# Muscle Microanatomy and Physiology Study Guide

1. **Gross Anatomy of a Skeletal Muscle** (hand-out, p. 180, fig. 6.1)
   1. Muscle fibers, fascicles, blood vessels, and tendons.
2. **Microscopic Anatomy of a Skeletal Muscle** (hand-out, pp. 182-184, fig. 6.3)
   1. Muscle cell membrane (Sarcolemma), myofibril, dark band, light band, nuclei, z discs, thin actin filaments, thick myosin filaments, sarcomere
3. **Steps for Muscle Contraction and Relaxation**
4. Nerve signal to muscle.
5. Thick myosin filaments bind to thin actin filaments.
6. Thick filaments use ATP to pull the thin filaments together, which shortens the muscles fibers’ sarcomeres causing contraction.
7. Nerve signal stops, thick and thin filaments no longer bind each other and can slide past each other – muscle relaxes.
8. **Providing Energy for Muscle Contraction** (hand-out, pp. 189-191, fig. 6.10)
   1. Aerobic Energy Pathway (also called Cellular Respiration)
      * How we provide energy (ATP) to our cells 99% of the time.
      * Fuels = glucose in muscle and liver (2-3hrs), fat stores (6-12hrs), and proteins (days-starvation)
      * Requires oxygen and mitochondria
      * Produces 36 ATP per glucose and produces CO2 as waste
      * Produces ATP relatively slowly
   2. Anaerobic Energy Pathway (also called Lactic Acid Fermentation)
      * High intensity, short duration muscle activity like sprinting.
      * Our muscles use this pathway to produce fast energy during “emergencies”.
      * Fuel = glucose stored in muscle only (30-60sec)
      * Produces only 2 ATP per glucose and produces lactic acid as waste. Lactic acid is very irritating to our muscles.
      * But it produces ATP very quickly
9. **Effects of Exercise on Muscles** (notes, pp. 191-192)
   1. Low intensity, long duration exercise (Aerobic energy pathway used)

• Increased blood vessels (capillaries) in muscles and lungs

• Increased mitochondria in muscle cells

• Increased glucose stores in muscle and liver

• Increased heart strength

• Increased amount of myoglobin protein, which binds oxygen, in muscles

* 1. High intensity, short duration exercise (Anaerobic energy pathway used)

• Increased size and strength of muscles

• Muscle cells make more muscle protein

• Increased tendon size and strength

• Increased glucose stores in muscle cells

• Increased blood supply to muscles to more efficiently remove lactic acid