the muscles and glands (sends messages)
- **Interneurons** - connect sensory and motor neurons and carry messages between them



Dendrites: short, branched extensions that carry impulses to the cell (closer to nucleus) (receivers)

Axon: long, slender projections that carry impulses away from the cell body (sends signal) tail

Myelin Sheath: lipid/protein layer of insulation surrounding axons of some neurons;speeds up transmissions



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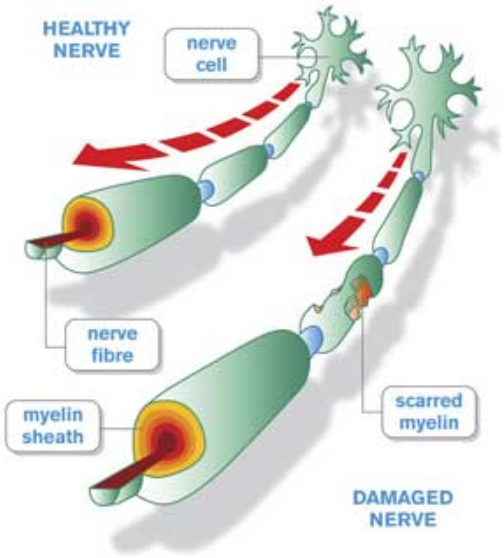
- The myelin sheath is not well developed at birth, and babies' movements are jerky and uncoordinated.

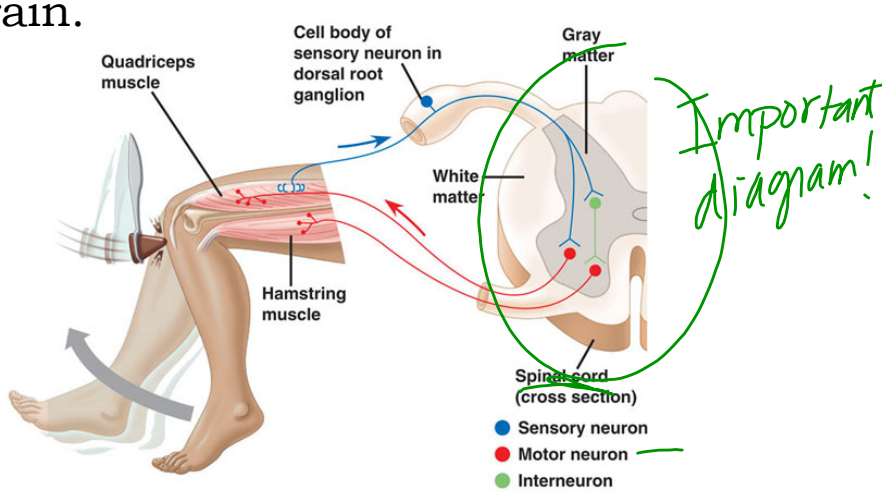
- Myelin sheath may be damaged or destroyed by inflammation, drug and alcohol use, or immune disorders such as **Multiple Sclerosis** (MS).



Reflex Arc

- A **reflex** is a rapid, involuntary response to a stimulus.

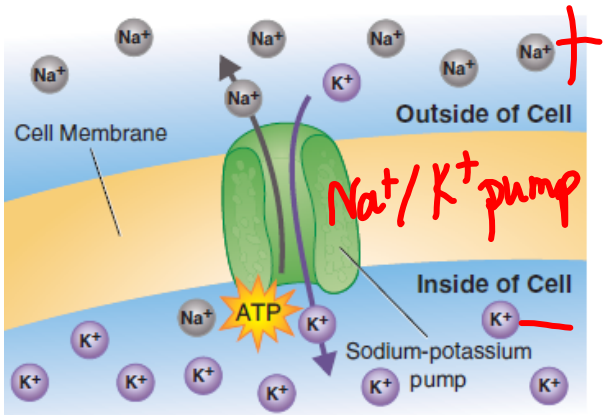
- They occur more quickly than most responses because they occur over a **reflex arc**, a pathway that bypasses the brain.



The Nerve Impulse

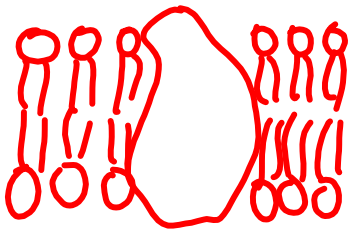
- **Resting Neuron**: positive outside cell
  (charged, ready to fire) negative inside cell

Recall - selectively permeable membrane



- K+ leaks through the membrane easily.

- Na^+ is actively pumped out of the cell, K^+ is pumped in.



- The difference in charges is known as the **resting potential**.

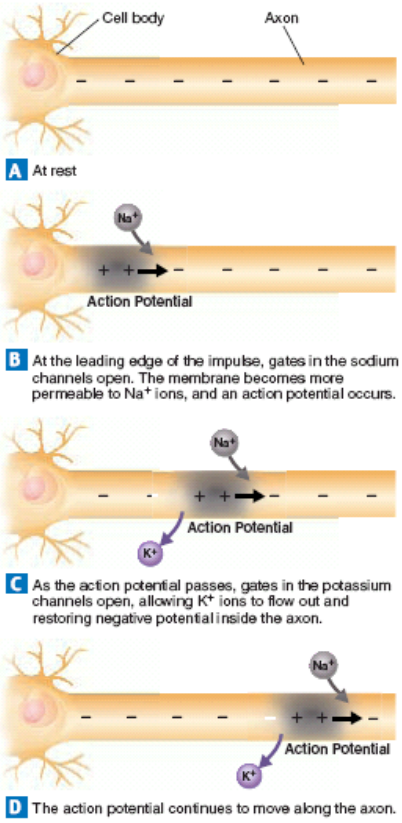
- When an impulse is received, ions move across the cell membrane.

- Protein pumps allow in more Na^+ ions (temporarily more ~~positive~~ inside the cell).

- This is the **action potential**.

→ nerve impulse

- At the end of the impulse, K^+ pumps allow these ions out, restoring the resting potential of the cell.



All-or-None!

- The strength of an impulse is always the same; the nerve cell fires, or it does not (**all-or-none principle**).
- The minimum level required to activate a neuron is the **threshold.**

Nerve Impulse Animation

https://www.youtube.com/watch?v=dSkxlpNs3tU

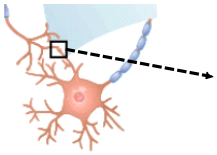
Active Art Animation (PH School)

http://www.phschool.com/webcodes10/index.cfm?wcprefix=cbp&wcsuffix=0352&area=view

The Synapse

- The gap between cells across which the impulse must travel is known as the **synapse**.

- **Neurotransmitters** are used to send packets of chemicals across the synapse to initiate the impulse in the next cell.



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