

# THE HUMAN BODY SYSTEMS

## The Skeletal System

- The skeletal system is made of bones, cartilage and ligaments.

- The skeletal system has five major functions:

- **Provides your body with support and shape**

- Many bones give your body the shape you are familiar with. The central part of your skeleton is your vertebral column, or spine. It is made up of 26 disc-shaped vertebrae.

- **Allows us to move**

- The skeletal and muscular systems rely on each other to allow movement. Muscles pull on bones to allow you to move body parts.

- **Protects internal organs**

- Some bones, such as the ribs and skull, do not move or provide much support, but they do protect internal organs. The skull surrounds the most important organ in the body, the brain. The ribs and sternum (breastbone) protect your lungs. The vertebrae help in several ways. They aid in movement, support and they protect your spinal cord.

- **Makes red blood cells**

- Red blood cells are made in the red marrow of certain bones in your body. This is why people who may have a disease of the blood, like leukemia (cancer of the blood), may need a bone marrow transplant.

- **Stores certain materials until the body needs them (like calcium)**

- Bones have different parts:

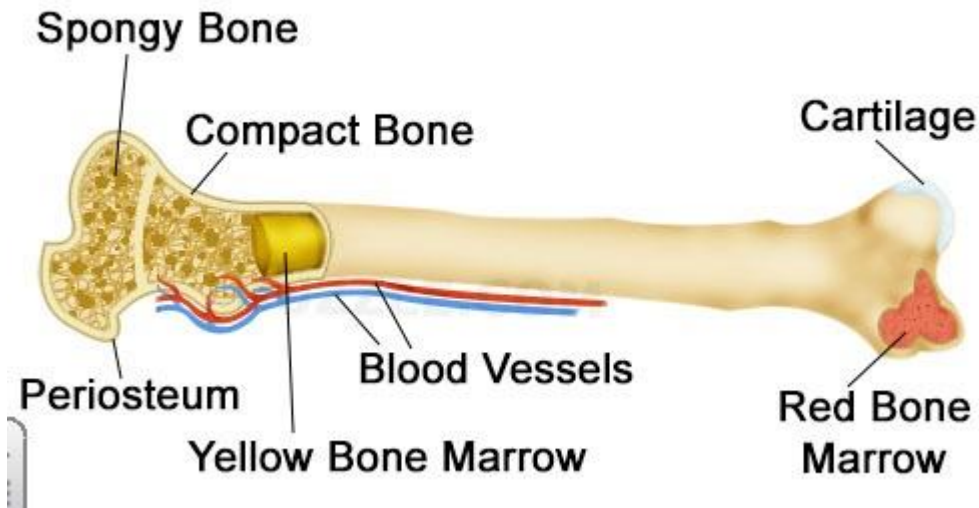
- **Compact bone:** Strong, dense bone that forms the outer layer of your bones. This is the material which gives bones their strength.

- **Spongy bone:** Light-weight, porous (full of holes) bone found under the compact bone. Blood vessels and nerves run through spongy bone.

- **Red marrow:** Soft tissue that makes red blood cells. In adults, it is only found in certain bones (ends of the femurs-thigh bones, skull, pelvis and sternum-breastbone).

- **Yellow marrow:** Soft tissue found in the center of most bones. It is mostly made of fat.

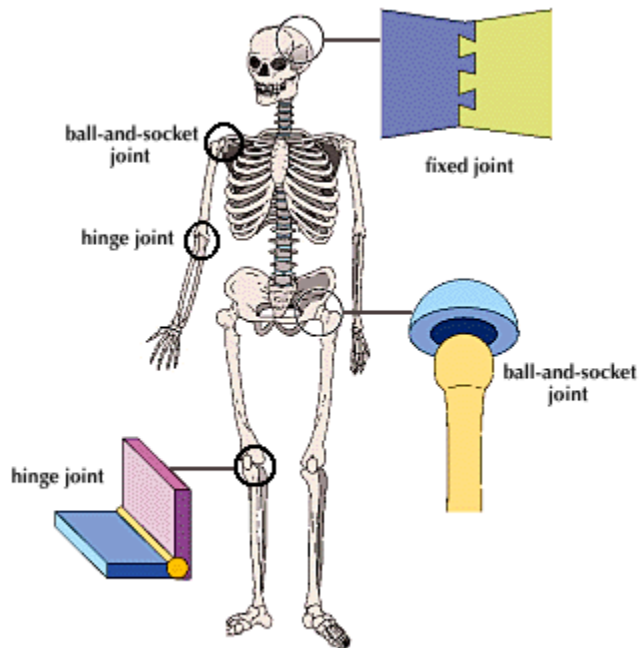
- **Periostium:** tough outer covering of bones. Place where tendons and ligaments attach.



- **Joint:** a place where two bones meet; there are several types of joints

**Ligaments:** bands of tissue that attach bones to other bones.

- **Fixed (immovable) joint:** a joint that cannot move (ex. skull)
- **Pivot joint:** a joint in which one bone rotates in the ring of another bone (ex. the place where the base of the skull meets the top of the spine)
- **Hinge joint:** a joint that only allows back-and-forth movement (ex. elbow, knee, jaw, knuckles)
- **Ball-and-socket joint:** a joint in which one bone with a rounded end fits into a cup shaped hole in another bone (ex. shoulder, hip)
- **Gliding joints:** a joint in which one flat bone moves over another (ex. wrist, ankle)



## The Muscular System

The main job of the muscular system is **movement**. Your skeletal muscles move your bones, and your bones move your body. Your cardiac muscle contracts your heart, and squeezes blood out and forces it through blood vessels around your body, and your stomach muscles churn up your food. The esophagus squeezes food to move it through your digestive system.

- Muscles fall into one of two categories: voluntary and involuntary muscle.

- **Involuntary muscle:** muscle that cannot consciously control
- **Voluntary muscle:** muscle that you can consciously control (when you think you want to move it, it moves)

- There are three types of muscle: skeletal, smooth, and cardiac.

- **Cardiac muscle:** the unique muscle found only in the heart (it is involuntary muscle)
- **Skeletal (striated) muscle:** muscle that is attached to bones by tendons. They make bones move. It is the only type of muscle you can control.
  - Most skeletal muscles are voluntary muscles. However, reflexes that move skeletal muscles are not voluntary (like when the doctor taps your knee with the hammer.) Some skeletal muscles are voluntary and involuntary at the same time, like your diaphragm and your eyelids.
- **Smooth muscle:** muscle that is found in hollow organs, like your stomach or esophagus. (It is

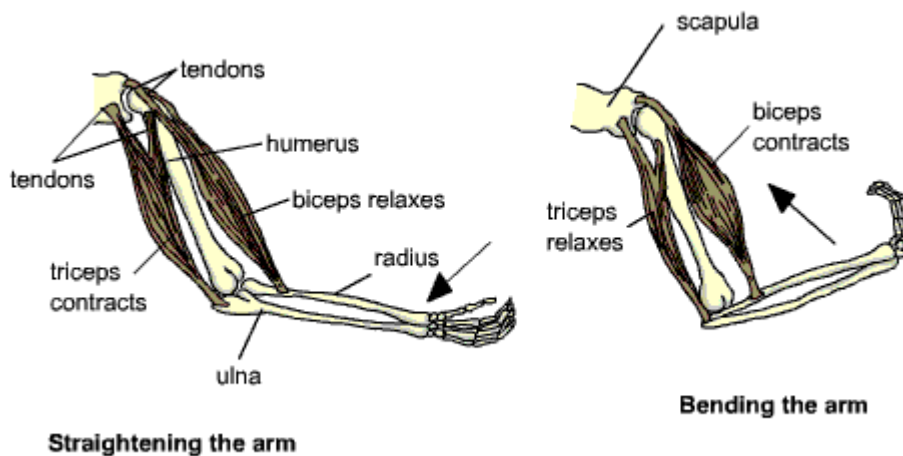
involuntary muscle)

- Muscles work closely with bones to help you move.

- **Tendons:** tough bands of tissue that attach muscles to bones

### How muscles cause bones to move.

- When a muscle **contracts (shortens)** the tendons pull on the bones making them move. (Like a string puppet. A puppeteer pulls on the strings, making the puppet move. The muscles are like the puppeteer. The strings are like the tendons. The puppet is like the bones.)
- Muscles work in pairs. When one muscle contracts, an opposite muscle relaxes.
  - When you pull your hand to your shoulder, your biceps (the muscle in the front of your upper arm) contract and your triceps (the muscle in the back of your upper arm) relax. When you straighten your arm, your triceps contract and your biceps relax.



### The Digestive System

- The human body requires six types of nutrients. The digestive system helps deliver these nutrients to the rest of the body, in a form that the body's cells can use.

- The digestive system has 3 jobs:

- It breaks down food into molecules the body can use.
- It helps move nutrients into the bloodstream so it can be carried throughout the body.
- It eliminates solid wastes from the body.

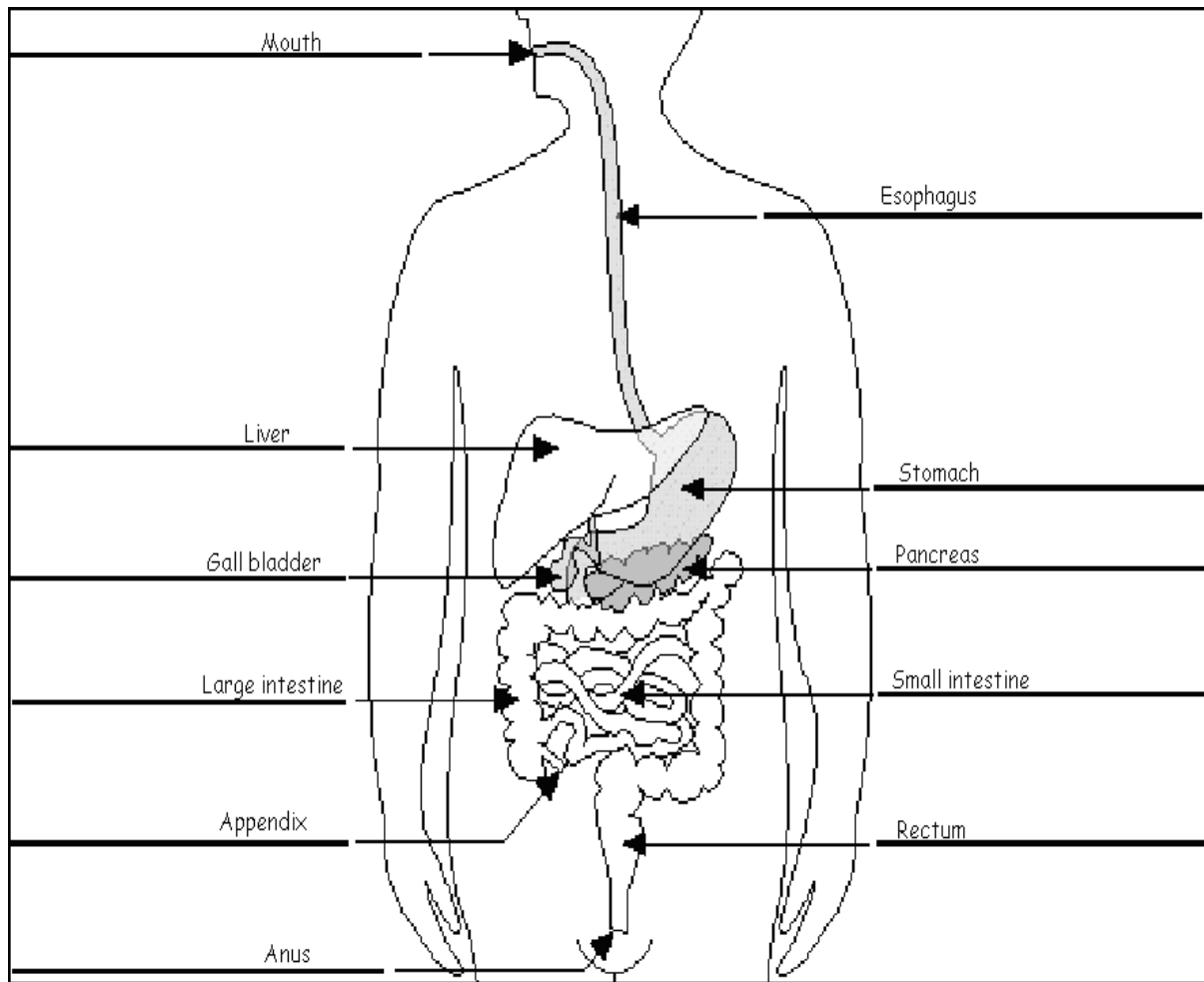
- Parts of the digestive system:

- Food actually moves through the following organs

- **Mouth:** the first part of the digestive system, where food enters the body. Chewing and salivary enzymes in the mouth are the beginning of the digestive process (breaking down the food).
- **Esophagus:** the long tube between the mouth and the stomach. It uses rhythmic muscle movements (called peristalsis) to force food from the throat into the stomach.
- **Stomach:** a sack-like, muscular organ that is attached to the esophagus. When food enters the stomach, it is churned in an acid bath.
- **Small intestine:** the long, thin winding tube that food goes through after it leaves the stomach. This is where most absorption of nutrients takes place.
- **Large intestine:** the long, wide tube that food goes through after it goes through the small intestine. This is where absorption of water takes place.
- **Rectum:** the lower part of the large intestine, where feces are stored before they are excreted from the body.
- **Anus:** the opening at the end of the digestive system from which feces exit the body.

- The following organs are called accessory organs: they aid in the digestive process by producing enzymes and other digestive chemicals, but the food doesn't actually move through them

- **Pancreas:** an enzyme-producing gland located below the stomach and above the intestines. Enzymes from the pancreas help in the digestion of carbohydrates, fats and proteins in the small intestine.
- **Gall bladder:** a small, sac-like organ located by the duodenum (where the stomach and small intestine connect). It stores and releases bile (a digestive chemical which is produced in the liver) into the small intestine.
- **Appendix:** a small sac located near the start of the large intestine.
- **Liver:** a large organ located above and in front of the stomach. It makes bile (which breaks down fats).



### - Types of Digestion:

- The digestive system breaks down food in two ways: **mechanical digestion and chemical digestion.**

- **Mechanical digestion:** the breaking up of food into smaller pieces

- Mechanical digestion occurs when **muscle is used** to break up food. Most mechanical digestion occurs in the mouth (teeth and tongue) though some occurs in the stomach,

- **Chemical digestion:** using **chemicals** (enzymes, hydrochloric acid, etc.) to break down food into molecules the body can use

- Most chemical digestion occurs in the small intestine, though some occurs in the mouth (saliva) and stomach.

- When food has been completely broken down into usable molecules it must be absorbed into the blood stream. This happens in the small intestine. Villi absorb the nutrients and then they enter the capillaries.

## The Respiratory System

- The respiratory system is the group of organs responsible for carrying oxygen from the air to the bloodstream and for removing the waste product carbon dioxide from our bodies.

- Humans need oxygen to allow our cells to release energy from the food we eat.

### - Parts of the respiratory system:

- **Larynx (voice box):** a muscular structure at the top of the trachea containing the vocal cords

- **Trachea (windpipe):** the tube through which air travels from the larynx to the lungs

- **Bronchi:** either of two main branches of the trachea, leading directly to the lungs

- **Bronchioles:** the system of airways within the lungs, which bring air from the bronchi to the lung's tiny air sacs (alveoli)

- **Alveoli (air sacs):** a microscopic, thin-walled, capillary-rich sac in the lungs where the exchange of oxygen and carbon dioxide with capillaries takes place

- **Left lung & right lung:** together with the heart, the lungs job is to remove carbon dioxide from the blood and provide oxygen to the blood.

- **Diaphragm:** a muscular membrane under the lungs

- Breathing is controlled by the diaphragm. When the diaphragm contracts it flattens out and air flows into the lungs (inhale). When it relaxes, it curves upward and air is forced out of the lungs (exhale).

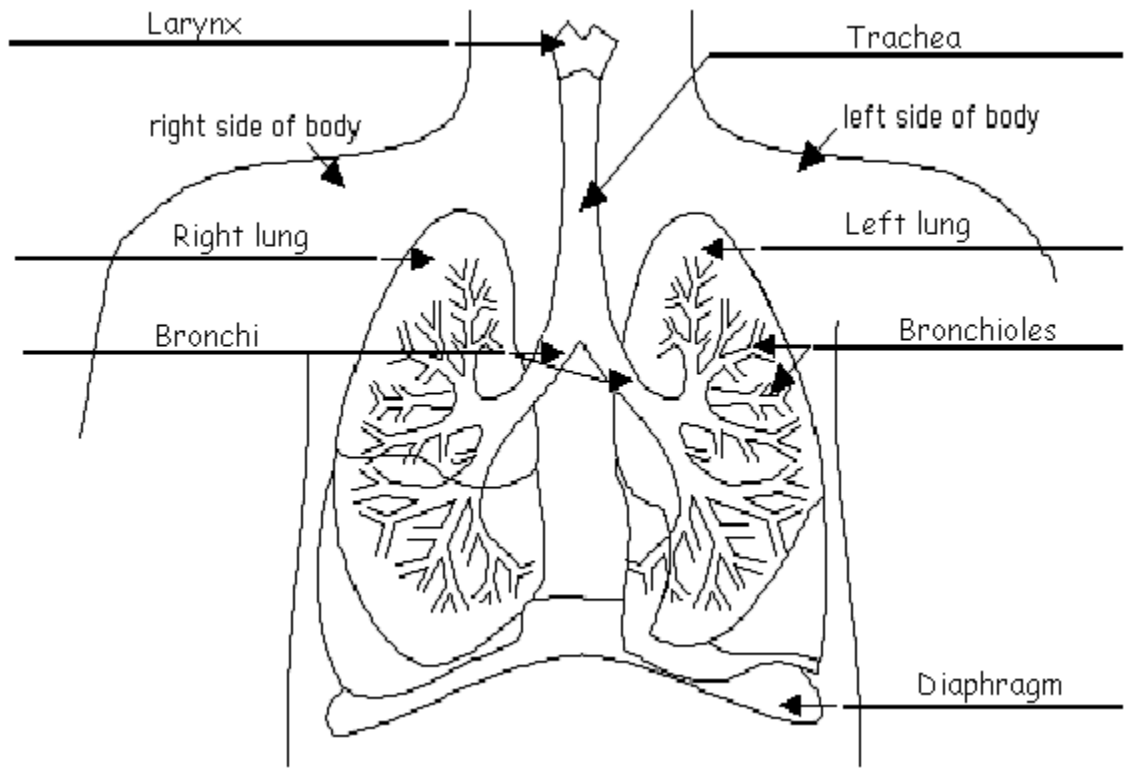
- Gas exchange: Gas exchange is the process in which oxygen is passed into the blood while carbon dioxide exits the blood. This occurs in the alveoli.

- When a person inhales, air flows into the nose and mouth, through the trachea, to the bronchi, to the bronchioles and fills up the alveoli found at the end of the bronchioles.

- Red blood cells moving through capillaries receive oxygen from the alveoli.

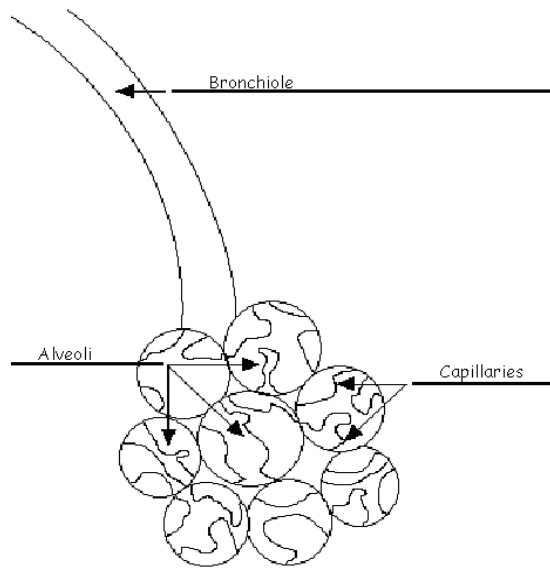
- The alveoli receive carbon dioxide from the red blood cells.

Diagram of the respiratory system:



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Location of Gas Exchange in the Lungs:





## The Circulatory or Cardiovascular System

- The circulatory system's job is to be the body's transportation system. It takes needed substances to cells and takes waste products away from cells.

- The circulatory system is made of three parts: the heart, blood vessels and blood.

- **The heart:** the central organ of the circulatory system. It is a powerful muscle which pumps blood through blood vessels and around the body.

- The heart is divided into four chambers.

- **Ventricles:** the two lower chambers of the heart

- **Atria (singular-atrium):** the two upper chambers of the heart

Aorta (to the body)

Vena Cava (from the body)

Pulmonary Artery (to the lungs)

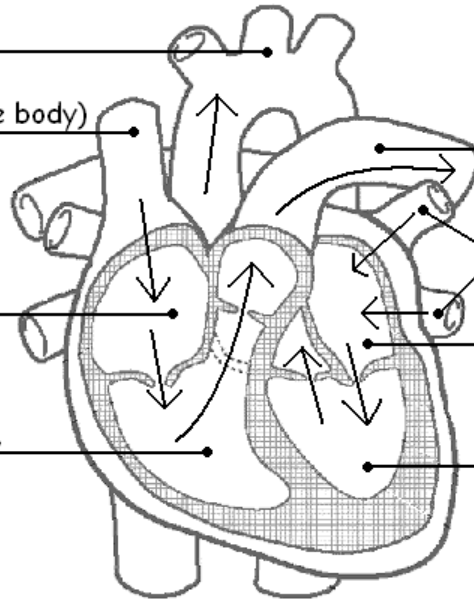
Right Atrium

Pulmonary Vein (from the lungs)

Left Atrium

Right Ventricle

Left Ventricle



- There are 3 major categories of blood vessels: arteries, veins and capillaries.

- **Arteries:** blood vessels which carry blood away from the heart

- **Veins:** blood vessels which carry blood toward the heart.

- **Capillaries:** tiny blood vessels which allow materials (oxygen, nutrients, wastes) to be exchanged between the blood and the body's cells

## The Excretory System

The **function** of the excretory system is to remove **wastes** from the body.

- The excretory system relies on many other body systems to remove waste from the body.

- **The urinary system is not really a body system, but part of the excretory system.**

- The urinary system removes most of **the liquid waste** from your body in the form of **urine**.

Urine is mostly made of water, but it obviously contains some other chemicals.

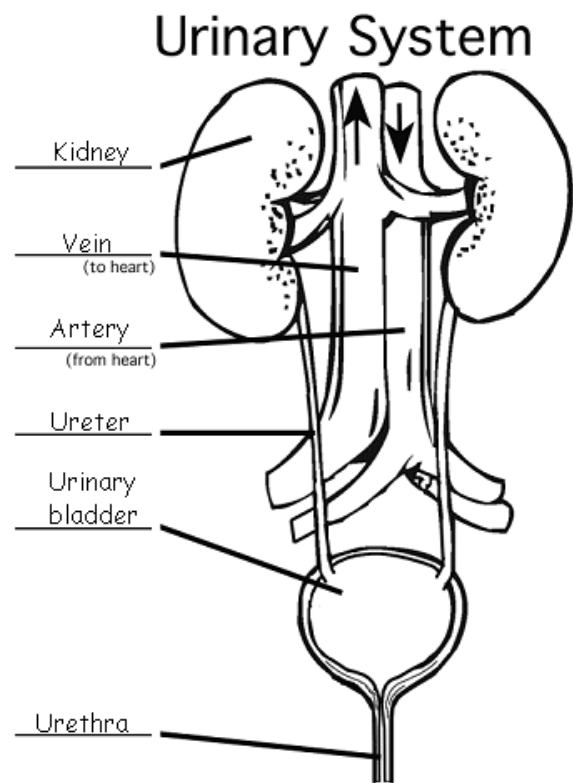
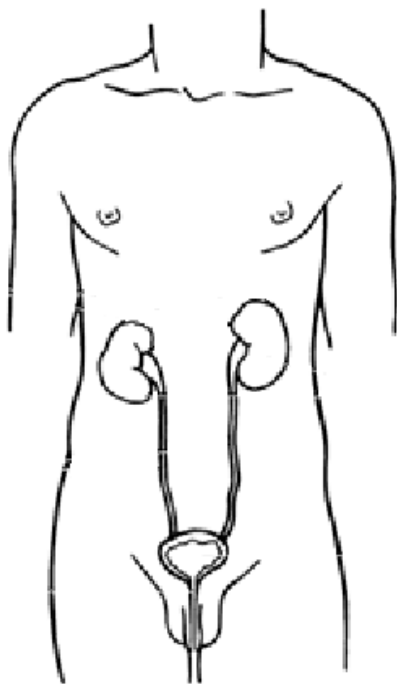
- The urinary system has four major parts.

- **Kidney:** either one of a pair of organs in the abdominal cavity, which filter wastes from blood, which are then excreted as urine

- **Ureter:** a long, narrow tube that carries urine from the kidney to the urinary bladder

- **Urinary bladder:** an elastic (stretchy), muscular sac in which urine collects before excretion

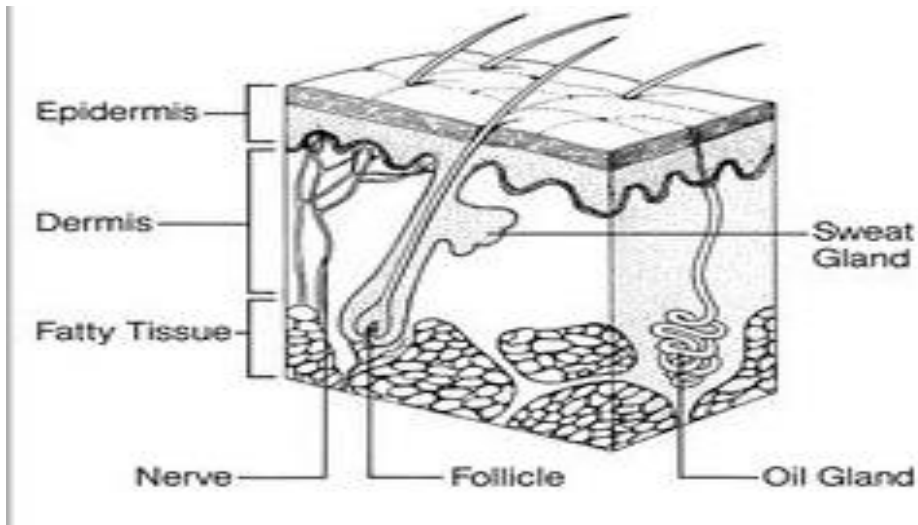
- **Urethra:** the tube through which urine is released from the bladder



- The respiratory system is also part of the excretory system. Your lungs (and alveoli) remove carbon dioxide and some waste water from your blood.

## THE SKIN

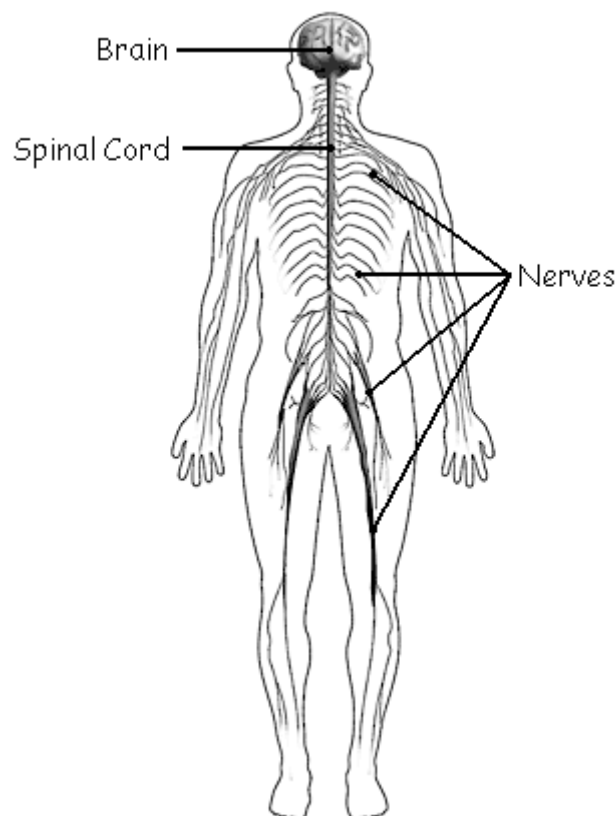
- The skin also acts as an excretory organ, helping to remove waste water, salts and some urea.



## The Nervous System

- The three main parts of the nervous system are the brain, spinal cord and nerves.

- **Brain:** the part of the nervous system that is located in the skull and controls most functions in the body
- **Spinal cord:** the thick cord of nerve tissue that is protected by the vertebrae and that links the brain to most of the nerves in the body
- **Nerve:** a bundle of nerve fibers that carries an impulse (message) through the body. For the most part, nerves carry the impulses using electricity



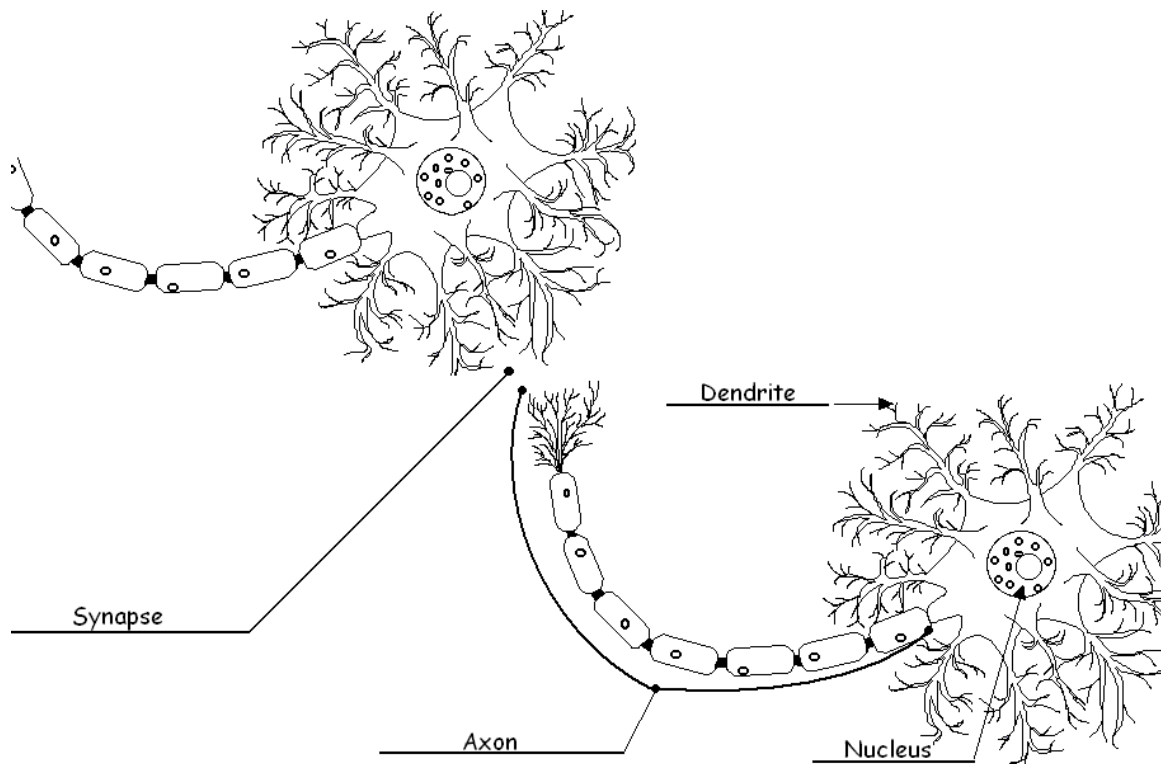
- The job of the nervous system is to **receive and interpret messages** (stimuli) from our external and internal environments (inside and outside our body). It also directs our body to **respond** appropriately to these messages.

- **Stimulus:** any change in the environment that makes an organism react
- **Response:** an organism's reaction to a stimulus

- We receive messages using our five senses. The five senses are sight, hearing, taste, smell and touch.

- Nerves are made up of many individual nerve cells called neurons. Neurons have three main parts.

- **Axon:** the long extension of a neuron that carries nerve impulses away from the body of the cell.
- **Dendrites:** the branching structure of a neuron that receives messages (attached to the cell body)
- **Nucleus:** the organelle in the cell body of the neuron that contains the genetic material of the cell



- **Synapse:** the tiny space between the end of an axon and the next structure (a dendrite, a muscle cell or the cell of another organ). Electrical messages cannot cross synapses. Instead, when an impulse reaches a synapse, chemicals carry the message across.

## Endocrine System

The endocrine system controls daily activity and long term changes such as development using chemicals known as **HORMONES**.

The endocrine system is made of glands.

Glands are the organs that make hormones.

Hormones control the activities of the body.

### **-Glands:**

Glands are organs which release chemicals directly into the blood stream.

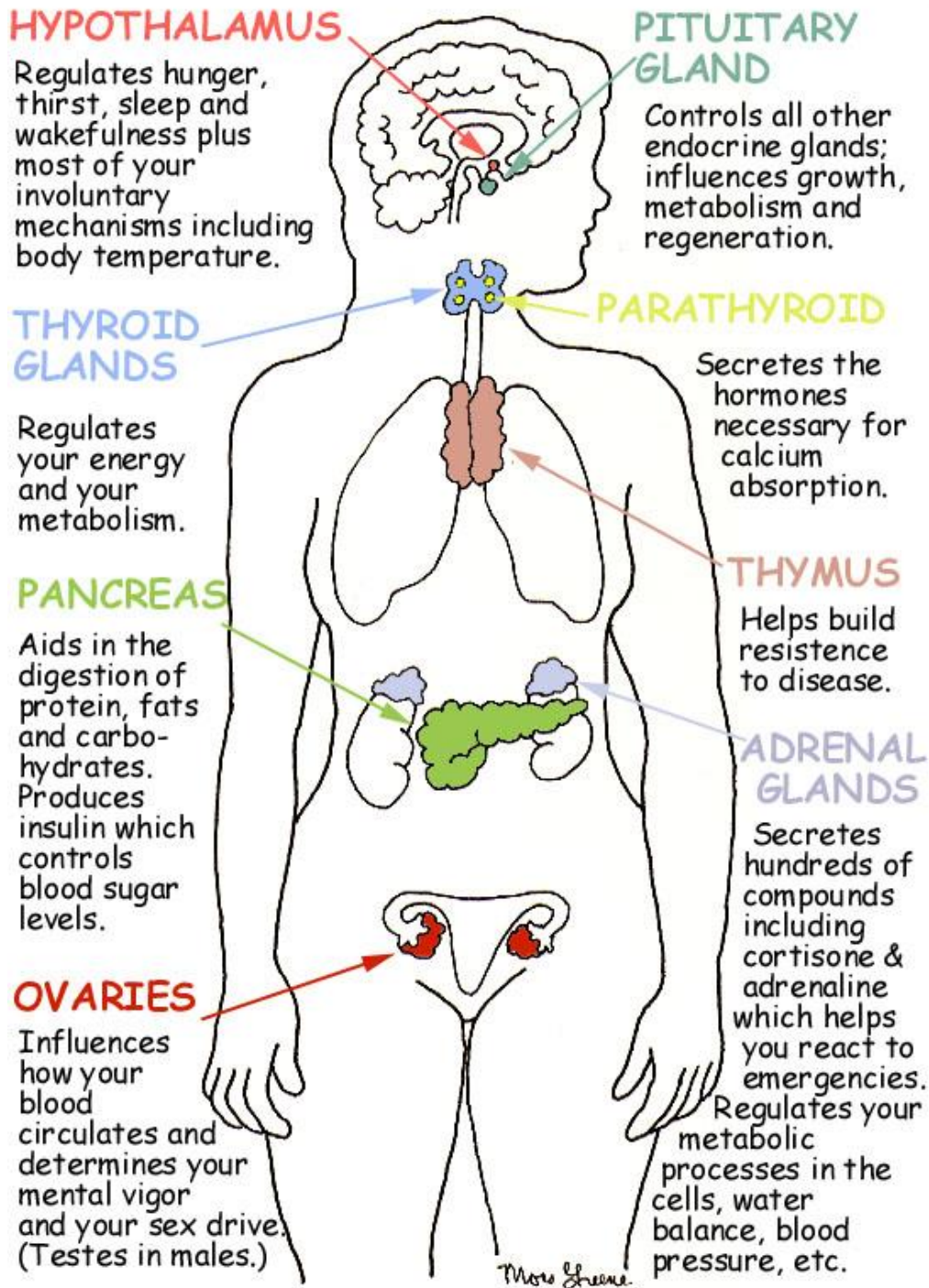
Endocrine glands are NOT like salivary or sweat glands. Salivary and sweat glands deliver their chemicals through tubes and must act close to the gland.

### **-Hormones:**

- They are **chemical messengers** made by endocrine glands.
- Hormones turn on, turn off, speed up, or slow down activities of a specific organ or tissue. Hormones act on target cells like a "lock and key".
- Hormones can work far from glands that make them since they are delivered by the bloodstream.
- Hormones are slower to act but longer lasting than nerve impulse response.
- Different types of hormones control reproduction, metabolism (food burning and waste elimination), and growth and development. Hormones also control the way you respond to your surroundings, and they help to provide the proper amount of energy and nutrition your body needs to function.

The glands that make up the endocrine system include the thyroid, parathyroid, pancreas, ovaries, testes, adrenal, pituitary and hypothalamus

# THE ENDOCRINE SYSTEM



**METABOLISM** - The conversion of nutrients into energy and building materials to meet your body's needs.

## Reproductive Systems

### Male Reproductive System

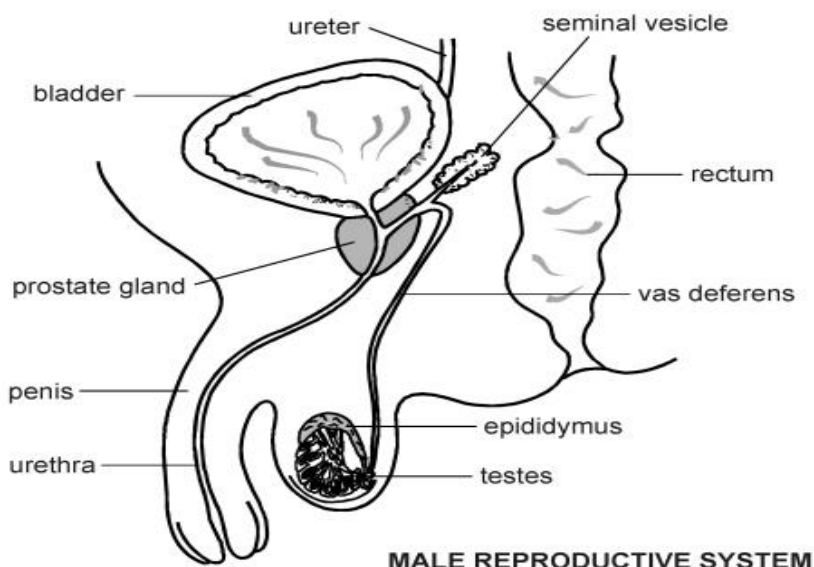
The main **function** of the male reproductive system is to produce sperm.

Sperm is the sex cell produced by the male. It joins with the female sex cell, known as the egg, in a process called fertilization, whereupon a fertilized egg (or zygote) is formed. The zygote is the fertilized egg. Over a period of 9 months this fertilized egg cell develops into a new person.

#### Parts of the male reproductive system:

- Testes:** produce sperm, the male sex cell
- Vas deferens:** tube that delivers sperm from testes
- Seminal Vesicle:** adds fluids to sperm to make semen
- Prostate gland:** adds fluids to sperm
- Penis:** deposits semen in female
- Urethra:** tube that delivers semen out of the body

#### Diagram of the male reproductive system

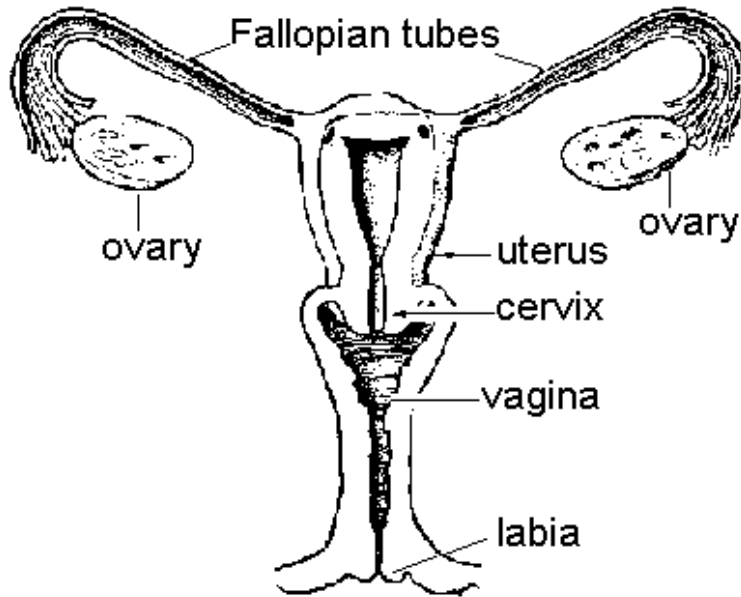




## Female Reproductive System

The **2 functions** of the female reproductive system are to produce eggs, and to provide a place to protect and nourish the developing baby.

### Diagram of the Female Reproductive System



### Parts of the Female Reproductive System

-**Ovary:** The female is born with egg follicles in the ovary. These develop into eggs. One egg is released each month, in a process called **ovulation**.

-**Fallopian Tube:** The released egg travels through the fallopian tube to the uterus. **Fertilization** occurs in the fallopian tube.

-**Uterus:** The developing baby implants into the wall of the uterus. This is where the baby will develop until it is ready to be born. (AKA womb)

-**Cervix:** The opening of the uterus.

-**Vagina:** The baby passes through the vagina, or birth canal.

