

**MCB 160L – Spring 2010****Exercise 2 – Frog Sciatic Nerve Recordings – Long Report Guide**

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**Due: Section 1: Thurs Feb 4****Section 2: Fri Feb 5****Email your reports to: [allanpool@berkeley.edu](mailto:allanpool@berkeley.edu) AND [dfegen@berkeley.edu](mailto:dfegen@berkeley.edu)****For the Report:**

- *The text of the Long Report should be ~5 pages (not including figures and tables) typed, double spaced, font size 10 or larger.*
- *Graphs may be neatly hand-drawn and scanned in or done on computer.*
- *For all pictures, graphs, tables and photographs, include a title or caption, label axis and units and show any relevant features. Failure to do so will result in points being taken off. Please don't attach the illustrations separately but include them with the file.*
- *When doing your calculations, remember to take into account the gains and multipliers of the pre-amplifier, stimulator, SIU, and oscilloscope.*

*When writing the report use the outline and questions here below as a guideline for what to include/comment on in your report. The report shouldn't be just a list of answers to these questions with no overall organizing structure, but be modeled after a scientific paper (see lab reader).*

**GENERAL (8 pts)**

- 1) Why do the alpha and beta peaks have different amplitudes? What is responsible for their different latencies? (2 pts)
- 2) Why are there different threshold values for different peaks? (1 pt)
- 3) How do velocities of propagation in your experiment compare to literature values? Why might they differ? (1 pt)
- 4) What happens to the separation of alpha and beta peaks as the distance between stimulating and recording electrodes increases? Why? What happens to the amplitude and duration of each peak as it gets further from the stimulating electrodes? Why? (2 pts)
- 5) Is the velocity of propagation constant as the distance between stimulating and recording electrodes increases? Why? (1 pt)
- 6) Why is the cathode the stimulating electrode? (1 pt)

**CHECKING THE SET-UP (2 pts) Instructions on pg. 39.**

- a. Photo of compound action potential (please include scale bars). (1pt).
- b. Does the waveform change when changing stimulus polarity? Why or why not? (0.5 pt)
- c. Were you able to observe anode block? Why does anode block occur? (0.5 pt)

**THRESHOLD AND MAXIMAL RESPONSE (1 pt) Instructions on pg. 39.**

- d. Alpha and beta peaks threshold voltages (at 0.1 ms duration – if longer durations were necessary to elicit response, please report them!). (0.5 pt)
- e. Alpha and beta peaks maximal response (i.e. amplitude) (0.5 pt)

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CONDUCTION VELOCITY CALCULATIONS (2 pts) Instructions on pg. 39 -40.

- a. Alpha and beta conduction velocity values (please include any photos, your calculations and all the relevant variables that you kept track of). Include calculations for at least 2 different distances between the stimulating and recording electrodes. (1.5 pts)
- b. Is the velocity calculated at the stimulated end of the nerve the same as that calculated at the recorded end? (pg 40). Why could they differ? (0.5 pt)

THRESHOLD AND STRENGTH-DURATION CURVE. (2.5 pts + 0.5 pt extra credit) Instructions on pg. 40-41.

- c. Strength-duration plot (for alpha response). (1.5 pts)
- d. Rheobase and chronaxie values (for alpha response). Explain the significance of these terms. (1 pt)
- e. Repeat (a) and (b) for the beta response. (0.5 pts extra credit)

REFRACTORY PERIOD. (2.5 pts + 0.5 pt extra credit) Instructions on pg.41-42.

- f. For alpha. (2.5 pts)
  - i. Graph the amplitude of 2<sup>nd</sup> response vs. interval, while keeping the stimulation voltage constant. Why does it depend on the interval between the two stimulation pulses? (1 pt).
  - ii. Graph the stimulation voltage vs. interval, while maintaining the maximal amplitude. Why does it depend on the interval between the two stimulation pulses? (1pt).
  - iii. Indicate on graphs where relative and absolute refractory periods are. (0.5 pt)
- g. For beta (or any other later peak of the response) (extra credit 0.5 pt)
  - iv. Repeat (m-i) and (m-ii) for the beta response.(You do not need to answer the questions again).
  - v. Does the recovery process of this response follow the same time course as that of the alpha response? What, if any, are the differences?

DUAL STIMULATION. (2 pts + 1 pt extra credit) Instructions on pg 42-43.

- h. Why do the compound action potentials from orthodromic and antidromic stimulation appear inverted with respect to each other on the oscilloscope screen? (0.5)
- i. At the same stimulating voltage, do you observe differences between the amplitudes of the antidromic and orthodromic responses? Can you explain these differences? (0.5 pt)
- j. When stimulating both ends of the nerve, how does the response to the later stimulus depend on the interval between the stimuli? Do the responses differ if the orthodromic or antidromic stimulus occurs first? Show a graph of the amplitude of the second response vs. the interval between stimuli when (i) orthodromic stimulation occurs first and (ii) when antidromic stimulation occurs first. Explain your observations (1 pt).
- k. Show a graph of the stimulus voltage needed to attain the maximum response amplitude vs. the interval between stimuli when (i) orthodromic stimulation occurs first and (ii)

when antidromic stimulation occurs first. Explain your observations. [If you didn't acquire this data, just write down what you think would happen]. (extra credit 1 pt)

Definitions: Orthodromic – conduction in the direction the action potential usually goes (away from soma, or from the “fat” spinal cord end).

Antidromic – conduction in the opposite direction (towards the soma, or from the “thin” muscle side)