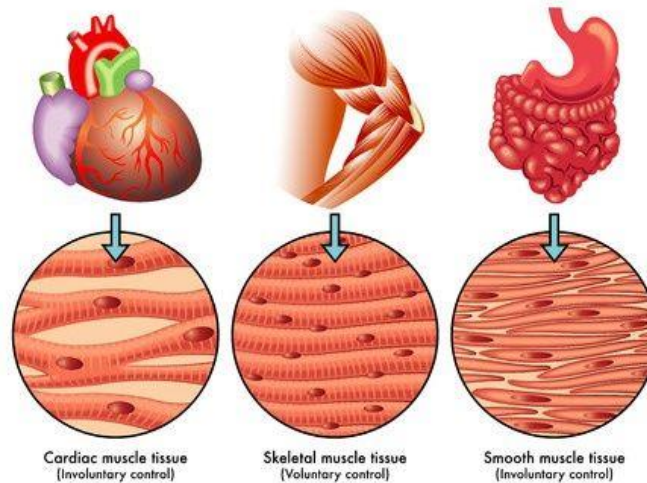
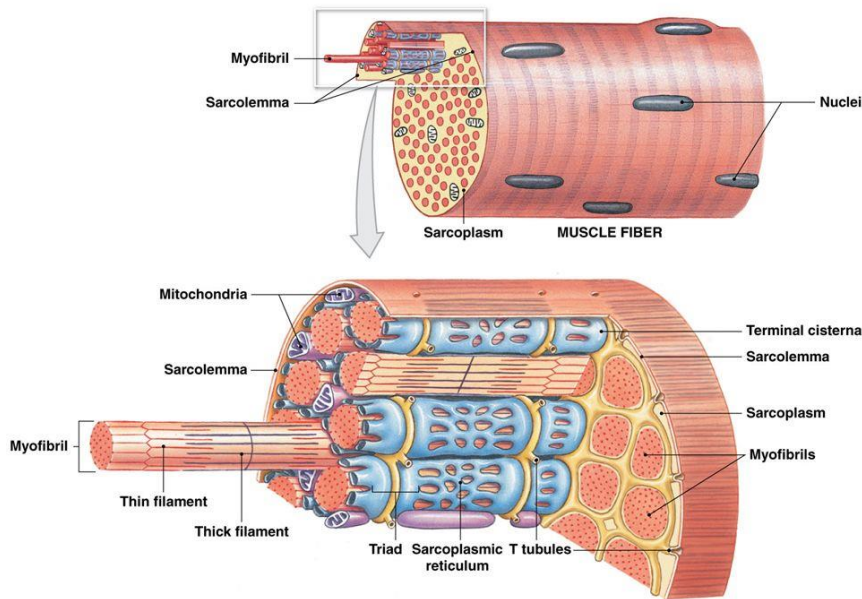


## Muscular System

- Properties of muscles
  - Excitability
    - All muscle tissues have an electric gradient which can be stimulated
  - Contraction
    - All muscle tissues have the ability to contract/shorten
  - Elongation
    - All muscle tissues can elongate/relax
- 3 types of muscle tissue

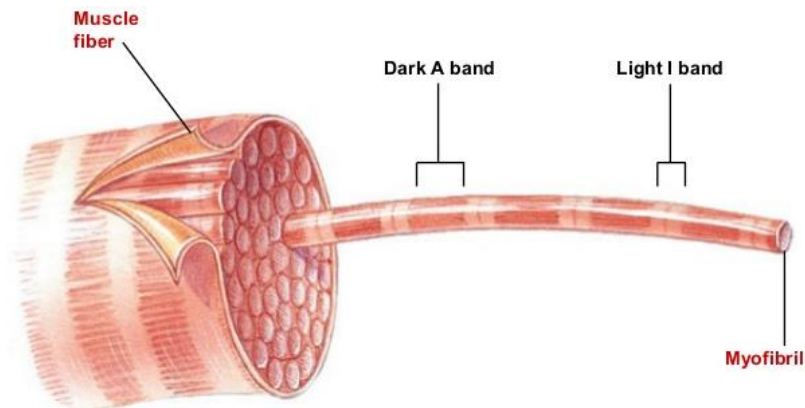


- Skeletal
  - Controls voluntary muscles that move parts of skeleton
    - The only muscle that interacts with skeleton movement
    - They exert force to attached bones when contraction occurs → movement of joints
    - Small contraction can cause large movements
  - Made of muscle fibers (muscle cells) that are connected in a PARALLEL MANNER
  - Striated
- Smooth
  - Controls involuntary muscles in walls of internal organs (like stomach)
  - Non-striated
  - Shorter and wider than skeletal muscles
- Cardiac
  - Controls involuntary muscle that is found only in the heart
  - Striated
- Myofibrils, myofilaments, skeletal muscle contraction
  - Myofibril
    - Make up the muscle cells
    - Made of contractile units called sarcomeres
    - Contains 2 protein microfilaments
  - Myofilament
    - Thick myofilament vs thin myofilament
      - Thick filament made of the protein myosin
      - Thin filament made of the protein actin



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- **Striations: dark band and light band**
  - Dark band is caused by overlapping of thick and thin filaments
  - Light band is caused by overlapping of thin filaments



- **Skeletal muscle contraction**
  - Cause by overlapping of thin filament slides over thick filament
  - Action potential (electrical signals) stimulates muscle fiber → calcium ions are released → calcium ions bind to myosin and actin → myosin head binds to actin molecules → ATP released from glucose provides energy for contraction