Communication
4 Work recorded in notebook (rather than pasted in)
8 Complete information: task descriptions, diagrams, data, reproducible one year later
4 Written in Ink
4 Student Signed every page
4 Student Dated every page
6 TA Signature for every lab session (-3 each session missed)

Lab 1.a

2 IV. CONSTRUCTION OF LED POWER INDICATORS
1 Explanation of task (built power indicators)
1 Diagram of circuit from Fig. 3

8 V. RESISTOR AND LED CURRENTS
A. Measurements of Voltages
1 Explanation of task (measured voltages for R and LED)
1 Table II filled in with measured values
B. Calculation of Current in Resistor and LED
1 Explanation of task (Used Ohm's law to calculate $i_R = i_{LED}$)
1 Table III filled in with measured values
C. Plot of Current versus Voltage in LED
1 Explanation of task (Commented on plot of LED current versus voltage)
3 Drew accurate plot of LED current vs voltage with all labels

5 VI. CONSTRUCTION AND TESTING OF PRE-AMPS
A. Construction
1 Explanation of task (constructed pre-amps circuits on breadboard)
1 Schematic of pre-amps
1 Explanation of testing (1 V 1 kHz sinusoid in, oscilloscope measure output)
B. Drawing of Waveforms
2 Careful drawing of oscilloscope screen

Lab 1.b

6 V. DEMONSTRATING THE NEED FOR PRE-AMPS
B. Procedure
1 Explanation of task (measured voltages for electrode model v-divider)
2 Table II-A filled in with measured values
1 Explanation of task (measured voltages for pre-amp model v-divider)
2 Table II-B filled in with measured values

18 VI. DERIVING AN EXPRESSION FOR THE DIFFERENTIAL AMPLIFIER OUTPUT
A. Deriving the Expression for $v_3$
1 Explanation of task (deriving expression for output of diff-amp)
1 Schematic of differential-amp
12 Derivations: $v_+,$ $v_-$, and $v_3$
B. Differential Gain
4 Derivation of $v_3$ in terms of $\Re$
21 VII. **Designing, Building, and Testing the Differential Amplifier**

A. *Resistor values for a gain of 500*
   1. Explanation of how $R_1$, $R_2$, $R_3$, and $R_4$ chosen
   2. List of values for $R_1$, $R_2$, $R_3$, and $R_4$

B. *Building and Testing the Differential Amplifier*
   1. Schematic (for circuit in Fig. 6 or for own circuit layout)
   2. Explanation of test procedure including 6 V power supply and v-divider
   3. Table of values of measured diff-amp output vs input 1 voltage
   4. Table of values of measured diff-amp output vs input 2 voltage

C. *Measuring the Gain of the Differential Amplifier*
   1. Plot of $v_3$ vs $v_2 - v_1$
   2. polyfit() straight line fit of data
   3. Calculation of gain of differential amplifier

10 VIII. **Measuring and Analyzing EMG's**

A. *Measuring EMG's*
   1. Explanation of task (used electrodes on biceps to measure EMG)
   4. Printout of EMG waveform on oscilloscope

B. *Power versus Weight for EMG signals*
   1. Explanation of task (Matlab® calculation of power in EMG waveform)

C. *Plot of EMG Power versus Weight*
   4. Matlab® plot of power vs weight