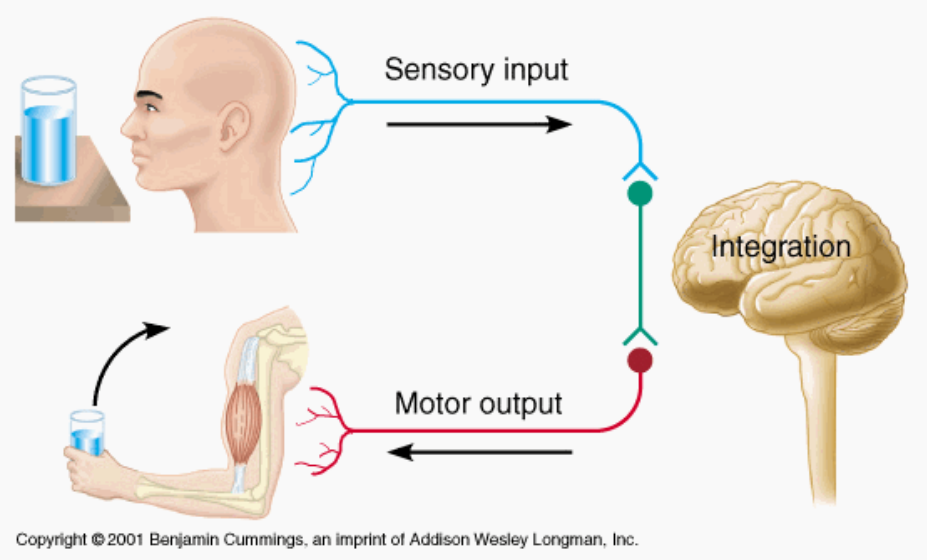
## Interesting Facts about the Neuron

- Longevity – can live and function for a lifetime
- Do not divide – fetal neurons lose their ability to undergo mitosis; neural stem cells are an exception
- High metabolic rate – require abundant oxygen and glucose

The nerve fibers of newborns are unmyelinated - this causes their responses to stimuli to be coarse and sometimes involve the whole body. Try surprising a baby!

https://www.youtube.com/watch?v=5ngaInWQ6lY



**Big Idea:** Sensory receptors signal neurons with ions creating changes in charge within the neuron. These changes produce an electrical impulse in neurons and they can signal effector cells to respond

chemistry.

+ −

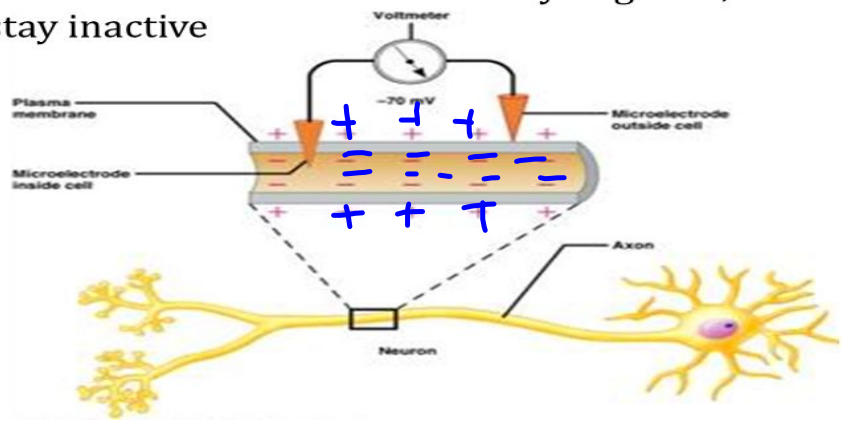
**BOOM HOMEOSTASIS!**

$Na^+$, $K^+$

$I^-$

# Step 1: Resting Potential

- Resting neurons have a **polarized** membrane
  - Fewer positive ions inside the plasma membrane then in the surrounding tissue fluid
  - Major internal ion is $K^+$, major external ion is $Na^+$
  - As long as internal environment is relatively negative, neuron will stay inactive



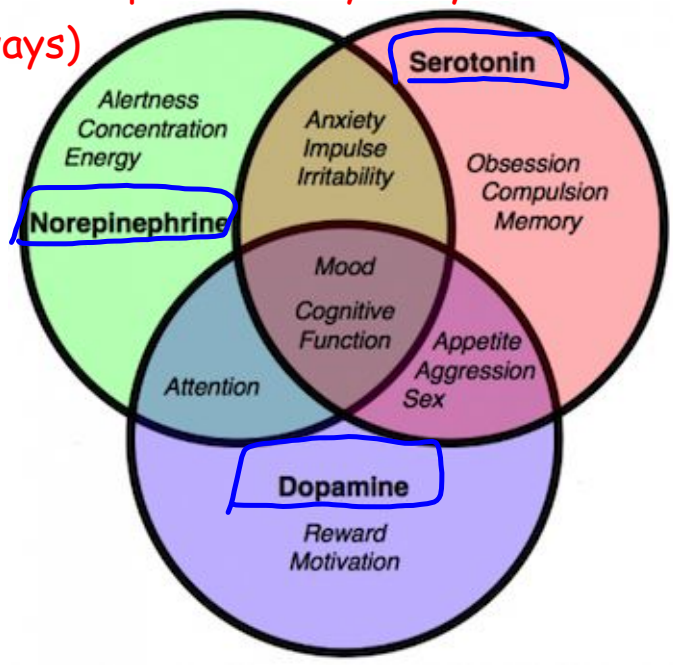
## Step 2: Stimulus is received

**Examples:**

Light receptors in eye

pain receptors in integument

NEUROTRANSMITTERS (chemicals produced by body to stimulate neurons in specific ways)



## Step 3: Sodium Channels Open

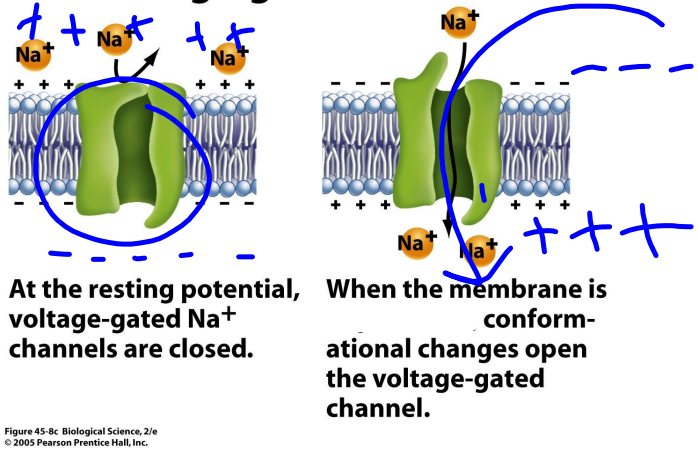



Figure 45-8c Biological Science, 2/e
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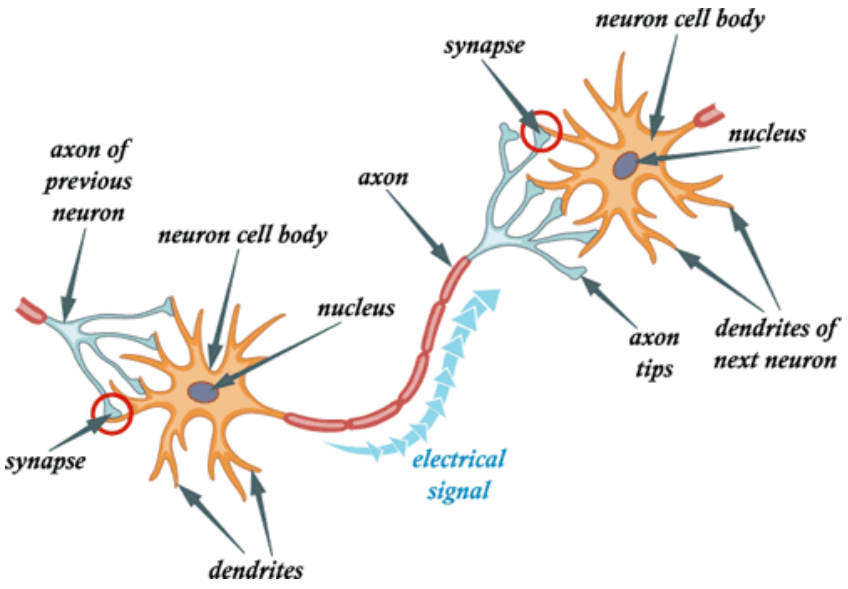
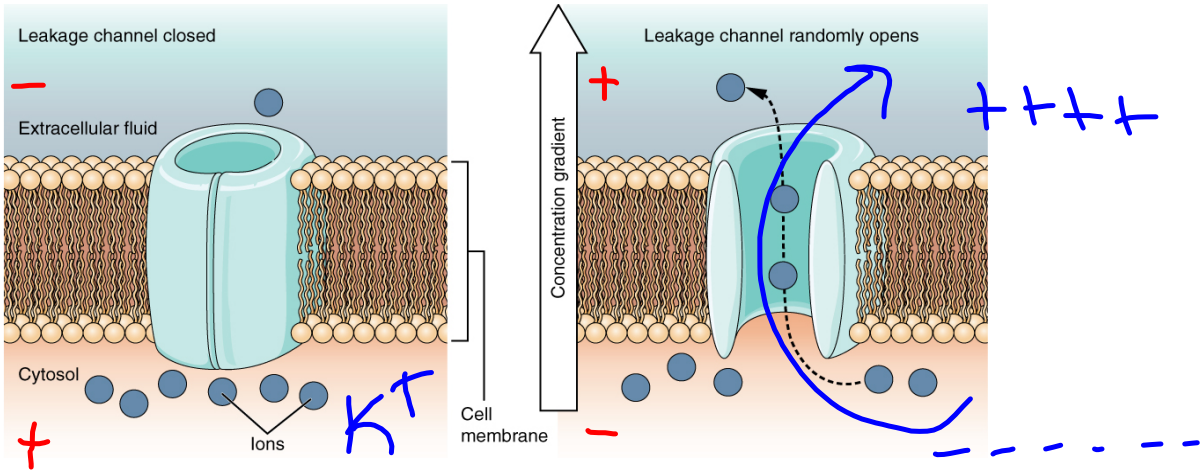
## Step 4: Sodium ions (+) diffuse inward depolarizing the membrane

Step 5: The difference in charge in and outside the cell creates an ACTION POTENTIAL (a nerve impulse) allowing the neuron to comunicate with other cells via electrical current

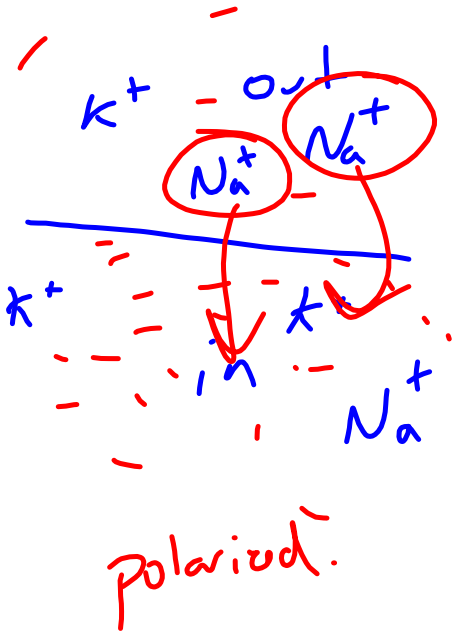



weak electrical signal

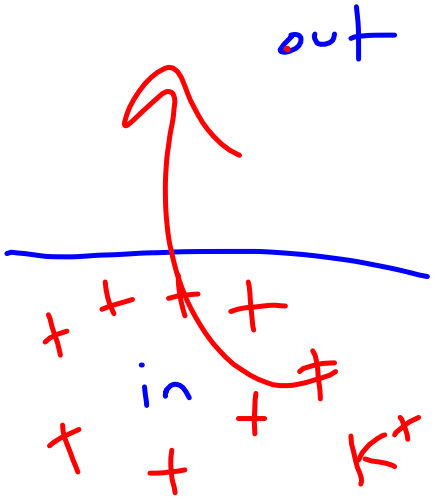
## Step 6: Potassium Channels Open




## Step 7: Potassium ions (+) diffuse outward, repolarizing the membrane




polarized.



# Nerve Impulse Propagation

- The impulse continues to move toward the cell body
- Impulses travel faster when fibers have a myelin sheath

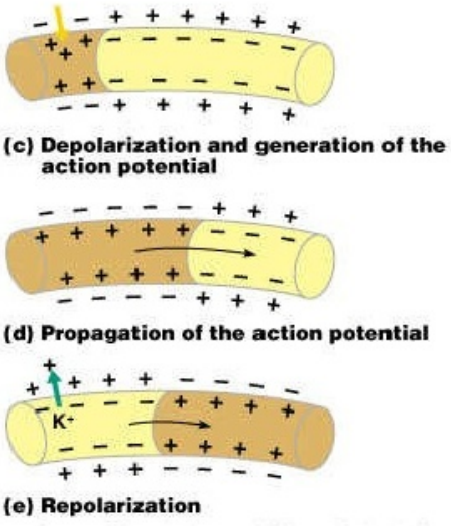



Figure 7.9c–e



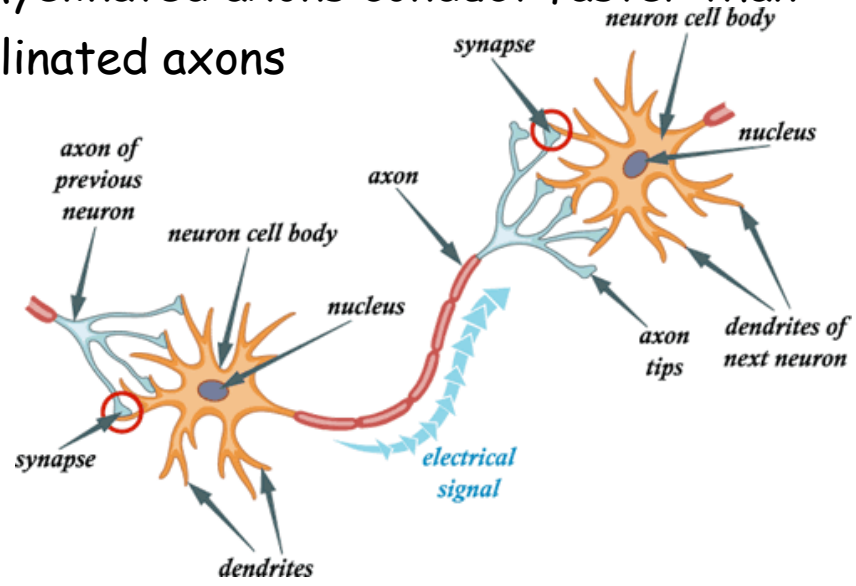
*Slide 7.20*

# Nerve Impulse

Speed of impulse proportionate to diameter of axon

-> Greater diameter = faster speed

-> Myelinated axons conduct faster than unmyelinated axons



# The Reflex Arc

- Reflex – rapid, predictable, and involuntary responses to stimuli
- Reflex arc – direct route from a sensory neuron, to an interneuron, to an effector

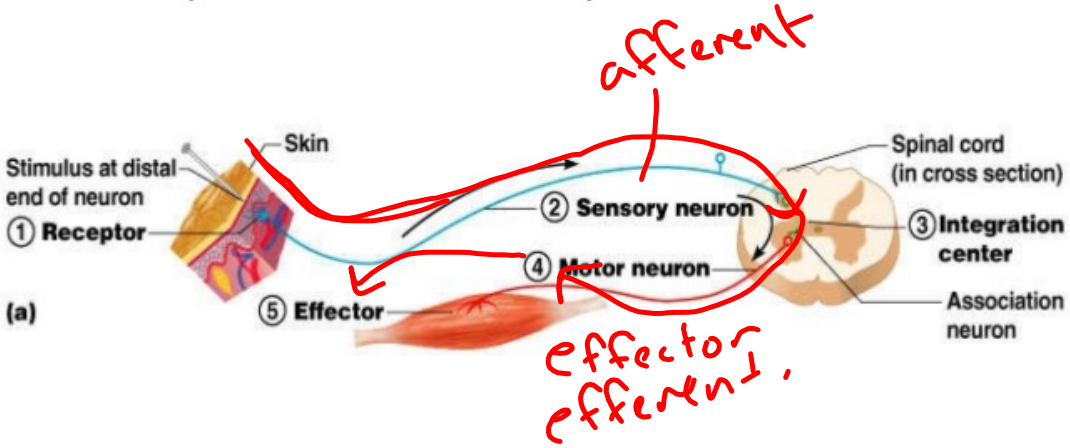



Figure 7.11a