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Membrane Tutorial Worksheet

Instructions: Work through the **Membrane Tutorial** lab in section and answer the following questions. All plots must be hand drawn. Use the back side of this sheet for drawing if you need more room. Feel free to ask TA/IAs for assistance. The lab worksheets will be graded for completion and correctness.

1. **Critical Concept** The neuronal membrane is often modeled as a capacitor, and this lab will test some of the neuronal properties related to capacitance. Explain capacitance using an analogy.

2. Using the default experimental conditions, run the lipid bilayer experiment and calculate the rate of change of the voltage. Compare your calculated value to the value observed in the plot of voltage vs time. Are they the same? **Note:** You should be able to obtain the calculated value in the absence of the graph, and the observed you obtain using the graph.

3. From these experiments, what role does the Na/K pump play in the action potential generation? Does its presence change the rate of change of the voltage?

4. Using default experimental conditions, run the leak conductance experiment and determine the amplitude and time constant of the voltage change using the plot generated.

5. Draw the results of the Hodgkin and Huxley conductance experiment. If you increase the stimulus duration, does spiking continue? Would this spike pattern occur in a real cell?

6. **Extra Credit: Run Your Own Experiment** Test the effect that membrane capacitance has on the time constant. Show the plot of at least 3 different trials along with the calculation of the time constant in each one. Describe the relationship between membrane capacitance and the time constant.