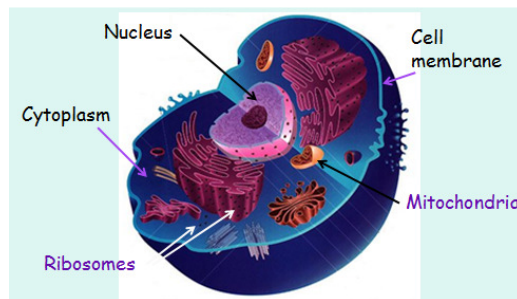


Chapter 6: Anatomy and Physiology

- **Anatomy**- study of the human body structures that can be seen with the naked eye
- **Physiology**- study of the functions and activities performed by the body's structures
- **Histology** (*microscopic anatomy*)- study of the tiny structures found on living tissues

Basic Structure of a Cell (p. 113)

- **Cell**- basic unit of all living things
- **Protoplasm**- colorless, jelly-like substance found inside cells in which food elements are present (similar to raw egg white)
- **Nucleus**- dense, active protoplasm found in the center of a cell ; important for cell reproduction and metabolism (similar to yolk of a raw egg)
- **Cytoplasm**- the watery fluid cells need for growth, reproduction, and self-repair
- **Cell membrane**- encloses the protoplasm; permits soluble substances to enter and leave the cell



Cell Reproduction and Division

- **Mitosis**- the usual process of cell reproduction of human tissues that occurs when the cell divides into two identical cells called daughter cells

Cell Metabolism (p. 114)

- **Metabolism**- a chemical process that takes place in living organisms through which cells are nourished
 - **Anabolism**- constructive metabolism; building of larger molecules from smaller ones; stores energy
 - **Catabolism**- breaking down of complex compounds into smaller ones; releases energy

Tissues (p. 114)

- **Tissue-** collection of similar cells that perform a particular function
- **Four types of tissue:**
 - **Connective-** fibrous tissue that binds, protects, and support various parts of the body (bones, cartilage, tendons, blood); **adipose tissue** is *the technical term for fat* (gives smoothness and contour to the body)
 - **Epithelial tissue-** protective covering on body surfaces (skin, mucous membranes, lining of the heart, tissue inside the mouth)
 - **Muscle tissue-** contracts and moves various parts of the body
 - **Nerve tissue-** carries messages to and from the brain; made up of special cells called neurons

Organs and Body Tissues (p. 114-115)

- **Organs-** structures composed of specialized tissues designed to perform specific functions in plants and animals
- **Body systems-** groups of organs acting together to perform one or more functions

Table 40.1 Organ Systems: Their Main Components and Functions in Mammals

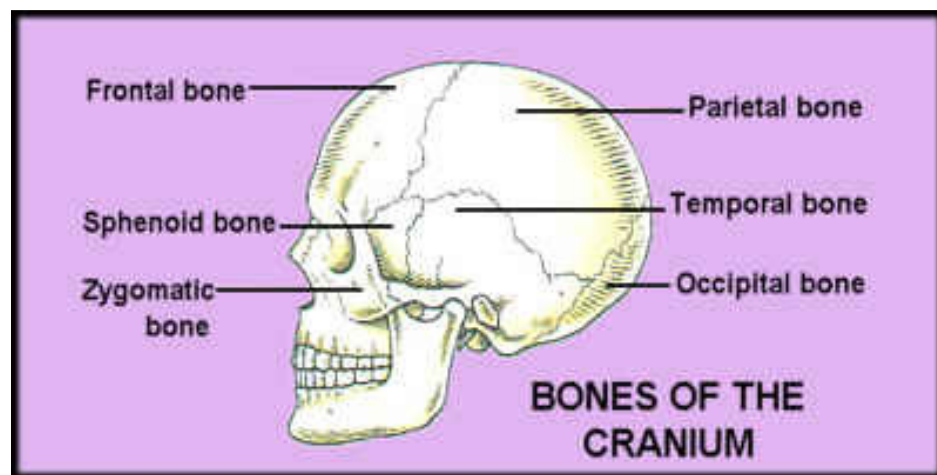
Organ System	Main Components	Main Functions
Digestive	Mouth, pharynx, esophagus, stomach, intestines, liver, pancreas, anus	Food processing (ingestion, digestion, absorption, elimination)
Circulatory	Heart, blood vessels, blood	Internal distribution of materials
Respiratory	Lungs, trachea, other breathing tubes	Gas exchange (uptake of oxygen; disposal of carbon dioxide)
Immune and lymphatic	Bone marrow, lymph nodes, thymus, spleen, lymph vessels, white blood cells	Body defense (fighting infections and cancer)
Excretory	Kidneys, ureters, urinary bladder, urethra	Disposal of metabolic wastes; regulation of osmotic balance of blood
Endocrine	Pituitary, thyroid, pancreas, adrenal, and other hormone-secreting glands	Coordination of body activities (such as digestion and metabolism)
Reproductive	Ovaries or testes, and associated organs	Reproduction
Nervous	Brain, spinal cord, nerves, sensory organs	Coordination of body activities; detection of stimuli and formulation of responses to them
Integumentary	Skin and its derivatives (such as hair, claws, skin glands)	Protection against mechanical injury, infection, drying out; thermoregulation
Skeletal	Skeleton (bones, tendons, ligaments, cartilage)	Body support, protection of internal organs, movement
Muscular	Skeletal muscles	Locomotion and other movement

THE SKELETAL SYSTEM (p. 115)

- **Skeletal system-**
 - Forms the physical foundation of the body; composed of 206 bones that vary in size and shape
 - Gives shape and support to the body
 - Protects various internal structures and organs
 - Serves as attachments for muscles and acts as levers to produce body movement
 - Produces both white and red blood cells (in the bone marrow)
 - Stores most of the body's calcium supply
- **Osteology-** the study of the anatomy, structure, and function of the bones
- **Joint-** the connection between two or more bones of the skeleton

Bones of the cranium (p. 117)

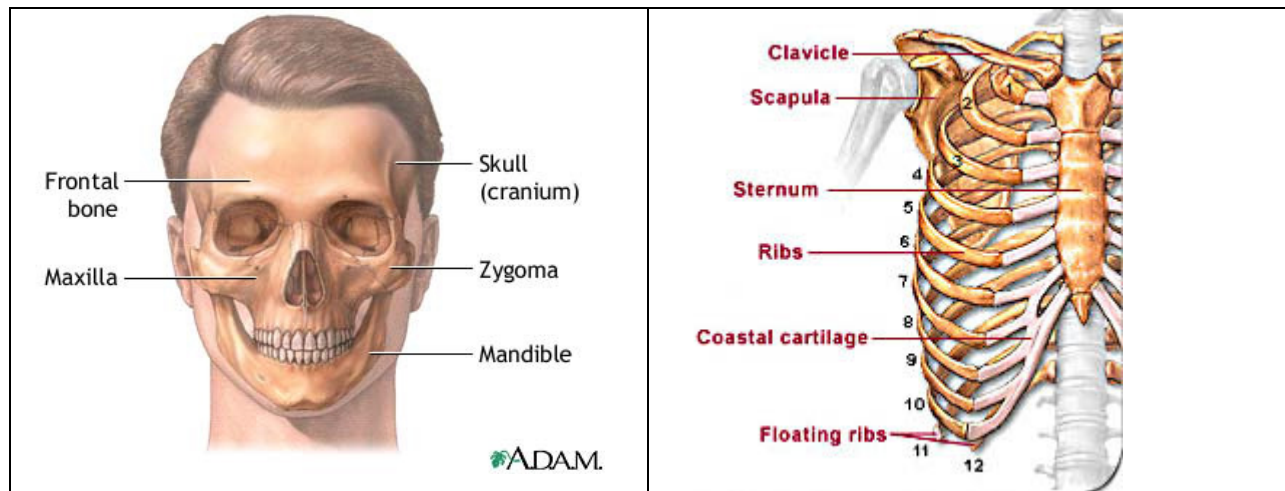
- **Cranium-** oval, bony case that protects the brain
- **Occipital bone-** forms the back of the skull above the nape
- **Parietal bones-** form the sides and top of the cranium
- **Frontal bone-** bone that forms the forehead
- **Temporal bone-** bones that form the side of the head in the ear region
- **Ethmoid bone-** spongy bone between the eye sockets; forms part of the nasal cavity
- **Sphenoid bone-** bone that joins all of the bones of the cranium together



Bones of the Face (p. 117-118)

**There are 14 bones in the face, but the following are involved in facial massage*

- **Nasal bones**- bones that form the bridge of the nose
- **Lacrimal bones**- small, thin bones located at the front inner all of the eye sockets
- **Zygomatic bones**- bones that form the cheeks (cheekbones)
- **Maxillae**- bones of the upper jaw
- **Mandible**- lower jawbone

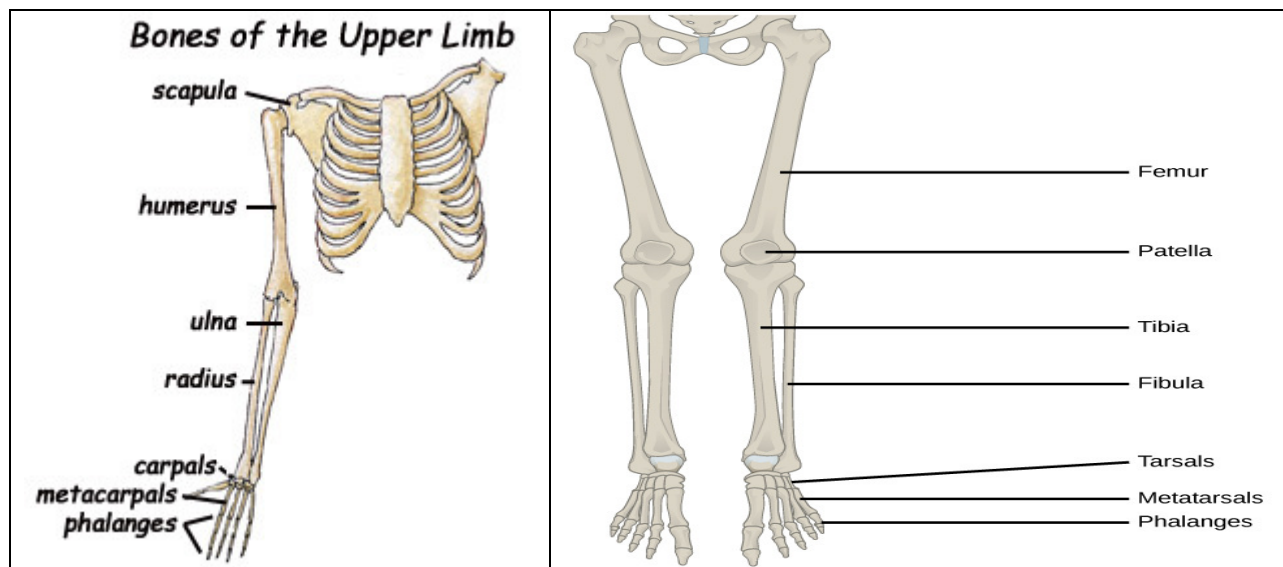


Bones of the Neck, Chest, Shoulder, and Back (p. 118)

- **Hyoid**- u-shaped bone at the base of the tongue
- **Cervical vertebrae**- seven bones at the top portion of the vertebral column (neck region)
- **Thorax**- chest, pulmonary trunk; elastic, bony cage that protects the heart, lungs and other internal organs
- **Ribs**- 12 pairs of bones forming wall of the thorax
- **Scapula**- shoulder blades
- **Sternum**- breastbone
- **Clavicle**- collarbone

Bones of the Arms and Hands (p. 118-119)

- **Humerus**- largest bone in the arm; extends from elbow to the shoulder
- **Ulna**- inner and larger bone of the forearm; attached to wrist
- **Radius**- smaller bone in the forearm on the same side as the thumb
- **Carpus**- wrist
- **Metacarpus**- bones of the palm of the hand
- **Phalanges**- bones of the fingers or toes



Bones of the Leg, Ankle and Foot (p. 119)

- **Femur**- heavy, long bone that forms the leg above the knee
- **Tibia**- larger of the two lower leg bones
- **Fibula**- smaller of the two lower leg bones
- **Patella**- kneecap
- **Talus**- ankle bone
- **Tarsal/Metatarsal/Phalanges**- bones of the foot

THE MUSCULAR SYSTEM (p. 120)

- **Muscular system-**
 - Covers, shapes, and holds the skeletal system in place
 - Contracts and moves various parts of the body
- **Types of muscles:**
 - **Striated-** skeletal muscles; attached to bones; are voluntarily or consciously controlled; help maintain posture
 - **Non-striated-** (also known as smooth muscles) involuntary muscles; function automatically; found in the internal organs like the digestive or respiratory systems
 - **Cardiac-** involuntary muscle that is the heart; found nowhere else in the body
- **Parts of a muscle:**
 - **Origin-** part of the muscle that does not move; attached closest to the skeleton
 - **Belly-** middle part of a muscle
 - **Insertion-** part of the muscle that moves; farthest from the skeleton

Muscles of the Scalp (p. 121)

- **Epicranius-** broad muscle that covers the top of the skull
- **Occipitalis-** back portion of the epicranius; muscle that draws the scalp backwards
- **Frontalis-** front portion of the epicranius; raises the eyebrows, draws the scalp forward

Muscles of the Ear (p. 121)

- **Auricularis superior-** muscle above the ear that draws it upward
- **Auricularis anterior-** muscle in front of the ear that draws it forward
- **Auricularis posterior-** muscle behind the ear that draws it backward

Muscles of Mastication (Chewing) (p. 122)

- **Masseter-** large muscle that raises and lowers the jaw
- **Temporalis-** muscle that also raises and lowers the jaw

Muscles of the Neck (p. 122)

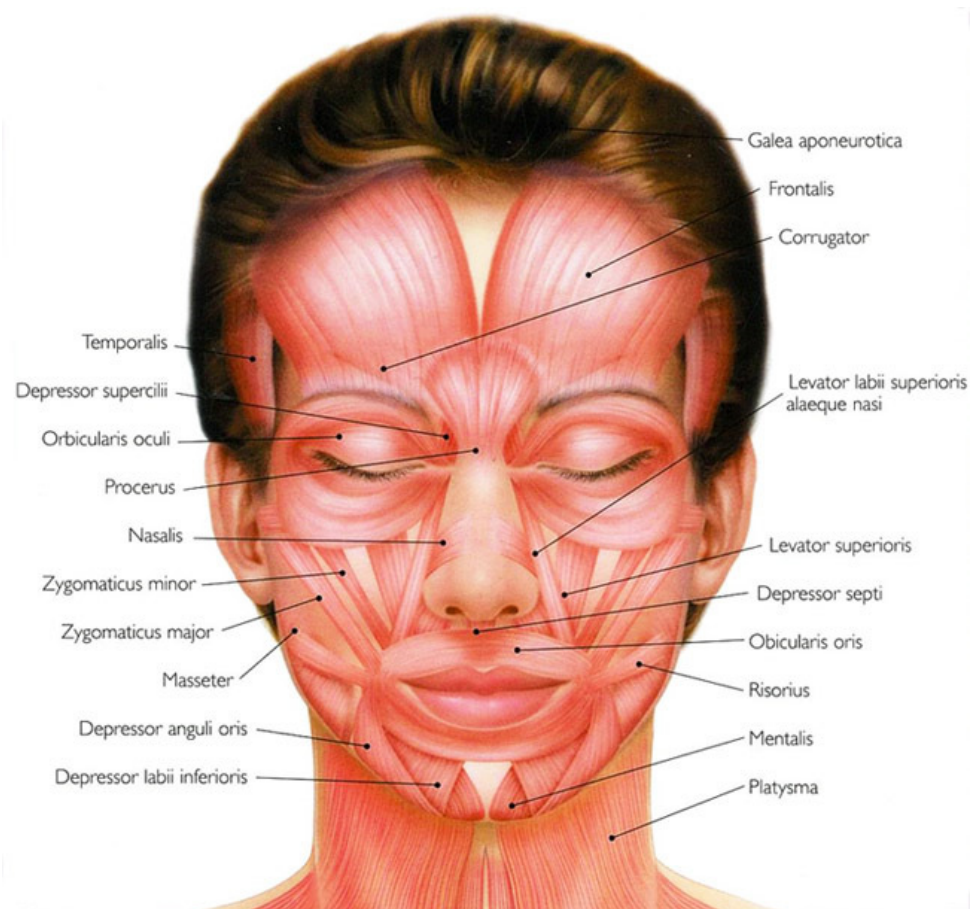
- **Platysma muscle**- broad muscle extending from the chest and shoulder muscles to the side of the chin; responsible for lowering the lower jaw and lip
- **Sternocleidomastoideus**- muscle of the neck that lowers and rotates the head

Muscles of the Eyebrow (p. 122)

- **Orbicularis oculi muscle**- ring muscles of the eye sockets; allows you to close your eyes
- **Corrugator muscle**- located below the orbicularis oculi muscle; draws the eyebrows down and wrinkles the forehead

Muscles of the Nose (p. 122)

- **Procerus muscle**- covers the bridge of the nose; lowers the eyebrows and causes wrinkle across the bridge of the nose



Muscles of the Mouth (p. 123)

- **Buccinator muscle**- thin flat muscle of the cheek between the upper and lower jaw that compresses the cheeks and expels air between the lips
- **Depressor labii inferioris muscle**- muscle surrounding the lower lip; lowers the lip and draws it to one side

Other muscles of the mouth include: levator anguli oris, levator labii superioris, mentalis, orbicularis oris, risorius, triangularis, zygomaticus major and zygomaticus minor.

Muscles that Attach the Arms to the Body (p. 123-124)

- **Latissimus dorsi**- large, flat triangular muscle covering the lower back; helps extend the arms away from the body and rotate the shoulder
- **Pectoralis major** and **pectoralis minor**- muscles of the chest that assist in the swinging movements of the arms
- **Serratus anterior**- muscle of the chest that assists in breathing and raising the arm
- **Trapezius**- muscle that covers the back of the neck and upper and middle region of the back; rotates and controls swinging movement of the arm

Muscles of the Shoulder and Arm (p. 124-125)

- **Bicep**- muscle that produces the contour of the front and inner side of the arm; lifts the forearm and flexes the elbow
- **Deltoid**- large, triangular muscle covering the shoulder joint; allows the arm to extend outward and to the side of the body
- **Tricep**- large muscle that covers the entire back of the upper arm; allows the forearm to extend
- **Extensors**- muscles that straighten the wrist, hand, and fingers to form a straight line
- **Flexor**- extensor muscle of the wrist involved in flexing the wrist
- **Pronator**- muscle that turns the hand inward so the palm faces downward
- **Supinator**- muscles of the forearm that rotates the radius outward and the palm upward

Muscles of the Hand (p. 125)

- **Abductors**- muscles that draw a body part away from the midline of the body; in hands, abductors separate the fingers
- **Adductors**- muscles that draw a body part inward toward the body; in hands they draw the fingers together (*think when you ADD something you put it TOGETHER*)

Muscles of the Lower Leg and Foot (p. 125)

- **Extensor digitorum longus**- bends the foot up, extends the toes
- **Extensor hallucis longus**- muscle that extends the big toe and flexes the foot
- **Tibialis anterior**- muscle that covers the front of the shin; bends the foot upward and inward
- **Peroneus longus**- covers the front of the shin; inverts the foot and turns it outward
- **Peroneus brevis**- bends the foot down and out
- **Gastrocnemius**- attached to the rear surface of the heel; pulls the foot down
- **Soleus**- bends the foot down
- **Flexor digiti minimi**- moves the little toe
- **Flexor digitorum brevis**- moves the toes; helps maintain balance
- **Abductor hallucis**- moves the toes; helps maintain balance
- **Abductor digiti minimi**- muscle separates the toes

THE NERVOUS SYSTEM (p. 126)

The nervous system is a well-organized body system composed of the brain, spinal cord, and nerves that is responsible for controlling and coordinating all other systems of the body.

- **Central nervous system (CNS)**- consists of brain, spinal cord, spinal nerves and cranial nerves; controls conscious and voluntary functions of the five senses as well as all body movements and facial expressions
- **Peripheral nervous system (PNS)**- connects the outer (peripheral) parts of the body with the CNS; carries messages to and from the CNS
- **Autonomic nervous system (ANS)**- control involuntary muscles; regulates the actions of smooth muscles, blood vessels, heart, and breathing

- **Brain-** largest and most complex nerve tissue; controls sensation, muscles, activity of glands, power to think, sense and feel; weighs about 3 pounds
- **Spinal cord-** originates in the brain and extends down to the lower extremity of the trunk

Nerve Cell Structure and Function (p.127)

- **Neuron-** nerve cell; primary structural unit of the nervous system; consists of cell body, nucleus, dendrites and axon
- **Dendrites-** tree-like branchings of nerve fibers extending from nerve cell that carry impulses toward the cell and receives impulses from other neurons
- **Nerves-** whitish cords; made up of bundles of nerves held together by connective tissue
 - **Sensory nerves (afferent nerves)-** carry impulses or messages from the sense organs to the brain
 - **Motor nerves (efferent nerves)-** carry impulses from the brain to the muscles or glands
- **Reflex-** automatic reaction to a stimulus

Nerves of the Head, Face and Neck (p. 128-129)

- **Trifacial nerve (fifth cranial nerve)-** chief sensory nerve of the face; motor nerve of muscles that control chewing
 - **Ophthalmic nerve-** supplies impulses to the skin of the forehead, upper eyelids, orbit, eyeball, and nasal passage
 - **Mandibular nerve-** affects the muscles of the chin, lower lip, and external ear
 - **Maxillary nerve-** supplied impulses to the upper part of the face

Nerves of the face affected by massage:

- **Auriculotemporal nerve**- affects external ear and skin above the temple
- **Infraorbital nerve**- affects skin of the lower eyelid, side of the nose, upper lip, and mouth
- **Mental nerve**- affects skin of lower lip and chin
- **Nasal nerve**- affects the point and lower side of the nose
- **Supraorbital nerve**- affects the skin of the forehead, scalp, eyebrow, and upper eyelid
- **Supratrochlear nerve**- affects skin between the eyes and upper side of the nose
- **Zygomatic nerve**- affects muscles of the upper part of the cheek

***other nerves are listed and described on p. 129 of the textbook**

Nerves of the Arm and Hand (p. 129-130)

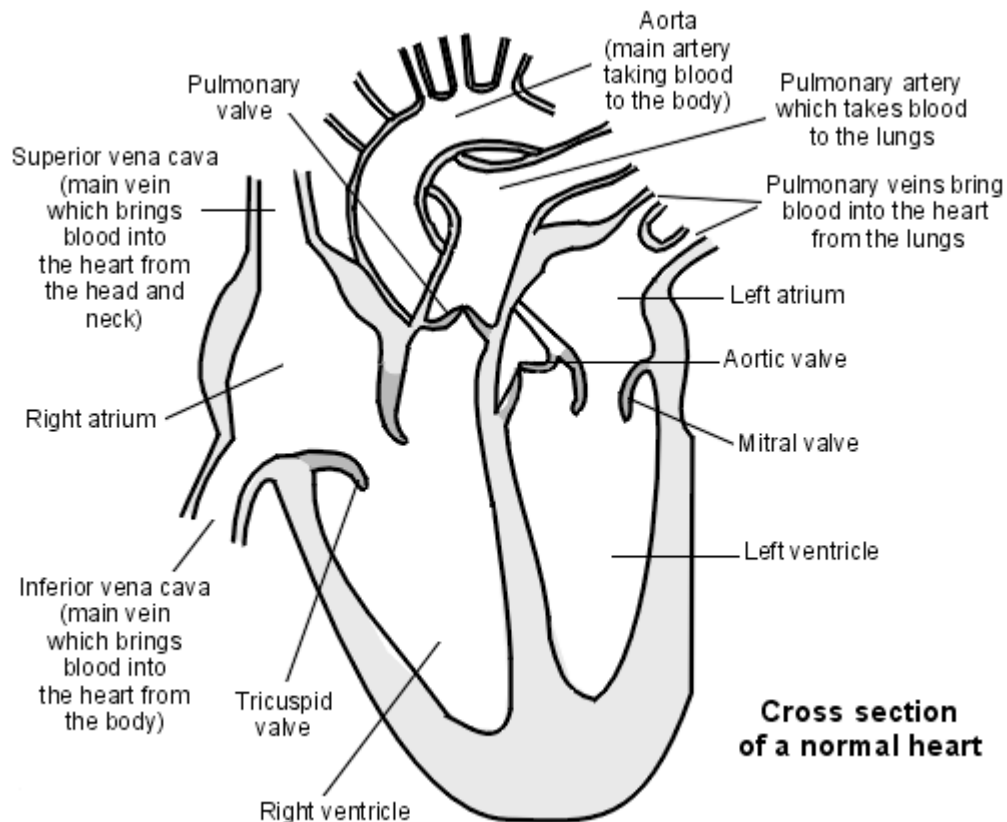
- **Digital nerve**- sensory motor nerve that supplies impulses to the fingers
- **Radial nerve**- sensory-motor nerve supplies the thumb side of the arm and the back of the hand (*think if something is rad, give it a thumbs up*)
- **Median nerve**- sensory-nerve that supplies the arm and the hand
- **Ulnar nerve**- sensory-motor nerve that supplies the little finger side of the arm and the palm of the hand

Nerves of the Lower Leg and Foot (p. 130)

- **Sciatic nerve**- longest and largest nerve in the body
- **Tibial nerve**- division of sciatic nerve that passes behind the knee
- **Common peroneal nerve**- division of sciatic nerve that extends from behind the knee to wind around to the front of the leg
- **Deep peroneal nerve**- extends down the front of the leg
- **Superficial peroneal nerve**- extends down the leg just under the skin
- **Dorsal nerve**- supplies impulses to the toes and foot as well as the muscles and skin of the leg
- **Saphenous nerve**- begins in the thigh; supplies impulses to skin of inner leg and foot
- **Sural nerve**- supplies impulses to skin on the outer side and back of the foot and leg

THE CIRCULATORY SYSTEM (p. 132-136)

- **Circulatory system (cardiovascular system)**- controls the steady circulation of blood through the body by means of the heart and blood vessels
- **Heart**- muscular, cone-shaped organ; referred to as the body's pump; enclosed by a double-layered membranous sac known as the pericardium; about the size of a closed fist; contains four chambers and valves
 - **Atrium**- upper, thin-walled chamber through which blood is pumped to the ventricles
 - **Ventricle**- lower, thick-walled chamber that receives blood from the atrium
 - **Valves**- structures that temporarily close a passage or permit blood to flow in one direction only
- **Pulmonary circulation**- sends blood *FROM* the heart *TO* the lungs to be purified then *BACK* to the heart again
- **Systemic circulation**- carries blood *FROM* the heart *THROUGHOUT* the body and *BACK* to the heart



Blood Vessels

- **Arteries**- thick, walled, muscular, flexible tubes that carry oxygenated blood away from the heart to the arterioles; largest artery in the body is the **aorta**
- **Arterioles**- small arteries that deliver blood to the capillaries
- **Capillaries**- tiny, thin-walled blood vessels that connect smaller arteries to venules
- **Venules**- small vessels that connect capillaries to the veins
- **Veins**- thin-walled blood vessels that are less elastic than arteries; contain valves that keep blood flowing on one direction; carry blood containing waste products back to the heart and lungs for cleaning and to pick up oxygen; closer to skin surface than arteries

The Blood

Blood is the nutritive fluid circulating through the body to supply oxygen and nutrients to cells and tissues and remove carbon dioxide and waste from them

- **Composition of Blood**
 - **Red blood cells**- carry oxygen from the lungs to the body cells and transport carbon dioxide from the cells back to the lungs; contains **hemoglobin** which gives blood its **color**
 - **White blood cells (known as white corpuscles)**- destroy disease releasing toxin and bacteria
 - **Platelets**- contribute to blood-clotting which stops bleeding; much smaller than red blood cells
 - **Plasma**- fluid part of the blood in which red and white blood cells and platelets flow; about 90% water
- **Chief Functions of the Blood**
 - Carries oxygen, water, and food to all cells and tissues
 - Carries away carbon dioxide and waste products to be eliminated
 - Helps to equalize the body's temperature
 - Works with immune system
 - Seals leaks found in injured vessels by forming clots

Arteries of the Head, Face, and Neck (p. 134-135)

Common carotid arteries-main arteries that supply blood to the head, face, and neck; located on both sides of the neck; divided into internal and external branch

- **Internal carotid artery**- supplies blood to the brain, eyelids, forehead, nose, and internal ear
- **External carotid artery**- supplies blood to the front of the scalp, ear, face, neck, and sides of the head
- **Facial artery (external maxillary artery)**- supplies blood to the lower region of the face, mouth and nose
- **Superficial temporal artery**- supplies blood to the muscles on the front, side, and top of the head
- **Occipital artery**- supplies blood to the skin and muscles of the scalp and the back of the head up to the crown

Veins of the Head, Face, and Neck (p. 136)

- **Internal jugular vein**- located at the side of the neck to collect blood from the brain and parts of the face and neck
- **External jugular vein**- located at the side of the neck to carry blood returning to the head, face, and neck

Blood Supply to the Arm and Hand (p.136)

- **Ulnar artery**- carries blood to the little finger side of the arm and the palm of the hand
- **Radial artery**- supplies blood to the thumb side of the arm and the back of the hand (*remember...rad-thumbs up*)

Blood Supply to the Lower Leg and Foot (p. 136)

- **Popliteal artery**- supplies blood to the foot
 - **Anterior tibial artery**- supplies blood to lower leg muscles and muscles and skin on top of foot
 - **Posterior tibial artery**- supplies blood to ankle and back of lower leg
- **Dorsal pedis artery**- supplies blood to the foot

THE LYMPHATIC/IMMUNE SYSTEM (p. 137)

The **lymphatic/immune system** is made up of lymph, lymph nodes, the thymus gland, the spleen, and lymph vessels; it carries away wastes and impurities from the cells; protects the body by developing immunities

- **Lymph**- clear fluid that circulates in the lymph spaces; carries away wastes and impurities
- **Lymph capillaries**- blind-end tubes that are the origin of lymphatic vessels
- **Lymph nodes**- gland-like structures found inside lymphatic vessels; help fight infection

PRIMARY FUNCTIONS OF LYMPHATIC/IMMUNE SYSTEM:

- Carry nourishment from the blood to the body cells
- Act as a defense against toxins and bacteria
- Remove waste materials from the body cells to the blood
- Provide a suitable fluid environment for the cells

THE ENDOCRINE SYSTEM (p. 137-138)

The endocrine system is a group of specialized glands that affect growth, development, sexual functions, and health of the entire body.

- **Glands**- excretory organs that remove and release certain elements from the blood to convert them into new compounds

TWO MAIN TYPES OF GLANDS:

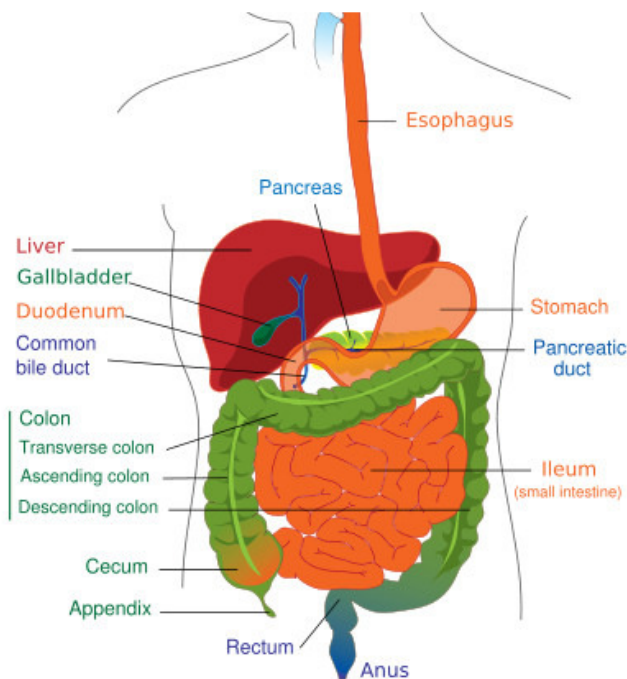
- **Endocrine (ductless glands)**- release hormonal secretions directly into the bloodstream; thyroid gland (*think d for directly; or endo- no duct*)
- **Exocrine glands (duct glands)**- produce a substance that travels through small, tube-like ducts; sweat glands
- **Hormones**- secretions that stimulate functional activity; insulin, estrogen
- **Pineal gland**- plays a major role in sexual development, sleep, and metabolism
- **Pituitary gland**-affects almost every physiological process of the body; most complex organ of the endocrine system

- **Thyroid gland**- controls how quickly the body burns energy, makes proteins, and how sensitive the body should be to other hormones
- **Parathyroid glands**- regulate blood calcium and phosphorus levels
- **Pancreas**- secretes enzyme-producing cells that are responsible for digesting carbohydrates, proteins, and fats
- **Adrenal glands**- secrete about 30 steroid hormones; control metabolic process and fight-or-flight
- **Ovaries**- female sexual gland
- **Testes**- male sexual glands

THE DIGESTIVE SYSTEM (p. 138-139)

The **digestive system**, also known as the gastrointestinal system, is responsible for breaking down foods into nutrients and waste; consists of the mouth, stomach, intestines, salivary and gastric glands and other organs.

- **Digestive enzymes**- chemicals that change certain types of food into *soluble* (able to be dissolved) form that can be used by the body

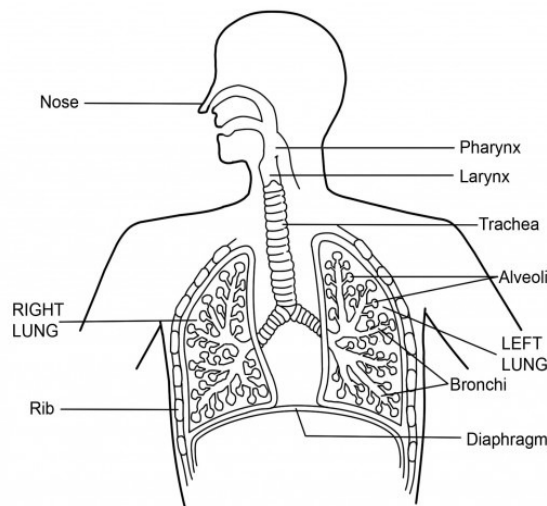


THE EXCRETORY SYSTEM (p. 139)

- **Excretory system**- group of organs that are responsible for purifying the body by eliminating waste matter; includes the kidneys, liver, skin, large intestine and lungs
- **Kidneys**- excrete urine (water and waste products)
- **Liver**- discharges toxins produced during digestion
- **Skin**- eliminates waste through perspiration
- **Large intestine**- eliminates decomposed and undigested food
- **Lungs**- exhale carbon dioxide

THE RESPIRATORY SYSTEM (p. 140)

- **Respiratory system**- consists of lungs and air passages; allows the body to be supplied with oxygen and remove carbon dioxide
- **Respiration**- act of breathing
- **Lungs**- spongy tissues composed of microscopic cells in which inhaled air is exchanged for carbon dioxide
- **Inhalation**-breathing in through the nose or mouth; oxygen is passed into the blood
- **Exhalation**- breathing out; carbon dioxide collected from the blood is expelled from the lungs



THE INTEGUMENTARY SYTEM (p. 140)

- **Integumentary system-** consists of the skin, hair, and nails; complex system that serves as protective covering and helps regulate the body's temperature
**The word integument means "natural covering".*

THE REPRODUCTIVE SYSTEM (p. 141)

- Reproductive system- performs the function of producing offspring
- Produces hormones that can affect skin in several ways (acne, hair loss, facial hair growth...)

