



## Notes: Muscular System

The muscles of your body produce movement by pulling, not pushing.

If all your muscles pulled in one direction, you could lift almost 25 tons.

What is important to know about muscles?

- Muscle contracts to move bones and body parts
- Muscles look either striated or smooth:
  - **Striated** muscle has stripes or striations in it.
  - **Smooth** muscle does not.
- Also, muscles are labeled as either voluntary or involuntary.
  - **Voluntary** muscles are muscles that you can move whenever you want to.
  - **Involuntary** muscles contract and relax automatically inside your body.  
We can not control our involuntary muscles.

### Types of muscles:

- **Cardiac** - involuntary muscle of the heart wall.
- **Smooth** - involuntary muscle of the stomach, intestine, and blood vessels.
- **Skeletal** - voluntary, striated muscles attached to bones.

The Three Types of Muscles			
Type of Muscle	Smooth Muscle	Cardiac Muscle	Skeletal Muscle
Appearance	Smooth	Striated	Striated
Voluntary or Involuntary	Involuntary	Involuntary	Voluntary
Function	Controls movement of <a href="#">internal organs</a> .	Controls contractions of the <a href="#">heart</a> .	Moves <a href="#">bones</a> . Skeletal muscles work in pairs. When one contracts, the other relaxes.  They are attached to bone by bands of tissue called <i>tendons</i> .

([http://vilenski.org/science/humanbody/hb\\_html/muscles.html](http://vilenski.org/science/humanbody/hb_html/muscles.html))



## FUNCTIONS OF MUSCLE

1. **Produces Movement**- Muscle contraction provides movement for the human body.
2. **Maintains Posture**- Muscles adjust continuously to provide coordination of movement.
3. **Stabilizing Joints**- Skeletal muscles pull against bones to cause movement and stabilize the joints of the skeleton.
4. **Generating Heat**-As ATP is used to provide energy for muscle contraction, almost 75% of the energy escapes as heat. This heat provides the majority of body heat needed for survival.

A **sarcomere** is the basic unit of a cross striated muscle's myofibril. Sarcomeres are multi-protein complexes composed of three different filament systems.

- The thick filament system is composed of myosin protein.
- The thin filaments are assembled by actin monomers.

A muscle cell, from a biceps, may contain 100,000 sarcomeres. The myofibrils of smooth muscle cells are not arranged into sarcomeres.




## ***Bands***

The sarcomeres are what give skeletal and cardiac muscles their striated appearance. A sarcomere is defined as the segment between two neighbouring Z-lines (or Z-discs). In electron micrographs of cross striated muscle the **Z-line** (from the German "Zwischen", *between* the I bands) appears as a series of dark lines. Surrounding the Z-line is the region of the **I-band** (for *isotropic*). Following the I-band is the **A-band** (for *anisotropic*).

Actin filaments are the major component of the I-band and extend into the A-band. Myosin filaments extend throughout the A-band and are thought to overlap in the M-band.

The interaction between actin and myosin filaments in the A-band of the sarcomere is responsible for the muscle contraction\_(sliding filament model).

 Visit the following website and view the animation that describes the structure and function of the sarcomere:

<http://lessons.harveyproject.org/development/muscle/swstfast.html>