

Name _____

Reci. Section 8:30 11:00 12:30

Please do your own work. Open book and notes. Please do not talk to your neighbors.

You may earn up to 12 points based on showing your work and explaining it.

The membrane that surrounds one of your nerve cells behaves somewhat like a small parallel plate capacitor. To send a message, the cell is fully charged ($V = 100$ millivolts = 100 mV) and then suddenly discharged. The discharge can be modeled, to first approximation, as an exponential decay.

Use your Student ID Number to find $T_{1/2}$, the time it takes for the electric potential across the cell to drop to one half of its original value. Place a decimal **after** the first non-zero digit in the last four digits of your student ID number, and then round this number to three significant digits. This number is $T_{1/2}$, in milliseconds. (If the last four digits of your student ID number are 5678, then $T_{1/2}$ is 5.68 ms.). You should get a number between 1 and 10 milliseconds, with three significant figures.

(2 points) Drop to one-half time = $T_{1/2} = \underline{\quad}.\underline{\quad}\underline{\quad}$ ms

1. (6 points). Plot the electric potential across the cell as a function of time. LABEL your axes with appropriate numbers and units!

2. (2 points) How long does it take the potential across the cell to drop to 6.25 mV ?

3. (2 points) If your diet is high in complex carbohydrates, then $T_{1/2}$ increases to three times its original value. With this new value of $T_{1/2}$ how long would it take the potential across the cell to drop from 100 mV to 12.5 mV ?