Computational Neurophysiology - Assignment 1

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1 Hypothesis 1

Test the hypothesis that the action potential is an "all-or-none" event. i.e. that there is a critical level of stimulus that results in an action potential - below that level no action potential is generated, above that level no further change in the amplitude of the action potential occurs. Draw a graph of maximum membrane potential vs. stimulus amplitude.

2 Hypothesis 2

Test the hypothesis that the frequency (i.e. number per unit time) of action potentials is determined by the stimulus amplitude. Draw a graph of the frequency of action potentials vs. the amplitude of the stimulus.

3 Hypothesis 3

Test the hypothesis that the density of sodium channels determines the rate of rise and amplitude of the action potential.

4 Hypothesis 4

Test the hypothesis that the density of potassium channels determines the rate at which the action potential falls. Describe the effect of reducing the Nernst reversal potential for sodium.

5 Hypothesis 5

Test the hypothesis that the current through the voltage-dependent sodium channels reverses when membrane potential exceeds the Nernst reversal potential for sodium ions. Describe the dependence of the maximal sodium conductance on the testing level of membrane potential

6 Hypothesis 6

Test the hypothesis that prior depolarization inactivates voltage-gated sodium channels.

7 Hypothesis 7

Test the hypothesis that the potassium channels DO NOT inactivate following prior depolarization.