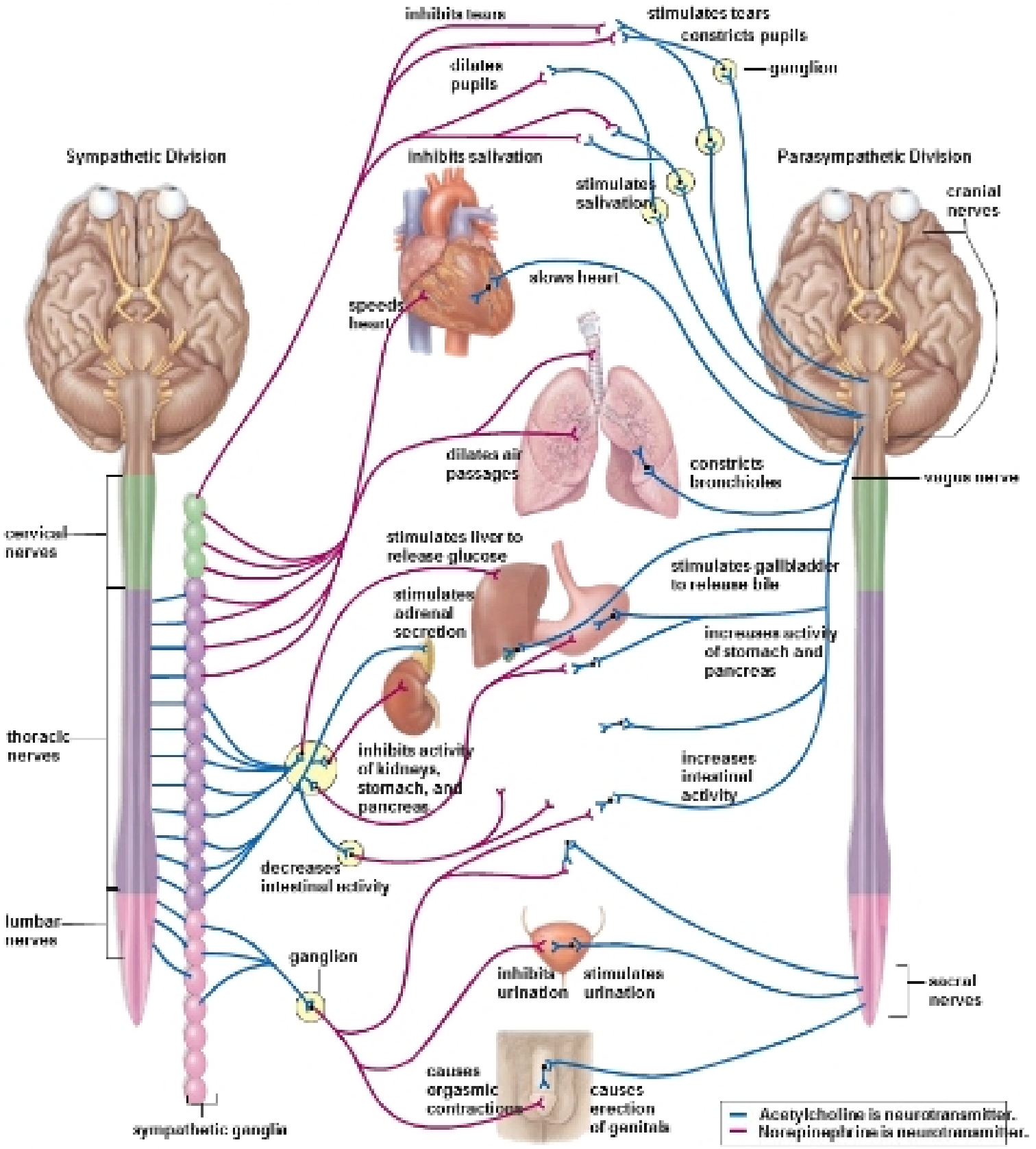
- Autonomic division: (automatic, not in our control)
  - Regulates the activity of involuntary muscles (cardiac and smooth) and glands.



1. Sympathetic division:

Coordinates the body for the "fight or flight" response by speeding up metabolism, heart rate, and breathing while slowing down and regulating other functions.

2. Parasympathetic division:

Counters the sympathetic system by bringing up a relaxed state by slowing down metabolism, heart rate, and breathing, and returning other functions to normal.

2 cell types in the Peripheral Nervous System

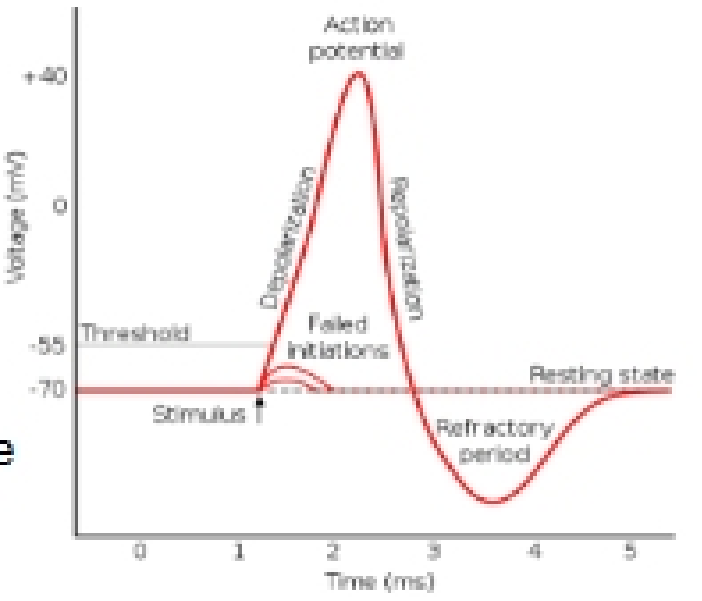
- Neurons: (we have different types of neurons to make it easier for us to distinguish emotions/sensations)
  - 3 types of neurons
    - Sensory – takes impulses from sensory receptor to CNS
    - Interneuron – receives information in the CNS and sends it to a motor neuron
    - Motor – takes impulses from the CNS to an effector (i.e., gland or muscle fiber)
  - Neuron structure

- Cell body – main cell where nucleus and most organelles reside
- Dendrites – many short extensions that carry impulses to a cell body
- Axon (nerve fiber) – single, long extension that carries impulses away from the cell body.
  - The Myelin Sheath:
    - A lipid covering on long axons that acts to increase the speed of nerve impulse conduction, insulation, and regeneration in the PNS
    - Schwann cells – neuroglia that make up the myelin sheath in the PNS
    - Nodes of Ranvier – gaps between myelination on the axons
    - Salutatory conduction – conduction of the nerve impulse from node to node.

- Neuroglia (supports and protects the neurons) (Schwann cells)

Nerve impulses: Resting potential and Action Potential (RP)

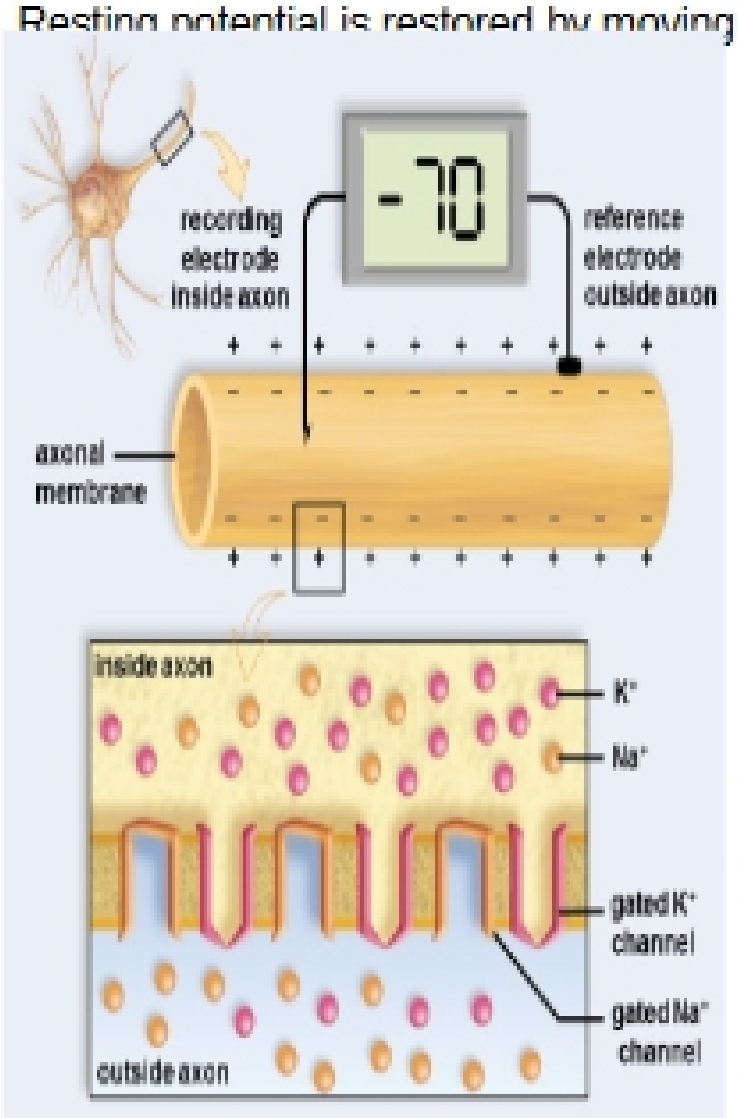
- Resting potential – when the axon is not conducting a nerve impulse
  - More positive ions outside than inside the membrane
  - -70 mV inside the axon – Resting Membrane Potential.
  - More Na+ outside than inside & more K+ inside than outside – maintained by Na+/K+ pump, which pumps 3 Na+ out and 2 K+ into the cell, making the resting membrane potential in the neuron negative.



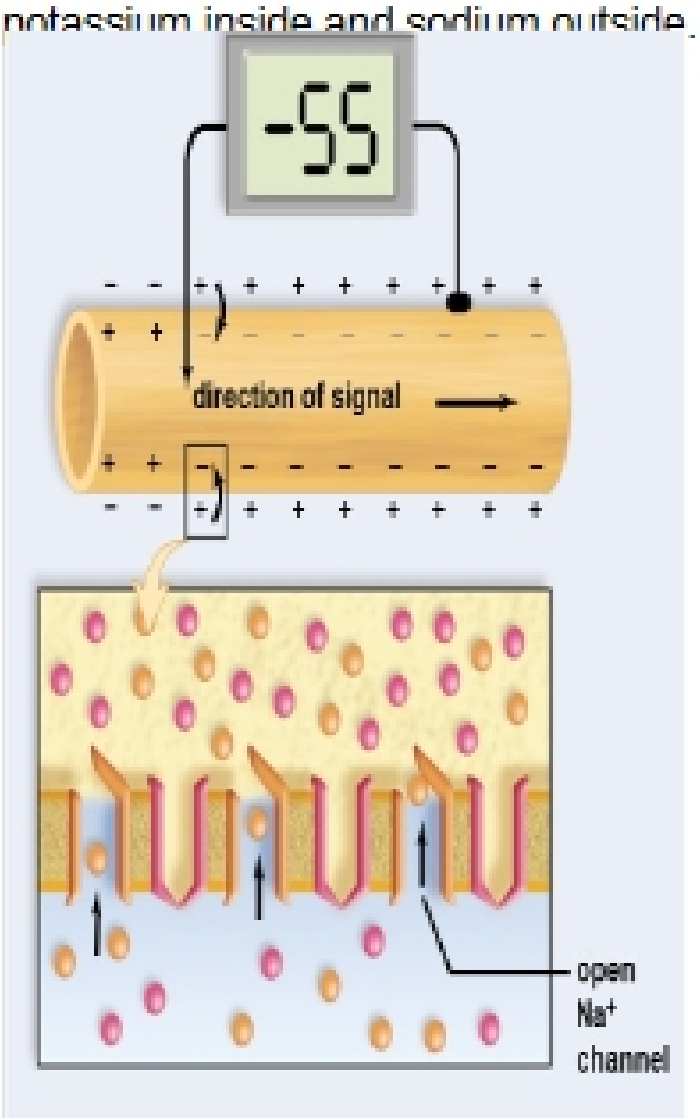
- Action potential – rapid change in the axon membrane that allows a nerve impulse to occur
  - Sodium gates open, letting Na+ in.
    - Depolarization occurs. (More + ions inside than outside)
    - Interior of axon loses negative charge (-55 mV, then +35 mV).
  - Potassium gates open, letting K+ out.
    - Repolarization occurs (More – ions inside than outside)
    - Interior of axon regains negative charge (-70 mV).
    - Wave of depolarization/repolarization travels down the axon.

Na+ = Sodium (+)
K+ = Potassium (-)

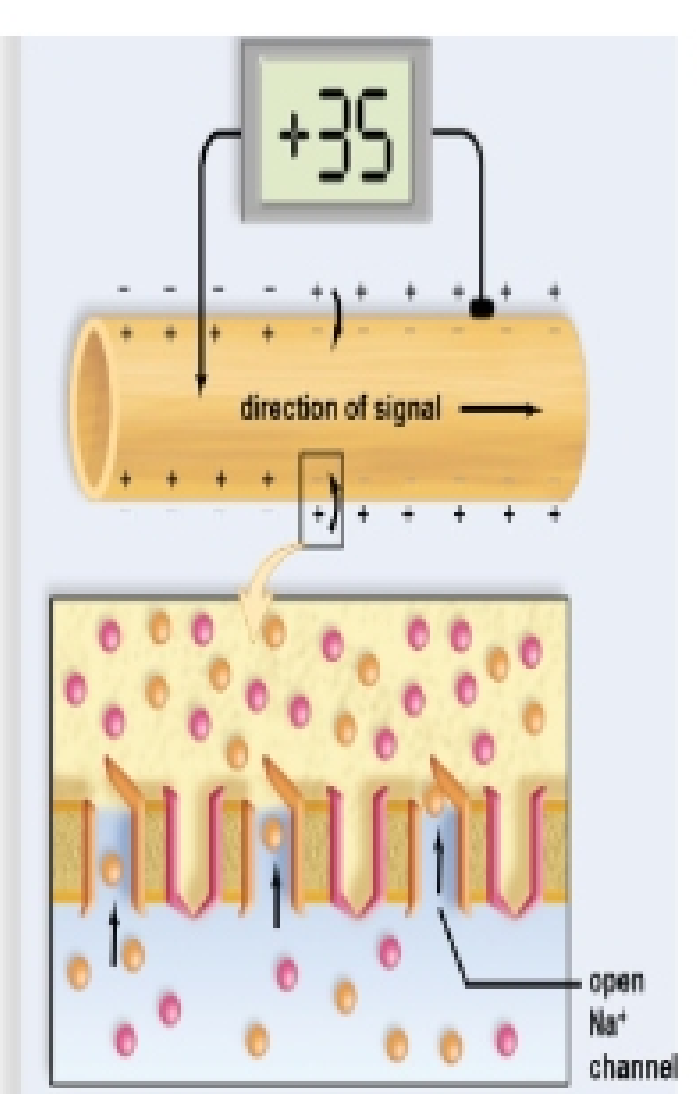
Resting potential is restored by moving potassium inside and sodium outside.



a. Resting potential: Na+ outside the axon, K+ and large anions inside the axon. Separation of charges polarizes the cell and causes the resting potential.



b. Stimulus causes the axon to reach its threshold; the axon potential increases from -70 to -55. The action potential has begun.



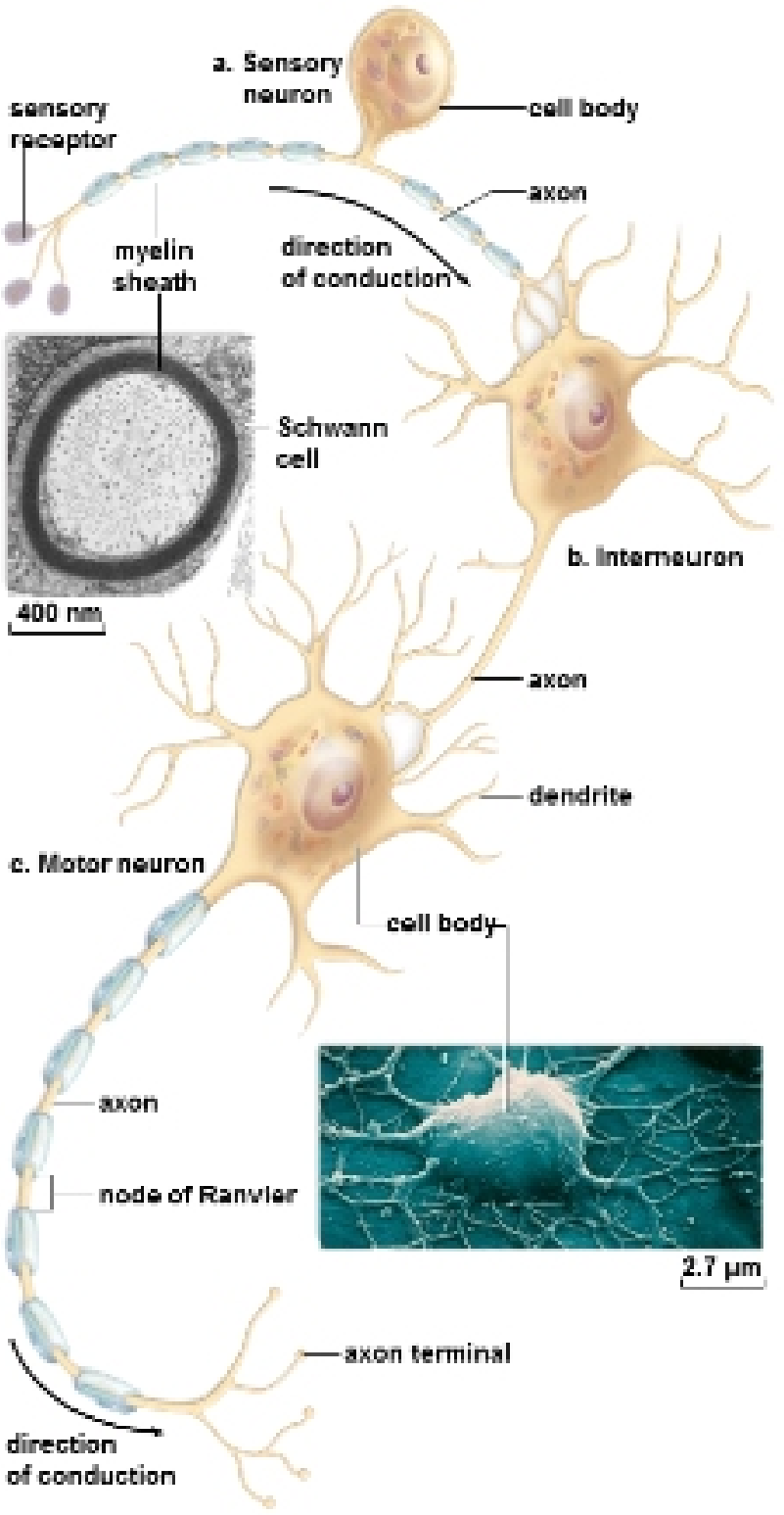
c. Depolarization continues as Na+ gates open and Na+ moves inside the axon.

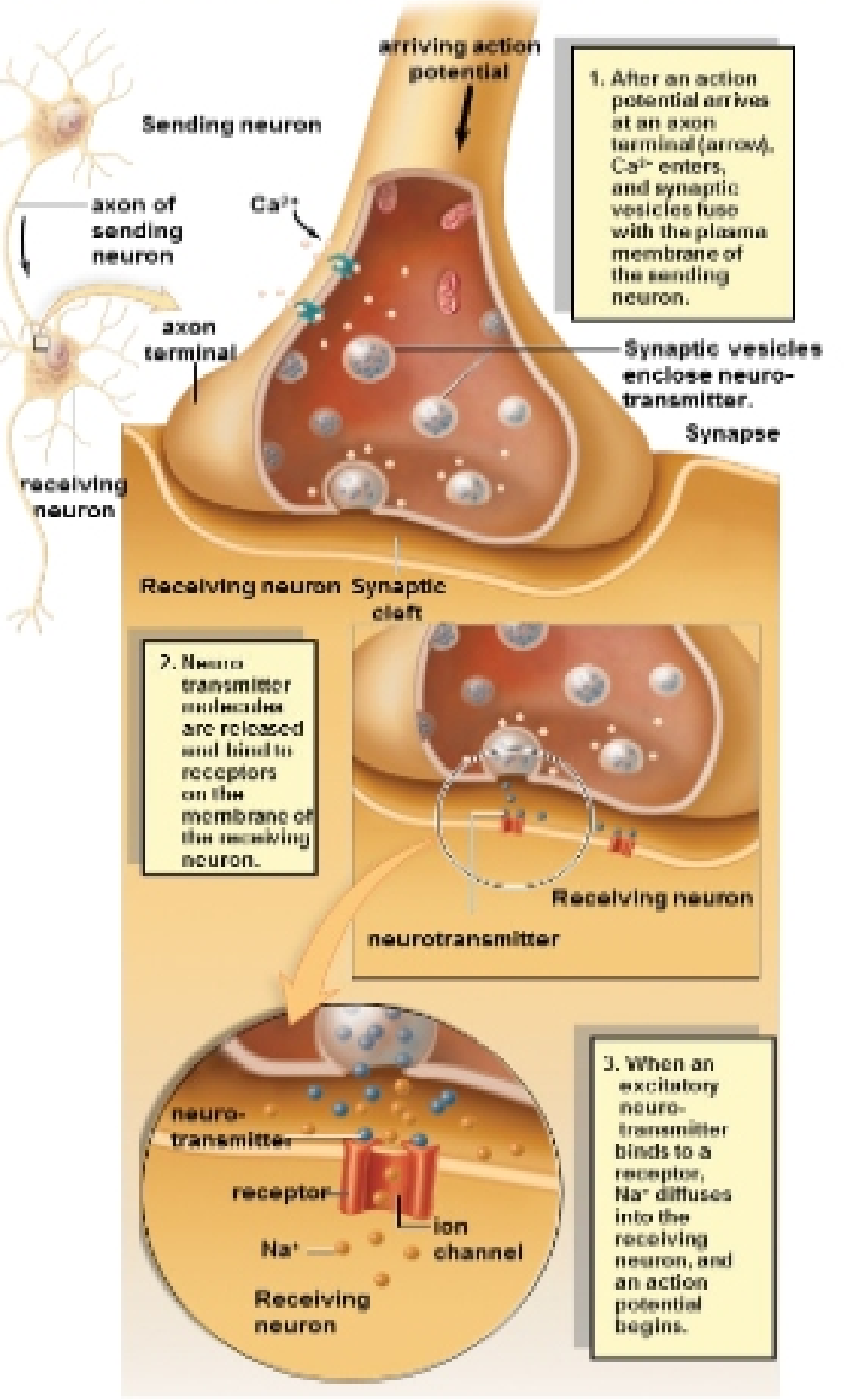
The synapse

- Small gap between the sending neuron (presynaptic membrane) and the receiving neuron (postsynaptic membrane).
- Transmission is accomplished across this gap by a neurotransmitter (e.g., Acetylcholine, dopamine, serotonin).
- Neurotransmitters are stored in synaptic vesicles in the axon terminals.

How does transmission across the synapse occur?

- Nerve impulse reaches the axon terminal.
- Calcium ions enter the axon terminal and stimulate the synaptic vesicles to fuse with the presynaptic membrane.
- Neurotransmitters are released and diffuse across the synapse, where they bind with the postsynaptic membrane to inhibit or excite the neuron.





Drug abuse:

- Both legal pharmaceuticals and illegal drugs of abuse have certain basic modes of action.

They:

- Promote the action of a neurotransmitter.
- Interfere with or decrease the action of a neurotransmitter.
- Replace or mimic a neurotransmitter or neuromodulator.