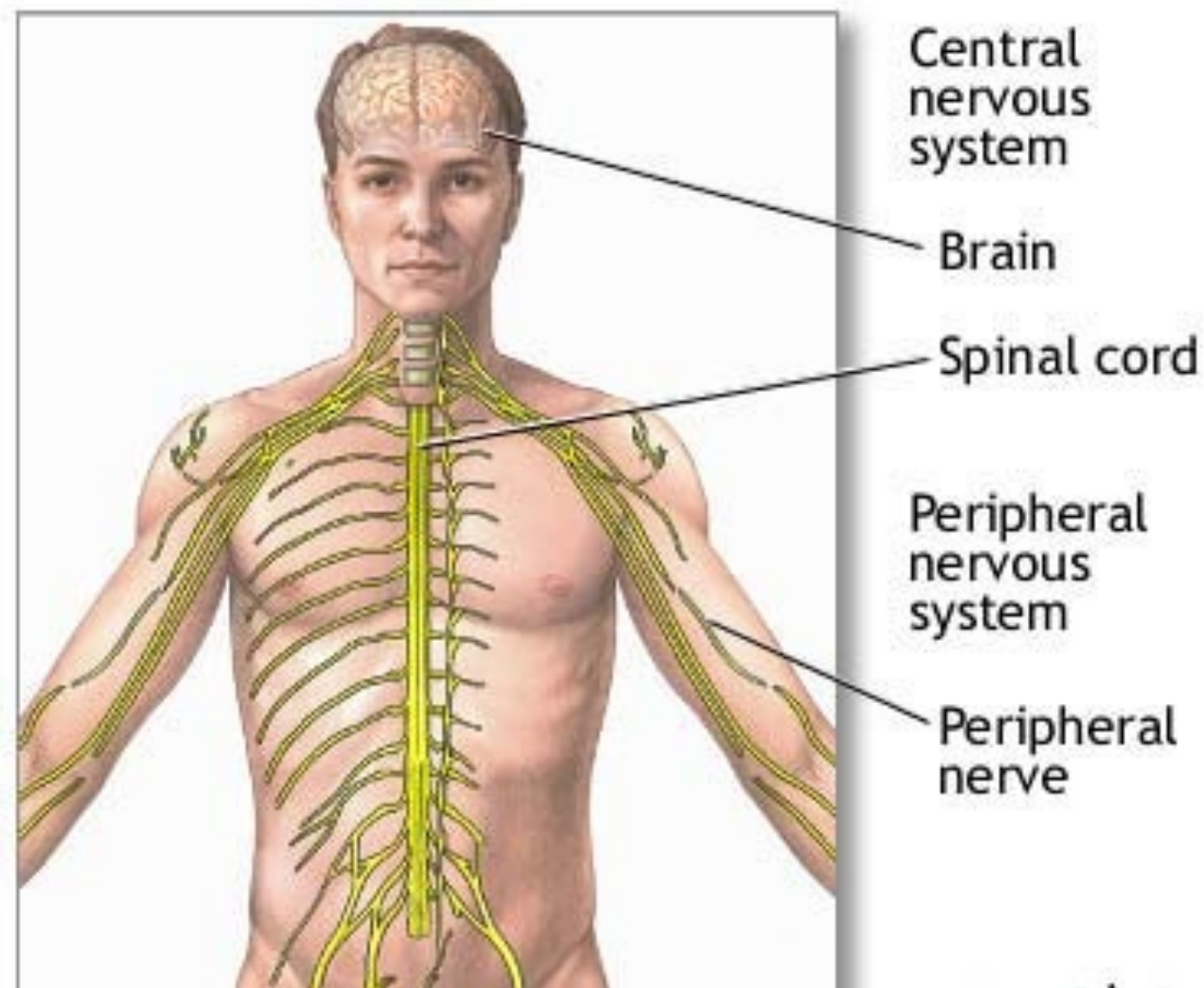
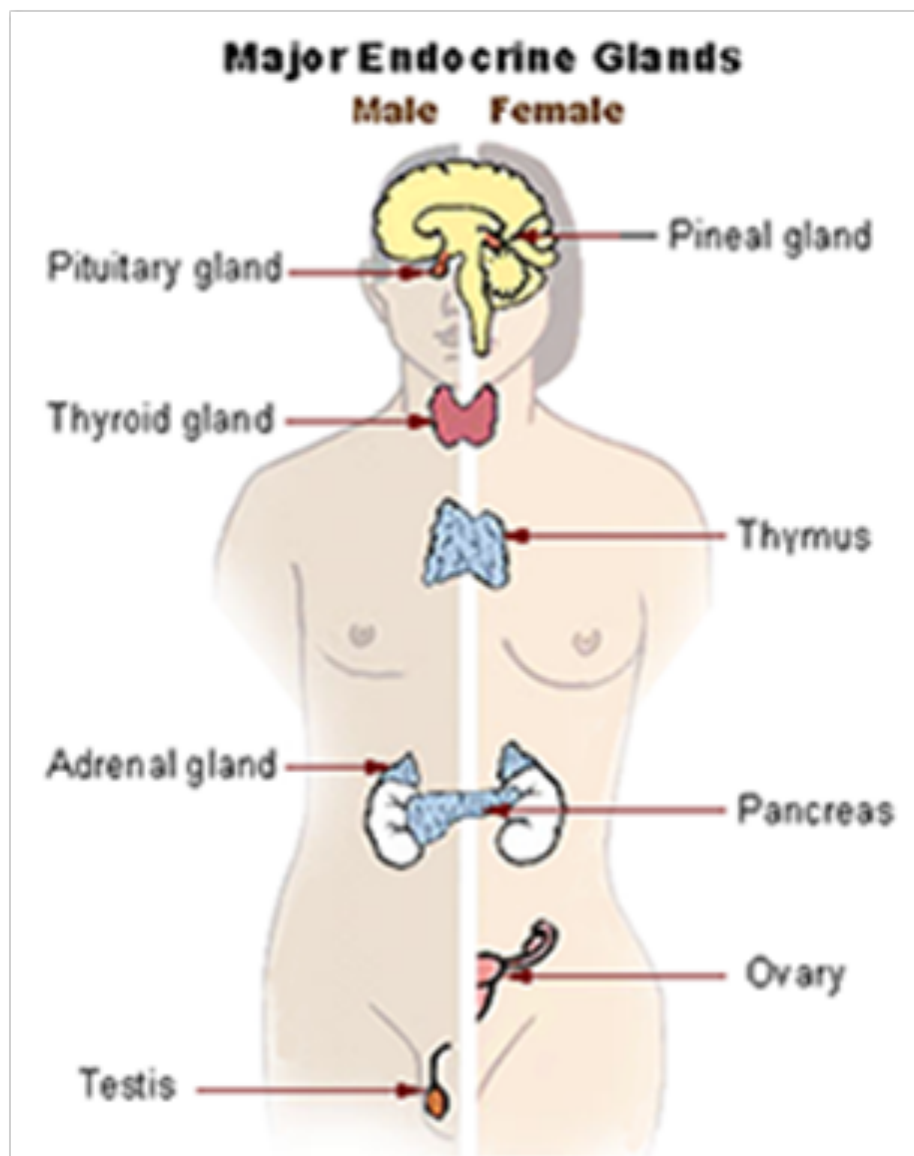


HOMEOSTASIS



What is Homeostasis?

- process by which a constant internal environment is maintained despite changes in external environment
- performed by the endocrine and nervous systems



Dynamic Equilibrium

- State of balance within fluctuating limits that is achieved as a result of internal control mechanisms

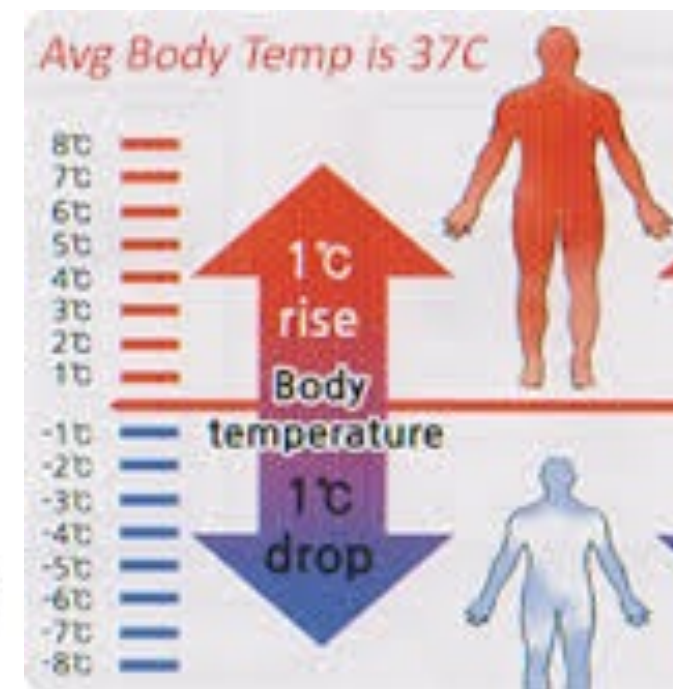
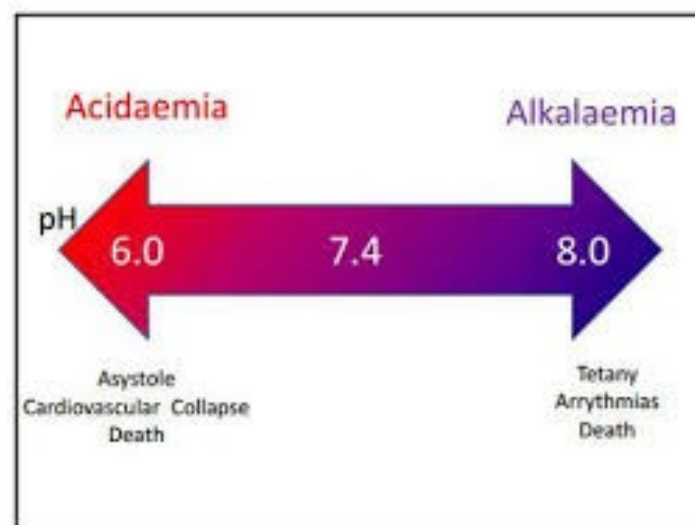
eg. Healthy people maintain:

blood glucose conc. at 100 mg/ml

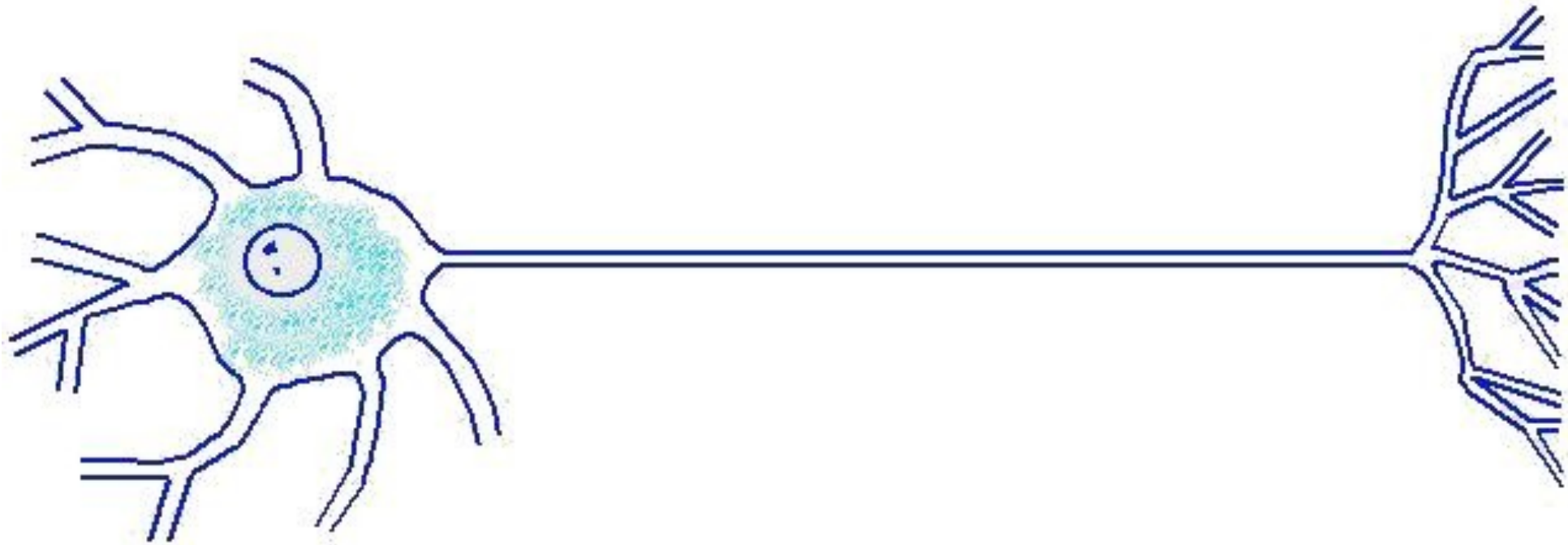
blood pH near 7.4

blood pressure at 120/80 mm Hg

body temperature of 37°C



Neurons ...Connecting systems



neuron - is the functional unit of the nervous system
3 classes of neurons:

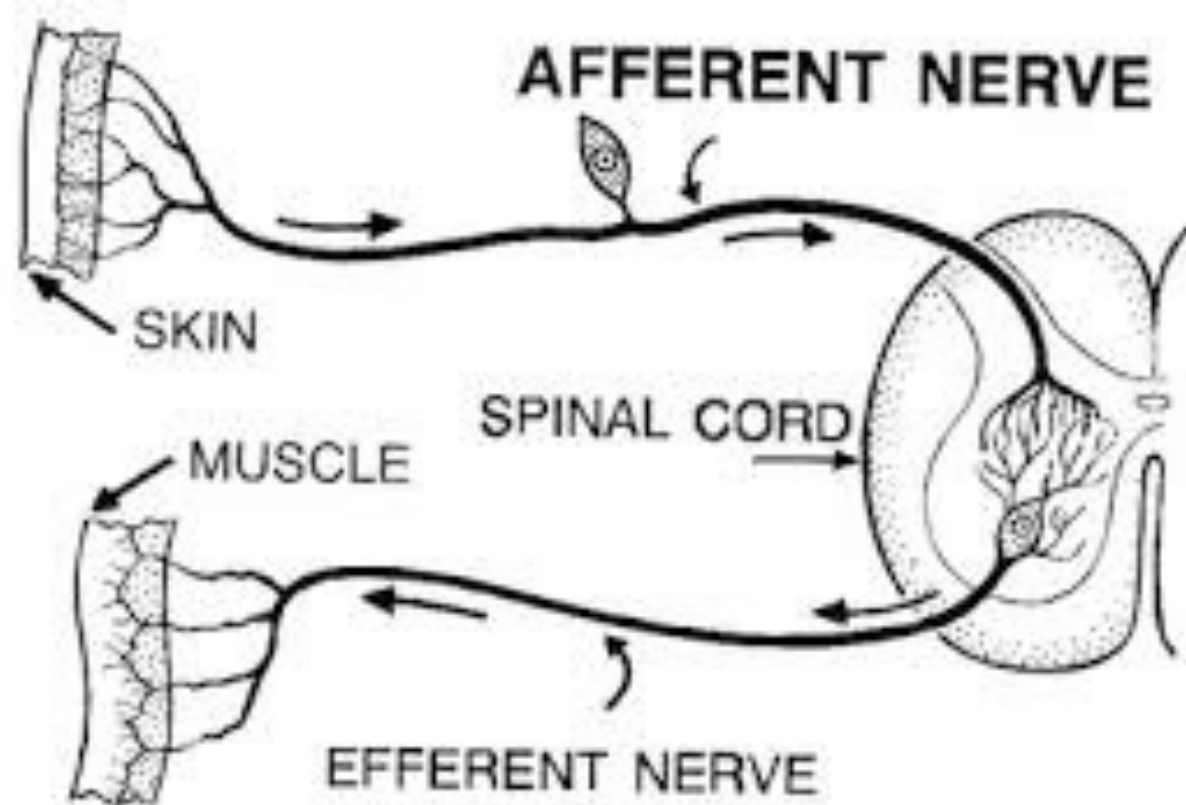
3 classes of neurons:

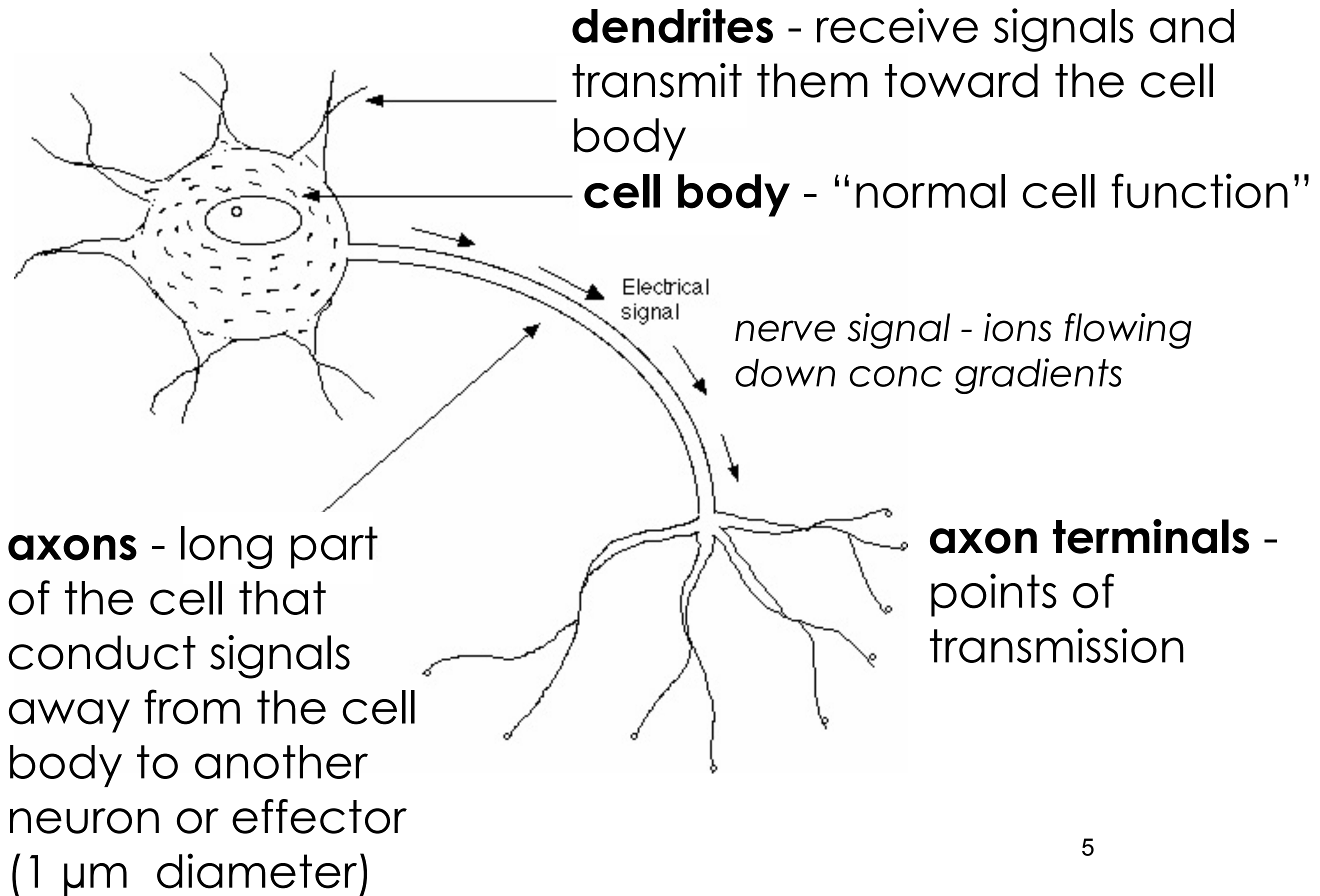
afferent neurons (*aka sensory neurons*) - transmit stimuli from receptors to interneurons

interneurons - integrate information (*found in brain & spinal cord*)

efferent neurons - carry response signal from interneurons to effectors (*muscles, glands, organs*)

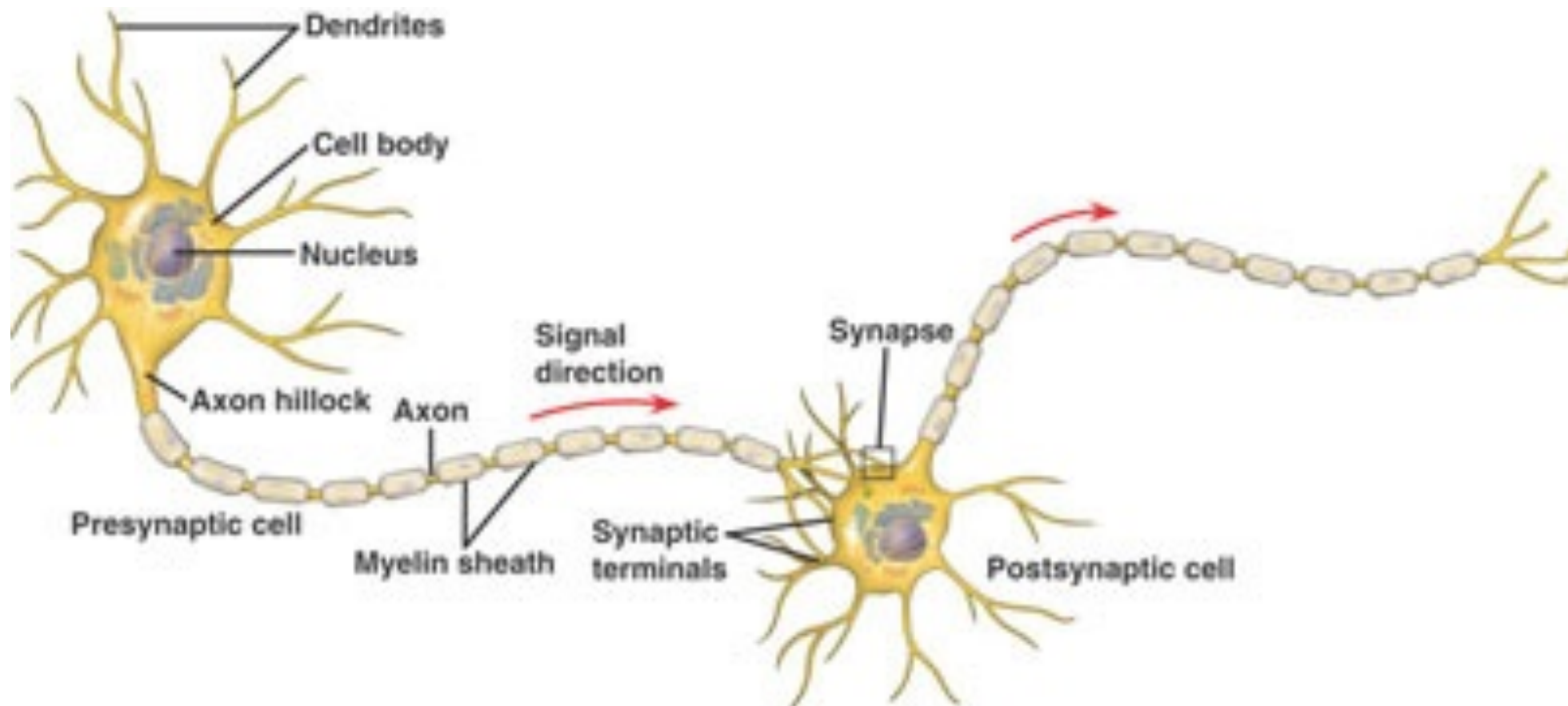
- *motor neurons are efferent neurons that send signals to skeletal muscles*





nerve - bundle of neurons

- neurons connect to each other - axon terminals connect to another cell's dendrites



Accessory Cells

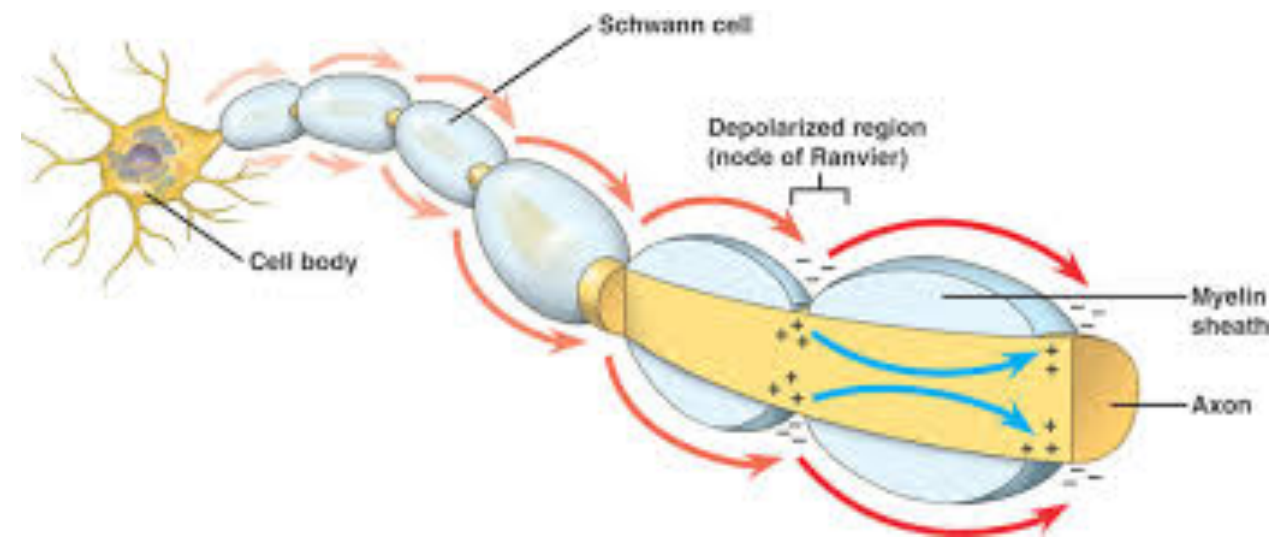
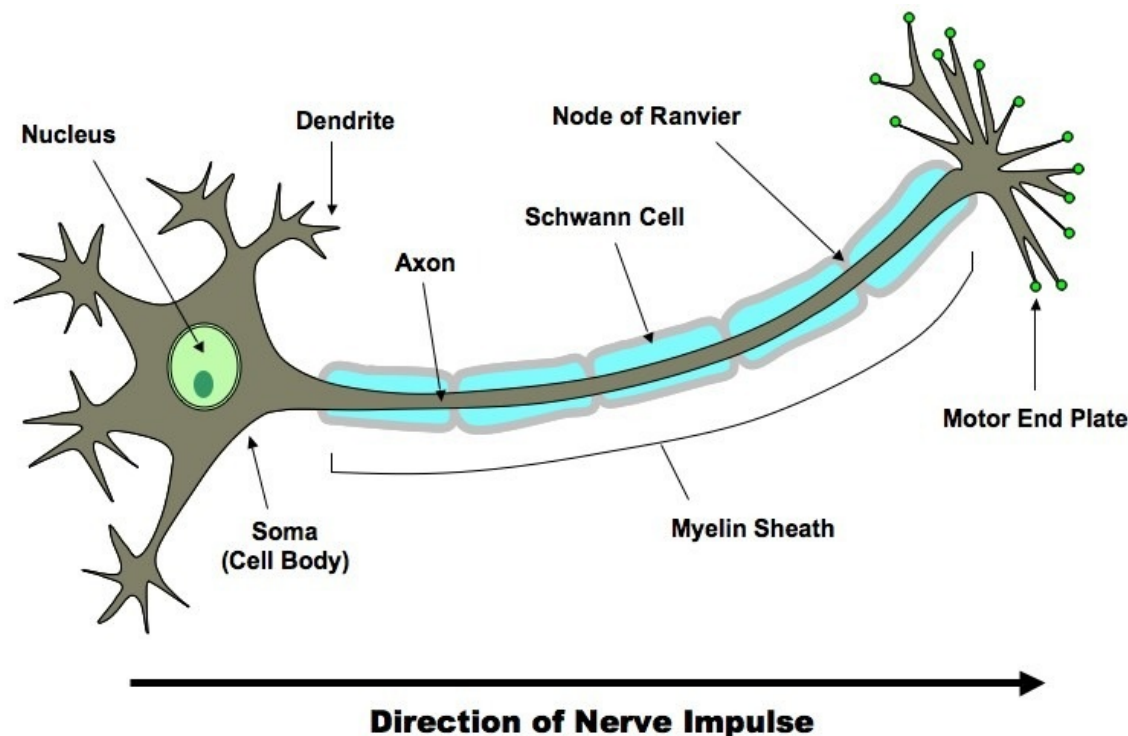
Glial cells - provide nutrition & support to neurons

- **Schwann cells** - tightly wrapped layers (up to 20) of myelin *around axons*

-electrical insulators

-**Nodes of Ranvier** are gaps between Schwann cells

-together the insulated stretches of axon & exposed gaps increase the speed of electrical impulses by **saltatory conduction**



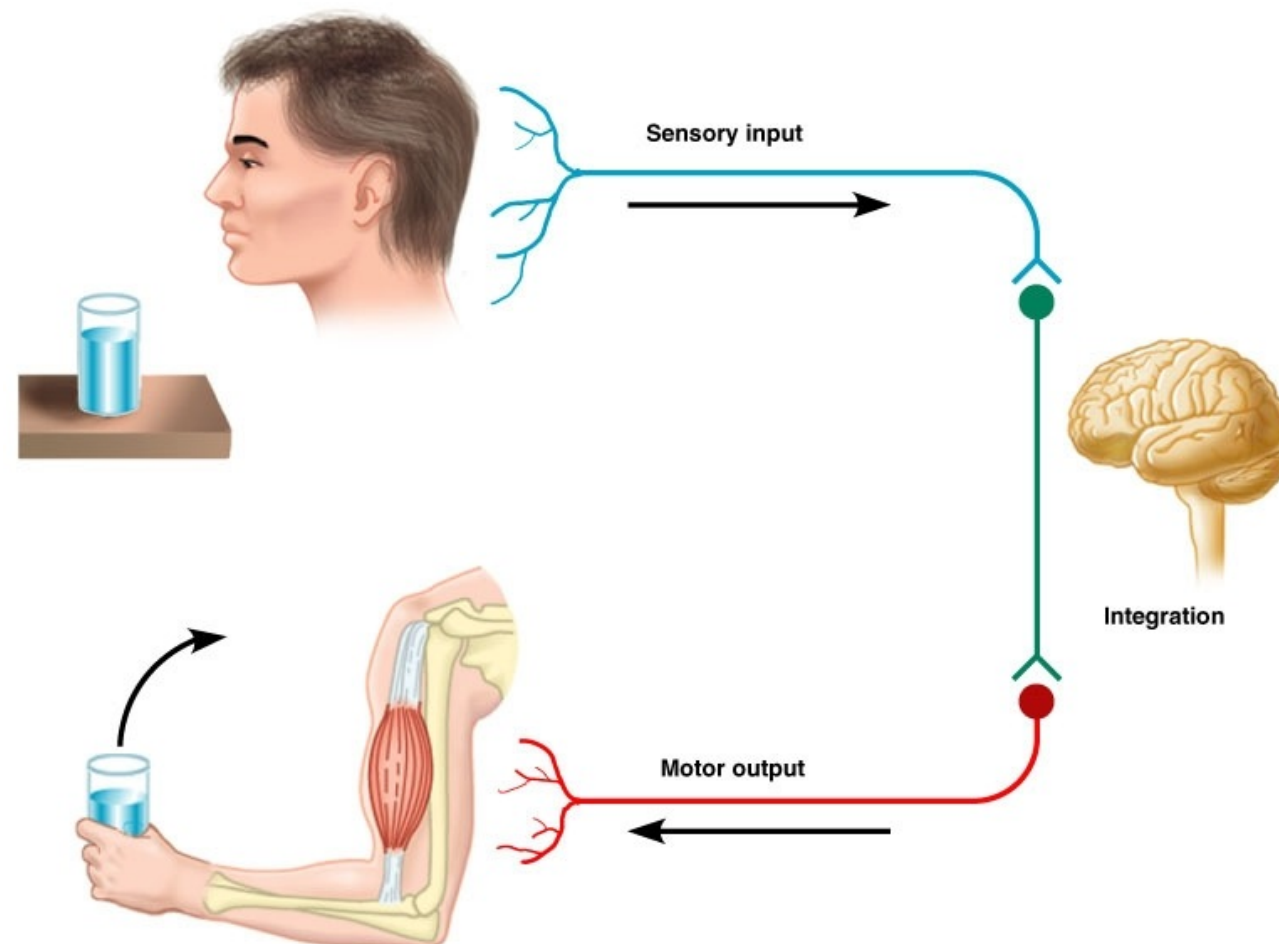
Neural Circuit (feedback loop) & Reflex Arc

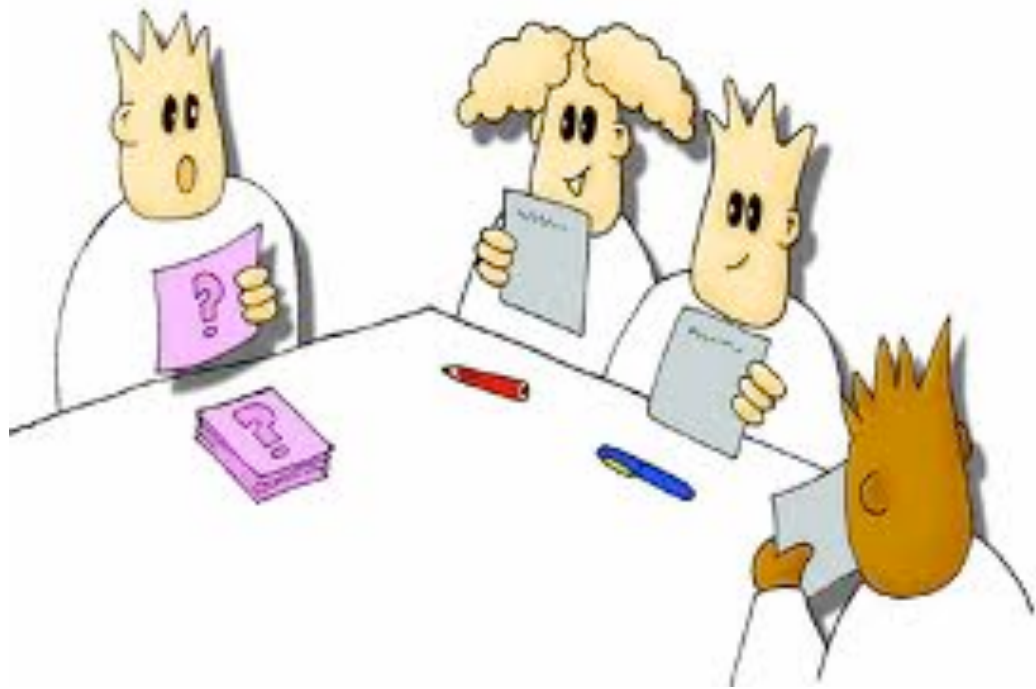
Neural Circuits

receptor → afferent neuron → interneuron → efferent neuron → effector

eg: seeing a glass of water

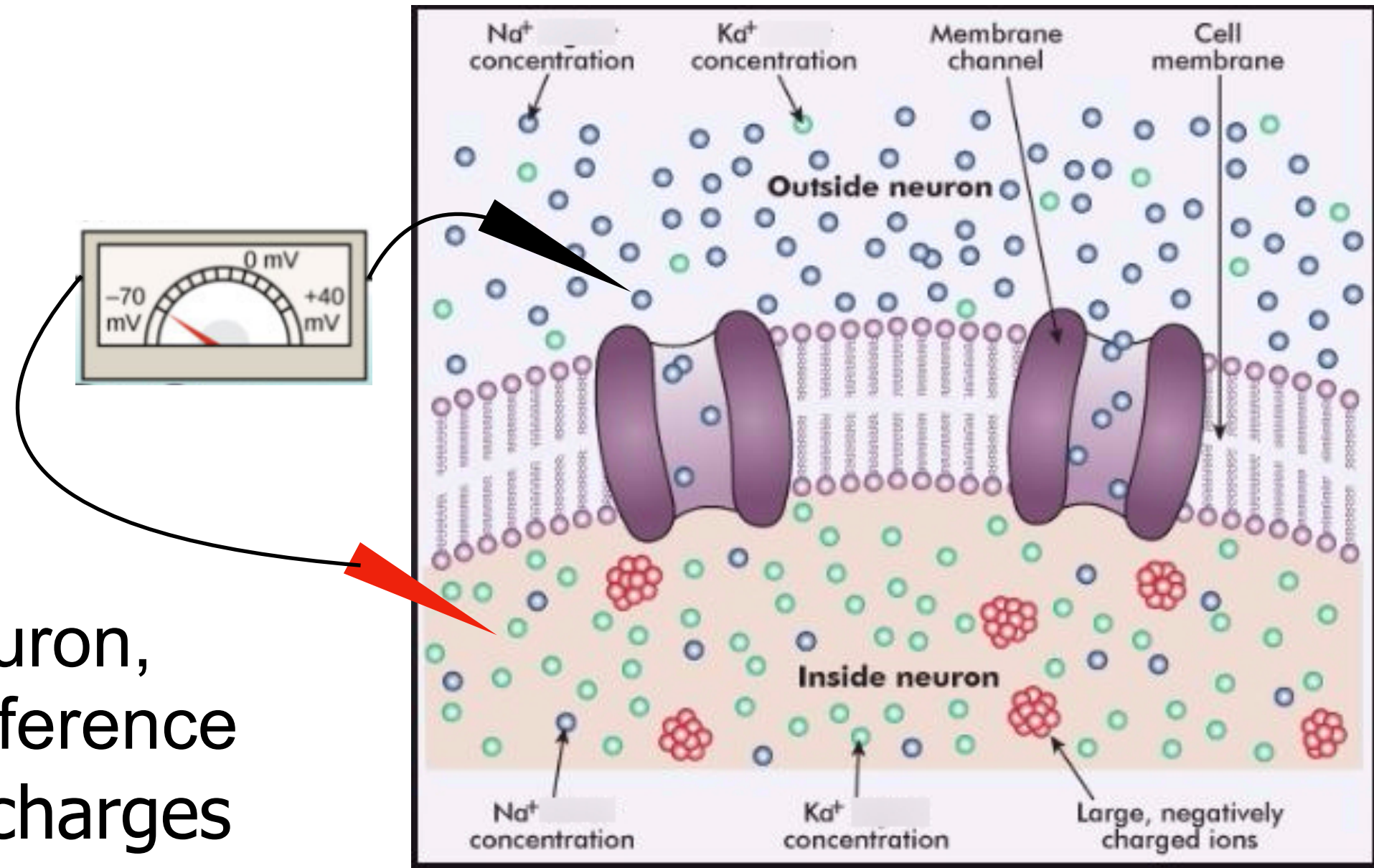
receptor → afferent neuron → interneuron → efferent neuron → effector
(eyes) (ocular nerves) (in brain) (motor neuron) (muscles of the arm)





- » As you watch;
- » What is an action potential?
- » What is the difference in the action potentials in strong sensation compared to weak sensations?

Resting Potential of a Neuron



In a resting neuron, there is a difference in electrical charges on the outside and inside of the plasma membrane.

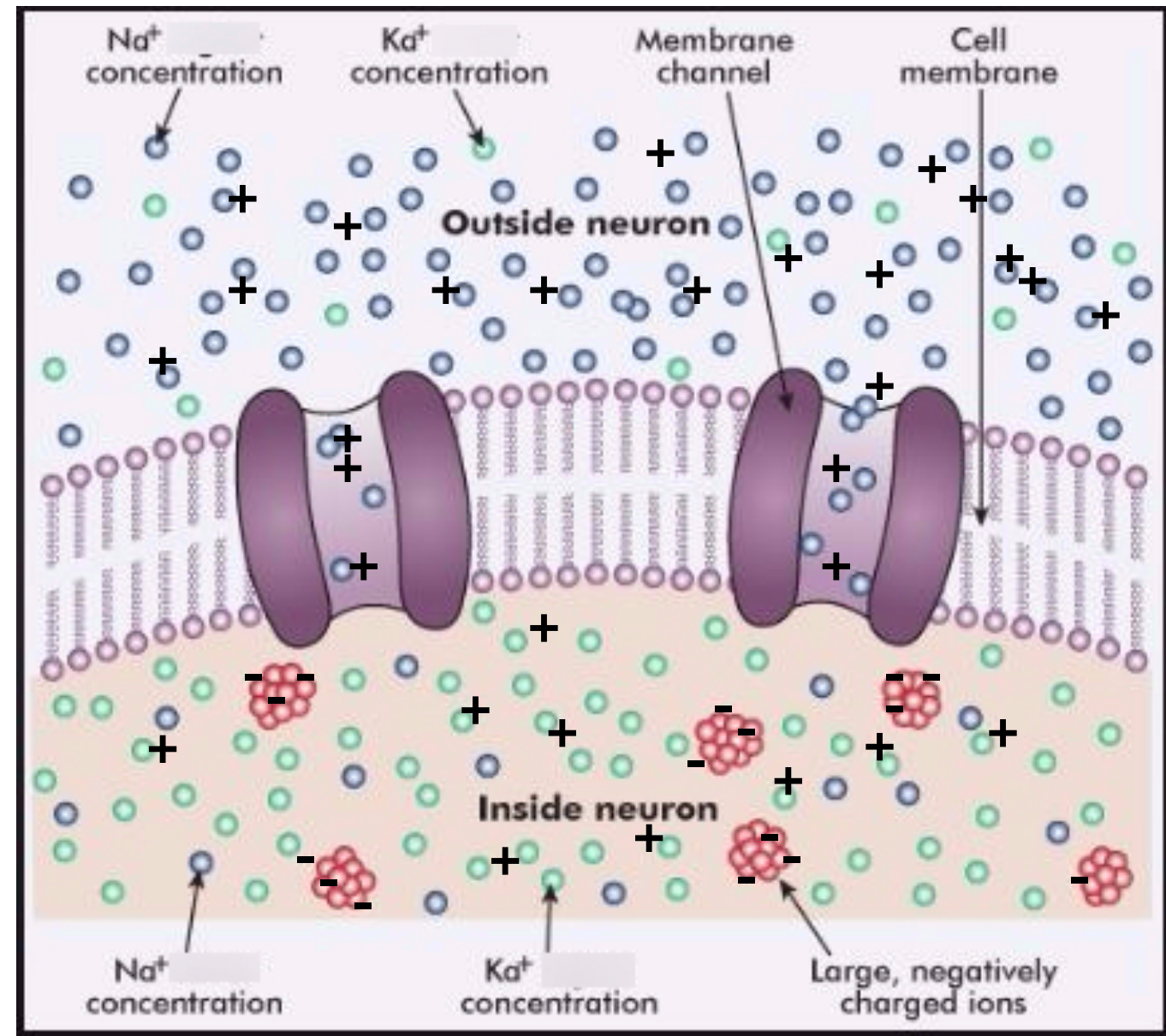
Resting Potential of a Neuron

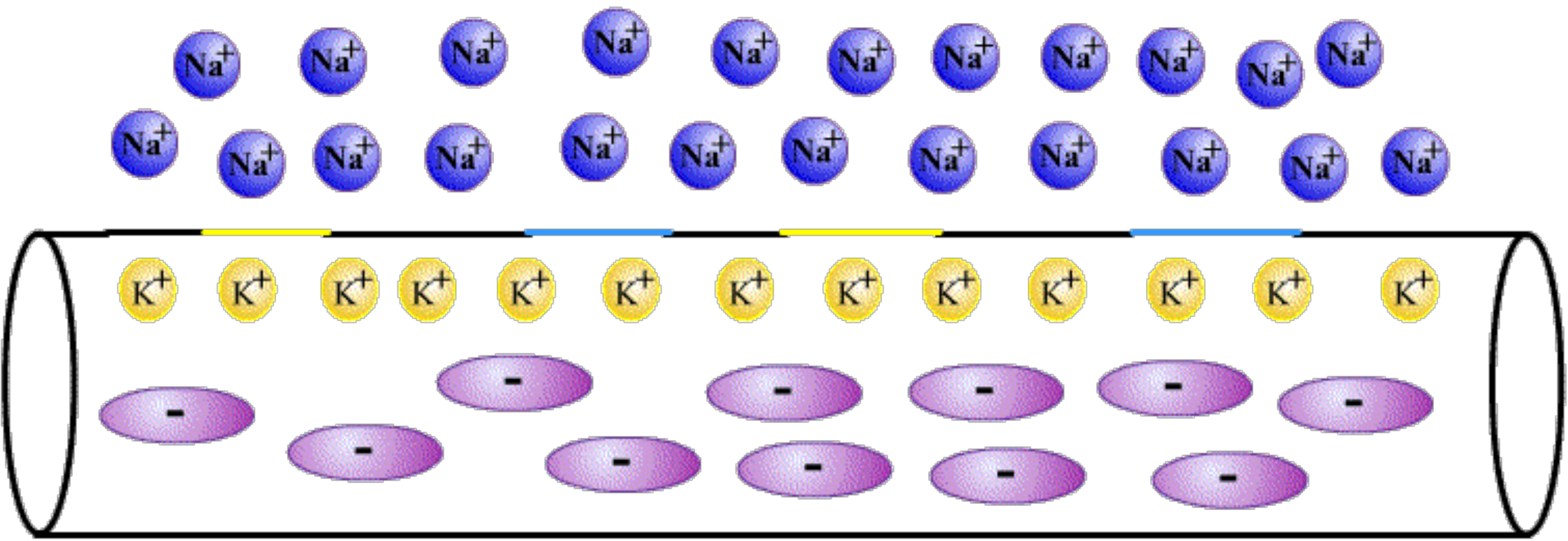
The outside has a greater amount **positive** charges

Na⁺ ions

The inside has a greater amount K⁺ ions as well as **negatively** charged proteins

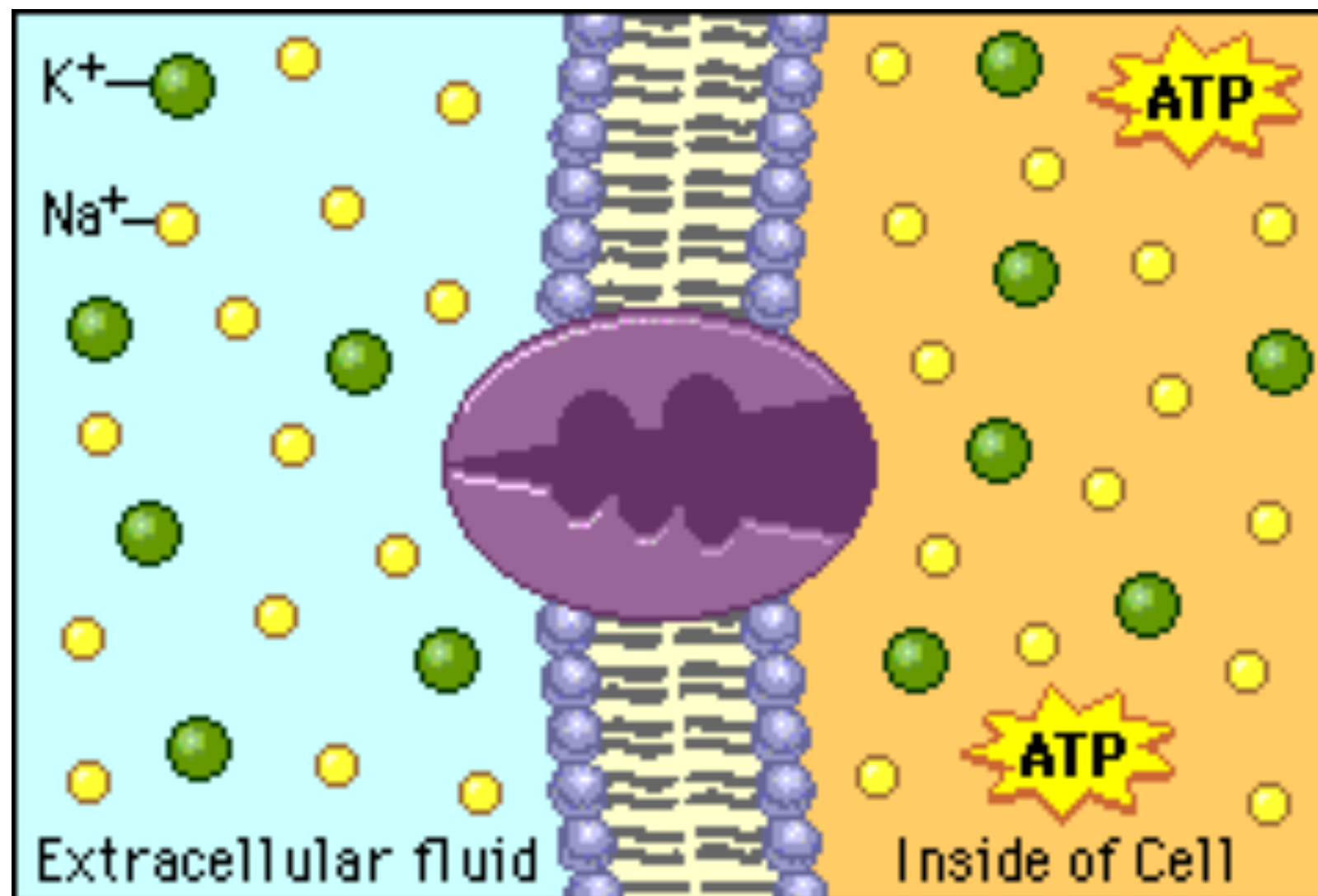
These factors result in a resting potential of -70mV



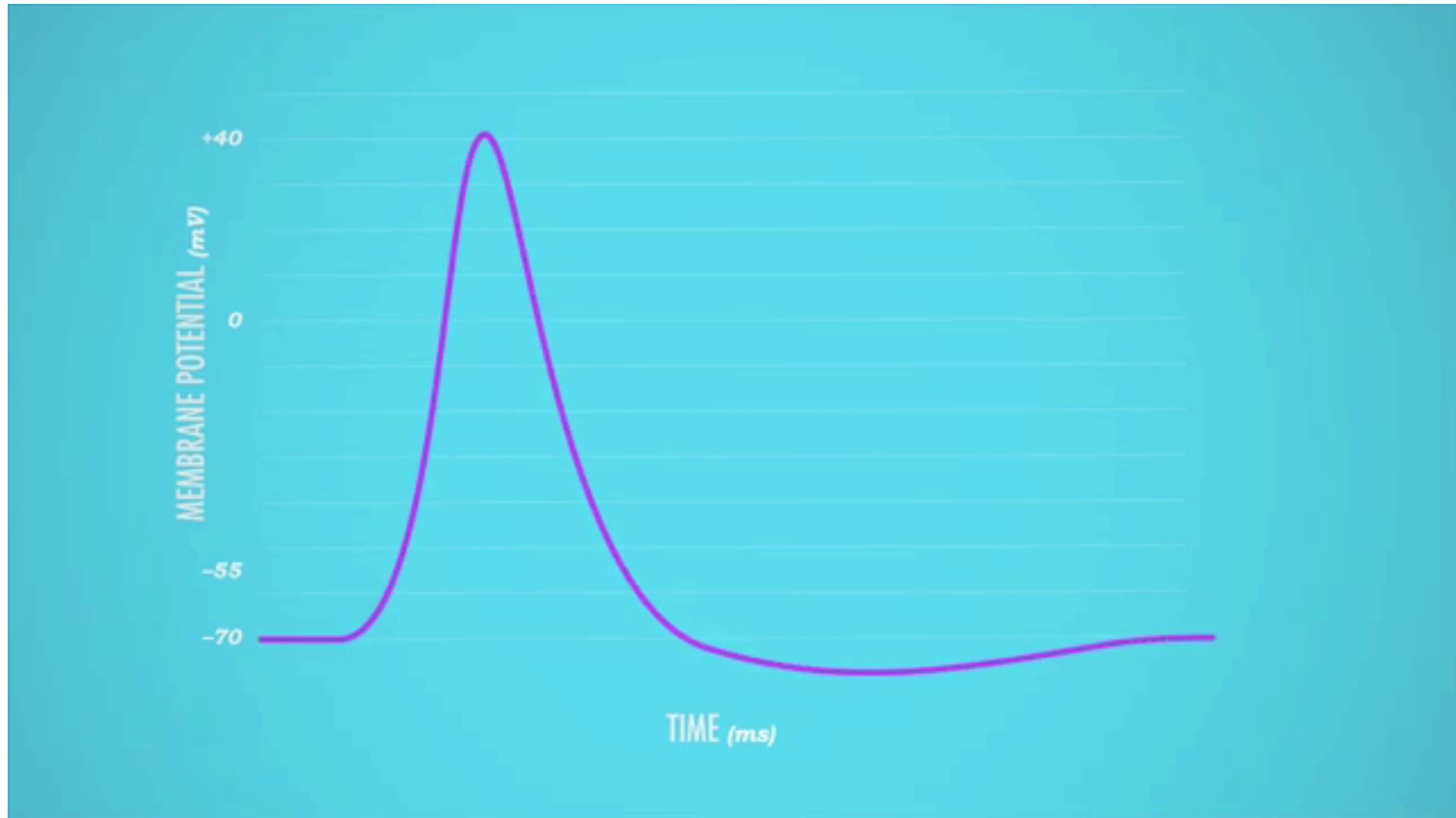


Resting Potential of a Neuron

- ATP energy, **actively transports** 3 Na⁺ out & 2 K⁺ ions into the cell, by the **sodium-potassium pump**.
- This pump maintains the resting ion gradients



Action Potential of a Neuron



Action Potential

- a rapid change in the electrical membrane potential
 - Depolarization = going from negative -70mV to $+30\text{ mV}$
 - Repolarization = returning from $+30\text{ mV}$ back to -70mV

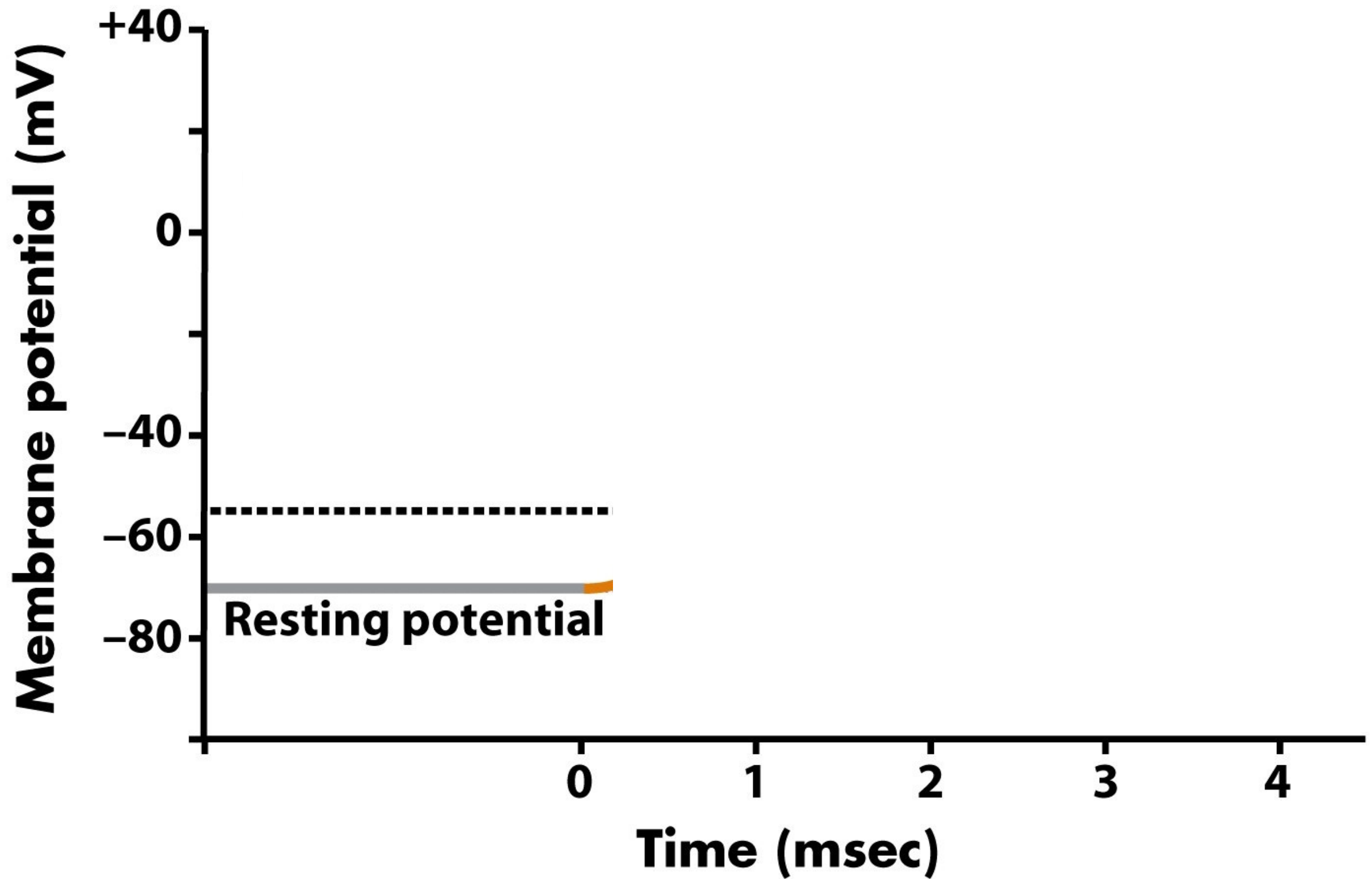


Figure 45-5 Biological Science, 2/e
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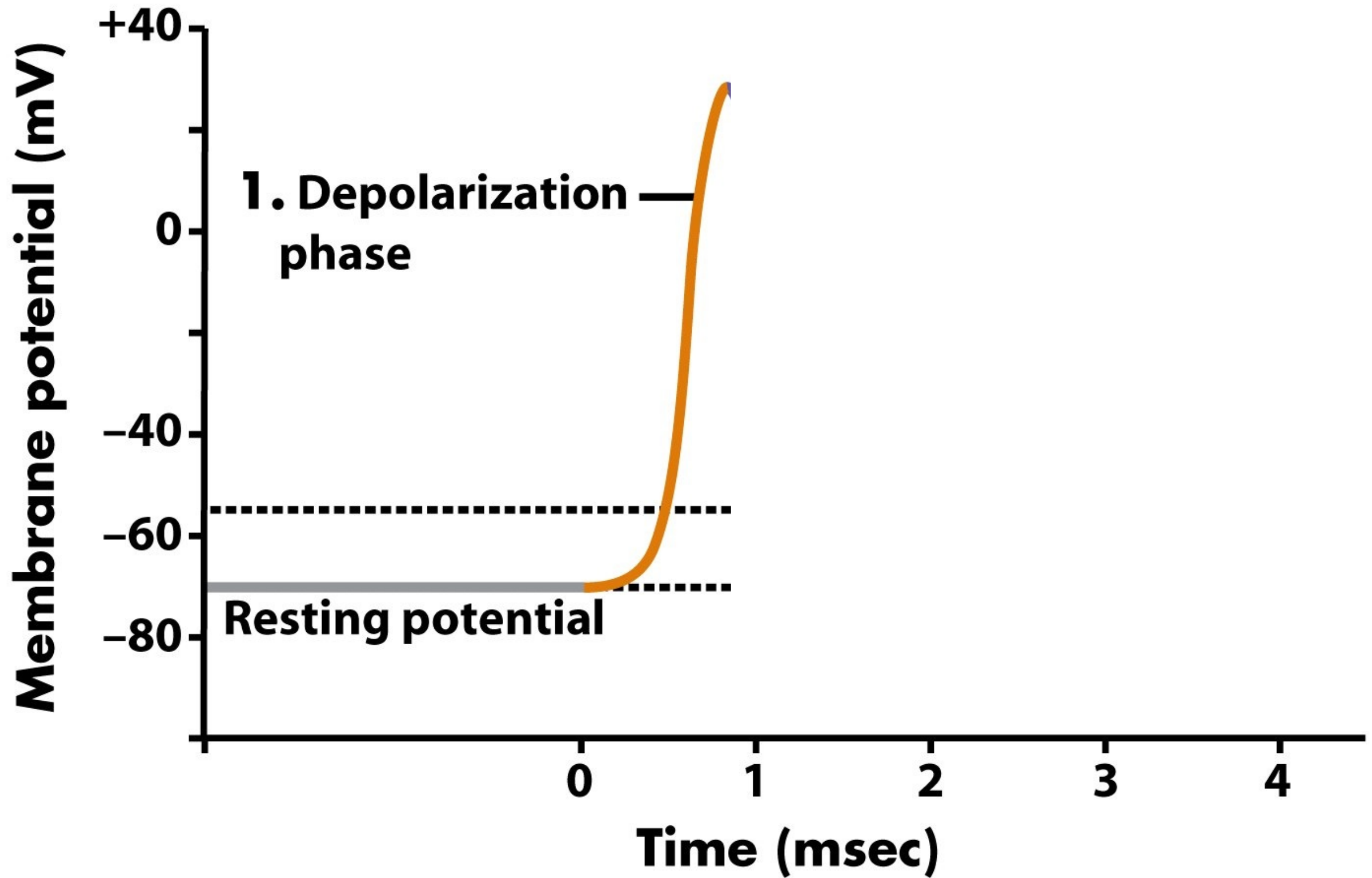


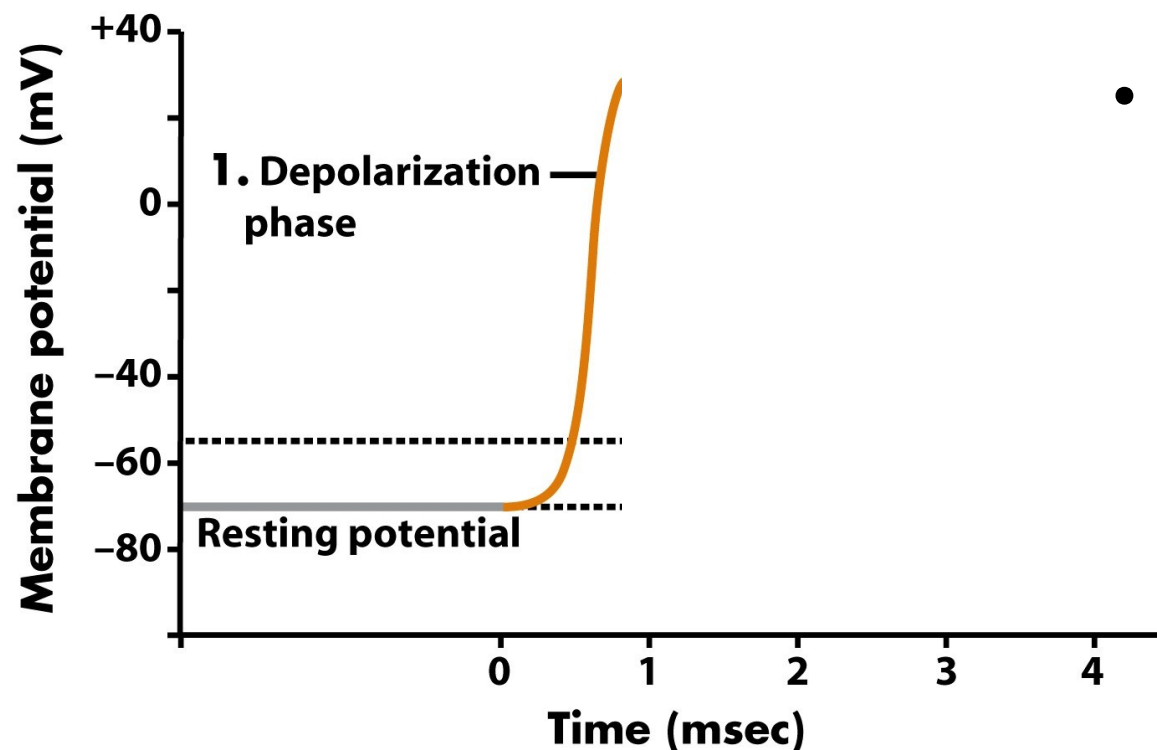
Figure 45-5 Biological Science, 2/e
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DEPOLARIZATION

As the **outside** of the cell becomes more **negative** than the inside of the cell, the mb is now **DEPOLARIZED**.

When enough sodium ions enter the cell to depolarize the mb to a critical level (**threshold level ≈ -50 to 55mV**) an action potential arises which generates an impulse.

= all or none principle



- the result of the opening of **sodium voltage gated channels**

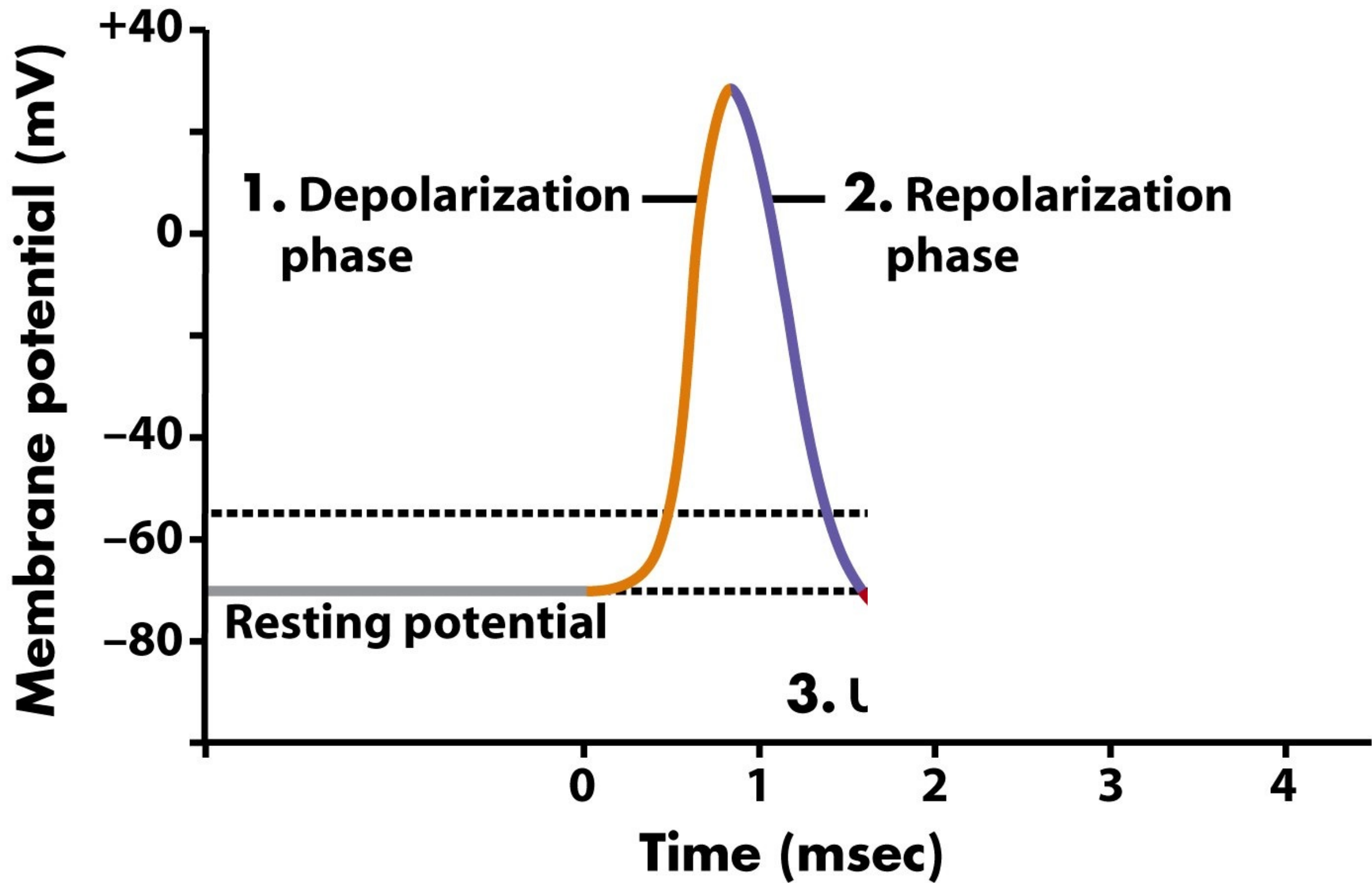


Figure 45-5 Biological Science, 2/e
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REPOLARIZATION

- K^+ leaves the cell
- charges switch
- the outside of the cell becomes more **positive** than the inside of the cell
- the mb is now repolarized

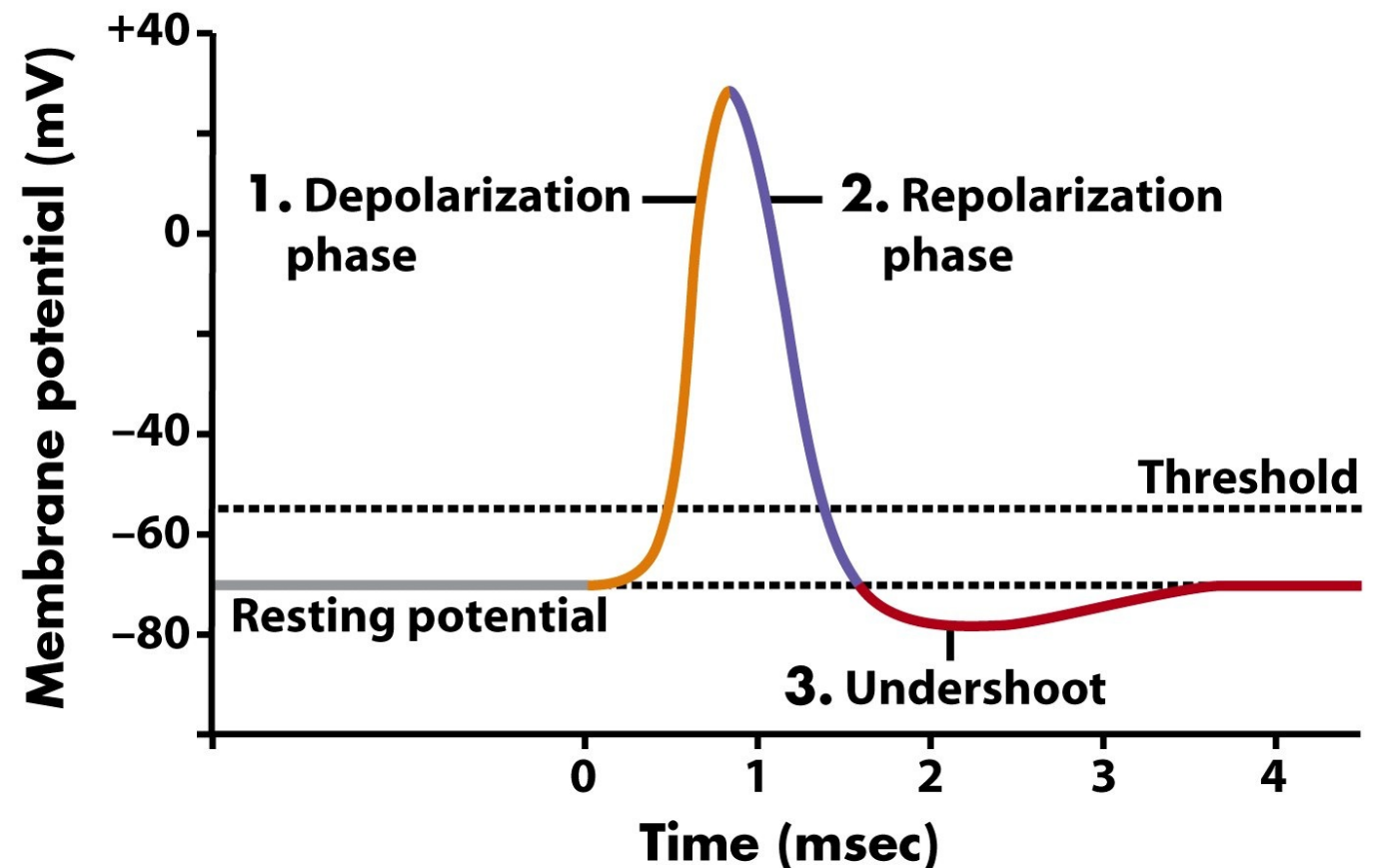
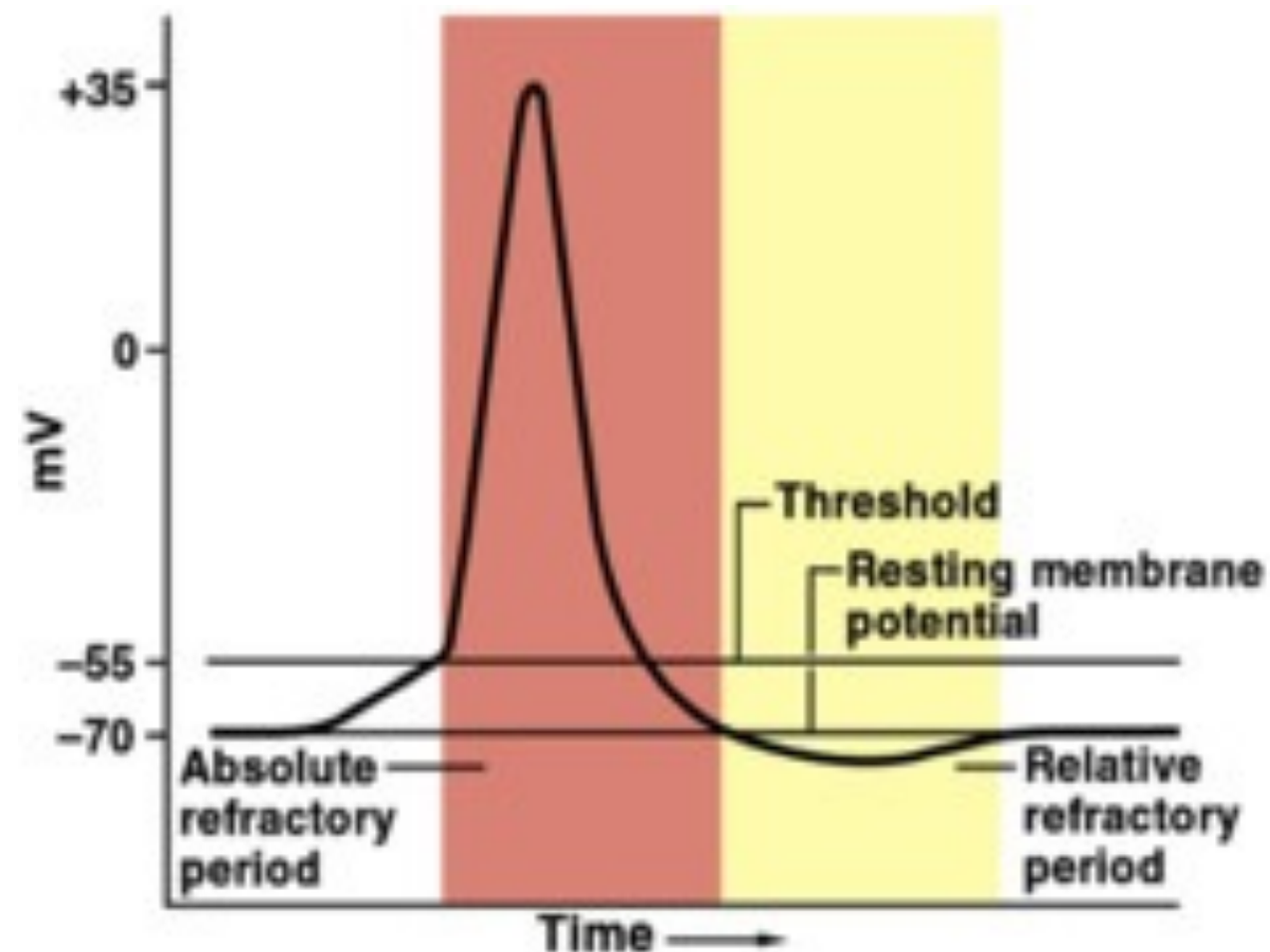


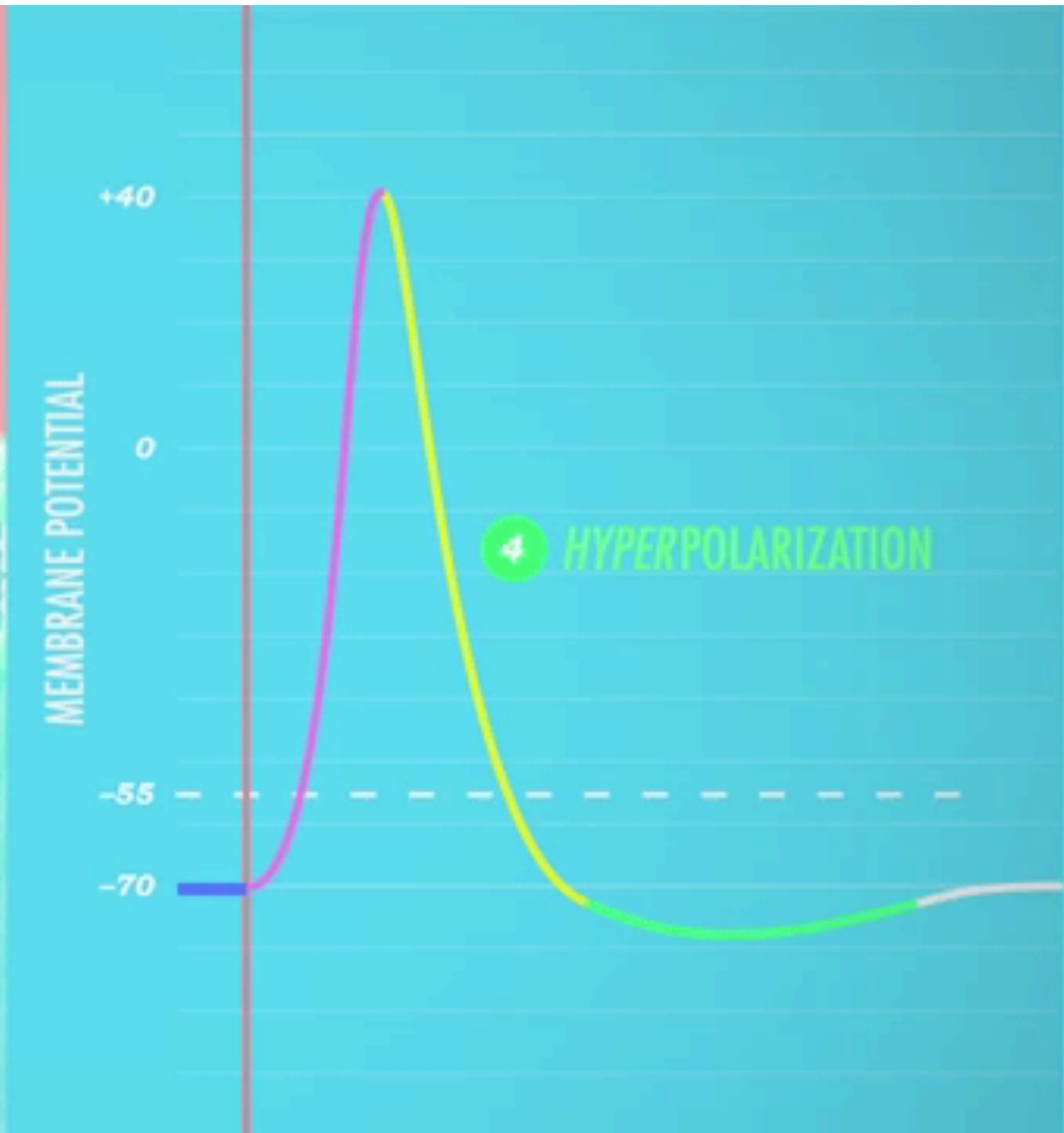
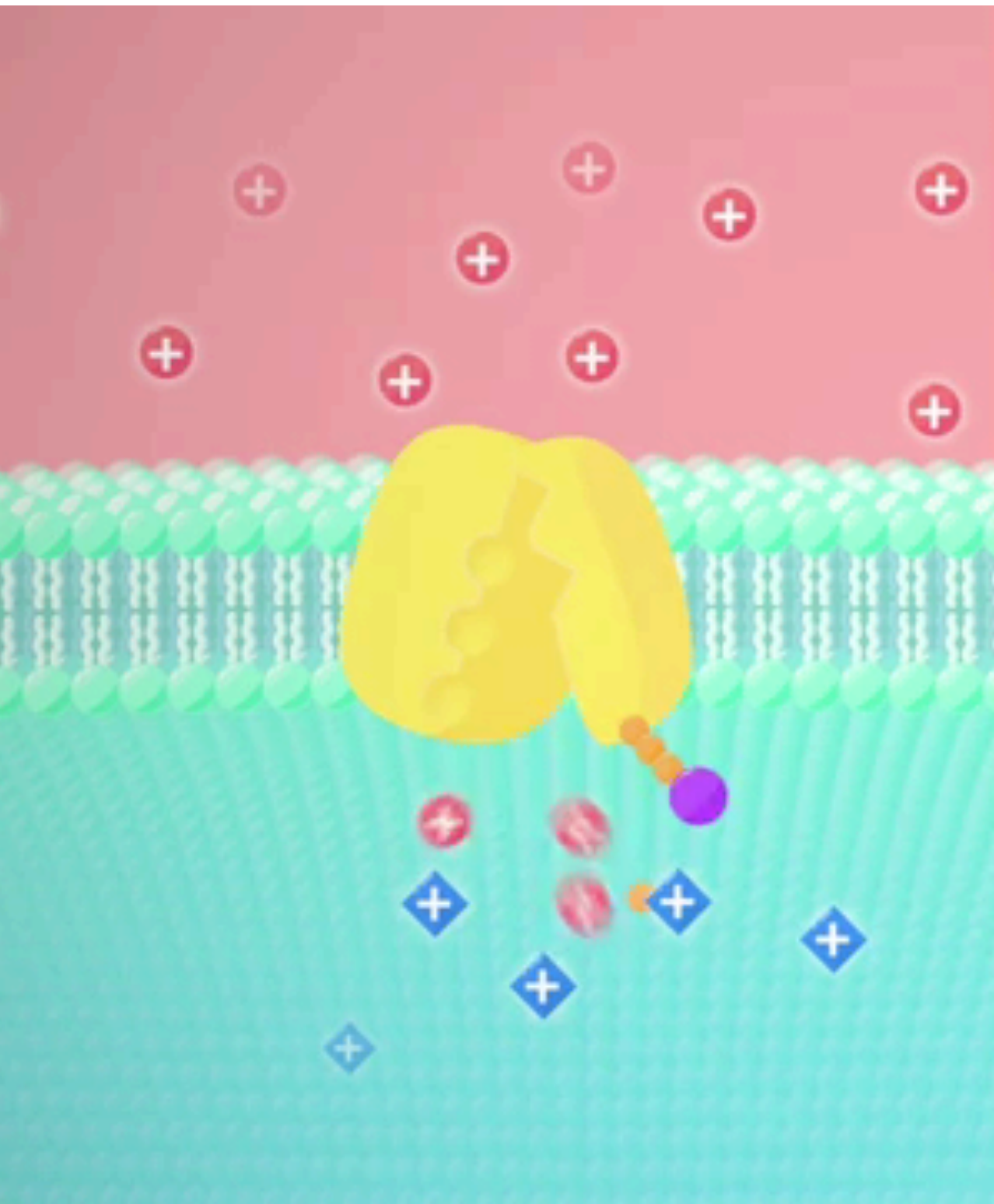
Figure 45-5 Biological Science, 2/e
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- the result of the opening of **potassium voltage gated channels**

Refractory Period

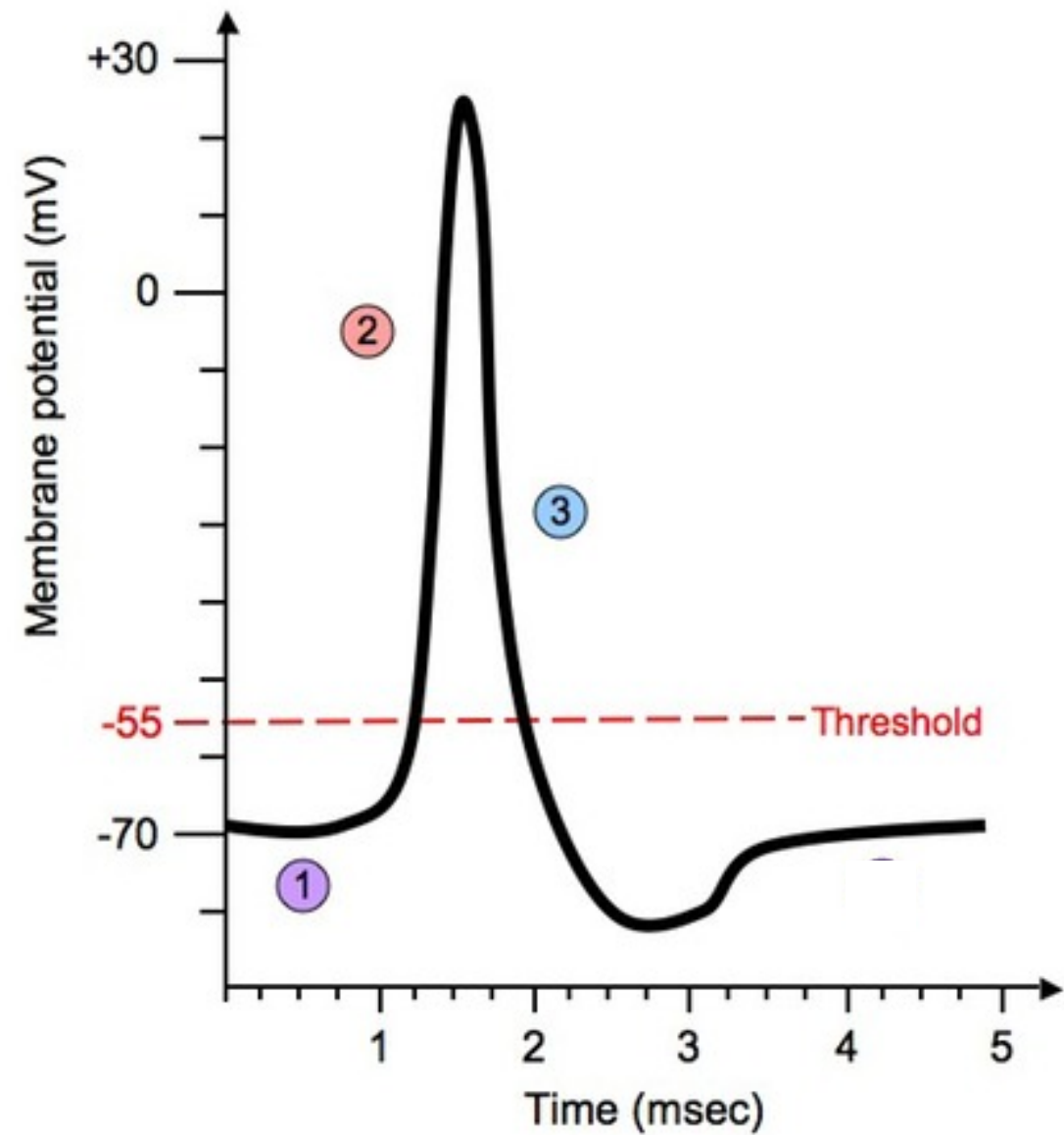
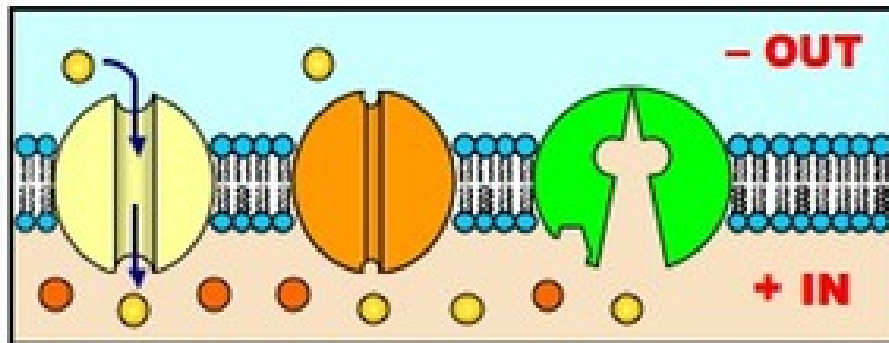
- after firing, the mb cannot send another signal for a short time = refractory period
- until the mb stabilizes the action potential is higher than normal...







The image to the left is an event occurring during an action potential. Match the figure to the corresponding number found on the graph to the right. Explain.



To do...

- Read about analysing an oscilloscope traces on page 324
- **Complete data based questions** on pg 324
- See you tomorrow.