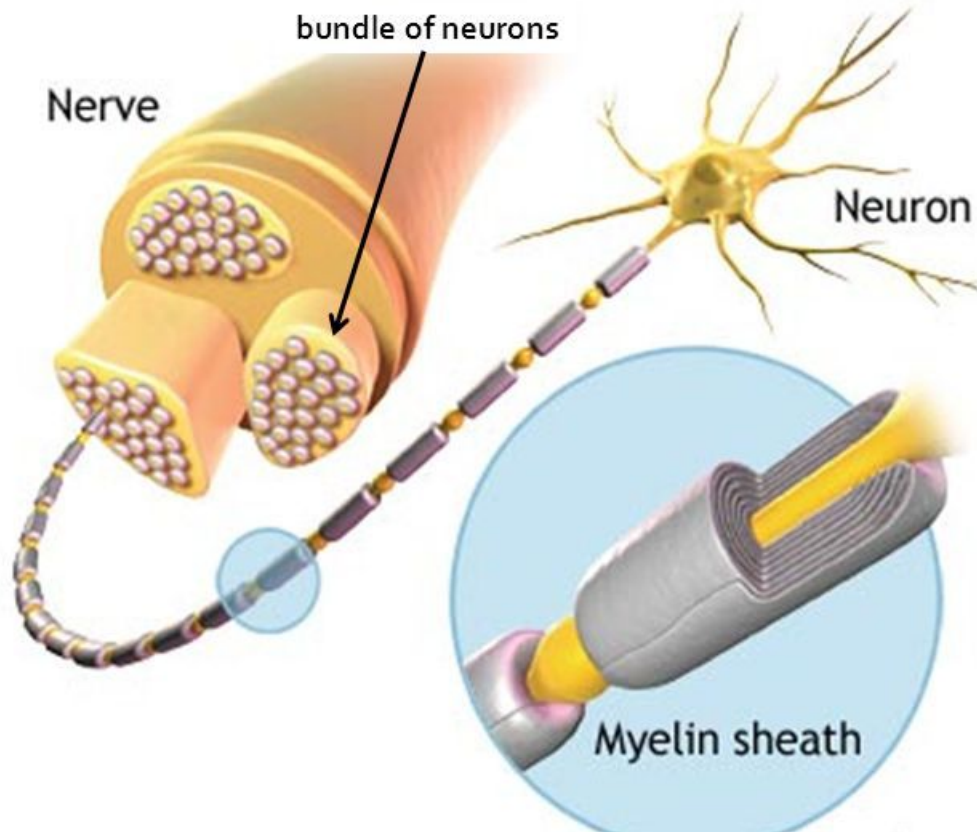


Neuron Functions

- The function of the nervous system is to **gather information** from stimuli, **integrate** this information, and **produce a response**.
- The nervous system depends on neurons to communicate information from sensory receptors to the CNS and back to an effector (a muscle or gland).

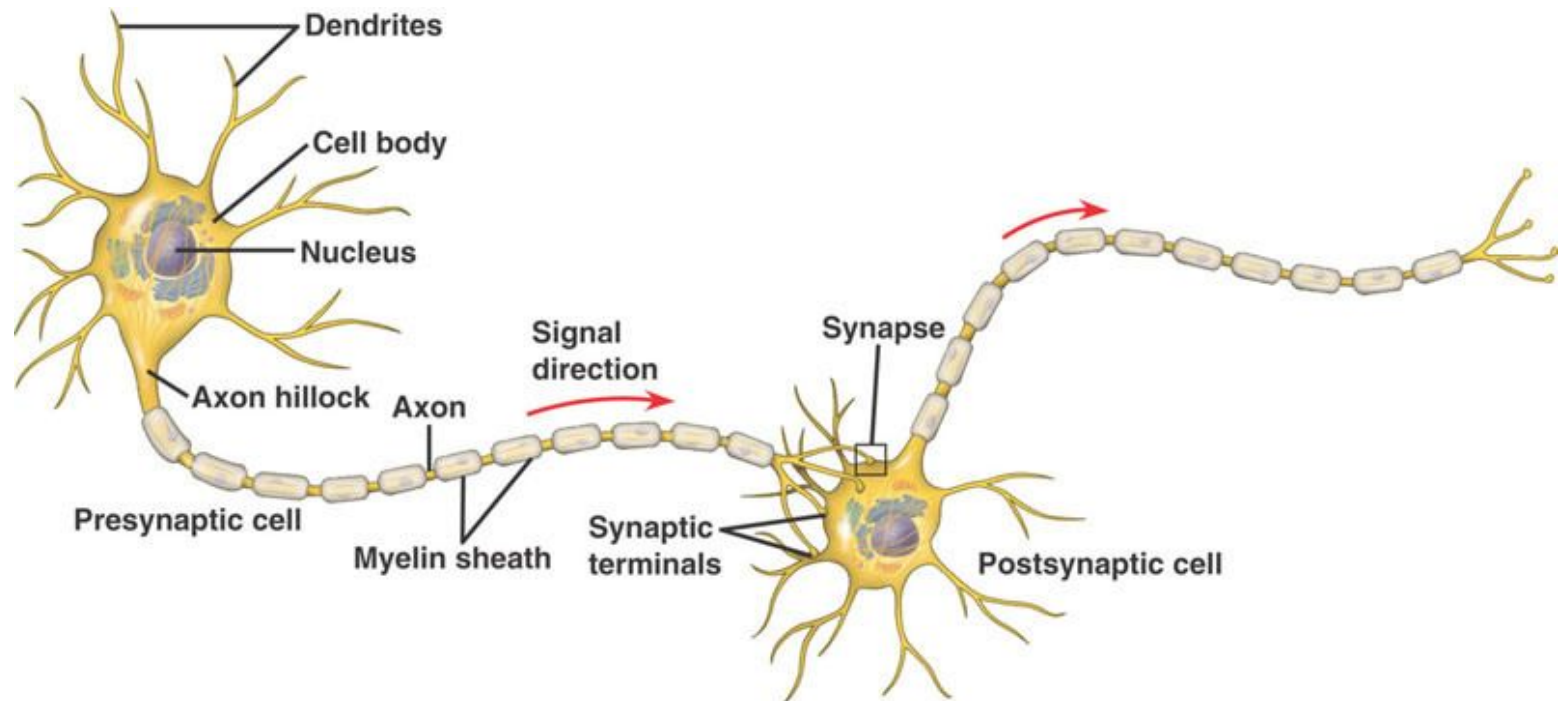
Neuron Functions

- Nerves are made up of **many neurons bundled together.**



Membrane Potential

- How does a signal from a sensory receptor pass from neuron to neuron and travel to the CNS?
- Neurons communicate with one another through **electrical signals along their axons.**



Membrane Potential

- An electrical signal is created due to a **difference in electrical charges (positive and negative) between the inside of the neuron and the surrounding extracellular fluid.**
- The inside and outside of the neuron is separated by the plasma membrane.
 - Ions **cannot move freely** in and out of the plasma membrane

Membrane Potential

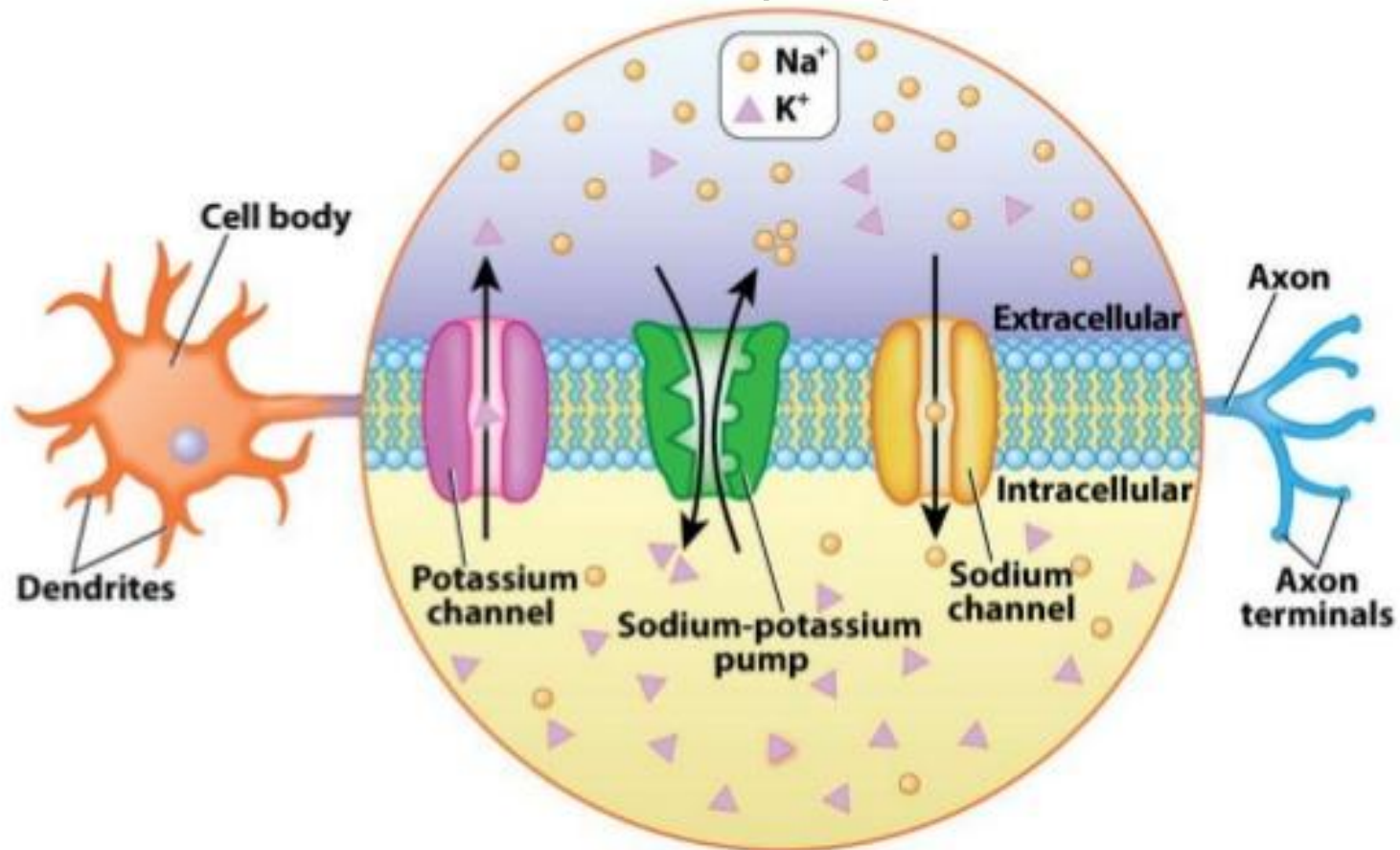
- The difference in electrical charge develops due to the **grouping of ions on the inside and outside of the membrane.**
 - The two ions that are important in an action potential are **sodium (Na⁺) and potassium (K⁺)**
- The difference in electrical charge between the inside and outside of the neuron is called the **membrane potential.**
 - It is measured in **millivolts (mV)**

Resting Membrane Potential

- When a neuron is at rest, there are:
 - More sodium ions outside the cell
 - More potassium ions inside the cell
- **At rest, the inside of the neuron is more negative than the outside**
- **The resting membrane potential of a neuron is -70 mV**
- **The membrane potential represents stored electrical energy that can be used to do work**

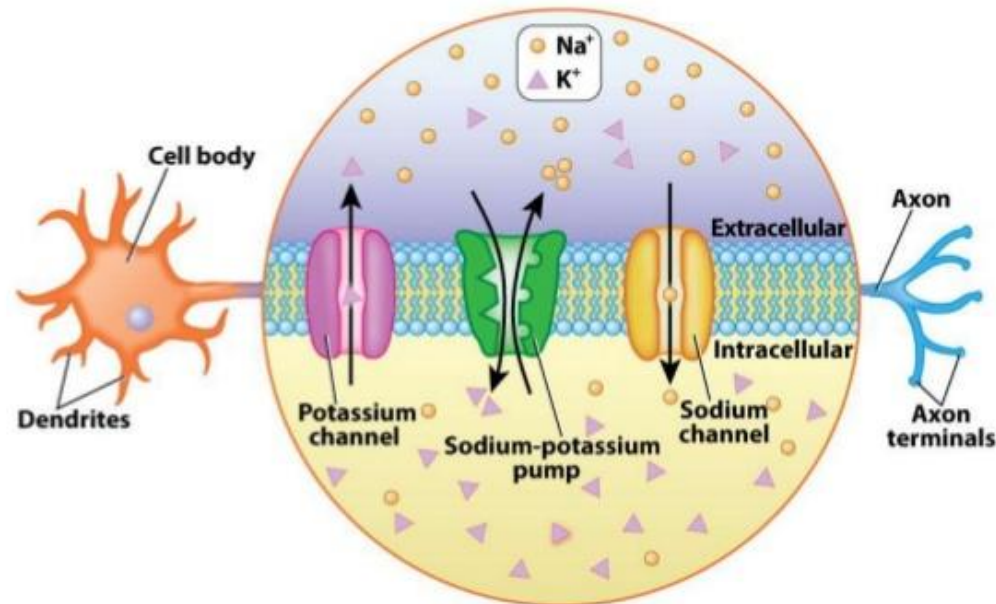
Ion Channels and Pumps

- The axon of a neuron has **ion channels and pumps** that act as doors through which **ions enter and exit the cell**
- There are **2 ion channels and 1 pump**



Ion Channels and Pumps

- The channels and pumps allow only **SPECIFIC** ions to flow or be pumped through them.
 - The sodium channel allows sodium ions
 - The potassium channel allows potassium ions
 - The sodium-potassium pump **moves sodium ions OUT** of the axon and moves **potassium ions INTO** the axon



Ion Channels and Pumps

- The channels are **voltage-gated**
 - This means that **the channel will only open at a certain voltage**
- The **sodium channels open** when the membrane potential is at **-55 mV**
- The **potassium channels open** when the membrane potential is at **+40 mV**
- The **sodium-potassium pump requires ATP to operate**

Action Potential

- When a neuron receives a stimulus, positive charged ions flow into the cell body
 - This causes the membrane potential to **depolarize**
 - Depolarize = **inside of cell becomes less negative**
- If the membrane potential reaches **-55 mV**, the **sodium channels will open**
- This potential (-55 mV) is the **threshold that initiates the action potential**
- The action potential is an **all-or-none response**