Neuron Structure

What are the essential structures that make up a neuron?

Why?

Cells are specialized for different functions in multicellular organisms. In animals, one unique kind of cell helps organisms survive by collecting information and sending messages throughout the body. The shapes and features of neurons, which are the primary cells in the nervous system, enable animals to experience all of the five senses; find food, mates, and shelter; and to survive in their diverse environments.

Model 1 – Parts of a Neuron

1. Model 1 is an illustration of two neurons. Label one of the neurons in the diagram with the following structures:

   Cell body or soma Axon

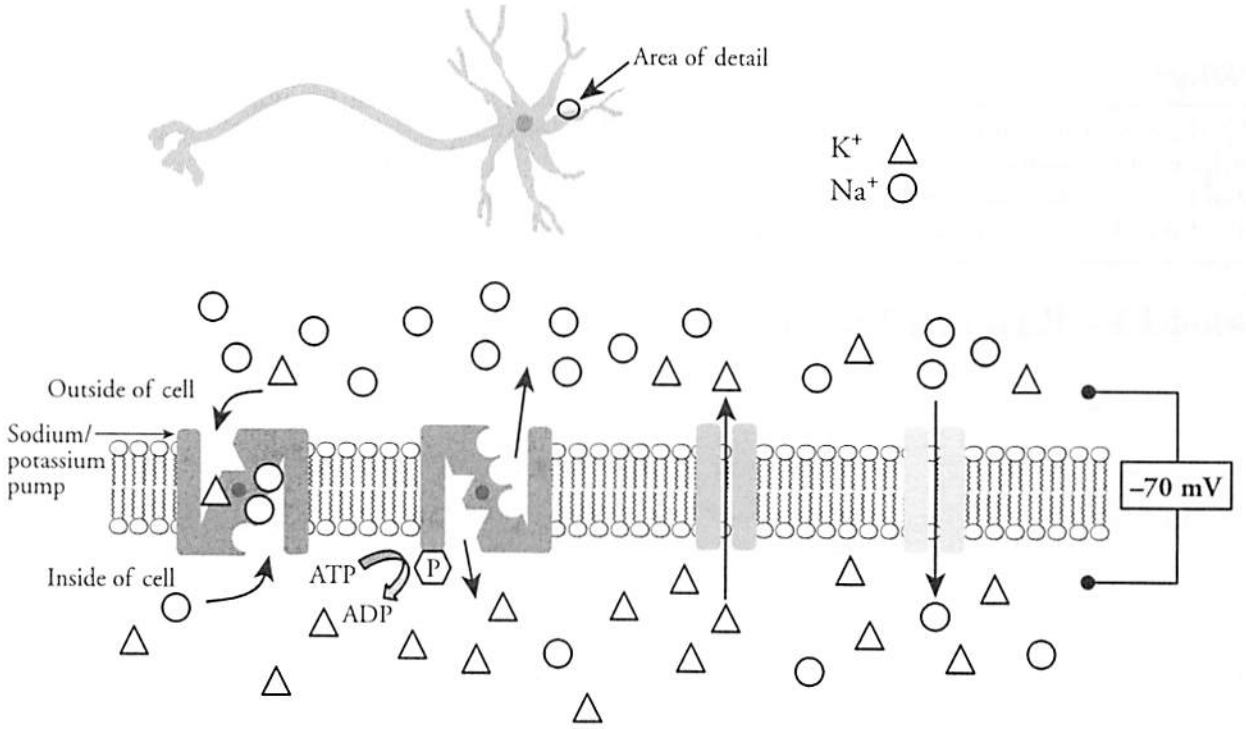
   Cell nucleus Synapse

   Dendrites

2. Which structure(s) on the neuron in Model 1 would receive a signal from either a sensory cell (taste bud, touch receptor, retinal cell) or from another neuron?

3. Draw an arrow through the two cells in Model 1 to show the path of a nerve impulse if a message was being sent through the two neurons.

Model 2 – Membrane Potential



4. Describe the cellular structure shown in detail in Model 2.

5. Identify each of these symbols in Model 2.

6. Consider Model 2.

   a. Which side of the membrane has more sodium ions when the neuron is at rest?

   b. Briefly explain why sodium ions cannot cross the membrane without the use of a protein channel.

   c. Which direction should sodium ions flow naturally if a channel is provided?

7. Consider Model 2.

   a. Which side of the membrane has more potassium ions when the neuron is at rest?

   b. Which direction should potassium ions flow naturally if a channel is provided?

8. The embedded proteins in Model 2 illustrate both active and passive transport. What evidence from Model 2 supports the idea that one of the types of embedded proteins use active transport?

9. Does the sodium/potassium ion pump move sodium ions into or out of the cell when activated?

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11. What is the ratio of sodium ions to potassium ions that are moved through the sodium/potassium ion pump each cycle?

12. If the sodium/potassium ion pump were to stop functioning, what would eventually happen to the concentration gradients of sodium and potassium ions across the membrane? Justify your answer with evidence from Model 2.

13. The diagram in Model 2 shows a voltage or potential across the membrane.

   a. What is the **resting membrane potential** of a neuron? (Be sure to include units.)

   b. Propose an explanation for why there is an uneven distribution of charge across the membrane, resulting in a potential.