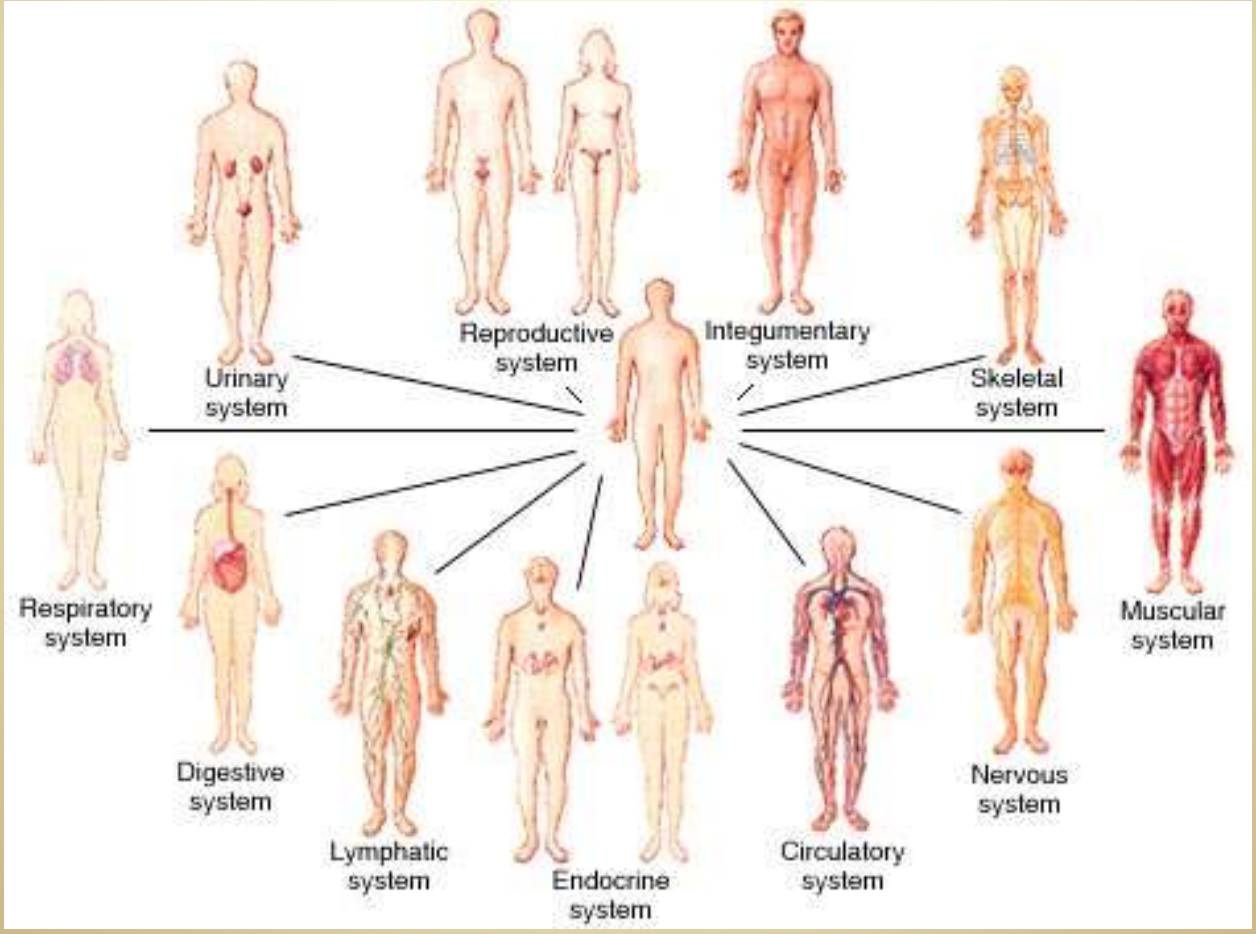
Human Body Systems



Levels of Organization: the order of organization in an organism from smallest to largest

- Cells
- Tissues
- Organs
- Organ Systems
- Organism

- Cells: the smallest unit of life.

Tissues: a group of cells working together to preform a specific function

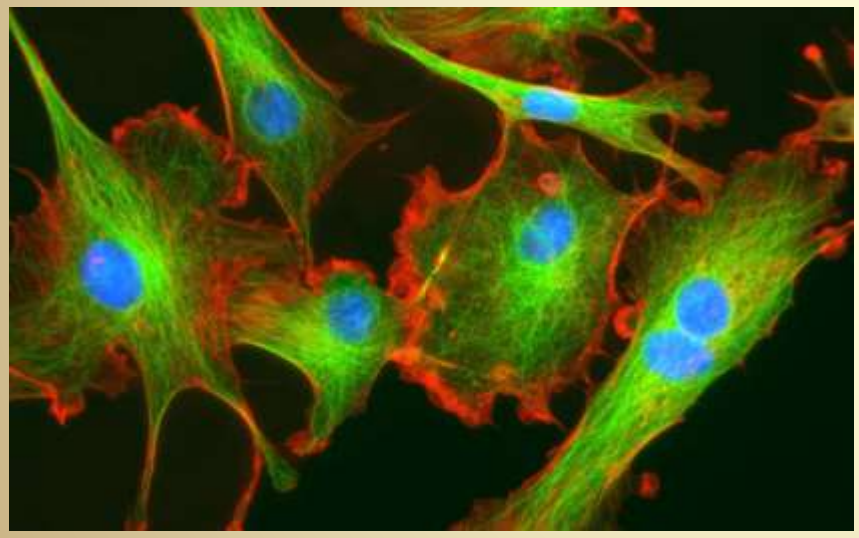
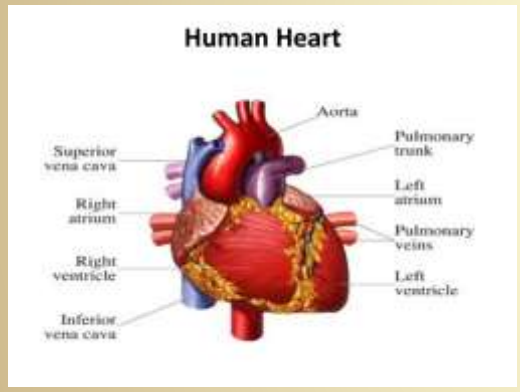
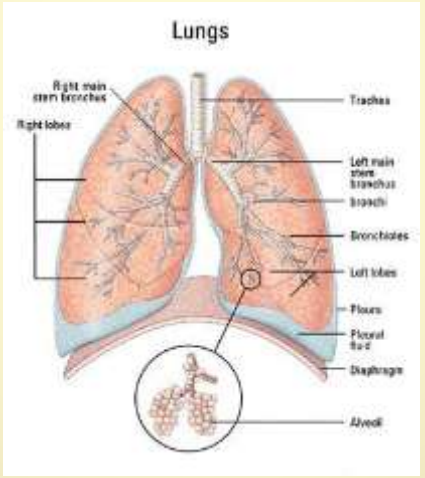
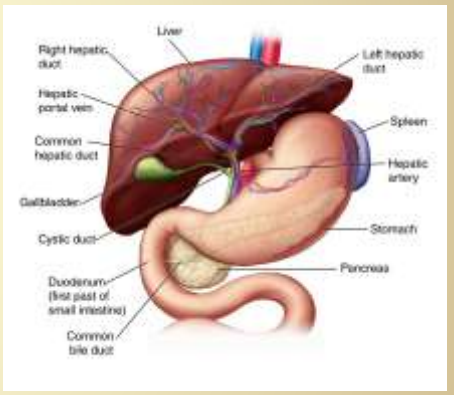


Fig. 1 Four main types of tissues found in humans

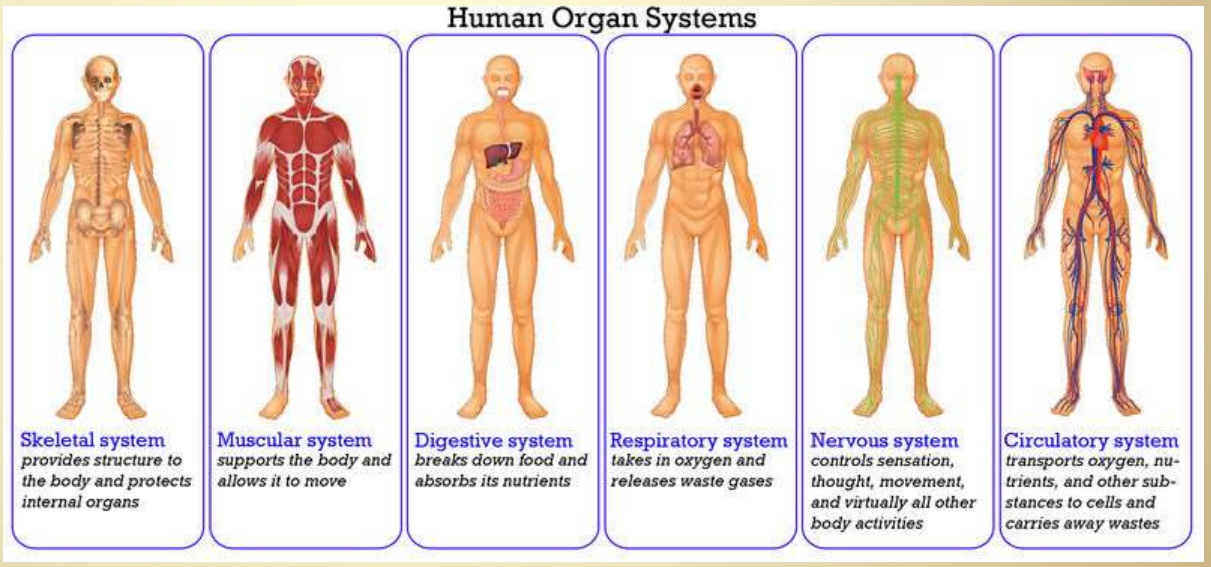
Organs: a group of tissues working to perform a function. Example: heart, liver, lung, stomach







Systems: a group of organs working together to perform a specific function



Organism: a group of systems working together to sustain life and maintain homeostasis.

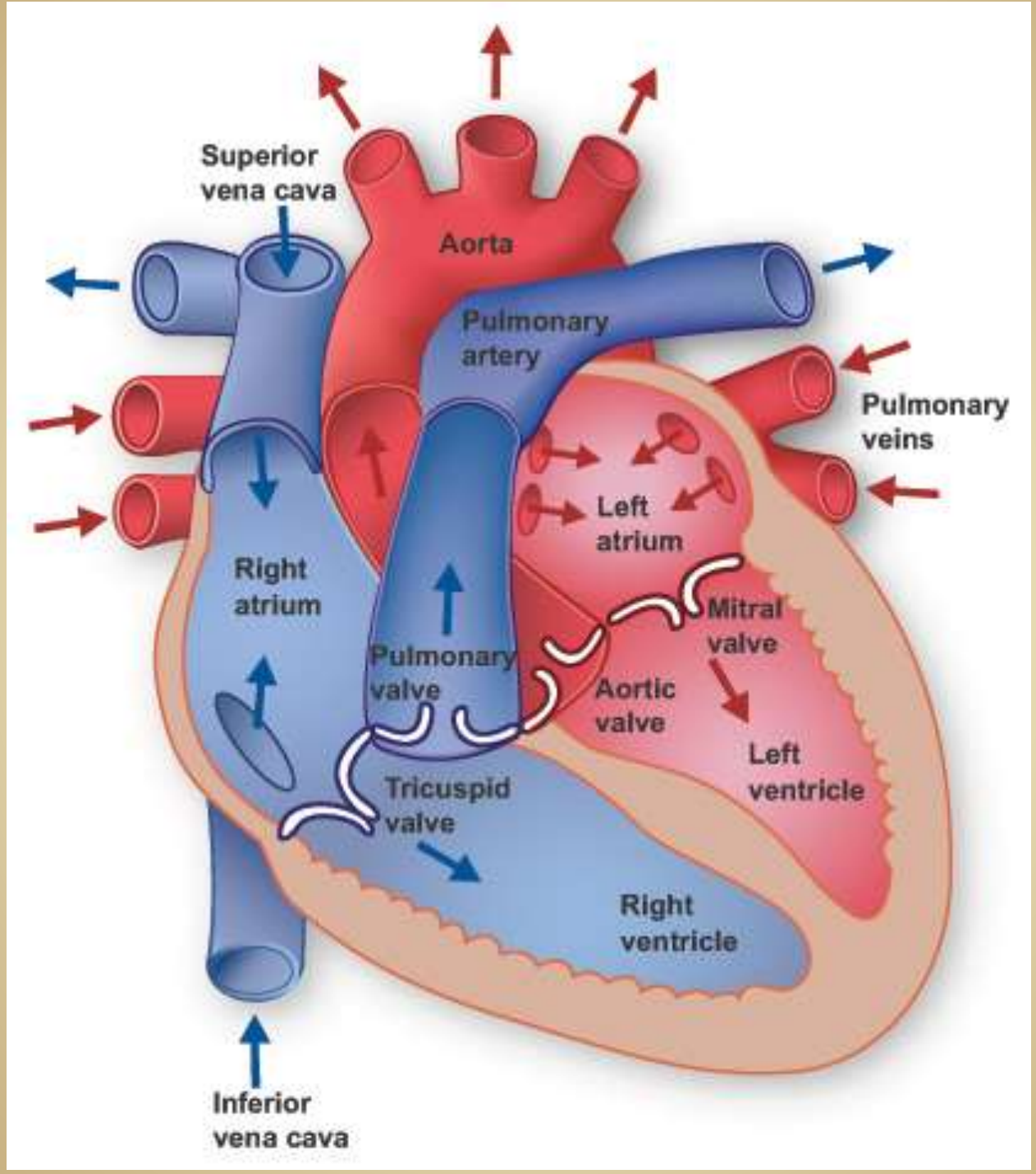
Circulatory System

Purpose

The Circulatory Systems brings oxygen, nutrients and hormones to cells; fights infections; removes cell wastes; regulates body temperature

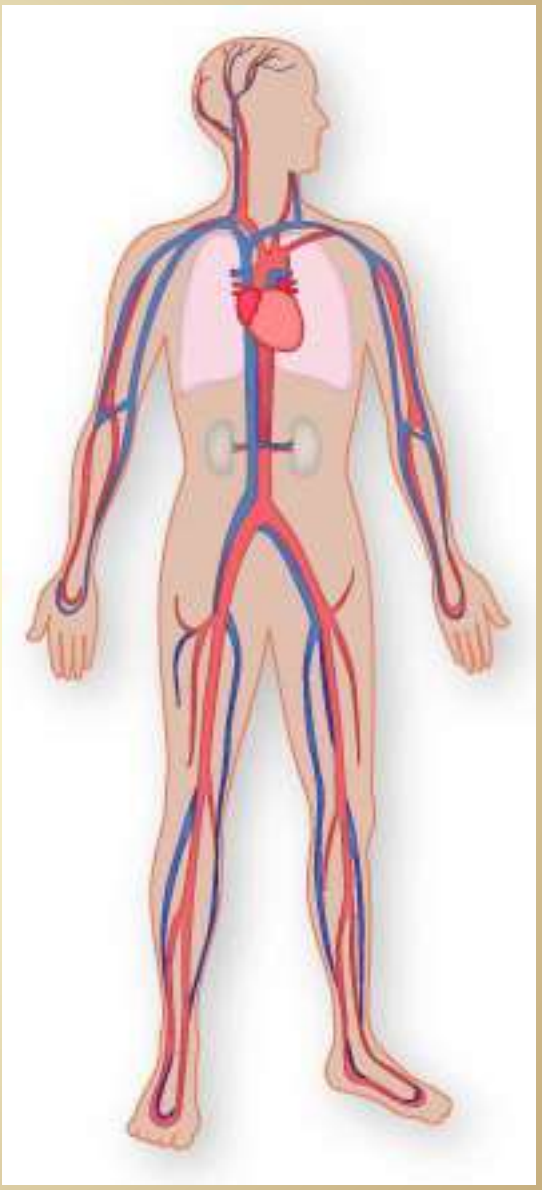
Organs/Components

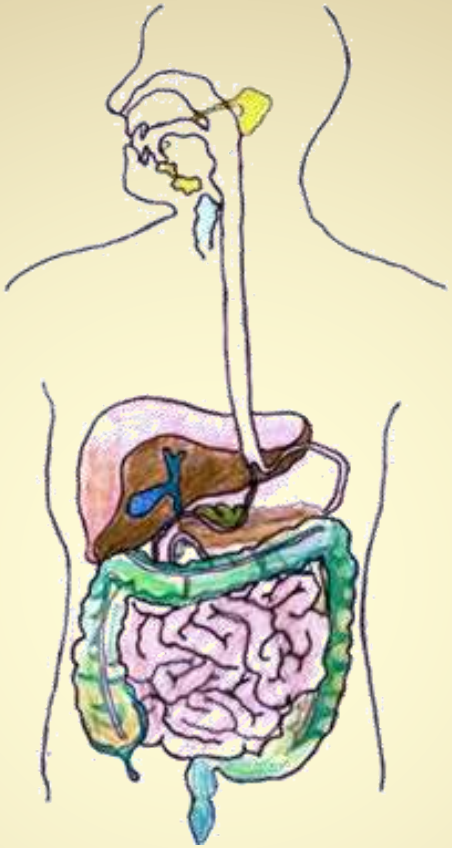
- Heart
  - The pump that keeps blood flowing through your body
- Blood Vessels
  - Arteries
    - Carry blood away from the heart
- Blood
  - Red Blood Cells
    - Carry oxygen to the body cells
  - White blood cells
    - Defend body against disease
  - Platelets
    - Cell fragments needed for blood clotting
  - Plasma
    - Fluid portion of the blood


Superior vena cava
Aorta
Pulmonary artery
Pulmonary veins
Left atrium
Right atrium
Mitral valve
Pulmonary valve
Aortic valve
Left ventricle
Tricuspid valve
Right ventricle
Inferior vena cava

How Does this System Relate to others?

Connected to almost all other systems since the circulatory system carries oxygen to all cells





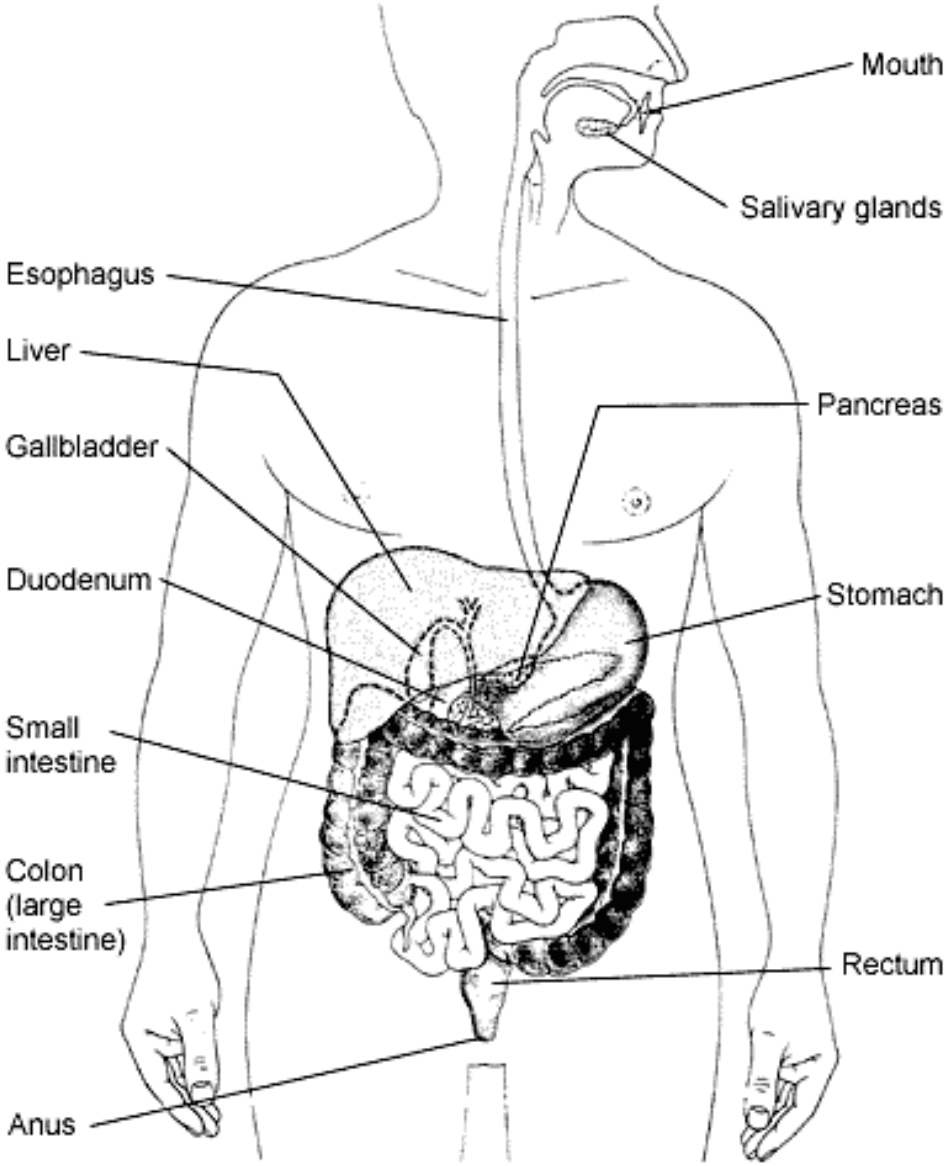
Digestive System

Purpose

The Digestive System converts food into simpler molecules that can be used by cells; absorbs food; eliminates waste

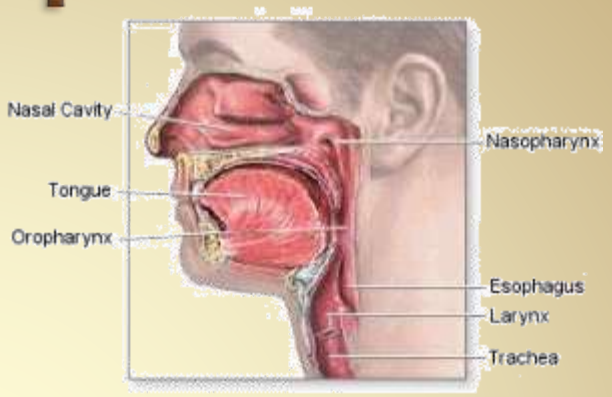
The entire digestive process takes between 24 and 33 hours

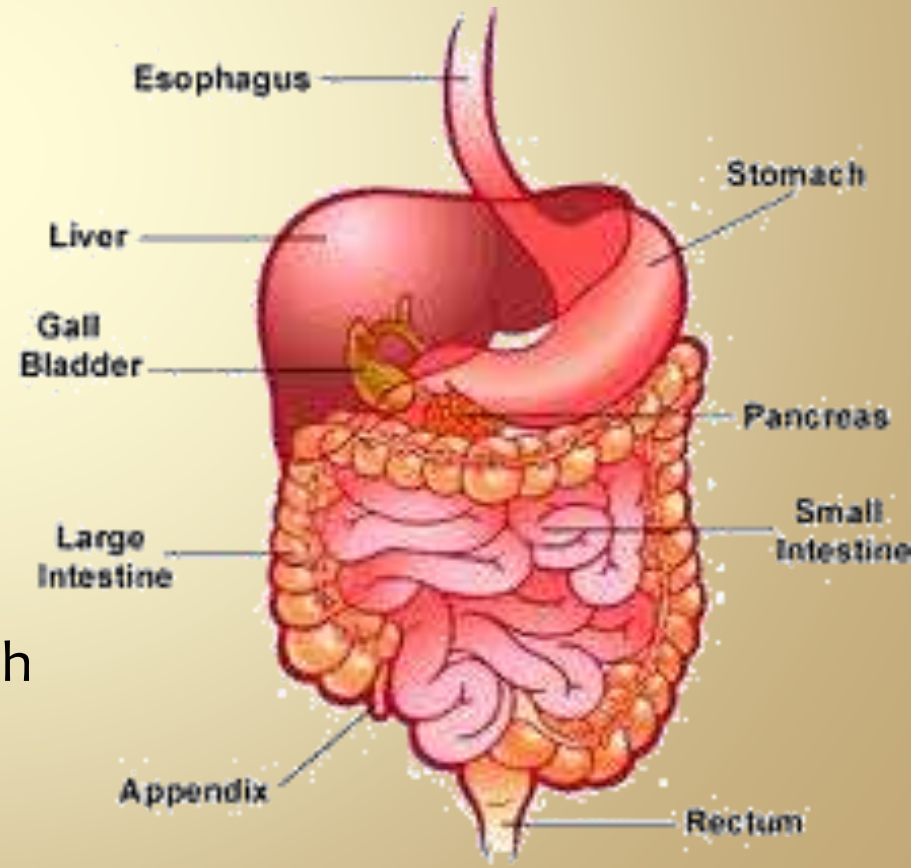
Digestive System



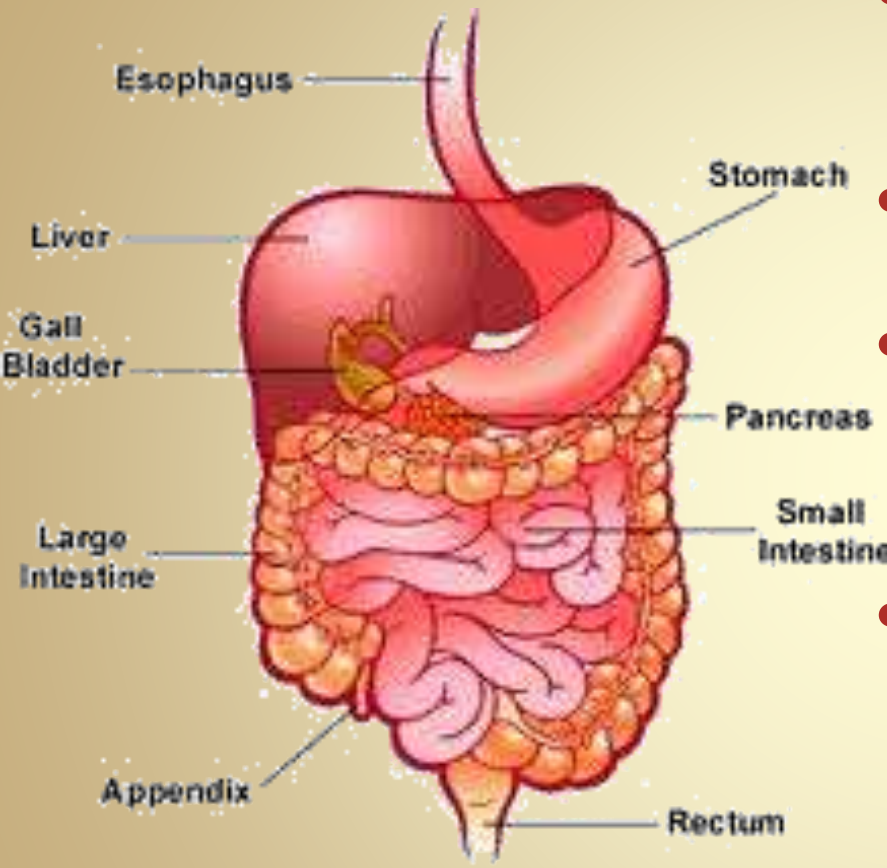
Organs/Components

- Mouth
  - The first stop in the disassembly of your food;
    Mechanical digestion = chewing and
    Chemical digestion = enzymes found in saliva
- Pharynx (throat)
- Epiglottis
  - Small flap that closes over the opening of the respiratory system when swallowing, preventing food from entering the airway.
- Esophagus
  - Muscular tube connecting the mouth to the stomach





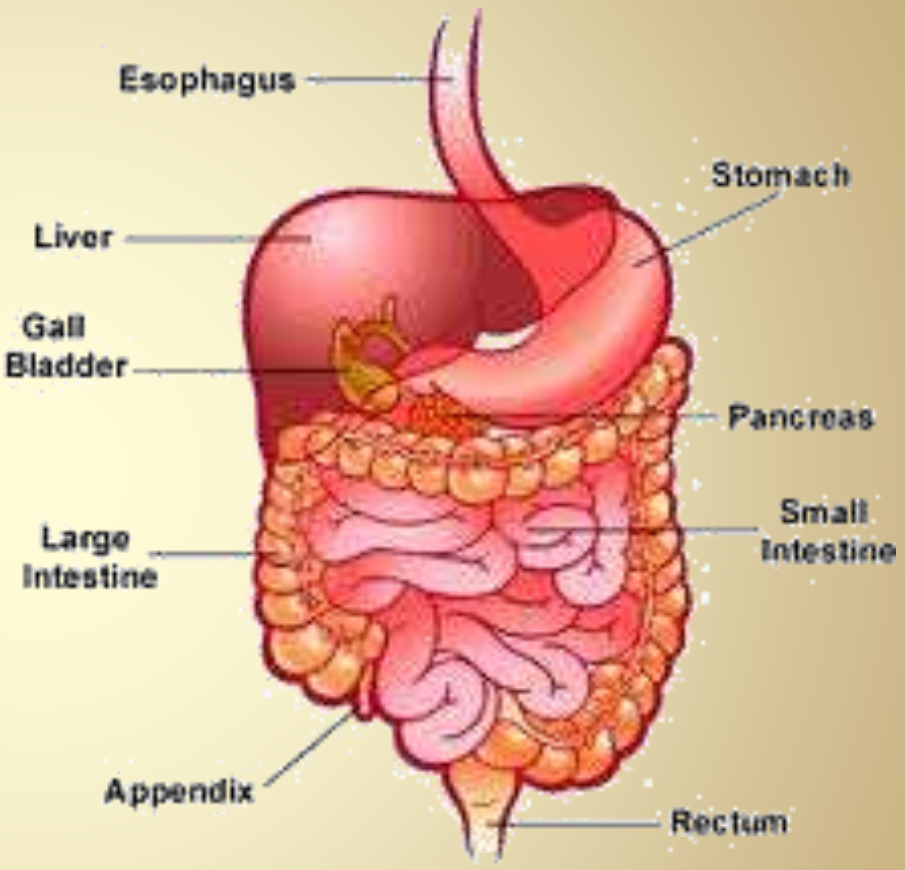
Organs/Components



- Liver
  - Produces bile, a substance that helps break down fats
- Gall Bladder
  - Stores bile produced by the liver
- Stomach
  - Muscular pouch like organ where involuntary muscular churning and chemical digestion occurs
- Pancreas
  - Secretes enzymes to help break down carbohydrates, proteins and fats
- Small Intestine
  - Narrow muscular tube where digestion of food is completed with the help of enzymes secreted by the liver and pancreas

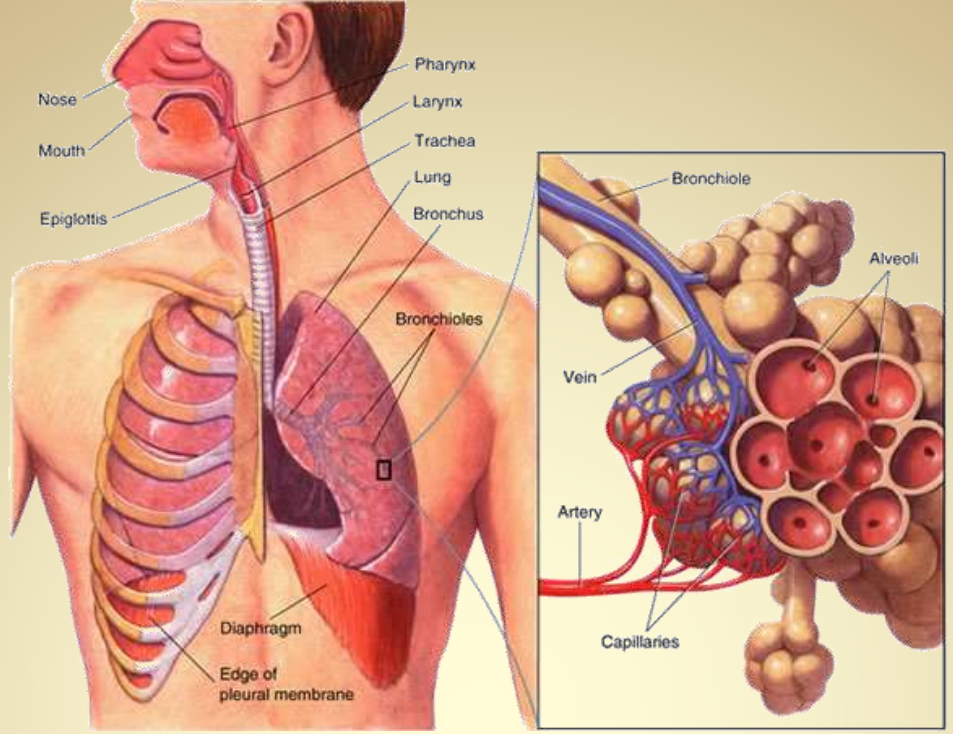
Organs/Components

- Villi (plural: Villus)
  - Little projections in the lining of the small intestine that function in the absorption of digested food
- Large Intestine (colon)
  - Muscular tube where water and salts are absorbed; material spends 18-24 hours here
- Appendix
  - Tube like extension off of the large intestine
- Rectum
  - The last part of the digestive system, feces are eliminated from the rectum through the anus



How Does this System Relate to others systems?

- Muscular – contains smooth muscle
- Nervous – gets signals that control the rate of digestion
- Circulatory – broken down food travels through blood vessels to cells
- Endocrine – hormones (ex. Insulin) control blood sugar levels



Respiratory System

On-Level Biology Book: Pages 971 – 974

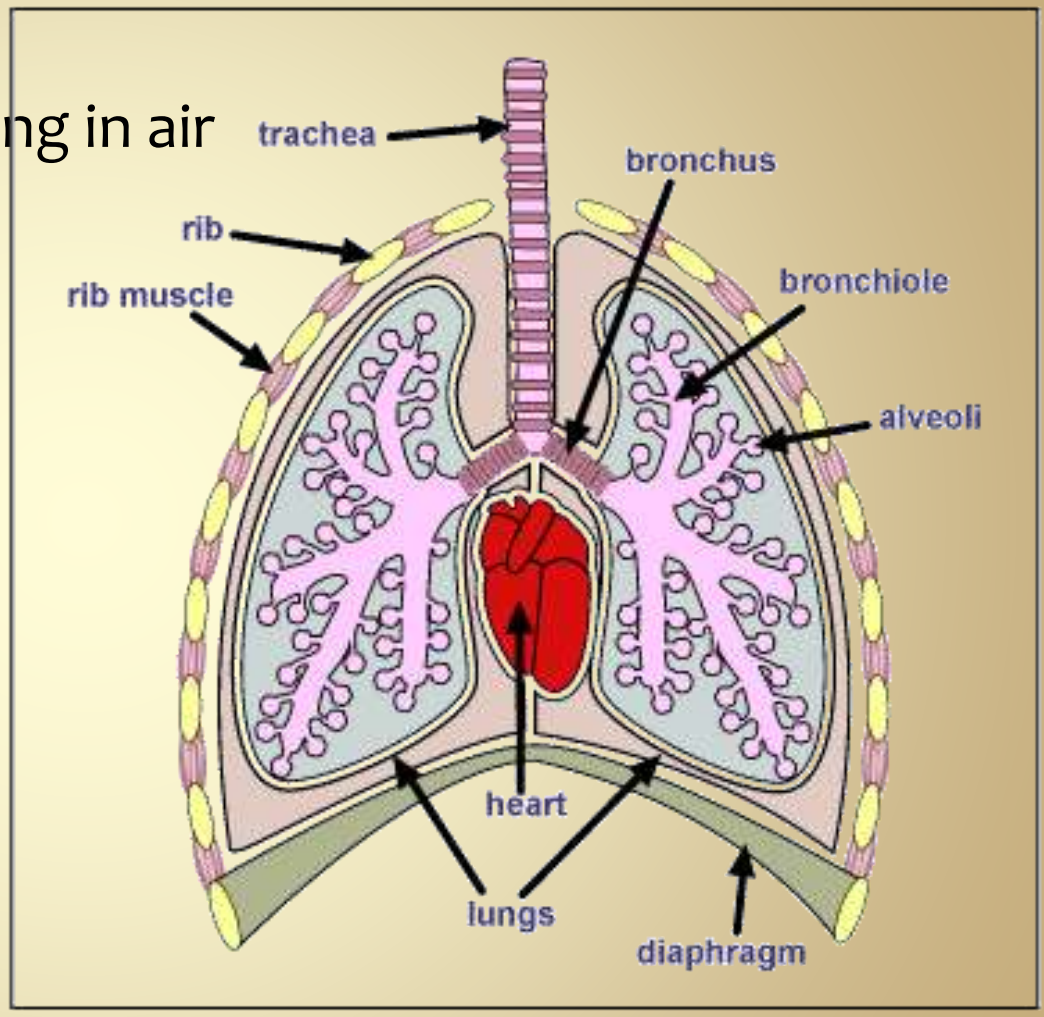
Pre-AP Biology Book: Pages 956 - 969

Purpose

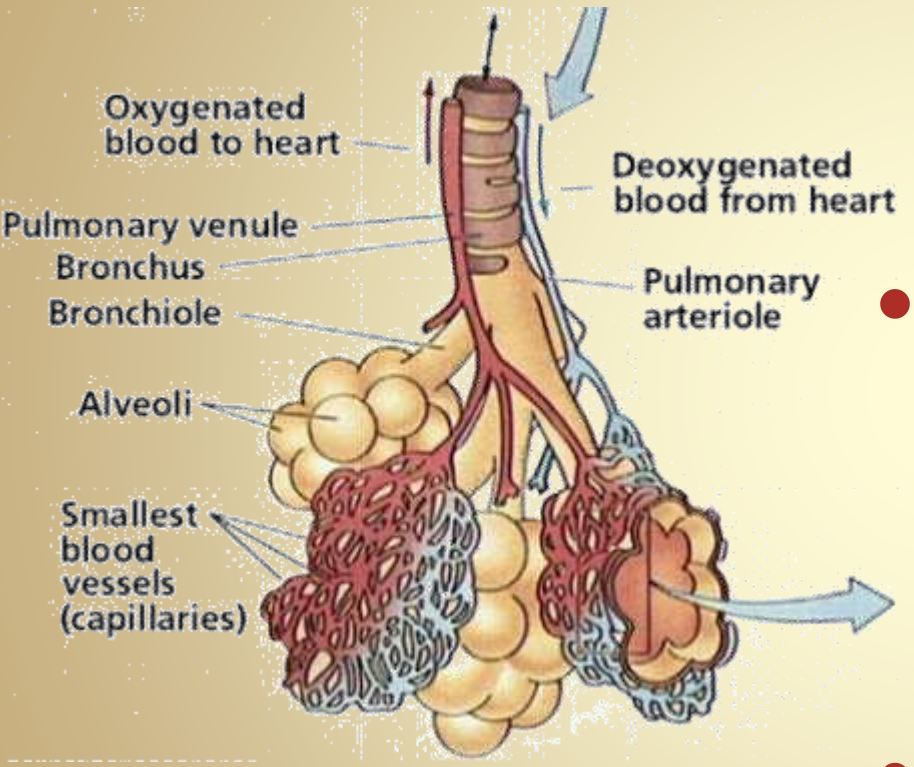
The Respiratory System provides oxygen needed for cellular respiration and removes carbon dioxide from the body

Organs/Components

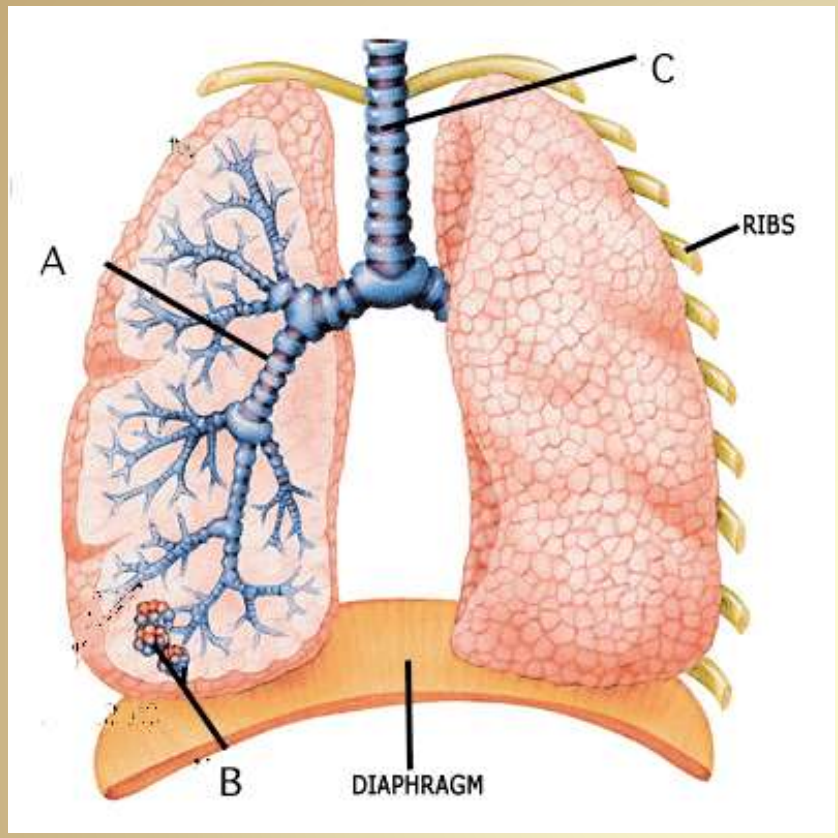
- Nose and Mouth
  - Respiration begins with taking in air
- Pharynx (Throat)
- Larynx
  - Where your vocal cords are
- Trachea (Windpipe)
  - Passes air into the bronchi
- Bronchi (singular: Bronchus)
  - Passes air from trachea to the lungs

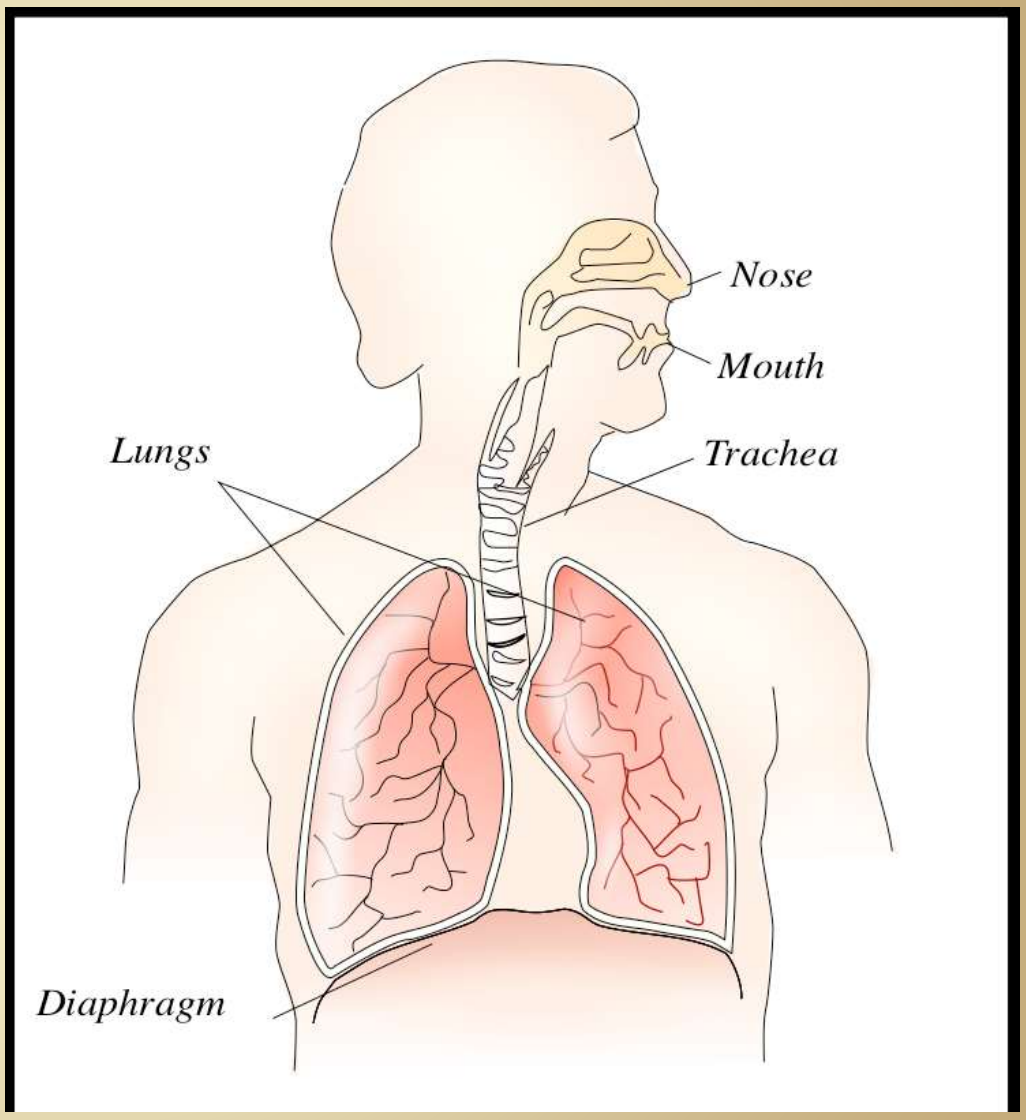


Organs/Components



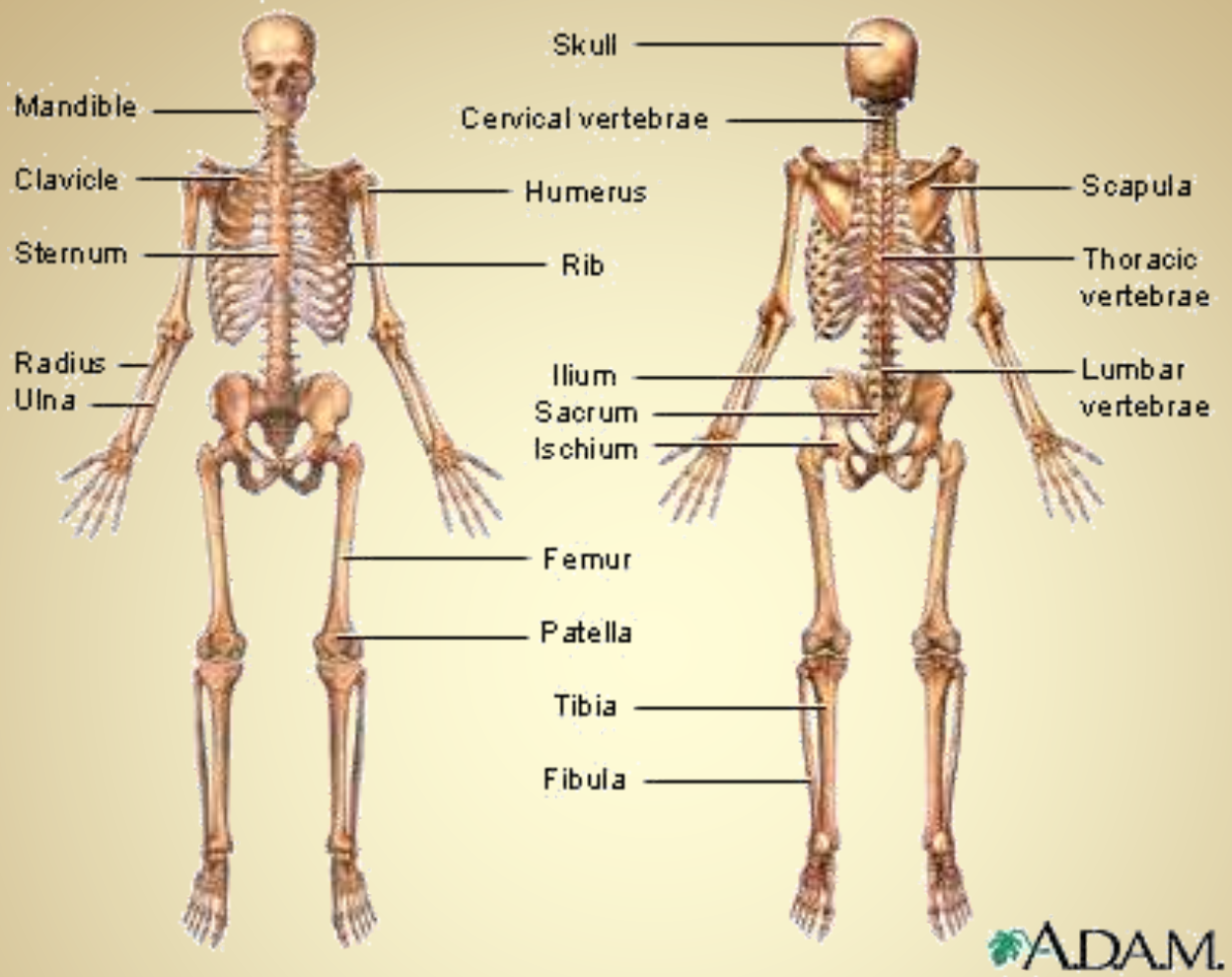
- Bronchioles
  - Each Bronchus in the lungs branches out like a tree into bronchioles
- Alveoli
  - Sacs at the end of the Bronchioles where oxygen and carbon dioxide are exchanged
- Diaphragm
  - Muscle that enables you to breathe


C
RIBS
A
B
DIAPHRAGM


Nose
Mouth
Lungs
Trachea
Diaphragm

How Does this System Relate to others?

- Circulatory – brings O_2 to the cells and CO_2 back to the lungs
- Excretory – part of the excretory system to get rid of toxic CO_2 from the body



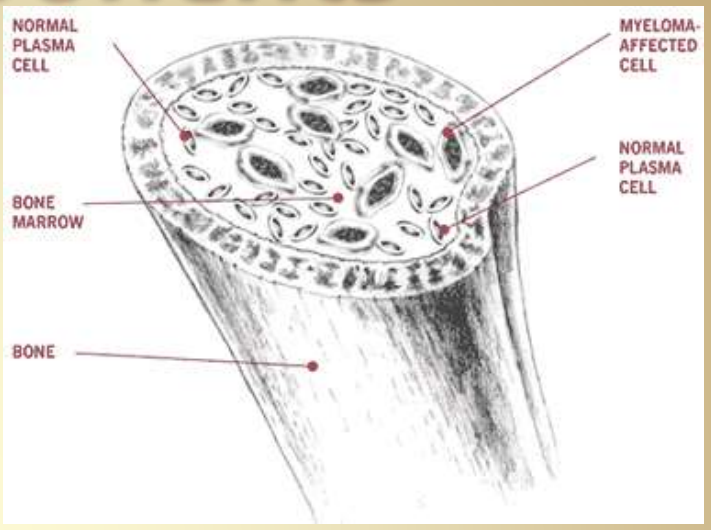
Skeletal System

Purpose

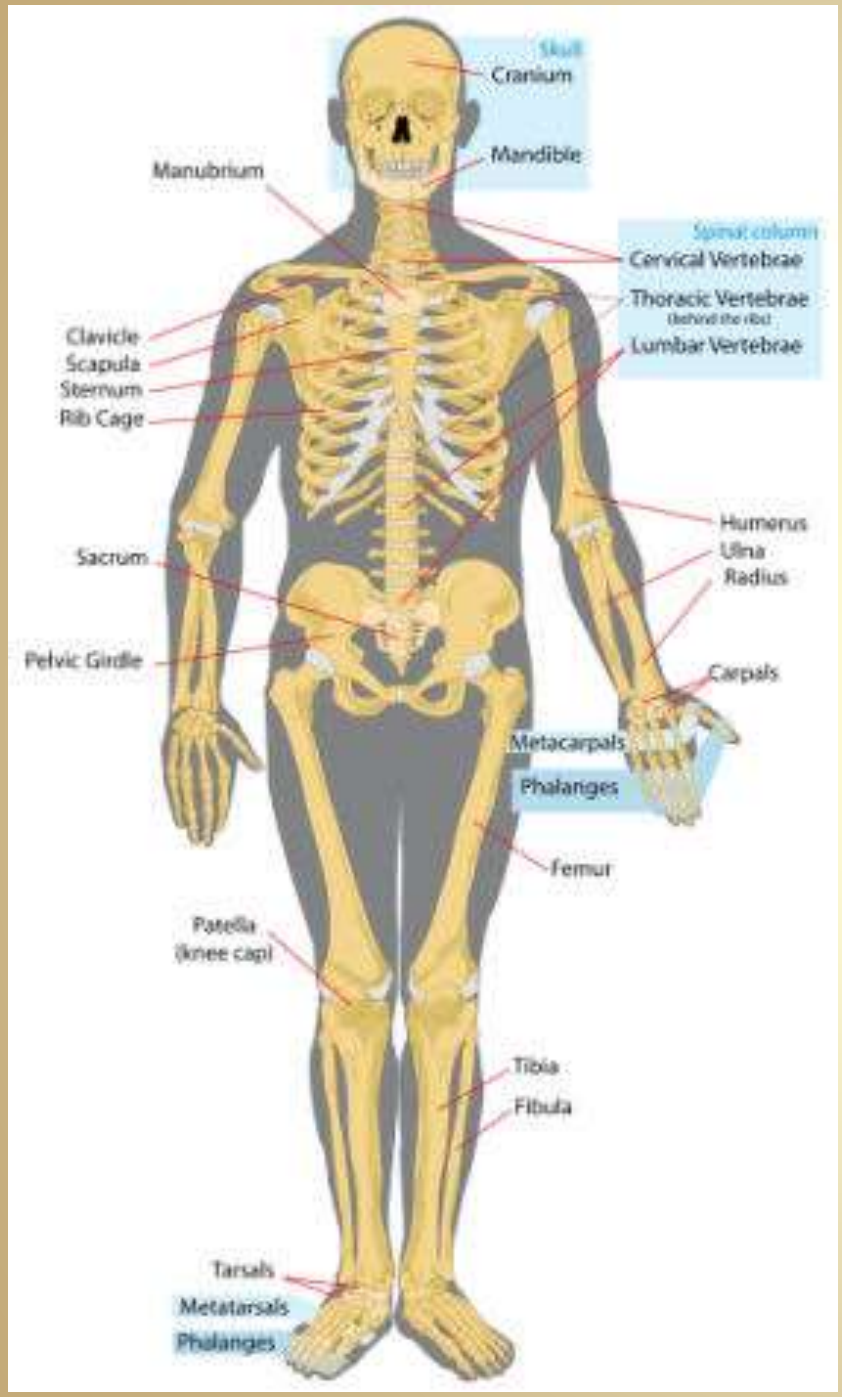
The Skeletal System supports the body; protects internal organs; allows movement; stores mineral reserves; provides blood cell formation

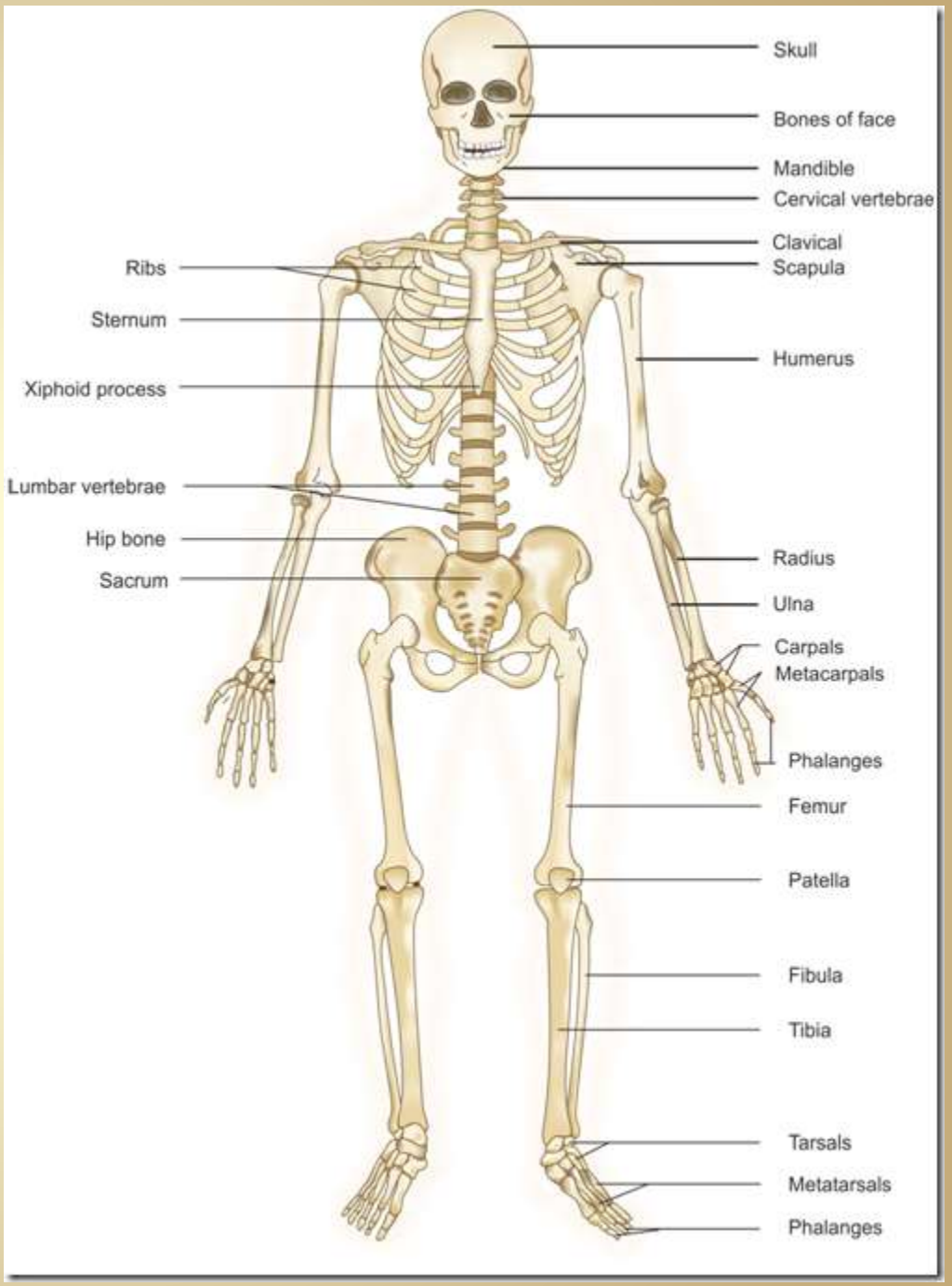
Organs/Components

- Bones
  - Produce blood cells
  - Red Marrow
    - Produce red and white blood cells
  - Yellow Marrow
    - Consists of stored fat



- Joints
  - Found where two (2) bones meet
- Cartilage
  - Surrounds the end on bone to prevent grinding upon another bone
- Ligaments
  - Tough band of tissue attaching one bone to another
- Tendons
  - Thick bands of tissue connecting muscle to bone

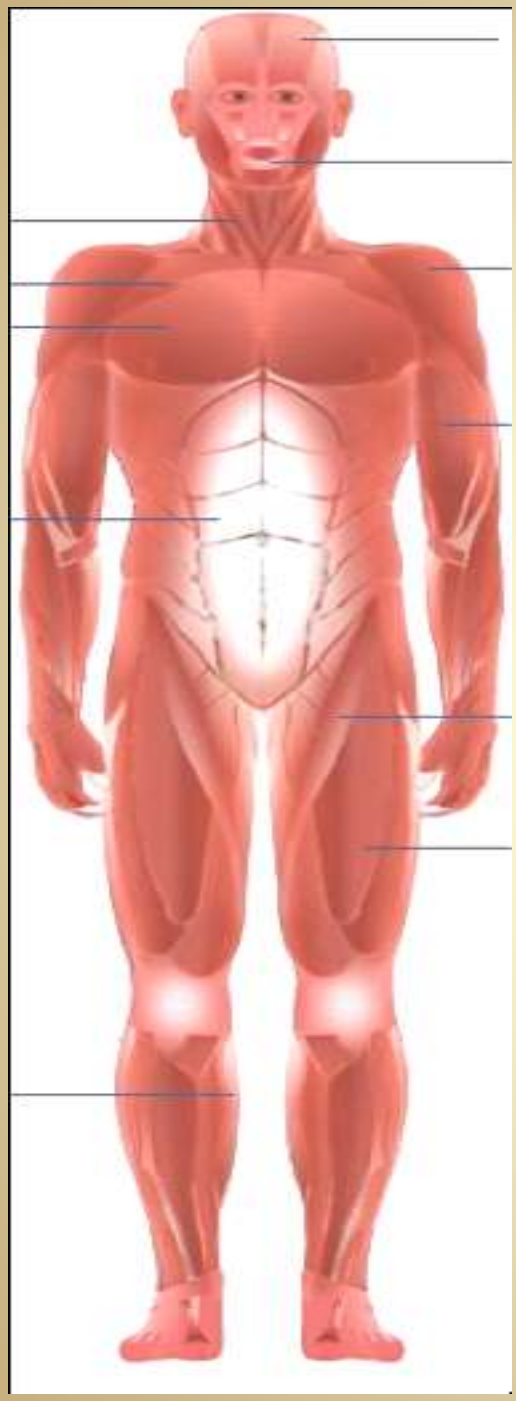

Skull
Cranium
Mandible
Manubrium
Spinal column
Cervical Vertebrae
Thoracic Vertebrae
(behind the ribs)
Lumbar Vertebrae
Clavicle
Scapula
Sternum
Rib Cage
Humerus
Ulna
Radius
Sacrum
Pelvic Girdle
Carpals
Metacarpals
Phalanges
Femur
Patella
(knee cap)
Tibia
Fibula
Tarsals
Metatarsals
Phalanges

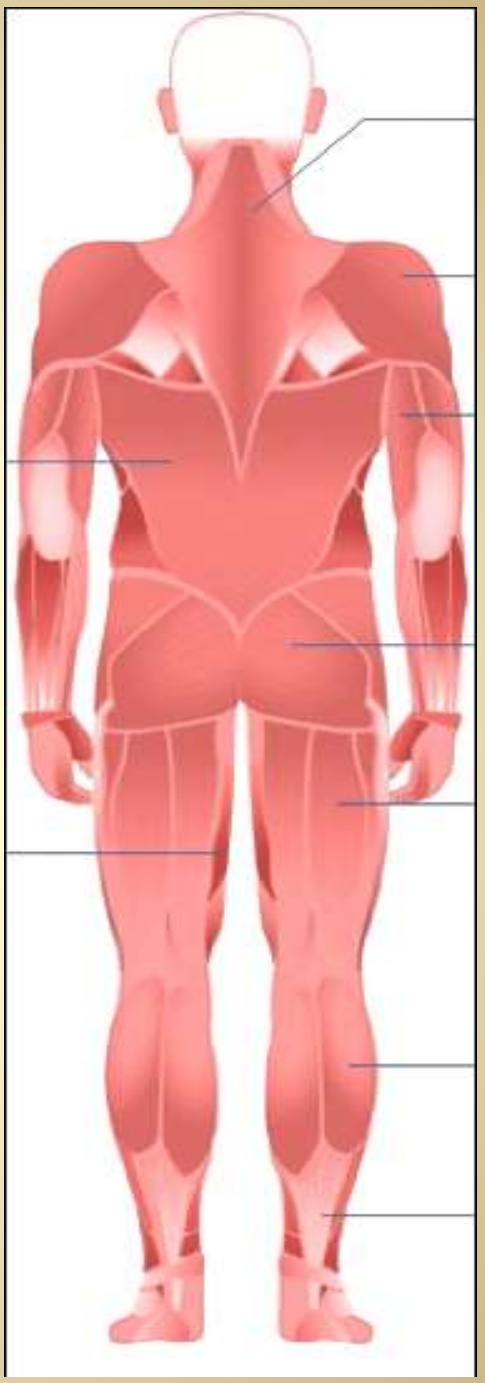

Skull
Bones of face
Mandible
Cervical vertebrae
Clavical
Scapula
Ribs
Sternum
Humerus
Xiphoid process
Lumbar vertebrae
Hip bone
Sacrum
Radius
Ulna
Carpals
Metacarpals
Phalanges
Femur
Patella
Fibula
Tibia
Tarsals
Metatarsals
Phalanges

How Does this System Relate to others?

- Muscular system – bones and muscles work together for movement
- Circulatory system and immune system – all blood cells (red and white) are made in the bone marrow

Muscular System



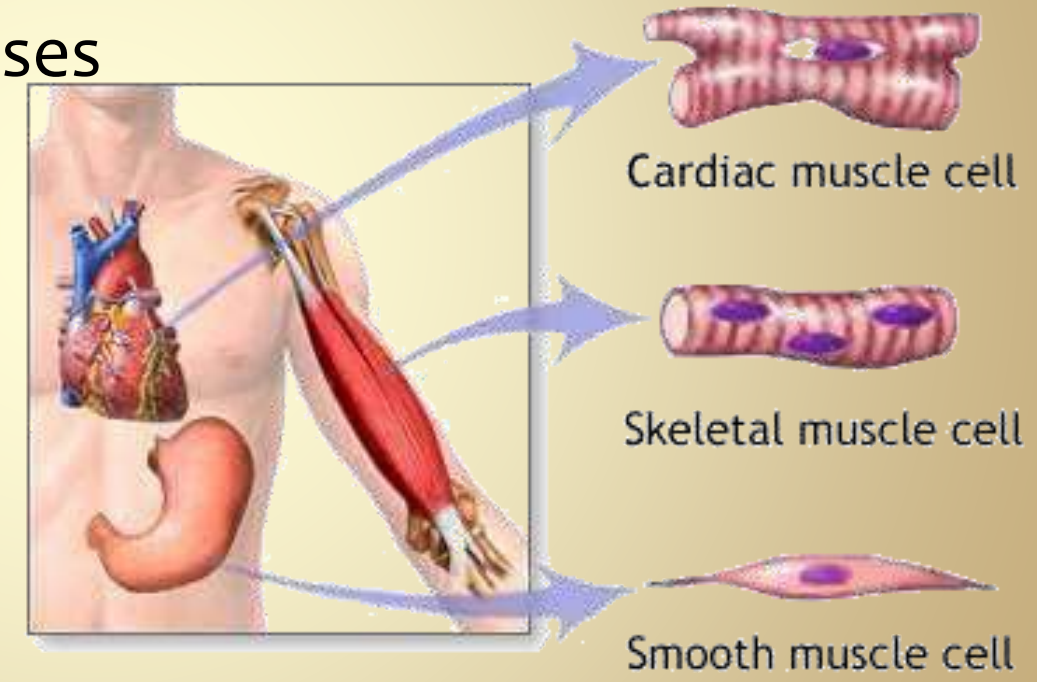


Purpose

The Muscular System produces voluntary movement; circulates blood, moves food through digestive system

Organs/Components

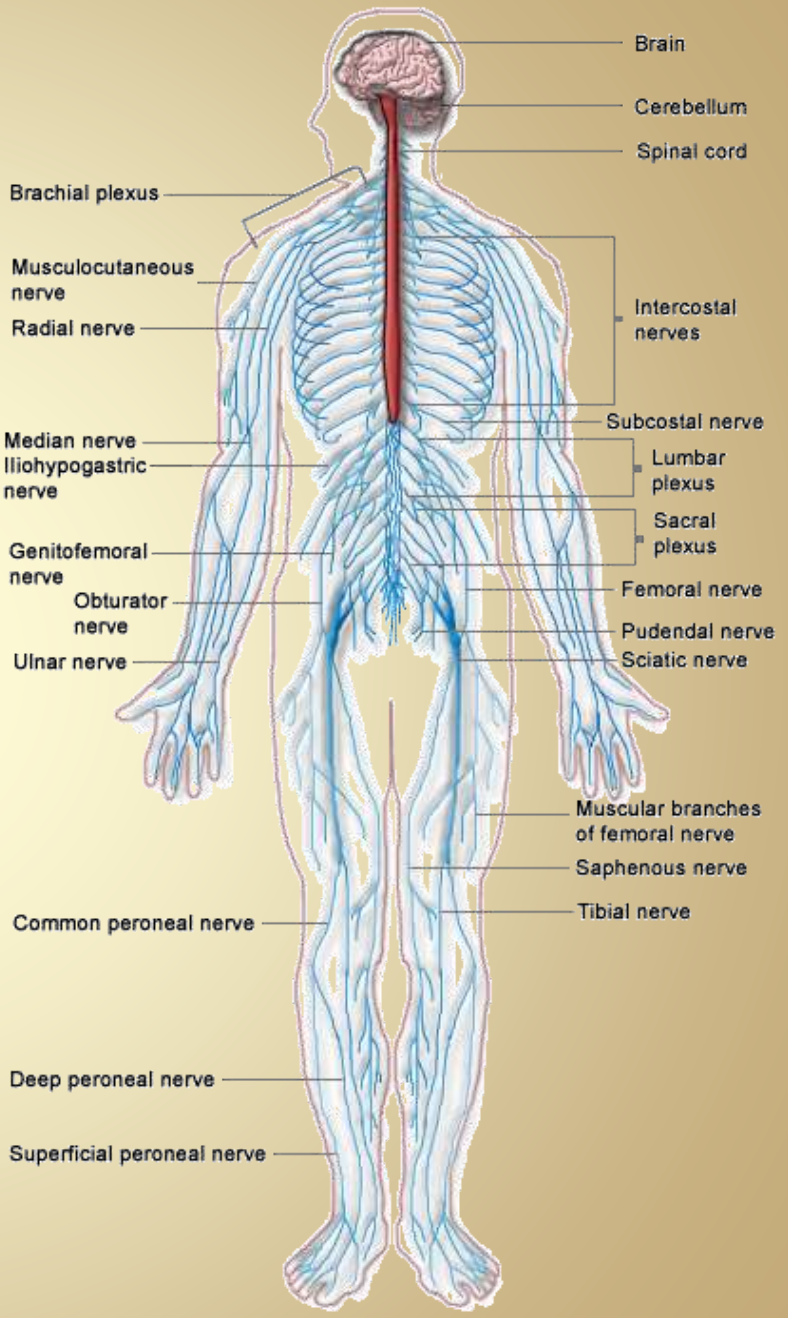
- Cardiac Muscle
  - Makes up your heart, is adapted to generate and conduct electrical impulses
- Skeletal Muscle (voluntary muscle)
  - Attaches to and moves bones
- Smooth Muscle (involuntary muscle)
  - Found on walls of internal organs and blood vessels



How Does this System Relate to others?

- Works closely with the:
  - skeletal system
  - Circulatory – brings O_2 to muscles and waste products such as lactic acid away
  - Nervous – how muscles contract

Nervous System

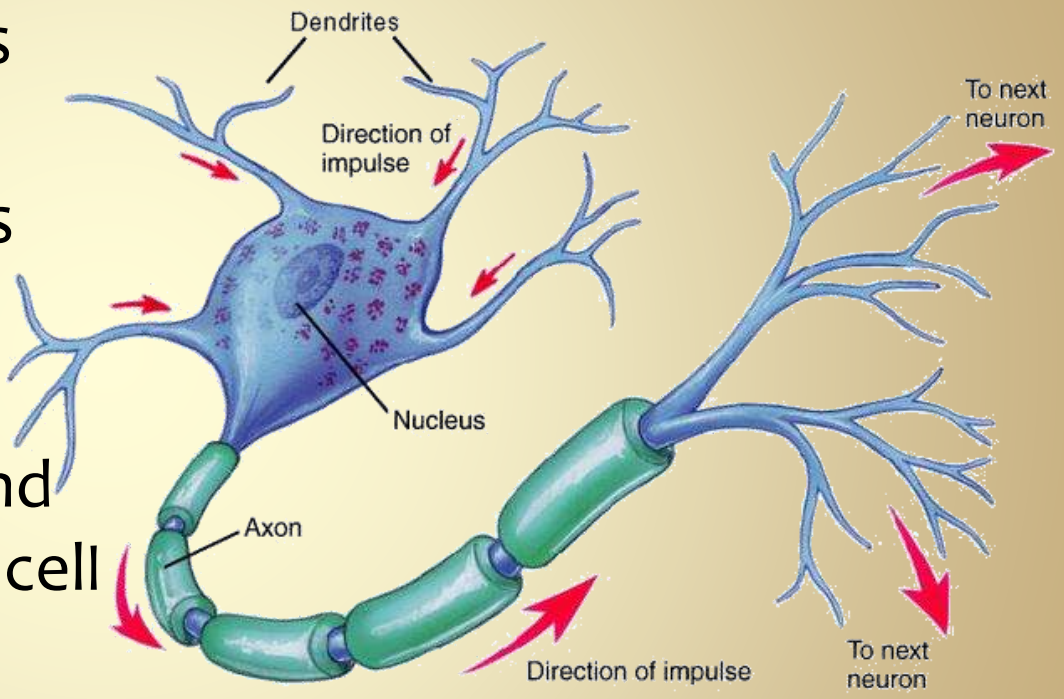


Purpose

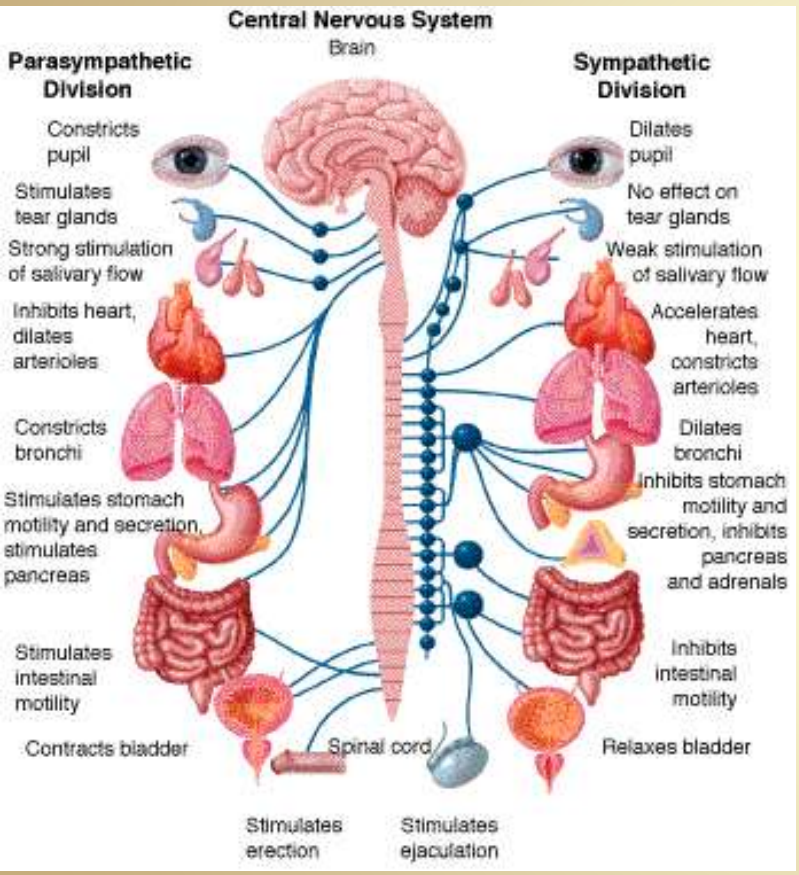
The Nervous System recognizes and coordinates the body's response to changes in its internal and external environments

Organs/Components

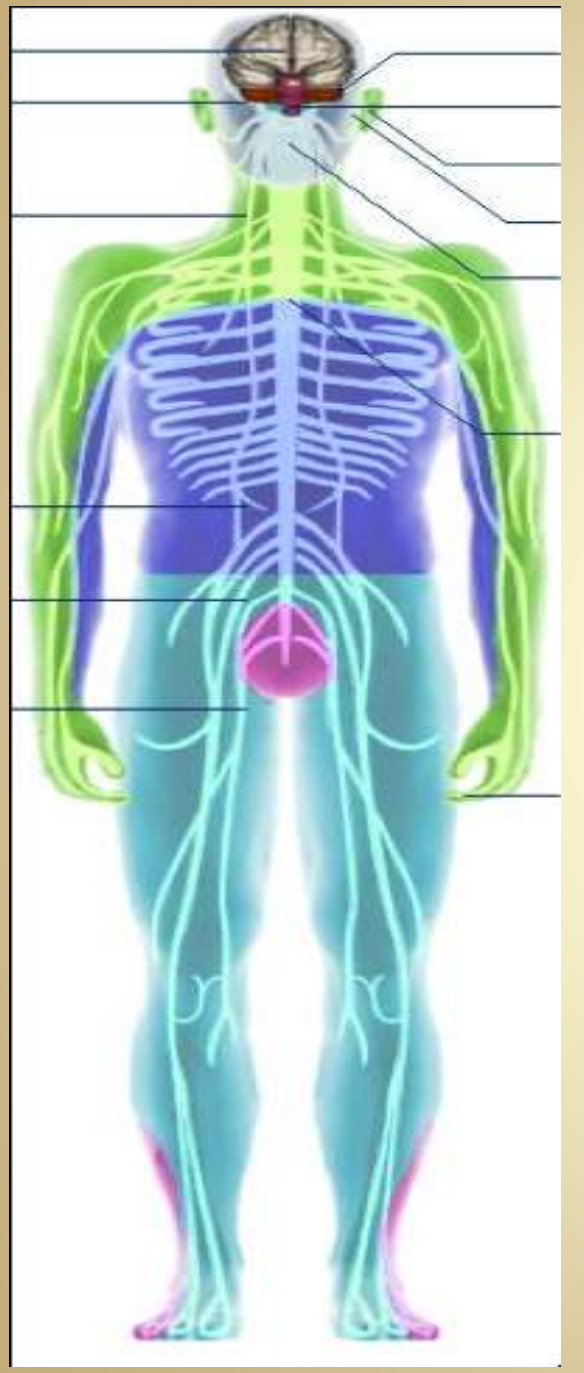
- Neurons (Nerve Cells)
  - Basic unit of structure and function of the nervous system
  - Long cell with 3 regions
    1. Cell body
    2. Dendrites
       - Receive impulses and deliver them to the cell
    3. Axon
       - Extension of the neuron that carry impulses away from the cell

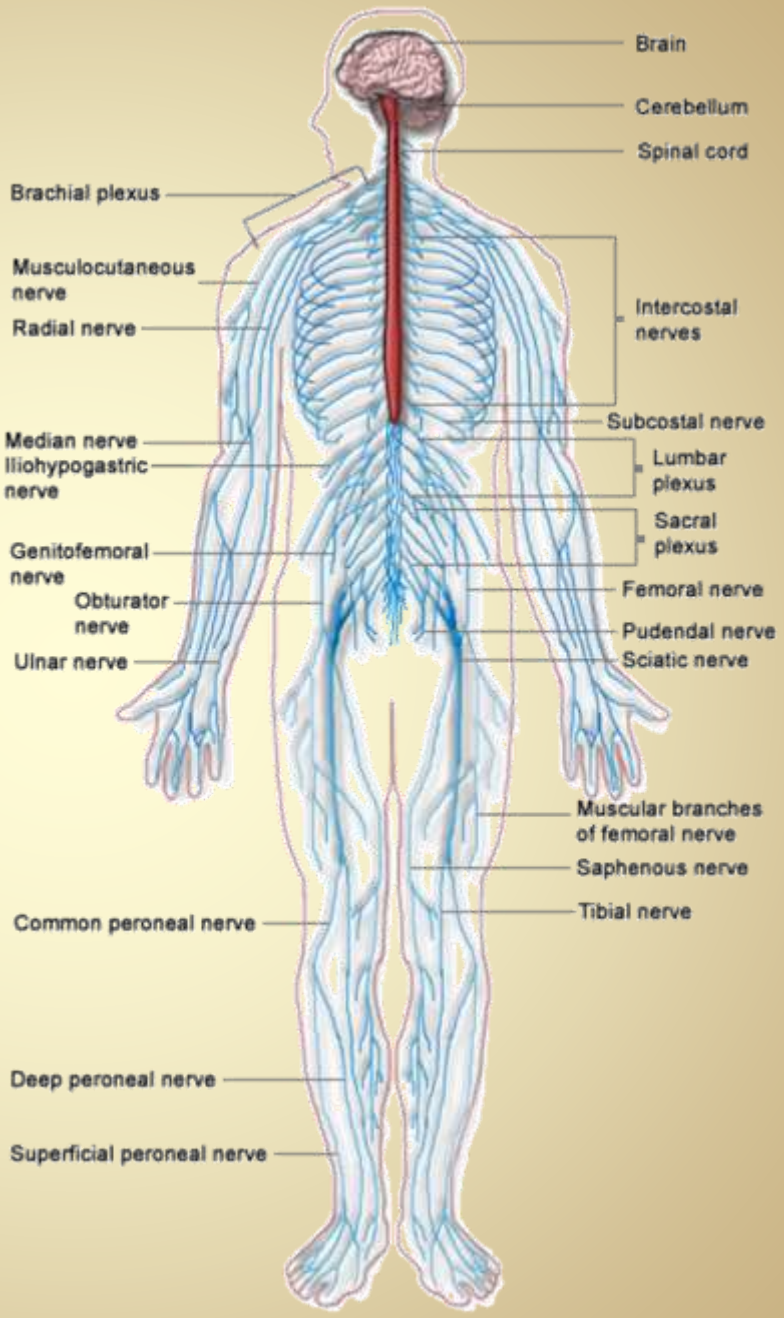


Organs/Components



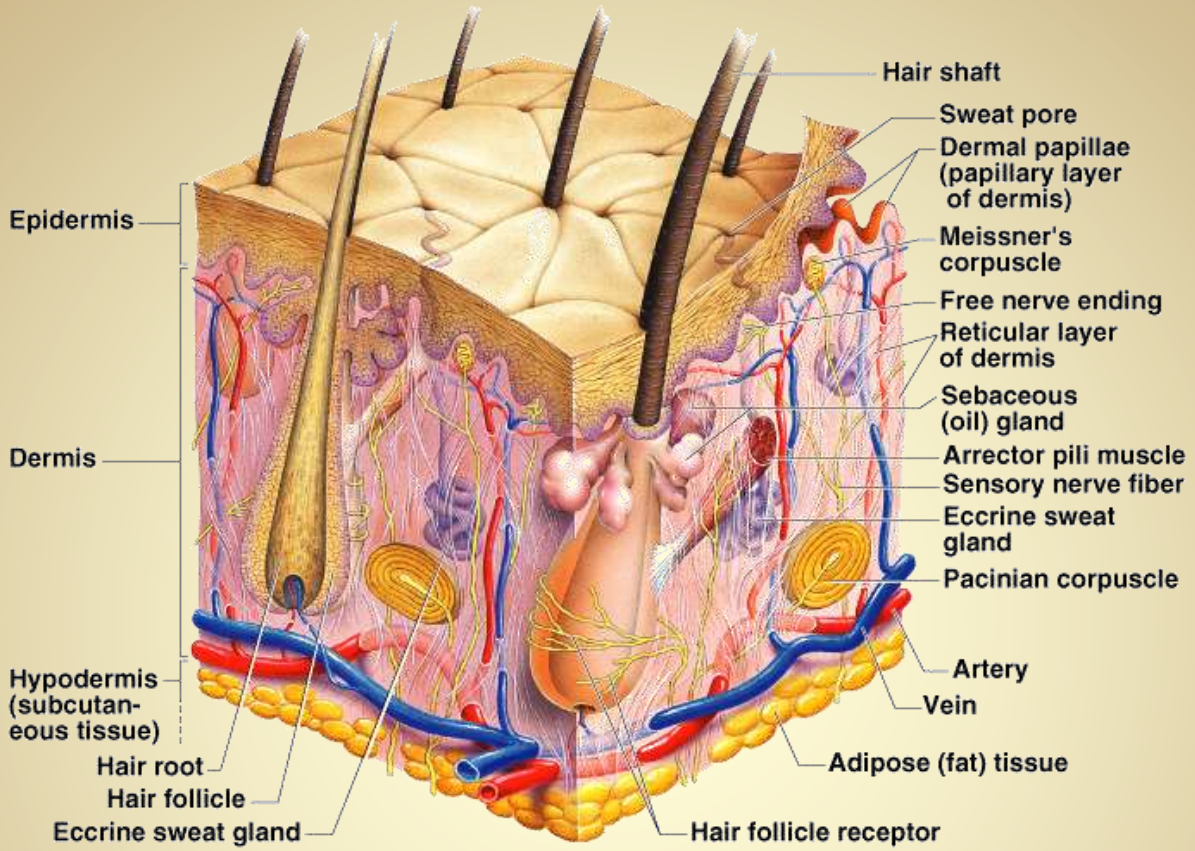
- Brian
  - Control center
- Spinal Cord
- Central Nervous System
  - Made up of the brain and spinal cord and coordinates your body's activities
- Peripheral Nervous System
  - Made up of the nerves which carry messages to and from the central nervous system




Brain
Cerebellum
Spinal cord
Brachial plexus
Musculocutaneous nerve
Radial nerve
Intercostal nerves
Subcostal nerve
Median nerve
Iliohypogastric nerve
Lumbar plexus
Sacral plexus
Genitofemoral nerve
Obturator nerve
Femoral nerve
Pudendal nerve
Ulnar nerve
Sciatic nerve
Muscular branches of femoral nerve
Saphenous nerve
Common peroneal nerve
Tibial nerve
Deep peroneal nerve
Superficial peroneal nerve

How Does this System Relate to others?

- The nervous system works with many other systems, but works closely with the:
- Digestive system
- Muscular system



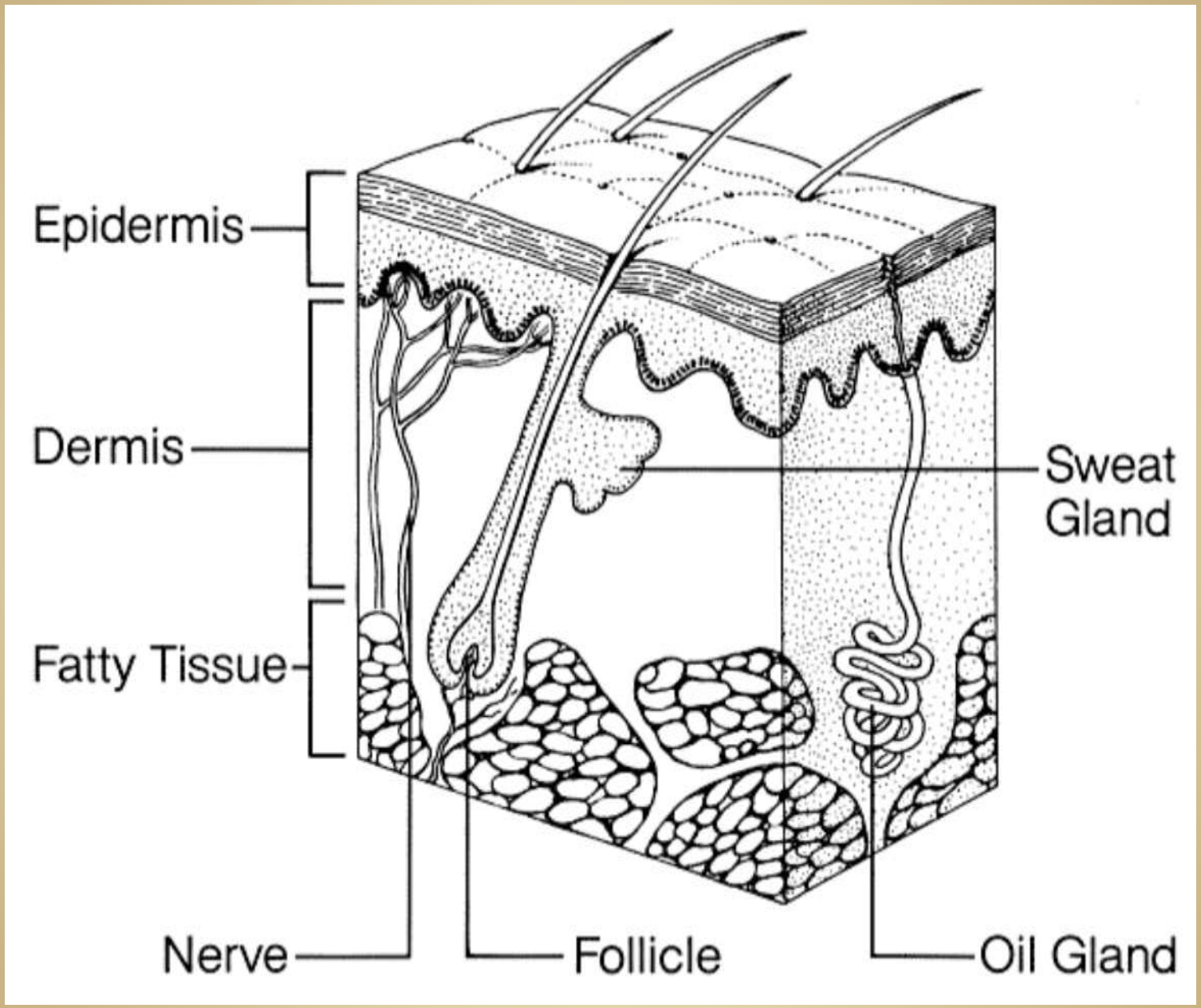
Integumentary System

Purpose

The Integumentary System is the barrier against infections and injury; regulates body temperature; protects against ultraviolet radiation

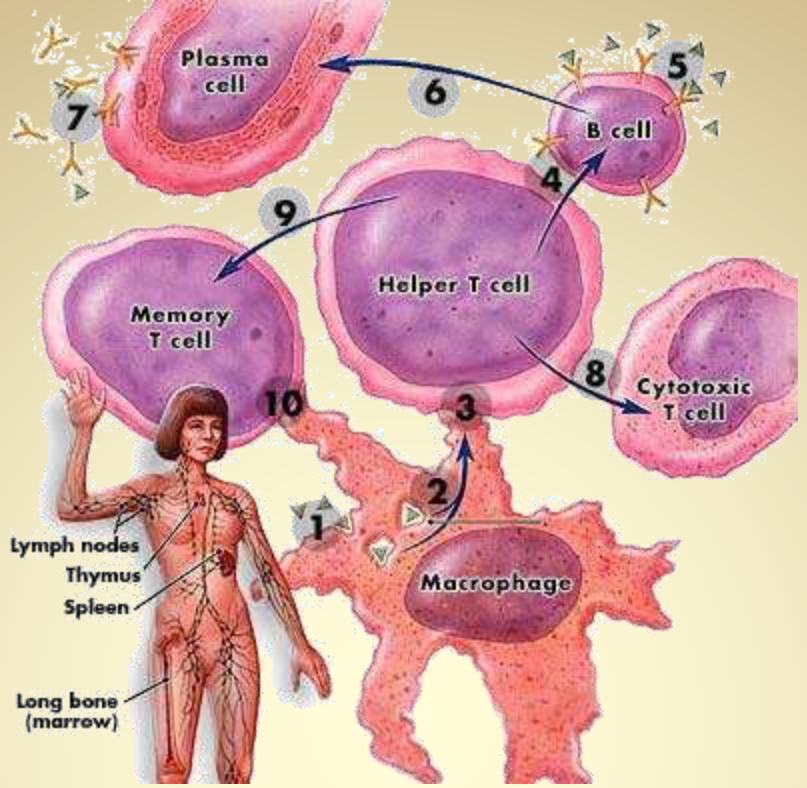
Organs/Components

- Skin
  - Epidermis: outermost layer of skin
    - covers the surfaces of the body
  - Dermis: inner layer of skin
    - Contains blood vessels, nerve cells, hair follicles, sweat and oil glands
- Hair, Skin and Nails
  - Made up of Keratin
- Pigment of skin and hair
  - Controlled by melanin
- Sweat
  - Produced to help maintain homeostasis
- Oil Glands


Epidermis
Dermis
Fatty Tissue
Sweat Gland
Nerve
Follicle
Oil Gland

How Does this System Relate to others?

The integumentary contains blood vessels and nerves



Immune System

On-Level Biology Book: Pages 1022 – 1045

Pre-AP Biology Book: Pages 1030 - 1059

Purpose

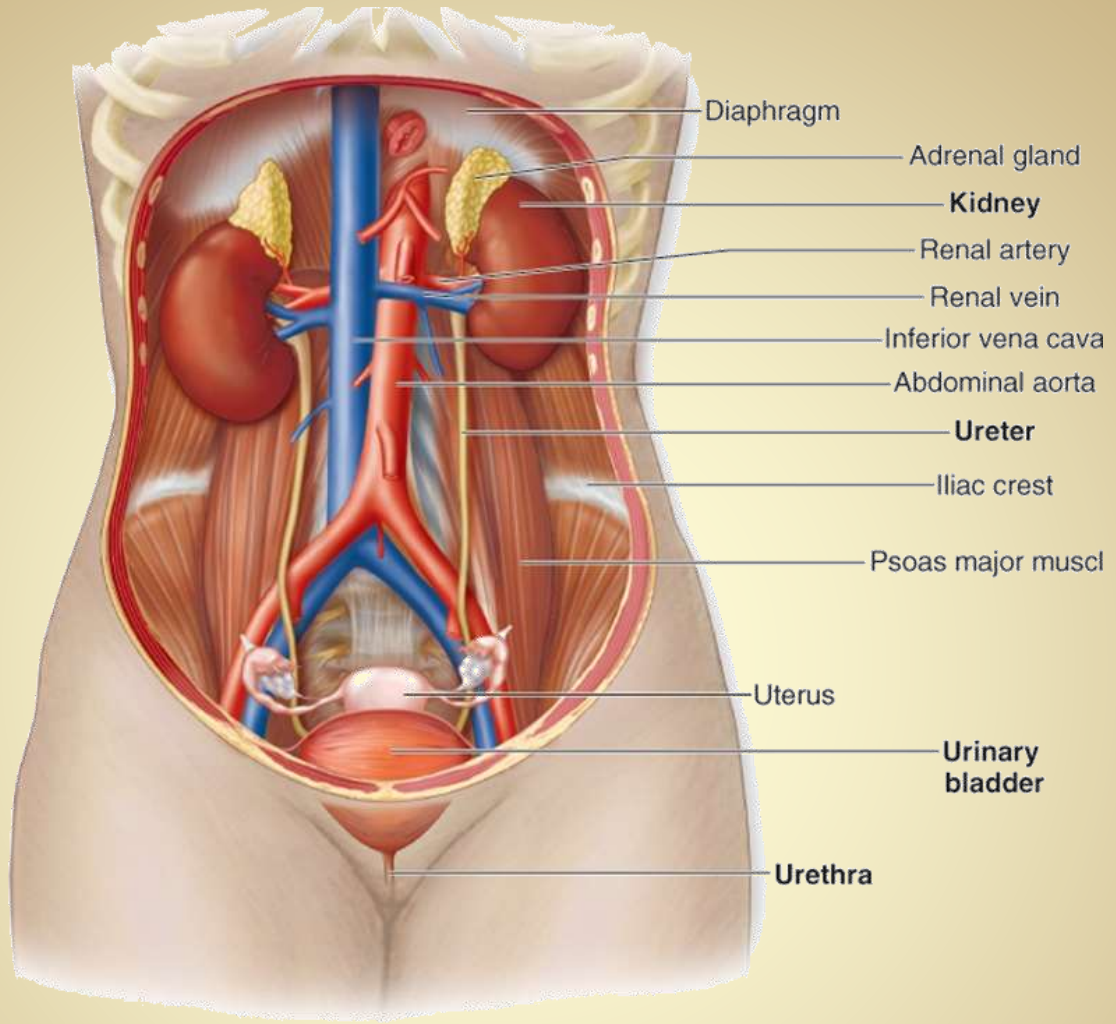
The Immune System helps protect the body from disease; collects fluid lost from blood vessels and return it to the circulatory system

Organs/Components

- White Blood Cells
- Thymus
- Spleen
- Lymph Vessels
- Lymph Nodes

How Does this System Relate to others?

The immune system works closely with the circulatory system



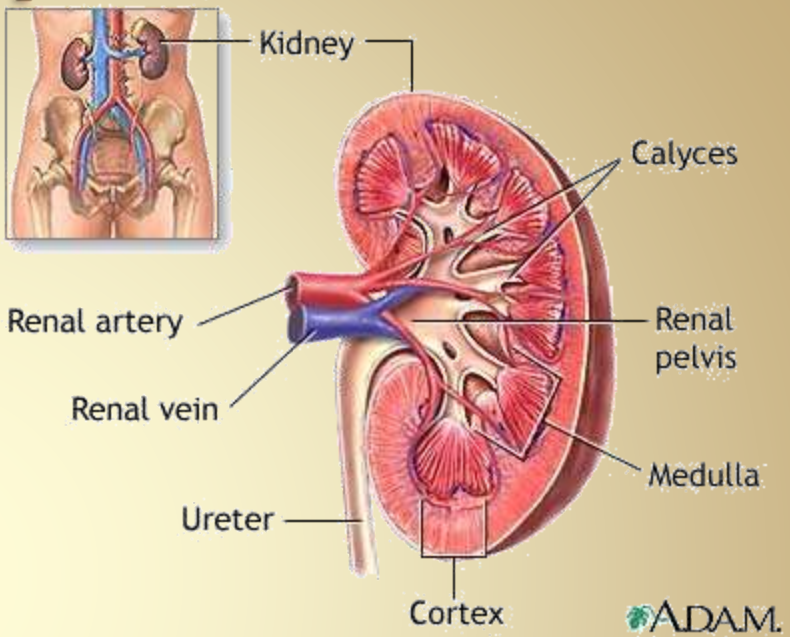
Excretory System

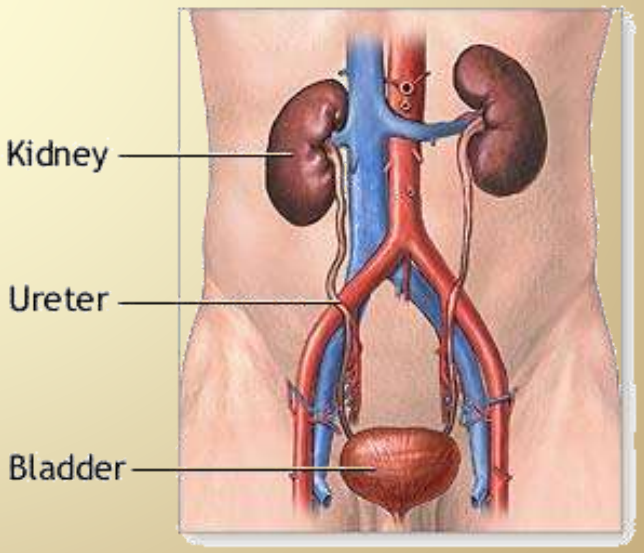
Purpose

The Excretory System eliminates waste products from the body

Organs/Components

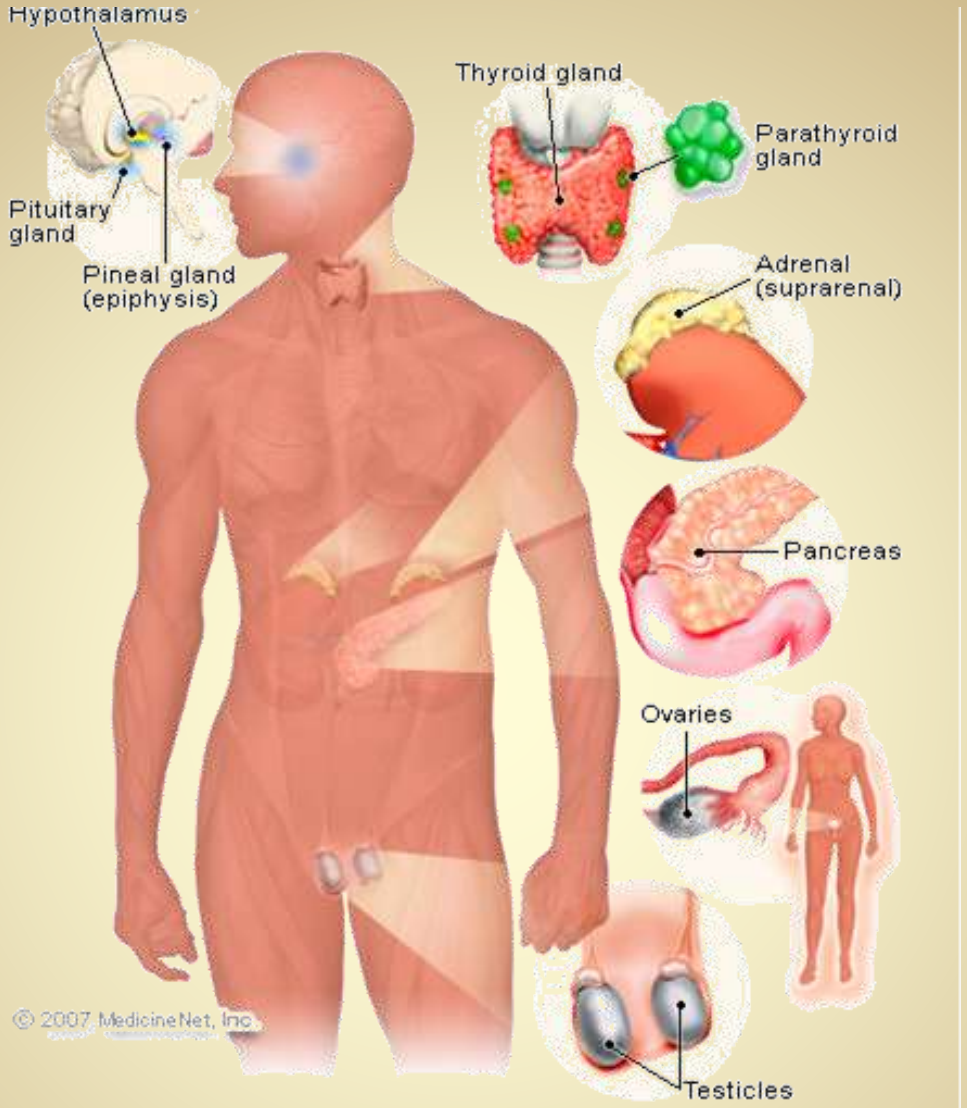
- Kidneys
  - Help maintain homeostasis by filtering blood to remove waste
- Nephron
  - Tiny filter that makes up the kidney, there are millions
- Ureters
  - Tubes connecting the kidneys to the bladder
- Urinary Bladder
  - Smooth muscle bag that stores a solution of wastes called urine
- Urethra
  - Tube where urine passed out of the body
- Skin
- Lungs





How Does this System Relate to others?

- Circulatory – waste products are carried from the cells to the kidney through blood vessels
- Endocrine – hormones are sent that control water levels and homeostasis
- Respiratory – expels toxic CO_2 out of body

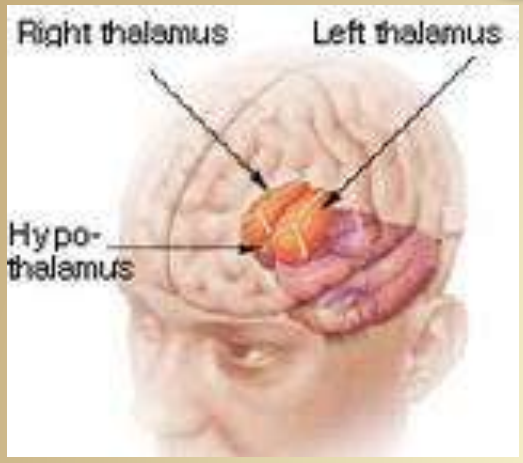


Endocrine System

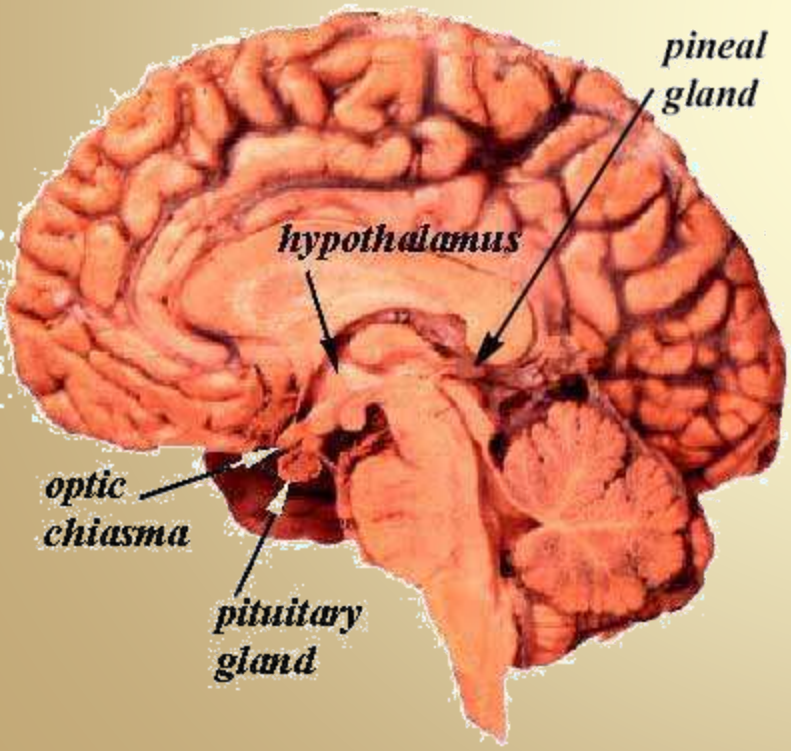
Purpose

The Endocrine System controls growth, development, and metabolism; maintains homeostasis

Organs/Components

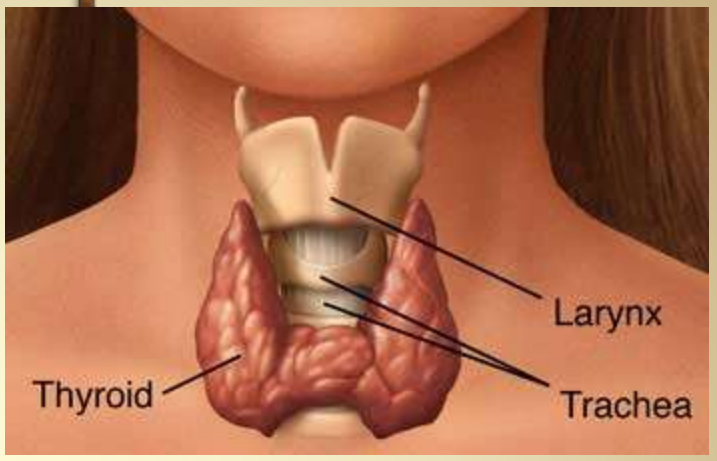


- Hypothalamus
  - Part of the brain that the main link between the endocrine and nervous systems
- Pituitary
  - The main gland of the endocrine system. It is stimulated by the hypothalamus when changes in homeostasis are detected and produces chemicals and stimulates other glands.

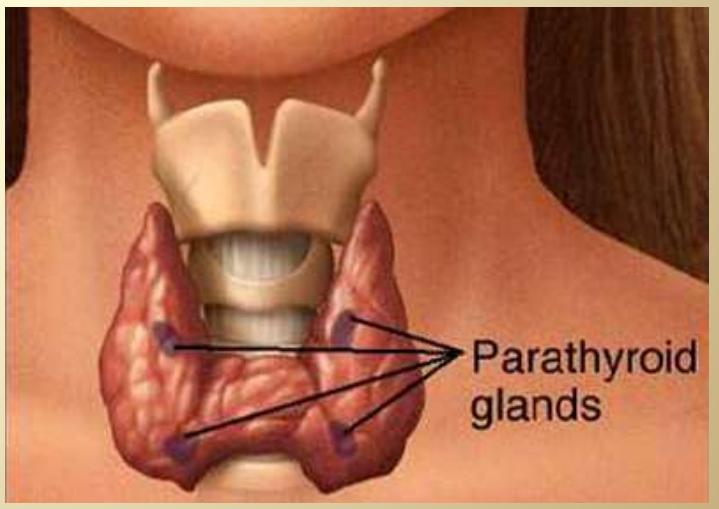


Organs/Components

- Thyroid
  - Produces thyroxin, the main growth and metabolic hormone
  - Also regulates calcium levels in the blood

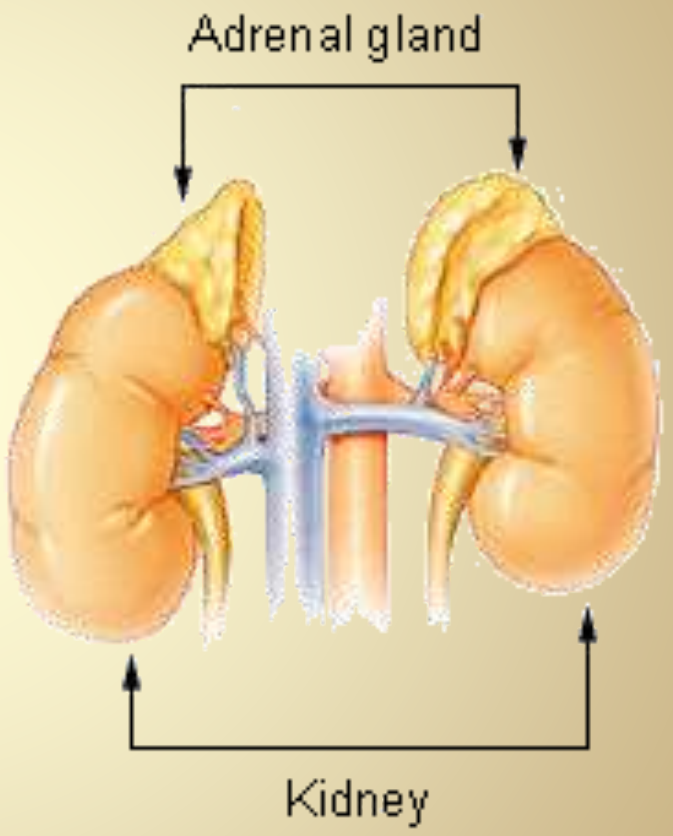


- Parathyroid
  - Regulates minerals by producing PTH (parathyroid hormone)



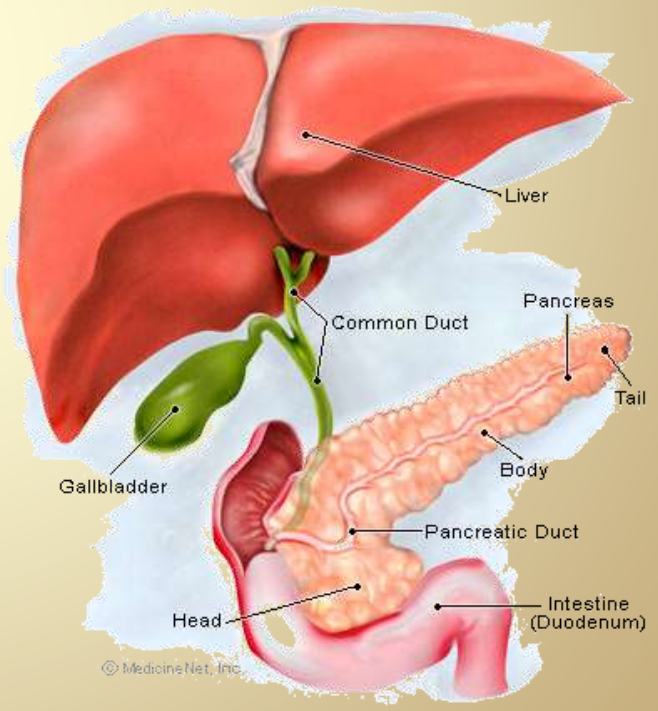
Organs/Components

- Adrenal Glands
  - Prepare the body for stress by releasing hormones
  - epinephrine (adrenaline) norephinephrine which increases blood pressure and heart rate
  - called corticosteroids that influence or regulate salt and water balance in the body



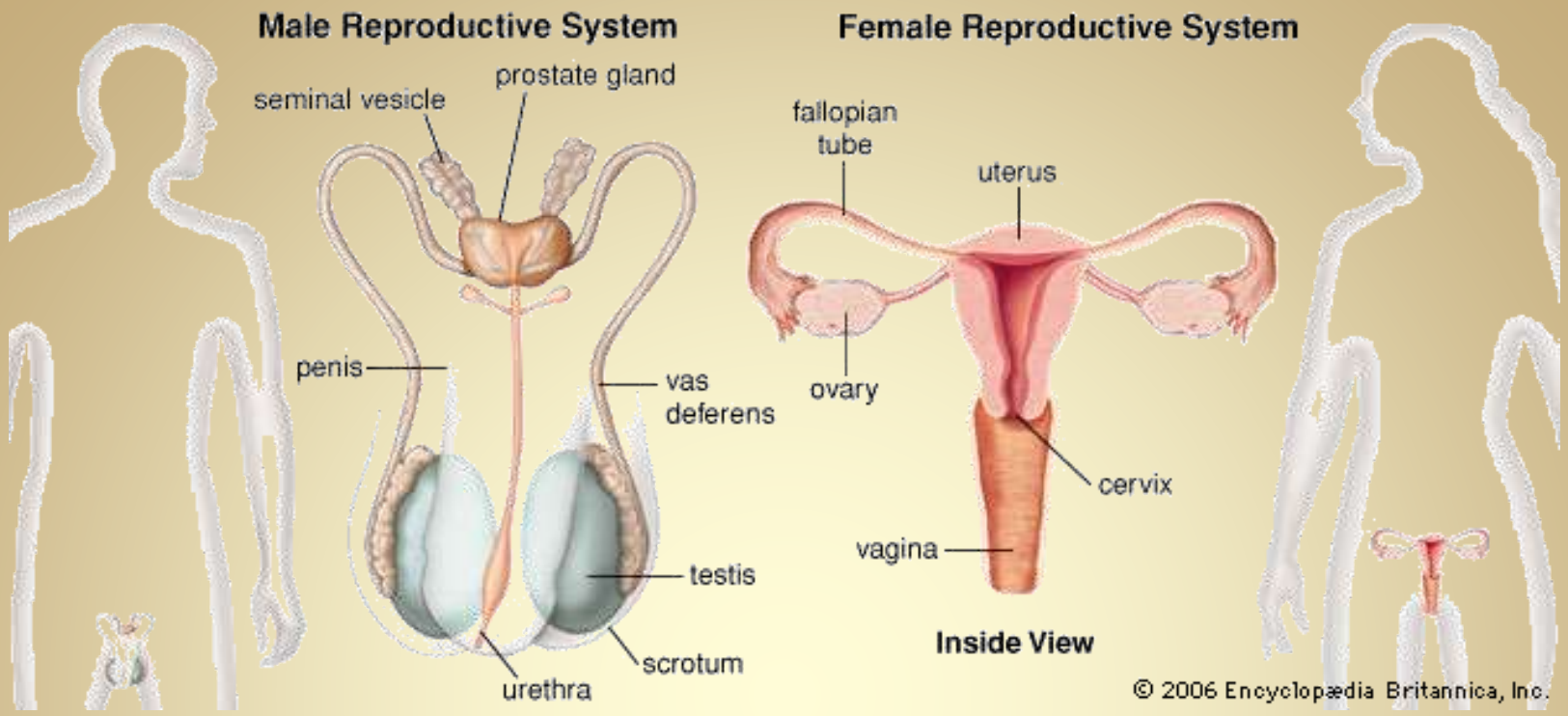
Organs/Components

- Pancreas
  - produces two important hormones
    - insulin and glucagon: they work together to maintain a steady level of glucose, or sugar, in the blood and to keep the body supplied with fuel to produce and maintain stores of energy
- Ovaries
  - Secretes female sex hormones
- Testes
  - Secretes male sex hormones



How Does this System Relate to others?

The endocrine system works closely with the reproductive system and the digestive system. Several hormones originate in the brain, part of the nervous system.



Reproductive System

On-Level Biology Book: Pages 995 – 1019

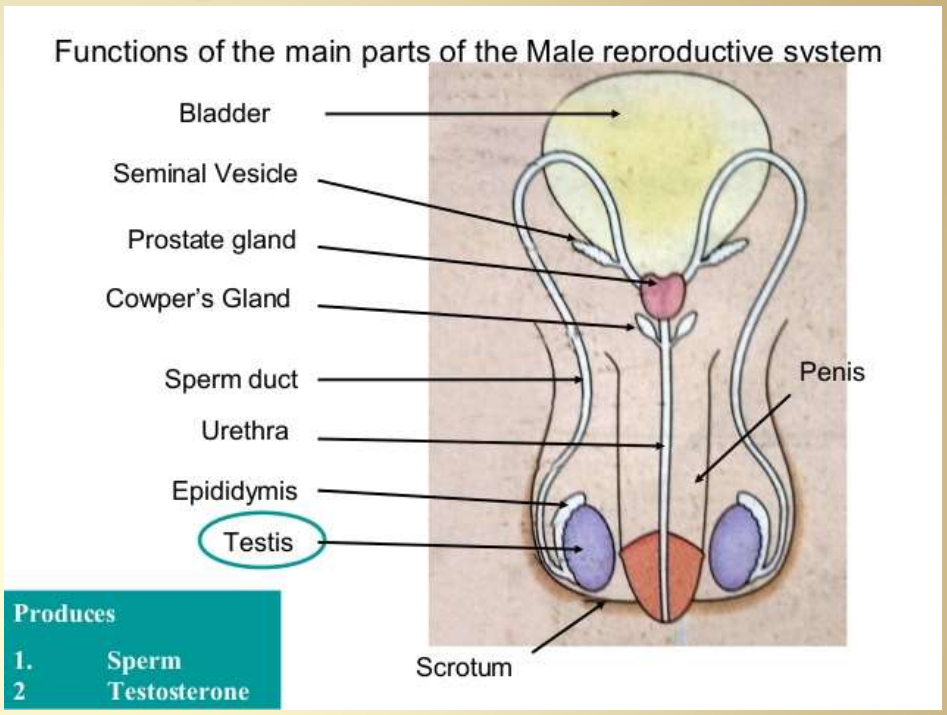
Pre-AP Biology Book: Pages 1009 - 1029

Purpose

The Reproductive System produces reproductive cells; in females nurtures and protects developing embryo

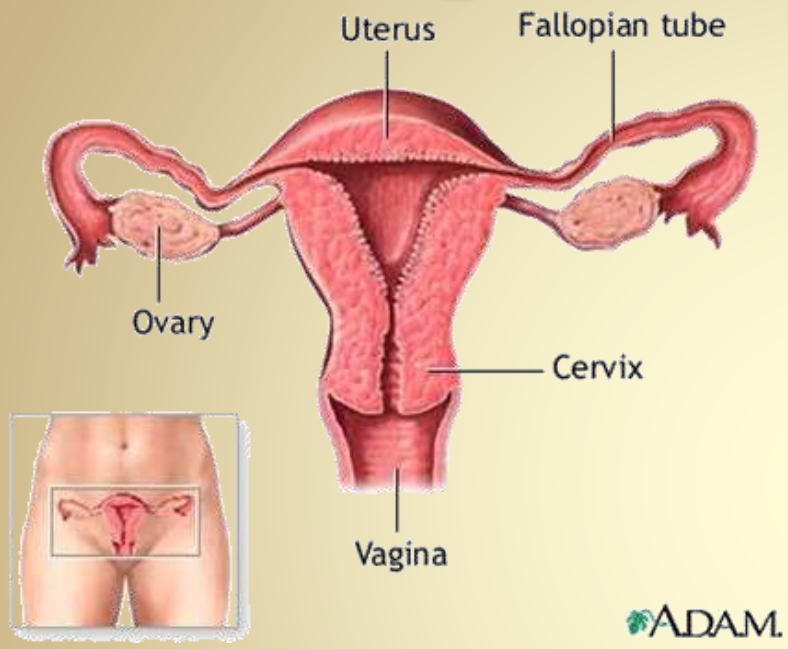
Organs/Components

Males



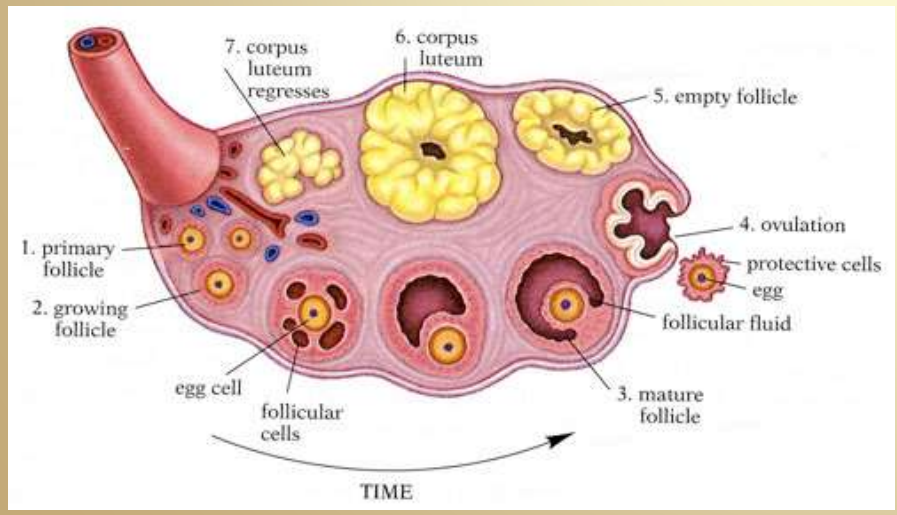
- Testes
  - Site of sperm production
- Epididymis
  - Where sperm mature
- Vas Deferens
  - Duct where mature sperm are stored before being transported to the urethra
- Urethra
  - Transports sperm out of the male body

Organs/Components



Females

- Ovaries
  - Where eggs mature
- Fallopian Tubes
  - Tube connecting ovaries to the uterus
- Uterus
  - Where a fetus develops during pregnancy
- Vagina
  - Canal leading to the uterus

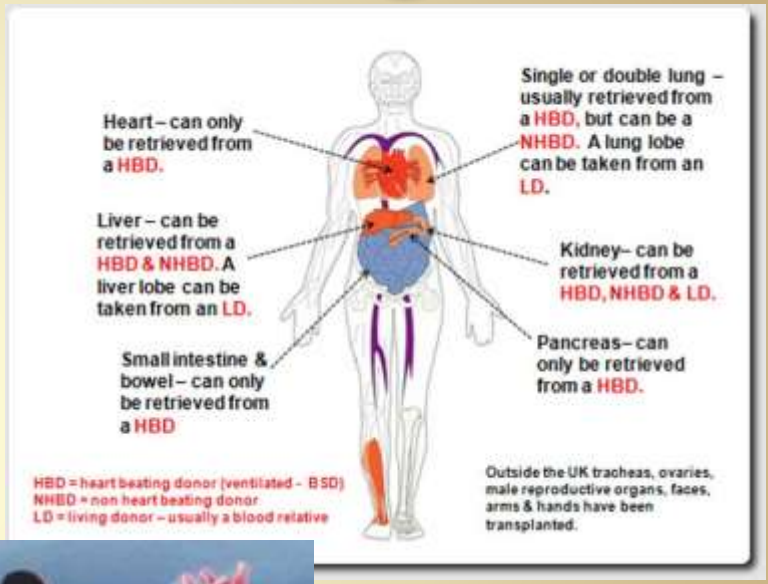


How Does this System Relate to others?

The reproductive system works most closely with the endocrine system (hormones)

Organ System Technologies

- Organ Transplants: when an organ from one person is given to another. This can be done from a donor who is living or has recently died.
- Organgenesis: when an organ is made from a person's cells and then transplanted into them



Organ System Technologies

- Prosthetics: An artificial device which places a missing body part

Organ System Technologies

- Cochlear Implants: an electronic implant to help with hearing
- Hormonal Modifications: the artificial alteration of hormone levels
- Lasik: laser eye surgery which restores 20/20 vision
- Kidney Dialysis: a machine which filters the blood in place of the kidneys
- Xenotransplantation: when cells, tissues, organs are taken from one species and put into another) pig to human)