I. Compare muscle fiber (cell), motor unit, and whole muscle response to stimulation.

A. All-or-None Response

1. Muscle fiber (cell)
   a. Response
   -
   -
   - All or none?
   b. Threshold (liminal) stimulus
   c. Subthreshold (subliminal) stimulus
      -
      -
   d. Factors that can influence muscle fiber (cell) response to stimulation.

2. Motor unit response to stimuli
   a. Define a motor unit (see Fig. 10.13, p. 309)
   b. Precise movements and motor units
   c. Gross movements and motor units
   d. All or none?

3. Contraction of a whole muscle
   a. Determined by
   b. Graded response
   c. All or none?
   d. Factors that can influence whole muscle response to stimulation
II. Describe various types of contractions as demonstrated via a laboratory study. Go to BA 209 and work through muscle physiology. Do this on your own.

B. Laboratory study of muscle contraction (note: you will use the computer simulation to do this exercise and you will do it on your own time).

1. Description and comparison to “real life” situation
   •
   •
   •

2. Myogram of twitch contraction: Draw Fig. 10.14.

3. Twitch contraction
   a. Definition

   b. Phases of a twitch

      1. Latent period
      2. Contraction period
      3. Relaxation period
      4. Refractory period

   c. Twitch and isotonic contraction vs. isometric contraction (See Fig. 10.16)

      1. Isotonic
         a. Concentric
         b. Eccentric
      2. Isometric
      3. Most activities involve
d. Note: Fast twitch and slow twitch muscle fibers (more later)

e. Factors affecting strength of contraction
   1. Number of motor units being stimulated
   2. Physiological conditions of individual fibers and surrounding conditions.
   3. Frequency of stimulation to muscle fibers
   4. Conclusion: The response of the whole muscle is the sum of the responses of the individual fibers.

4. Maximal Stimulation and Laboratory Study

5. The effects of multiple stimulations to whole muscle
   a. Refractory period
      1. Absolute refractory period
      2. Relative refractory period
   b. Treppe contraction (not in text) Diagram a treppe contraction below:

      1. Description
      2. Result
      3. Thought to be due to
      4. Describe “warming up” by athletes as it pertains to treppe contraction.
c. Summation
   1. Multiple motor unit summation (recruitment)
   2. Wave summation (temporal, over time)

d. Incomplete (unfused) tetanus

e. Complete (fused) tetanus

Diagram and describe each of the types of contractions: twitch, wave summation, incomplete tetanus, and complete tetanus. See Fig. 10.15.
III. Describe *muscle tone* and *abnormal muscle contractions* under various “real life” situations.

A. Muscle Tone
   1. Describe muscle tone
   2. Sleep
   3. Anxiety
   4. Atonic
   5. Hypotonia
   6. Hypertonia
   7. Catatonic

B. Abnormal skeletal muscle contractions (see p. 319)
   1. Spasm
   2. Cramp
   3. Tic
   4. Tremor
   5. Fasciculation (with MS and ALS)
   6. Fibrillation
   7. Volkmann’s contracture (BONUS)

IV. How does exercise (or the lack of it) affect muscle size? Relate this to endurance training vs. strength training.

A. Exercise and the size of muscles
   1. Atrophy
      a. Definition
      b. Cause and result
      c. Compare disuse atrophy to denervation atrophy
d. Prevention
   1. Transcutaneous muscle stimulation
   2. Range of motion exercises

2. Hypertrophy
   a. Definition

   b. Cause and result

   c. Misuse of HGH and anabolic steroids (detail)

   d. Isometric vs. isotonic exercise and muscle mass

B. Endurance training vs. strength training—relate to fiber types

C. Relate this to *Muscle, Meat, Athletes, and Birds* (see handout)