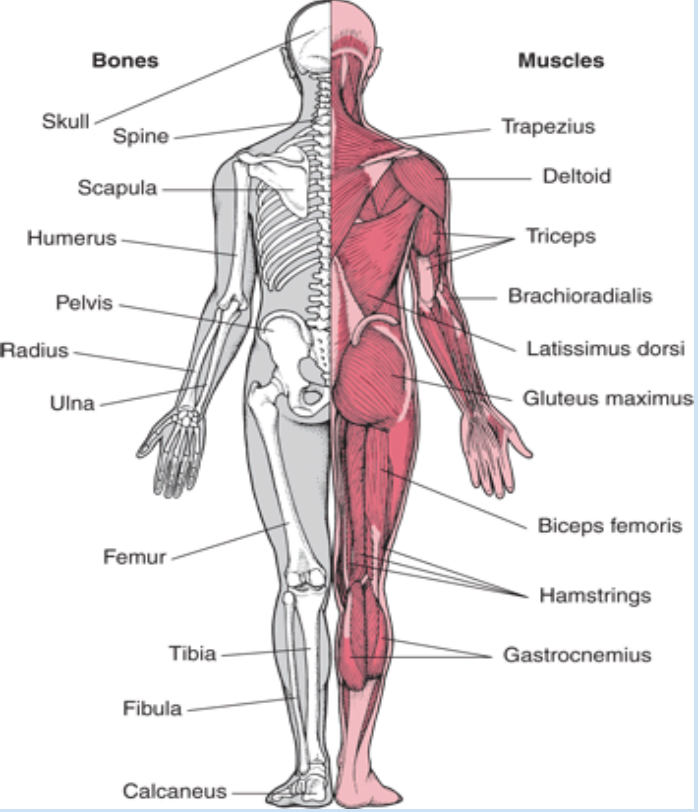
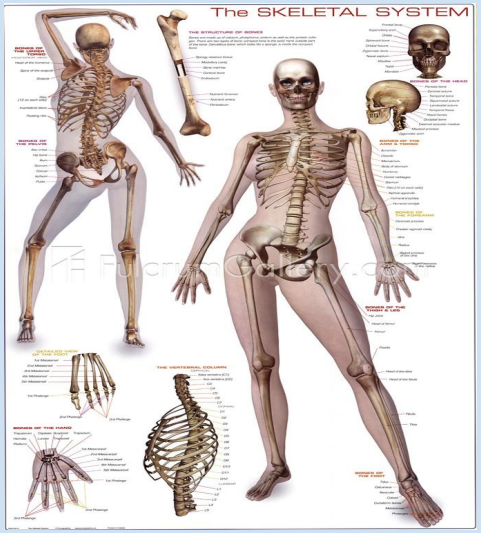


Skeletal/Muscle System

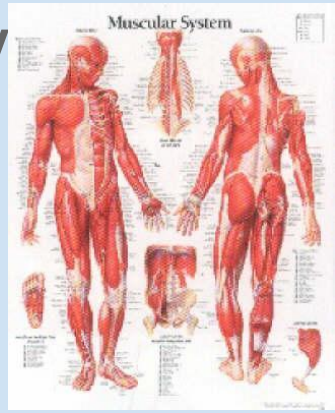
Dixie Elegant, Angie Ramirez, Jalen Waller, and Monika Kuzma
Thorp-B band

What is the skeletal/muscle system?

The skeletal system is all of the bones in the body and the tissues such as tendons, ligaments and cartilage that connect them.



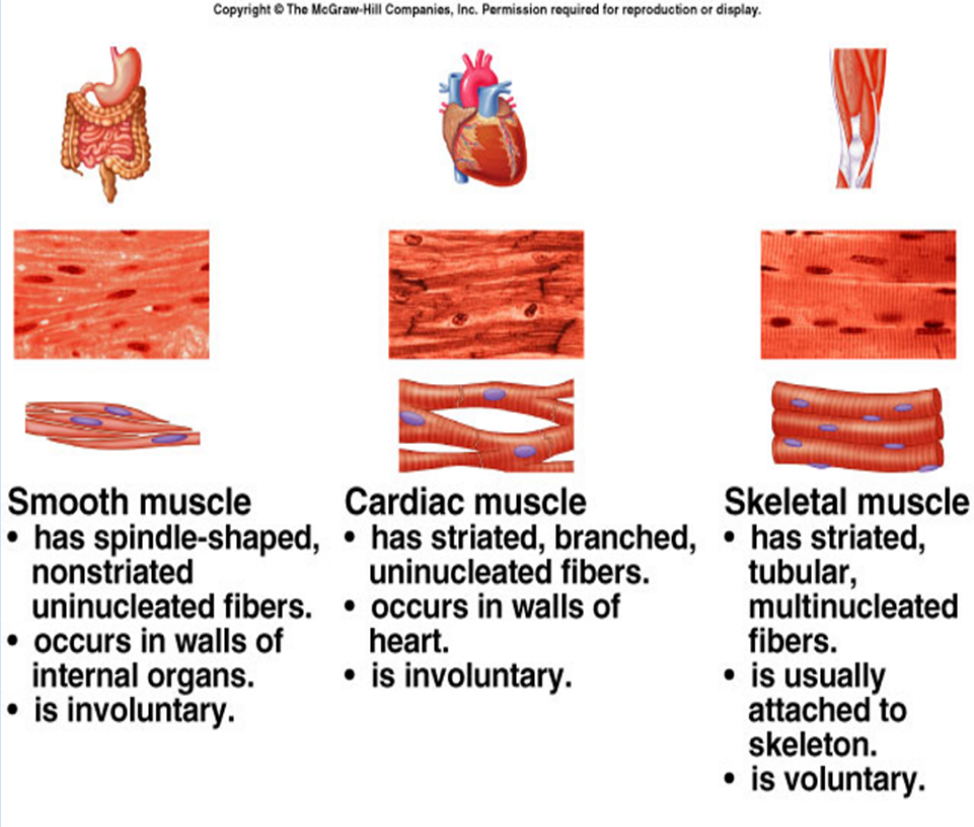
The muscular system includes over 600 muscles. Muscles are bundles of muscle fibers held together by connective tissue. All muscles have a specific job in the body



Types of Muscles

There are three types of muscles, skeletal, cardiac, and smooth. They provide

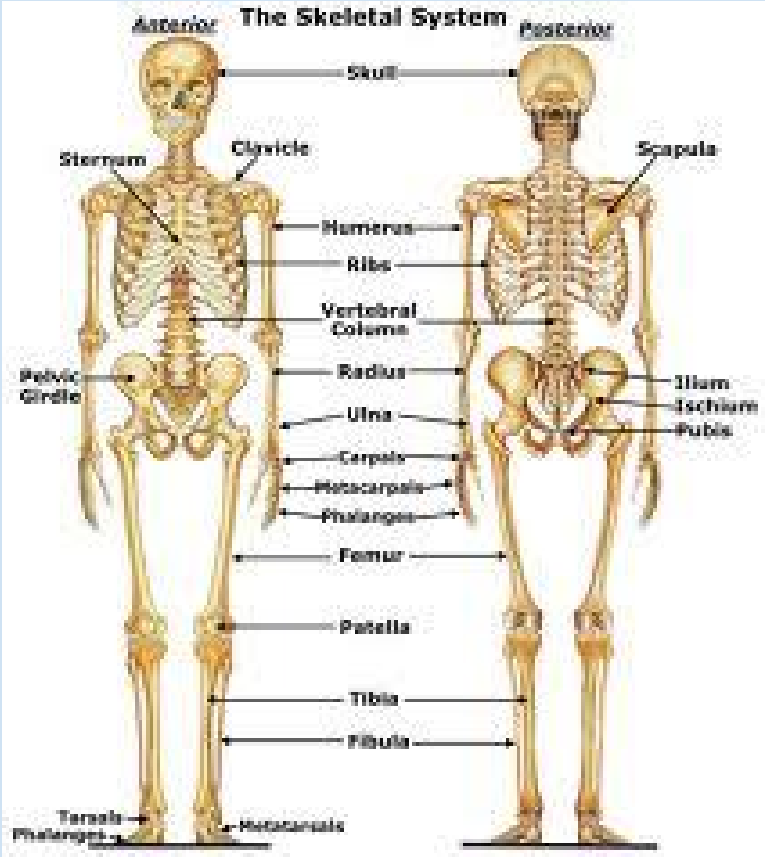
most of the human body's mass. Without the muscular system, all other essential functions of the body wouldn't be able to take place.



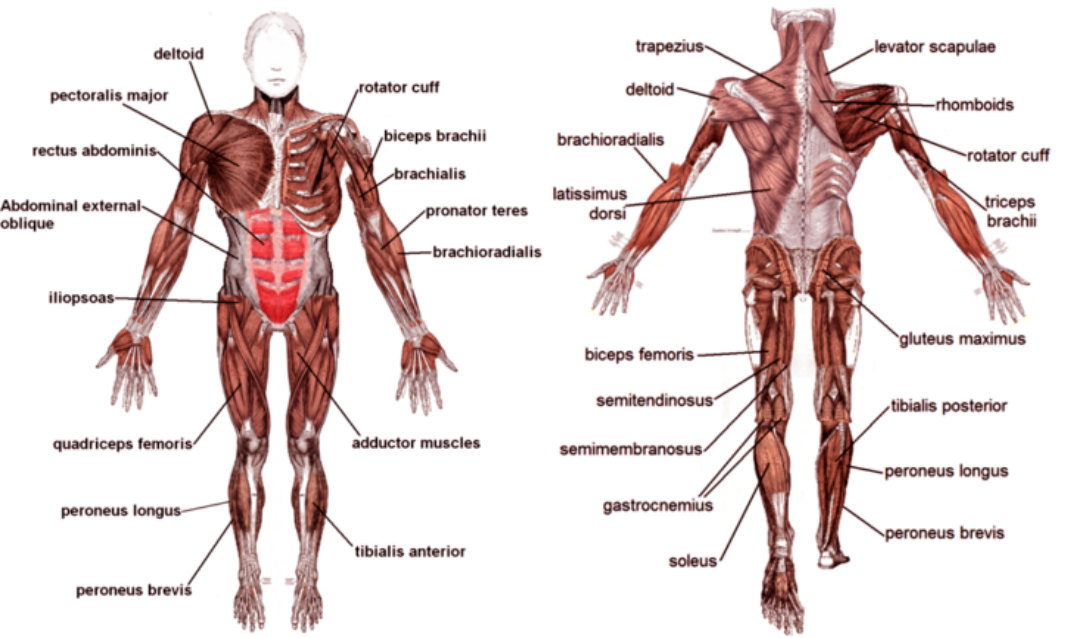
Skeletal System

The Skeleton can be defined as the hard framework of human body around which the entire body is built.

- made up 206 bones
- divided into two parts
- axial skeleton
- the appendicular skeleton



Muscular System



There are hundreds of muscles within the body, including more than 400 skeletal muscles.

These muscles are controlled by the nervous system. Some are involuntarily controlled (contract and relax without thought). Other muscles are voluntarily controlled (you control).

Components of the Skeletal System

- **Bone** - contains collagen and calcium phosphate which is a mineral crystal. Calcium phosphate is what gives bone its firmness, and collagen provides flexibility. Bone also contains small amounts of magnesium, sodium, and bicarbonate. 20% of adult bone mass is composed by water. By adulthood, there are 206 bones in the human body.

- **Cartilage** - provides flexible support for structures such as nose, ears and trachea. It is a form of fibrous connective tissue that is made of closely packed collagenous fibers in a substance called chondrin.

- **Tendon** - a fibrous band of connective tissue that is bonded to bone and connects bone to bone. It connects muscles to bones and helps to stabilize joints.

- **Ligaments** - a fibrous band made up of connective tissues that joins bones and tissues together at the joints and therefore allows for the controlled movements of joints.

- **Joints** - the point where two or more bones in the skeleton are joined together.

Components of the Muscle system

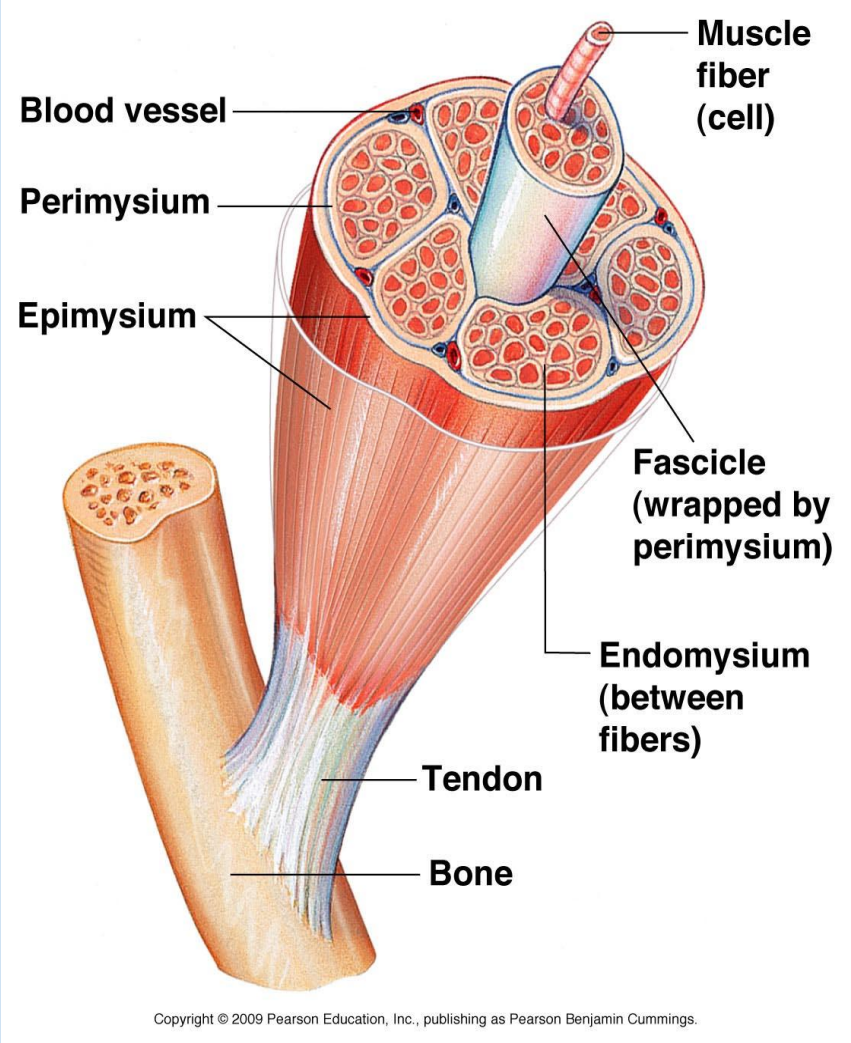
- **Cardiac muscle -** Cardiac muscle is only found in the heart. Its only function is to provide the major force of pumping blood through the body. The cells in the cardiac muscle are joined together by intercalated disks which allows for unique synchronized contraction of the heart.

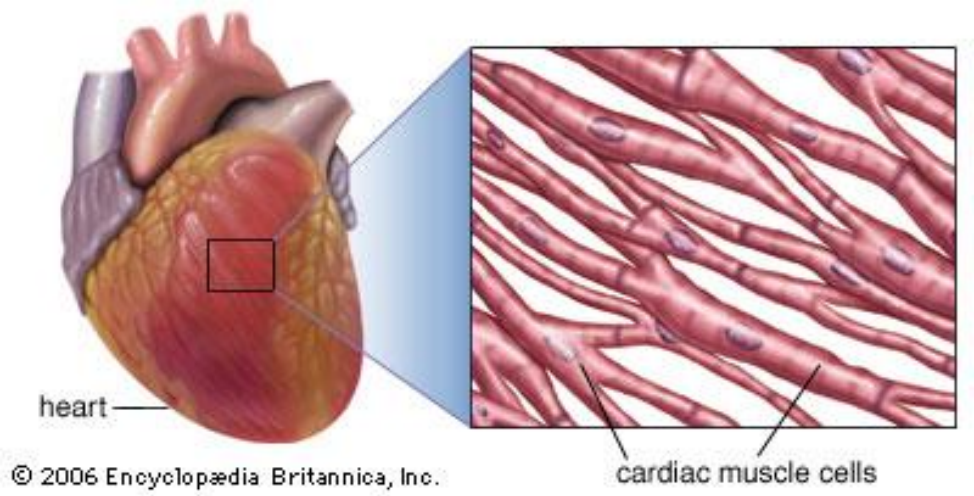
- **Smooth muscle -** Smooth muscle is found in the walls of certain organs, blood vessels, eyes, glands, and the skin. Unlike cardiac muscle, smooth muscles are not striated in appearance. They have an involuntary contraction.

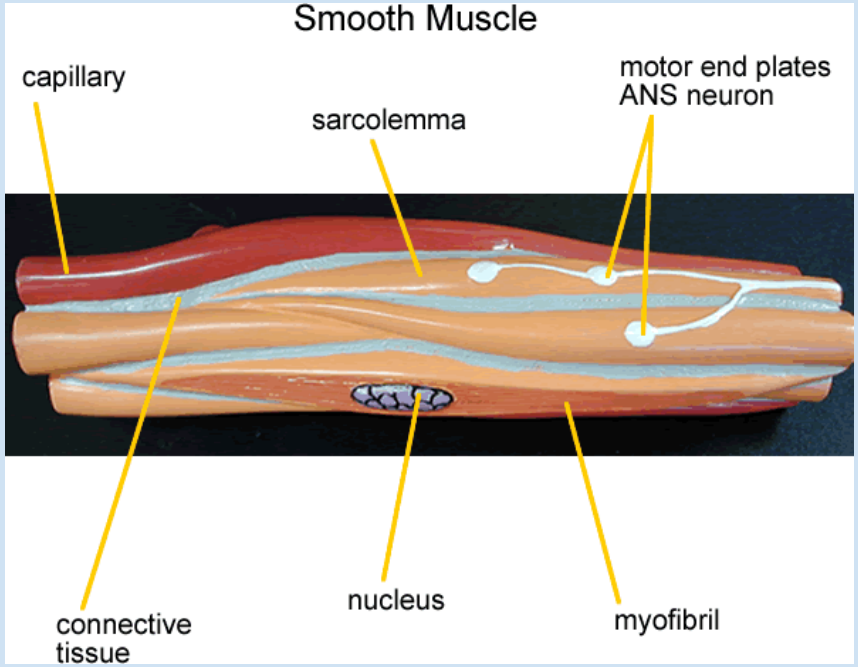
- **Skeletal muscle -** This muscle is responsible for the movement of the body as well as respiration and heat production. It is attached to the bone and striated in appearance. Its cells are larger than the other muscles and are shaped like a cylinder. Lastly, its fibers are divided in 2 main categories, slow twitch and fast twitch. Slow twitch muscles react more slowly, and are fatigue resistant while fast twitch muscle respond quickly, but fatigue quickly.

- **Connective tissue -** The connective tissue is found within and around skeletal muscle. There are different types of connective tissues such as tendons, fascia, endomysium and perimysium which have different functions and are found in different places around muscles.

MUSCLE DIAGRAMS







Functions of the Skeletal System

support- provides structural support for the entire body

protection- surrounds soft tissue, protects

movement- skeletal muscle is attached to bone so it pulls on the bone when it contracts

mineral homeostasis- skeletal muscle is attached to bone so it pulls on the bone when it contracts

blood cell production- red bone marrow produces red blood cells, white blood cells and other blood elements

storage- storage of minerals and lipids(fats)---yellow marrow stores fat --(found in long bones)

Functions of the muscular system

Skeletal Muscles Create Movement- The primary function of skeletal muscle is to produce voluntary gross and fine movements. Large movements include walking, standing, gathering food, cooking food, turning in a chair, running, playing sports and lifting weights. Fine motor skills or smaller movements include chewing, closing your eyes, blinking, typing, writing and talking.

Skeletal Muscles Protect Organs

Cardiac Muscle Pumps Blood- The contraction of the heart muscle is involuntary and primarily controlled by your heart's own electrical system, with and without influence from factors in the blood

Smooth Muscle helps with Digestion- The smooth muscles in your stomach and intestines work to process the food you eat.

Smooth Muscle Ensures Blood Flow- There are smooth muscles in the walls of your blood vessels. When your heart contracts, your arteries expand to accept the blood. The smooth muscles in your arteries contract to push the blood throughout the blood vessel systems in your body

Voluntary and Involuntary muscles

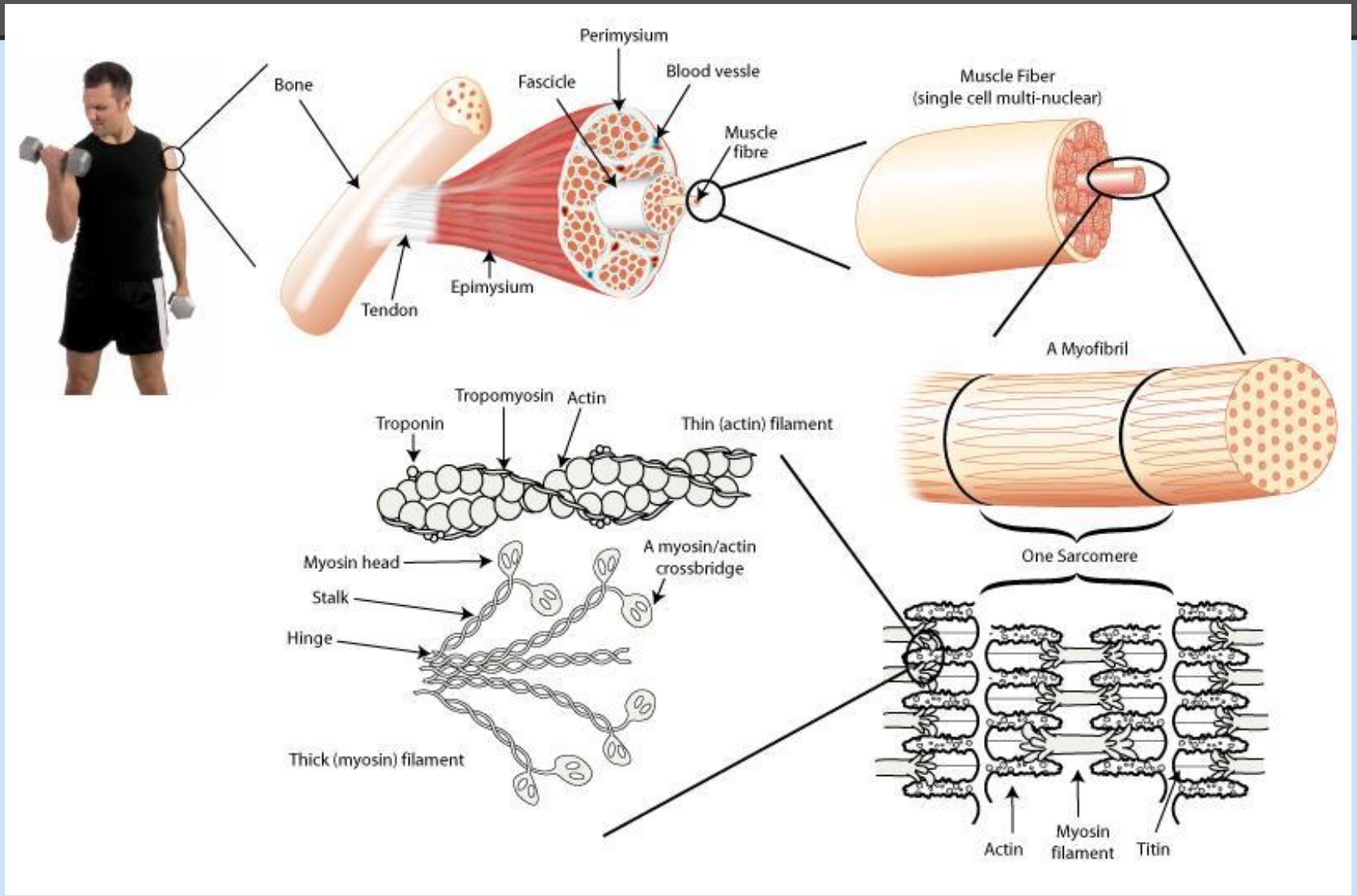
Voluntary muscles - are the ones that you can control. Most of them move your bones around. You use voluntary muscles while running, walking, eating, etc. They move your arms, legs and body around. Your brain must send the right messages (such as to contract and relax) to the body in order for voluntary muscles to produce these functions.

Involuntary muscles - don't need the brain to send them messages. You cannot control involuntary muscles. Your heart is an involuntary muscle and so are the muscles in your digestive system.

MUSCLE CONTRACTIONS

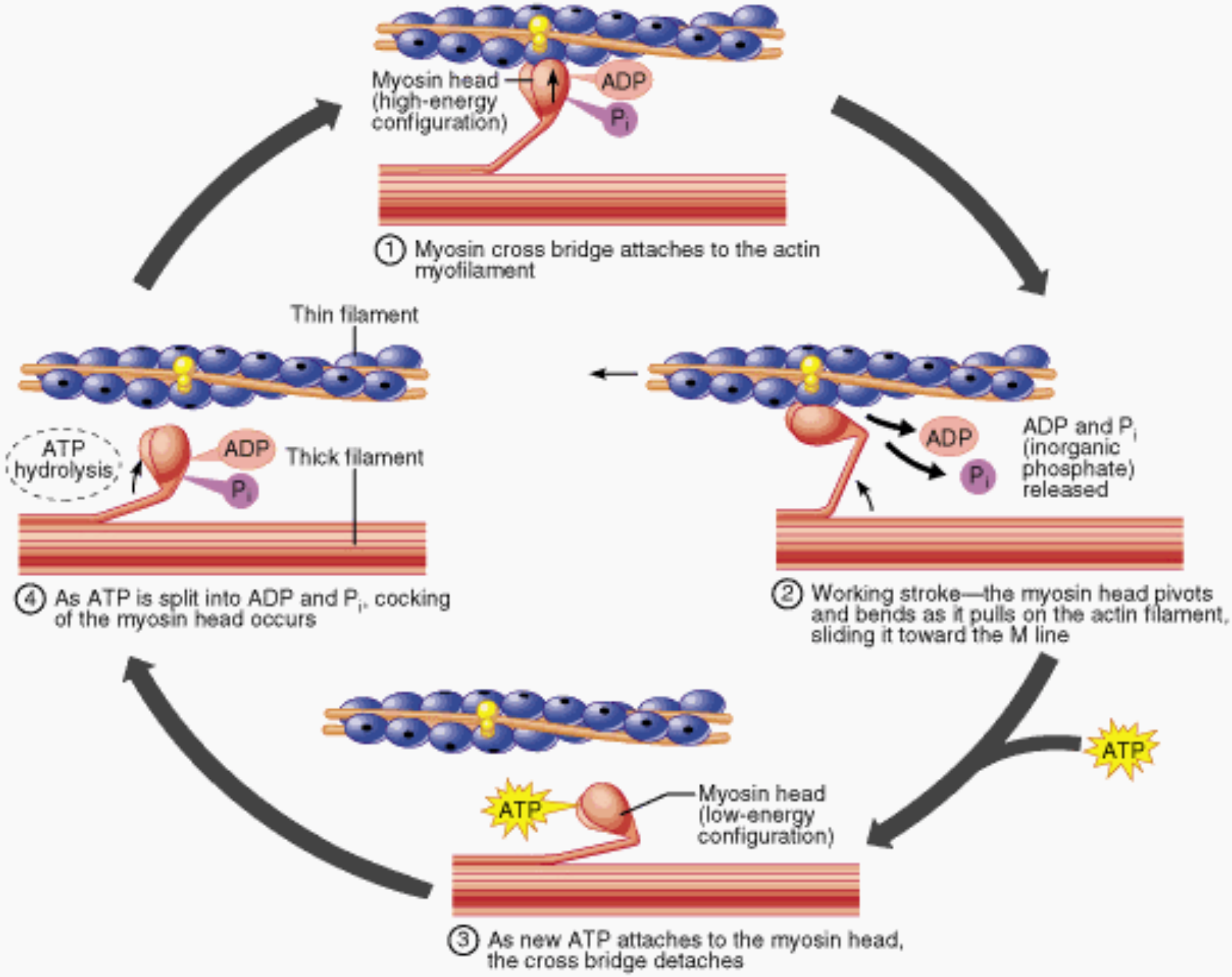
- Muscles are made of fibers. Each fiber is made up of long thin cells which are packed in bundles. The fibres have two kinds of protein, myosin and actin. Each bundle is wrapped in a thin skin called perimysium
- The bigger the muscle the more bundles of fibres it has.
- Inside the muscles there are nerves which carry messages to and from the brain. There are also blood vessels, which carry the energy that your muscles need and also carry away waste that your muscles have finished with.
- Muscle contraction causes the muscle fibers to shorten by a process called the sliding-filament mechanism. During a muscle contraction, the thin and thick filaments in a sarcomere (unit of muscle) slide past each other.

MUSCLE CONTRACTIONS



MUSCLE CONTRACTIONS

- Voluntary muscle contraction is controlled by the central nervous system.
- Involuntary muscles contract as a result of non-conscious brain activity.
- Muscle contractions are caused by actin filaments sliding past myosin filaments.
- The H zones contain only myosin, while the I bands contain both actin and myosin
- During muscle contraction, the A band remains the same and the I band narrows.
- In a contraction muscle, the Z lines come closer together. http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter10/animation__sarcomere_contraction.html



MUSCLE CONTRACTIONS

- During contraction of a muscle, calcium ions bind to the troponin molecule.
- The bond between the actin and myosin head is broken when an ATP molecule binds to the myosin head.
- Energy is released when ATP is broken down into ADP and phosphate
- The sequence of cross bridge formation and myofilament movement will be repeated as long as calcium ions are present.

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter10/animation__breakdown_of_atp_and_cross-bridge_movement_during_muscle_contraction.html

When Things Go Wrong

Skeletal:

Some common diseases of the skeletal system are **osteoporosis**, which results in the loss of bone tissue. In osteoporosis, bone losses calcium, the bone becomes thinner and may disappear completely.

Another disease is **arthritis** which damages joints and their surrounding structures. Arthritis can damage joints, joint capsules, and surrounding tissues throughout the body.

Leukemia affects the blood, but the cancer starts in the bone marrow. This causes abnormal white blood cells to multiply uncontrollably which affects the production of normal red & white blood cells.

Muscular:

Myasthenia gravis is a chronic, autoimmune disease that results in muscle weakness and fatigue. This breakdown of the neuromuscular junction can cause the brain to lose control over muscles and results in difficulty in breathing and swallowing.

Cerebral palsy is brain damage during childbirth. This causes a loss of muscle tone and impacts posture, balance, and motor function. So it becomes difficult to perform everyday tasks.

Reason For Importance

Skeletal System:

- It provides support for all the tissues and organs that make up the body
- Provides protection for the most important organs and supports the body
- Is the framework for your body
- Allows movement
- Provides the birthplace of new red blood cells in the marrow of the bone
- Joints are very important
- Stores materials like calcium until your body needs them

Reason for importance

Muscular System:

- Energy- Muscles store ATP which is the energy currency of life. Without muscles there would be no place to store the extra amount of ATP the body needs to survive.

- Movement- Without the muscular system, we wouldn't be able to talk, smile, or see. There are over 30 muscle in the face alone.

- Without the muscular system, the process of food digestion would never take place. Which would rob the body of essential nutrients. The muscle causes a series of contractions known as peristalsis which is how food is transported from the mouth to the esophagus.

- Cellular energy
- Cardiac muscle pumps blood all over your body. Blood moves through the heart through coordinated contractions of the cardiac muscle cells.

Video

http://www.youtube.com/watch?v=uxBe-BgmNTs (axial & appendicular)

links

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter10/animation__breakdown_of_atp_and_cross-bridge_movement_during_muscle_contraction.html

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter10/animation__sarcomere_contraction.html

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter10/animation__action_potentials_and_muscle_contraction.html

http://www.livescience.com/22537-skeletal-system.html

http://hes.ucfsd.org/gclaypo/skelweb/skel01.html#what

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http://www.scumdoctor.com/anatomy/skeletal-system/What-Are-The-Major-Components-Of-The-Skeletal-System.html