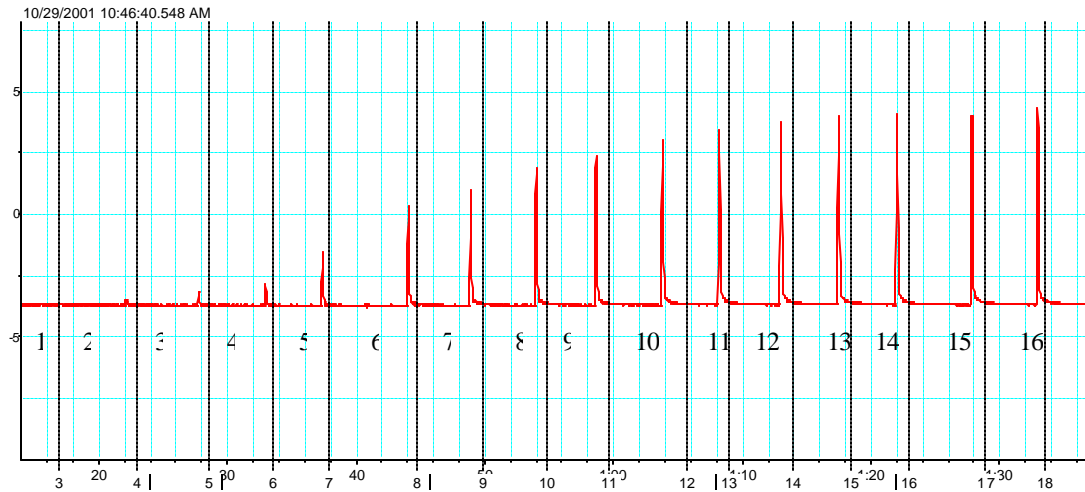


Names: _____

Complete this assignment in groups of two. Make sure that you answer the questions by discussing the respective results, explaining why the muscle responded as observed.

1. In your first experimental procedure you studied multiple motor unit summation, and you obtained the following chart recording while stimulating the muscle with progressively increasing stimuli intensities.

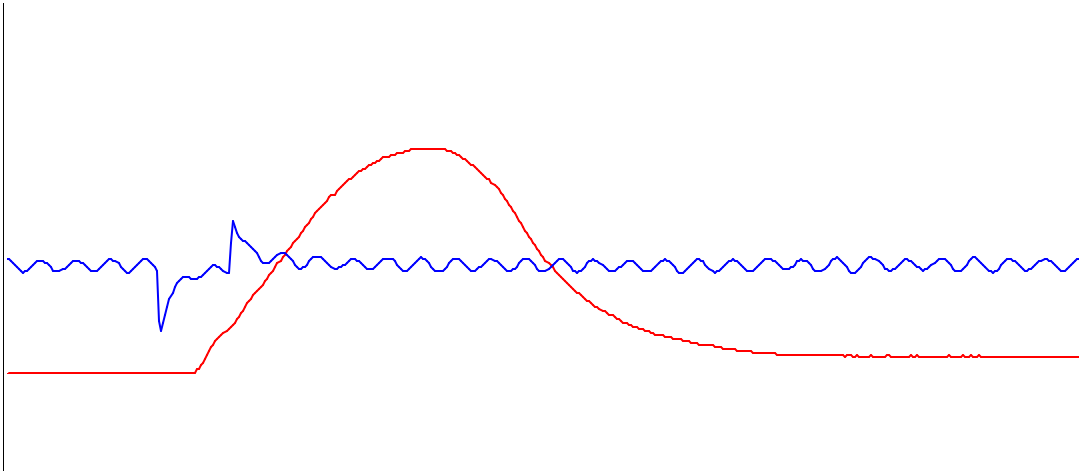


a. Classify each stimulus above as subthreshold, threshold, submaximal, maximal, or supermaximal. (2 points, all-or-none)

b. Why doesn't a muscle respond when stimulated with a subthreshold stimulus? (4 points)

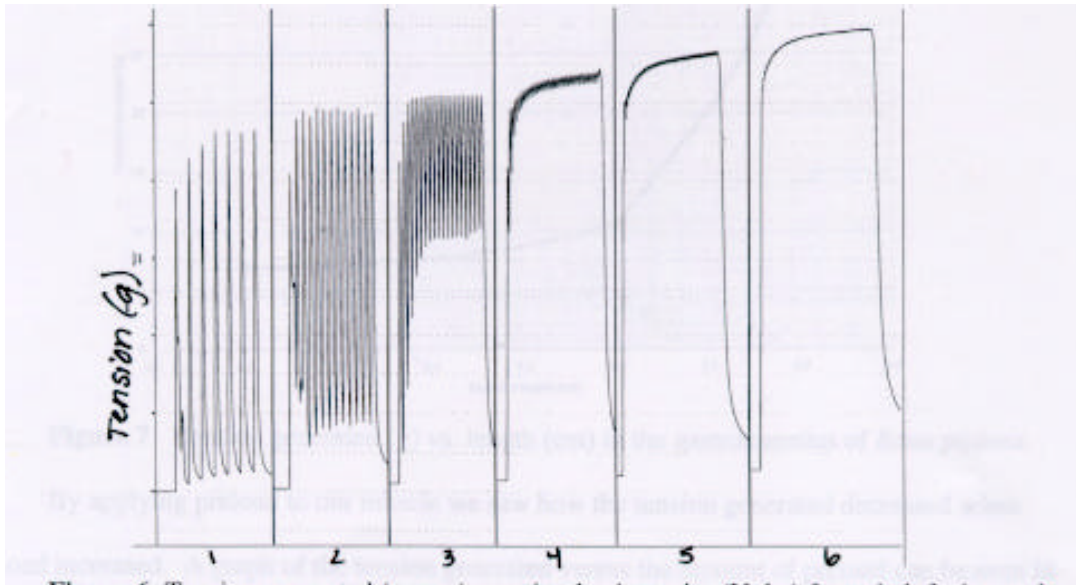
- c. Why and how does a muscle respond to a threshold stimulus? (4 points)
- d. Why do muscle responses increase in amplitude with increasing stimuli intensities? Why does the muscle response eventually peak out, regardless of intensity of stimulus applied? (5 points)
- e. The fact that muscle responses increase in amplitude with increasing stimuli intensities appears to violate the all-or-none law. Why is this not the case? (4 points)

2. Below is a high speed recording of the frog gastrocnemius response to a maximal stimulus, showing the time point at which the stimulus was applied.



- Highlight and label the latent period, the contraction period and the relaxation period. (2 points, all-or-none)
- Outline the cellular/molecular events that are occurring during each period shown above. (6 points)

3. Below is a chart recording of data from the twitch fusion/wave summation experimental procedure. Recall that you examined the gastrocnemius responses to supermaximal stimulation applied at progressively greater frequencies.



a. Identify the first instance of twitch fusion, incomplete tetanus, tetanus. Why do twitches fuse with increasing frequency of stimulation? (5 points)

b. Why is more tension produced by contractions resulting from higher frequencies of stimulation? Is this a violation of the all-or-none-law? (5 points)

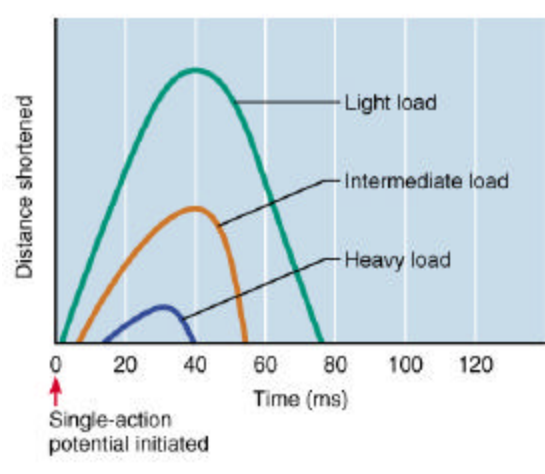
4. The table below shows the response of the gastrocnemius muscle to supermaximal stimulation as initial resting length of the muscle was changed.

Muscle resting length (cm)	Force of contraction (g)
4.7	5.2
4.8	6.1
4.9	7.1
5.0	7.5
5.1	6.2
5.2	5.0
5.3	2.8

a. At what point is the resting length of the muscle closer to optimal resting length? (1 point)

b. Why does force of contraction drop as muscle resting length is farther from optimal? Explain in relation to sarcomere organization. (4 points)

5. The following questions refer to the figure shown below that shows the duration of muscle contractions when opposed by different loads.



a. Why does onset of the contraction phase increase as the load placed on the muscle increase? (4 points)

- b. Does the velocity of contraction increase or decrease with increasing load? Why? (4 points)