


Chapter 6

General Anatomy and Physiology

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**“Remember, you can earn more money,
but when time is spent, it is gone
forever.”**

– Zig Ziglar

Objectives

- Define *anatomy* and *physiology* and explain their importance to the cosmetology profession.
- Describe cells, their structure, and their reproduction.
- Define *tissue* and identify the types of tissues found in the body.
- Name the 11 main body systems and explain their basic functions.

Anatomy

Defined: The study of the structures of the human body that can be seen with the naked eye and how the body parts are organized; the science of the structure of organisms or of their parts.

Physiology

Defined: The study of the functions and activities performed by the body's structures.

Histology

Defined: The study of tiny structures found in living tissues. Also known as microscopic anatomy.

Cells

- The basic units of all living things, from bacteria, plants, and animals to human beings. Cells carry out all life processes and reproduce. They vary in size, shape, and purpose.

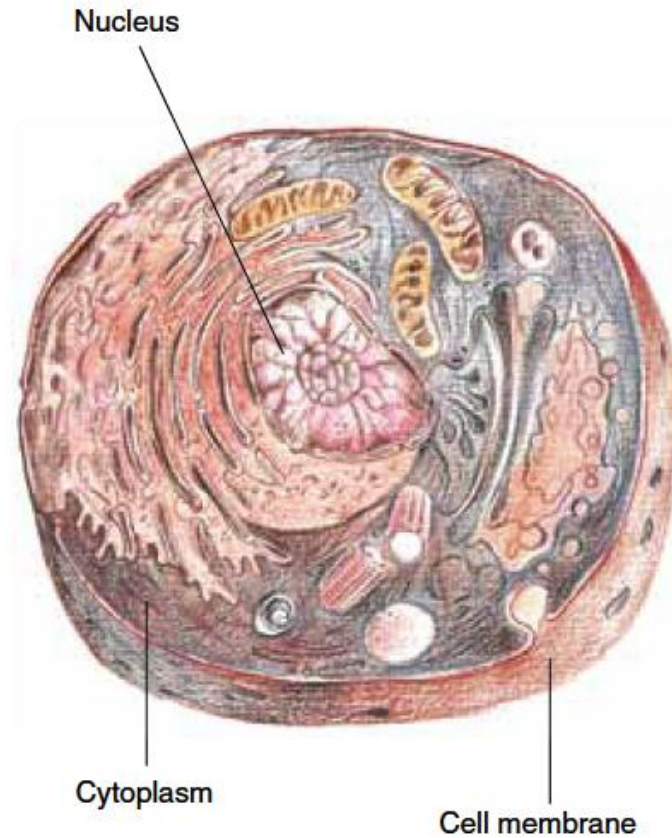
Cell Composition

- Cells of all living things are composed of *protoplasm*, a colorless jellylike substance in which proteins, fats, carbohydrates, mineral salts, and water are present.

Cell Structure

- Nucleus – center of cell
- Cytoplasm – watery fluid containing food materials necessary for growth
- Centrosome – controls transportation of substances in and out of cells
- Cell membrane – permits movement of soluble substances in and out of cells

Cell Construction



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Cell Mitosis

- Cell Reproduction and Division
 - Adequate food supply
 - Adequate oxygen supply
 - Adequate water supply
 - Waste elimination
 - Proper temperature
- Cell Metabolism
 - Anabolism
 - Catabolism

Cell Metabolism

- **Anabolism** – building up larger molecules from smaller ones
- **Catabolism** – breaking down of complex compounds within cells to smaller ones
- **Homeostasis** – the simultaneous activity of anabolism and catabolism that maintains normal, internal stability in organs

Tissues

- Connective tissue – binds together body tissues
- Epithelial tissue – provides protective covering on body surfaces
- Muscular tissue – contracts and moves various body parts
- Nerve tissue – carries messages to/from the brain; controls and coordinates body functions

Organs

- Brain – controls the body
- Eyes – control the vision
- Heart – circulates the blood
- Kidneys – excrete waste products
- Lungs – supply oxygen to blood
- Liver – remove toxins of digestion
- Skin – forms protective body covering
- Stomach/Intestines – digests food

Organs (continued)

NINE MAJOR BODY ORGANS AND THEIR FUNCTIONS	
ORGAN	FUNCTION
BRAIN	Controls the body.
EYES	Control the body's vision.
HEART	Circulates the blood.
KIDNEYS	Excrete water and waste products.
LUNGS	Supply oxygen to the blood.
LIVER	Removes waste created by digestion.
SKIN	Covers the body and is the external protective coating.
STOMACH	Digests food, along with the intestines.
INTESTINES	Digest food, along with the stomach.

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Systems

- Circulatory – controls circulation of blood
- Digestive – changes food into nutrients and wastes
- Endocrine – affects growth and development
- Excretory – eliminates waste
- Integumentary – regulates body temperature

Systems (*continued*)

- Muscular – covers, shapes, supports skeletal tissue
- Nervous – controls/coordinates all systems
- Reproductive – produces offspring
- Respiratory – enables breathing
- Skeletal – provides physical body foundation

Systems (continued)

ELEVEN MAIN BODY SYSTEMS AND THEIR FUNCTIONS	
SYSTEM	FUNCTION
CIRCULATORY	Controls the steady circulation of the blood through the body by means of the heart and blood vessels.
DIGESTIVE	Breaks down foods into nutrients and wastes; consists of mouth, stomach, intestines, salivary and gastric glands, and other organs.
ENDOCRINE	Affects the growth, development, sexual functions, and health of the entire body; consists of specialized glands.
EXCRETORY	Purifies the body by eliminating waste matter; consists of kidneys, liver, skin, large intestine, and lungs.
INTEGUMENTARY	Serves as a protective covering and helps regulate the body's temperature; consists of skin and its accessory organs, such as oil and sweat glands, sensory receptors, hair, and nails.
LYMPHATIC/IMMUNE	Protects the body from disease by developing immunities and destroying disease-causing toxins and bacteria.
MUSCULAR	Covers, shapes, and holds the skeletal system in place; the muscular system contracts and moves various parts of the body.
NERVOUS	Controls and coordinates all other systems of the body and makes them work harmoniously and efficiently; composed of the brain, spinal cord, and nerves.
REPRODUCTIVE	Produces offspring and passes on the genetic code from one generation to another.
RESPIRATORY	Enables breathing, supplying the body with oxygen, and eliminating carbon dioxide as a waste product; consists of the lungs and air passages.
SKELETAL	Forms the physical foundation of the body; composed of 206 bones that vary in size and shape and are connected by movable and immovable joints.

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Skeletal System

- The skeletal system forms the physical foundation of the body. It is composed of 206 bones that vary in size and shape and are connected by movable and immovable joints.

Bone Composition

- 1/3 Organic matter – cells and blood
- 2/3 Mineral matter – mainly calcium carbonate and calcium phosphate

Osteology

- Osteology is the study of the anatomy, structure, and function of the bones.
- Os means “bones.”

Primary Functions of Skeletal System

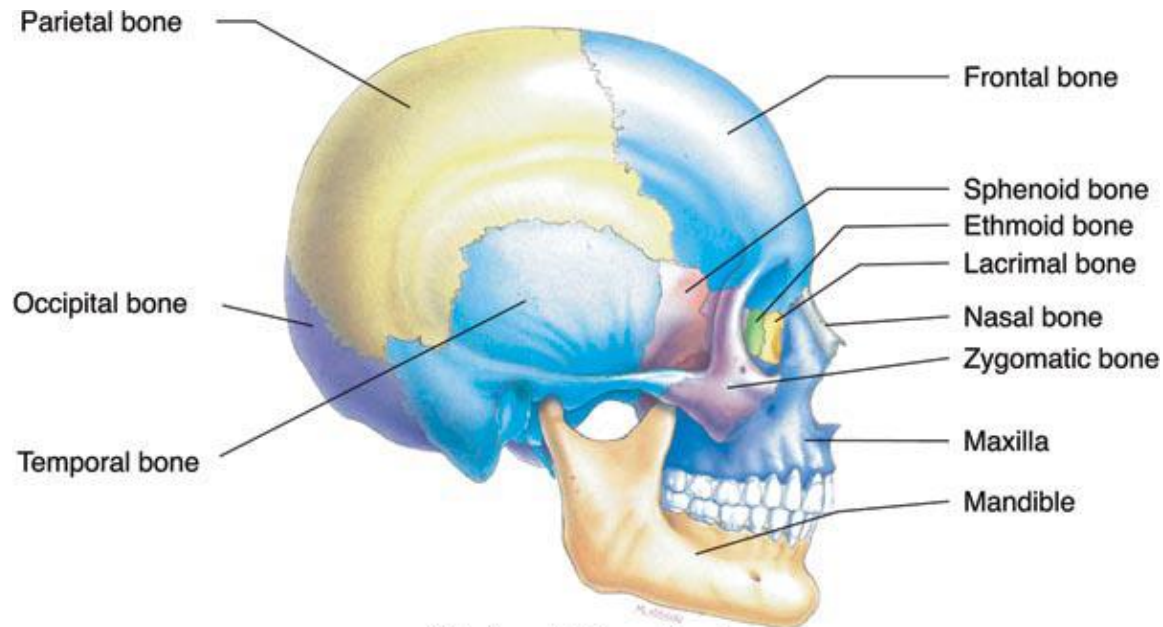
- Gives shape and support to body
- Protects internal structures and organs
- Acts as frame where muscles attach
- Acts as levers to produce body movement
- Helps produce white and red blood cells (a function of bone marrow)
- Stores minerals

Joints

- Joints are the connections between two or more bones of the skeleton.
- Movable – such as elbows, knees, and hips
- Immovable – such as pelvis or skull

Bones of the Skull

- Cranium – bony case that protects brain
- Facial skeleton – framework of face composed of 14 bones



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Bones of the Cranium

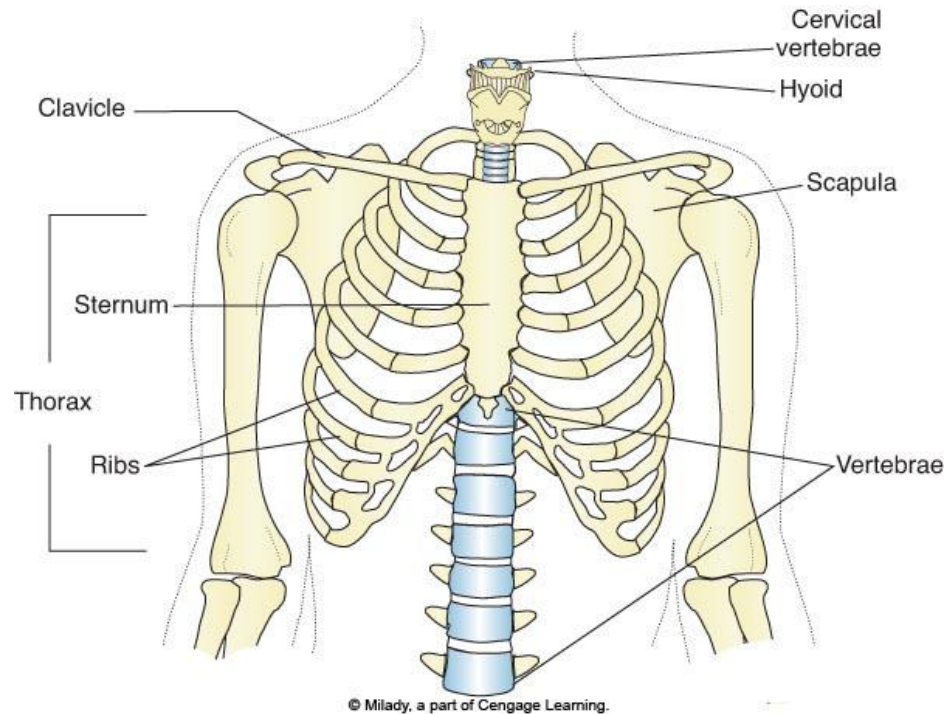
- Occipital – forms back of skull above nape
- Parietal – forms sides and top of cranium
- Frontal – forms the forehead
- Temporal – forms sides of head in ear area
- Ethmoid – between eye sockets
- Sphenoid – joins all cranium bones

Bones of the Face

- Nasal – form bridge of nose (2)
- Lacrimal – front, inner wall of eye sockets (2)
- Zygomatic – form prominence of cheeks (2)
- Maxillae – upper jaw (2)
- Mandible – lower jawbone; largest and strongest facial bone

Bones of the Neck

- Hyoid – supports tongue and muscles
- Cervical vertebrae – located in neck region (7)



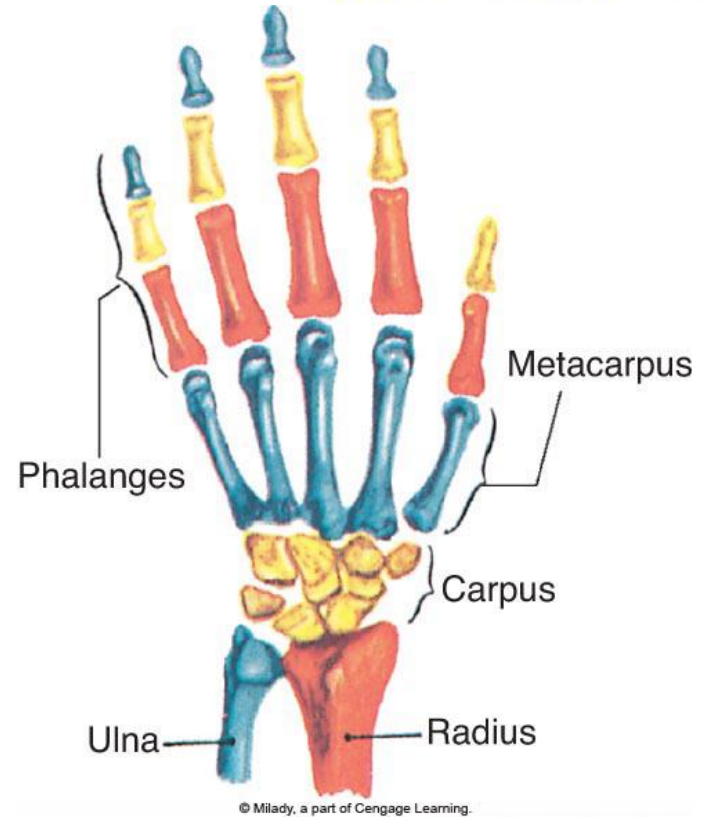
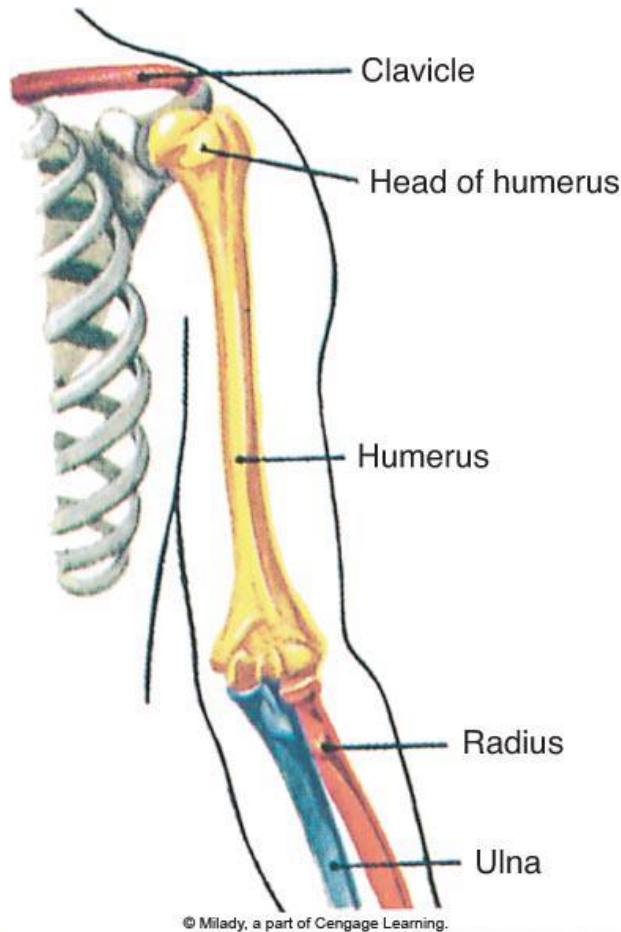
Bones of the Chest, Shoulder, and Back

- Thorax – protects heart and lungs
- Ribs – form wall of the thorax (12 pairs)
- Scapula – large, flat, triangular bones of the shoulder (2)
- Sternum – breastbone; supports ribs
- Clavicle – joins sternum and scapula

Bones of the Arm and Hand

- Humerus – largest arm bone, from shoulder to elbow
- Ulna – inner and larger bone of forearm
- Radius – smaller bones on thumb side of forearm
- Carpus – bones of wrist (8 irregular bones)
- Metacarpus – bones of palm (5)
- Phalanges – bones of the fingers (14 in each hand)

Bones of the Arm and Hand (continued)



Bones of the Leg

- Femur – long bone above knee
- Tibia – larger bone below knee (anklebone on big toe side of foot)
- Fibula – smaller bone below knee (anklebone on little toe side of foot)
- Patella – kneecap

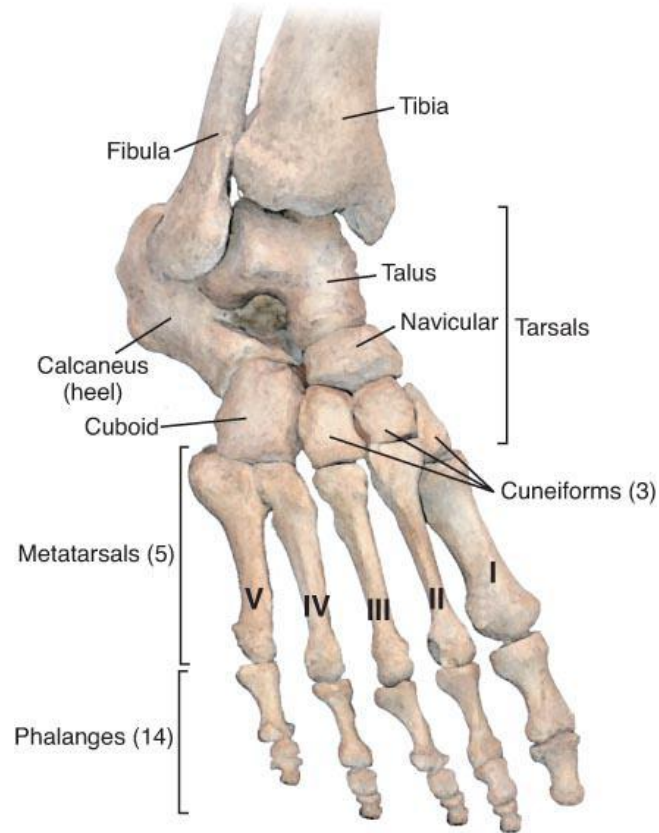
Bones of the Foot

- Ankle joint – composed of tibia, fibula, and talus (anklebone)
- Tarsal – bones of the ankle (7)
- Metatarsal – like metacarpal bones of the hand (5)
- Toe phalanges – bones of the toes (14 in each foot)

Bones of the Foot (continued)



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Muscular System

Myology – the study of the structure, function, and diseases of the muscles (fibrous tissues with the ability to stretch and contract). The human body has over 600 muscles responsible for 40 percent of the body's weight.

Muscular Tissue

- Striated muscles – skeletal muscles
- Nonstriated muscles – smooth muscles
- Cardiac muscle – the heart

Muscle Parts

- Origin – where muscle is attached to an immovable section of the skeleton
- Insertion – the portion of the muscle at the movable attachment
- Belly – the middle of the muscle

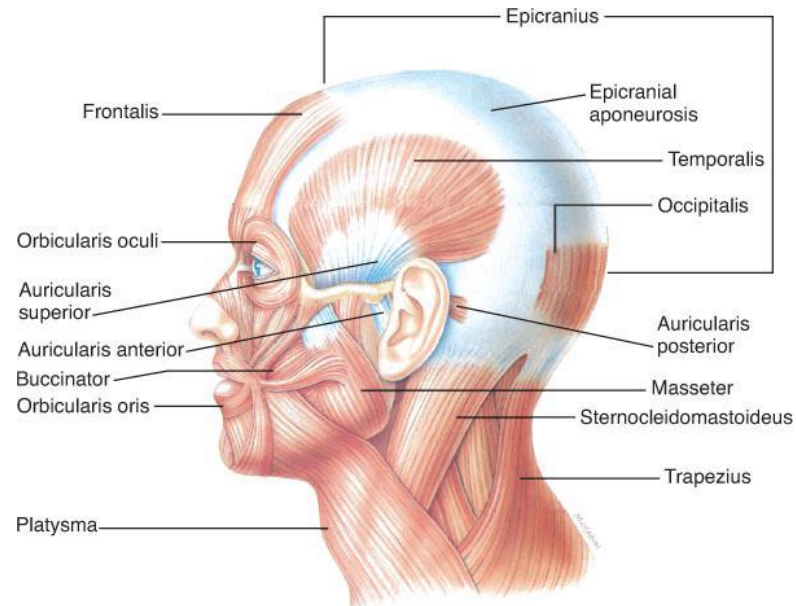
Pressure in massage is usually directed from the insertion to the origin.

Stimulation of Muscles

- Massage
- Electric current
- Light rays
- Heat rays
- Moist heat
- Nerve impulses
- Chemicals

Scalp Muscles

- Epicranium or occipitofrontalis – covers top of skull
- Occipitalis – back part of scalp
- Frontalis – front part of scalp; raises eyebrows
- Epicranial aponeurosis – connects occipitalis and frontalis



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Muscles of the Ear

- *Auricularis superior* – draws ear upward
- Auricularis anterior – draws ear forward
- Auricularis posterior – draws ear backward

Muscles of Mastication

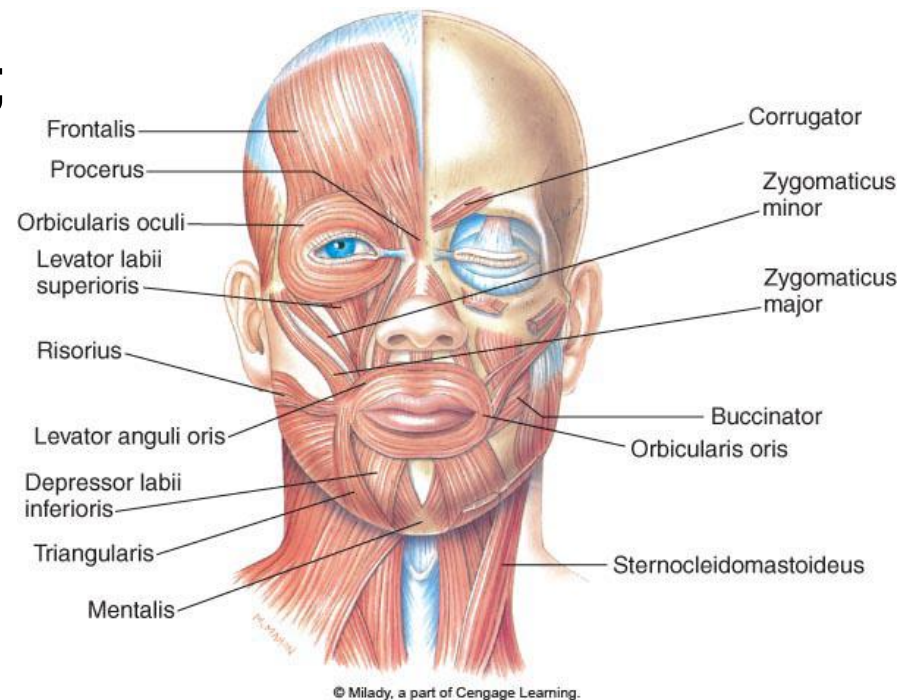
- Masseter
- Temporalis
- *Medial pterygoid*
- *Lateral pterygoid*

Neck Muscles

- Platysma – extends from chest and shoulder muscle to side of chin; lowers jaw and lip
- *Sternocleidomastoideus* – lowers and rotates the head

Eyebrow Muscles

- *Orbicularis oculi* – allows eye to close.
- *Corrugator supercilii* – draws eyebrow down and in; wrinkles forehead vertically



Muscles of the Nose

- *Procerus* – covers bridge of nose; lowers eyebrows; causes wrinkles across bridge of nose
- Other nasal muscles – contract and expand nostrils

Muscles of the Mouth

- **Buccinator** – compresses cheeks and expels air between lips
- Depressor labii inferioris – draws lower lip to one side
- **Levator anguli oris** – raises angle of mouth and draws it inward
- Levator labii superioris – elevates upper lip and dilates nostrils

Muscles of the Mouth (*continued*)

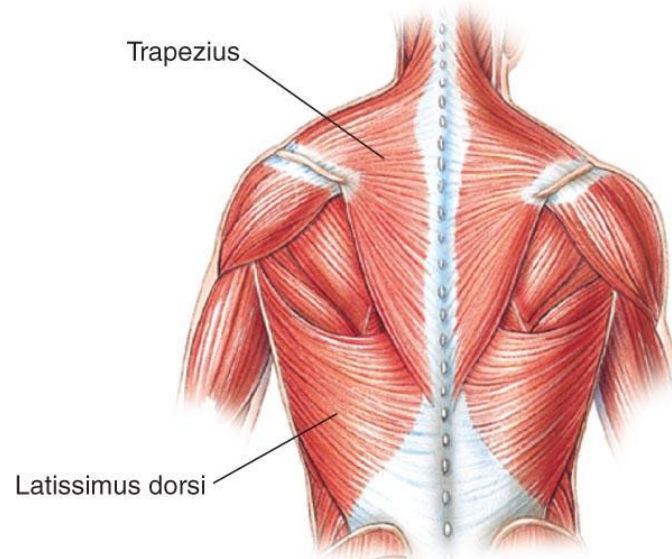
- Mentalis – elevates lower lip and raises and wrinkles skin of chin
- Orbicularis oris – compresses, contracts, puckers, and wrinkles the lips
- Risorius – draws corners of mouth out and back, as in grinning

Muscles of the Mouth (*continued*)

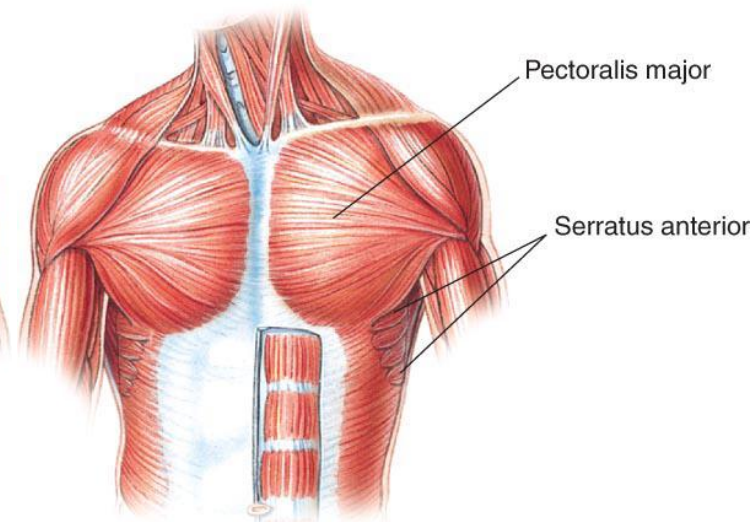
- Triangularis – pulls down the corner of the mouth
- Zygomaticus major – pulls the mouth upward and backward for smiling
- Zygomaticus minor – pulls the upper lip backward, upward, and outward when smiling

Muscles Attaching Arms to Body

- Latissimus dorsi
- Pectoralis major and minor
- Serratus anterior
- Trapezius



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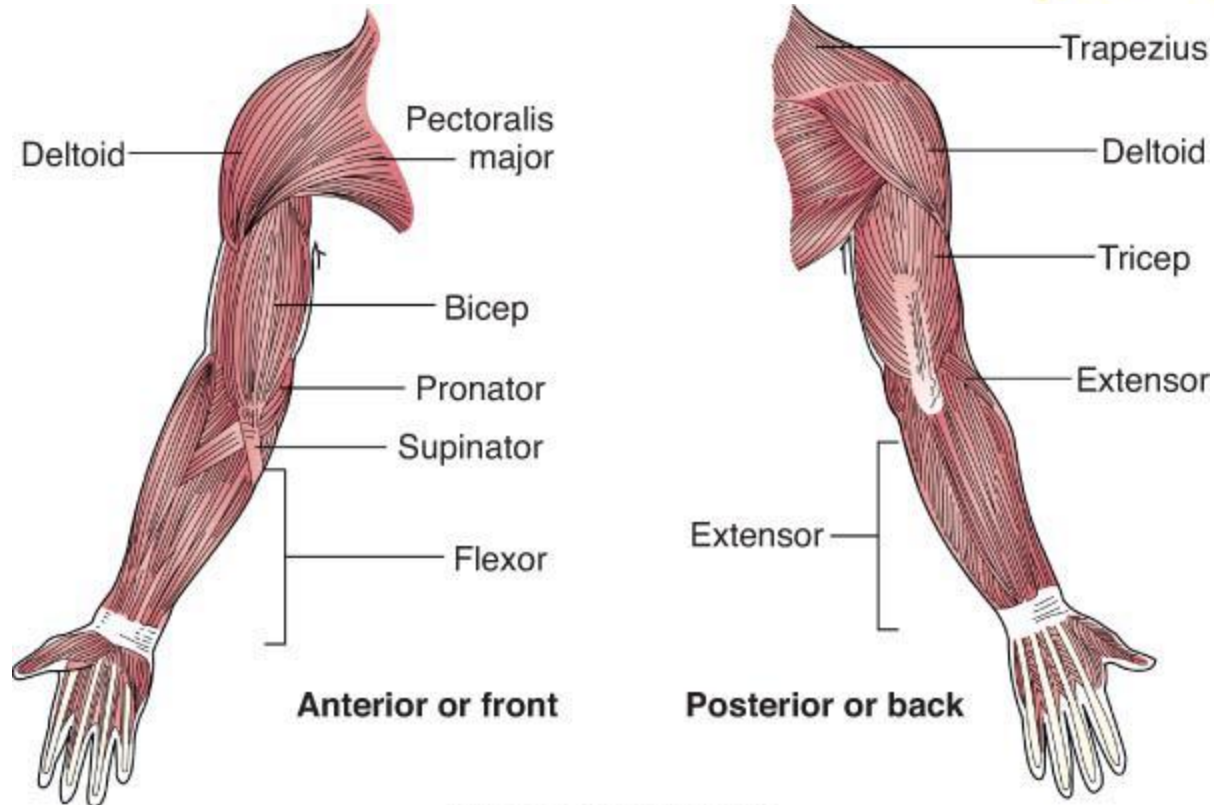
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Shoulder and Arm Muscles

- Deltoid – extends arm outward and to side
- Biceps – lifts forearm, flexes elbow
- Triceps – extends forearm
- Pronator – faces palm downward
- Supinator – faces palm upward
- Flexor – flexes wrists
- Extensor – straightens wrist, hand, fingers

Shoulder and Arm Muscles (continued)

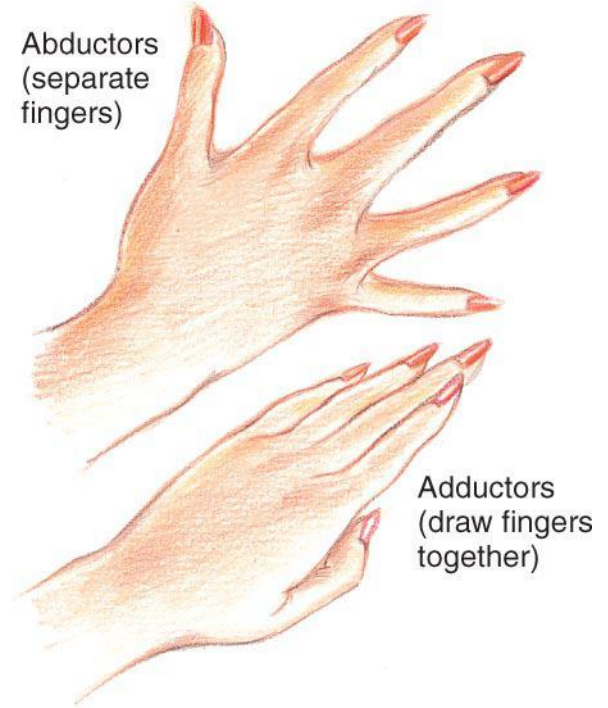


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Muscles of the Hand

- Abductor – separates fingers
- Adductor – draws fingers together



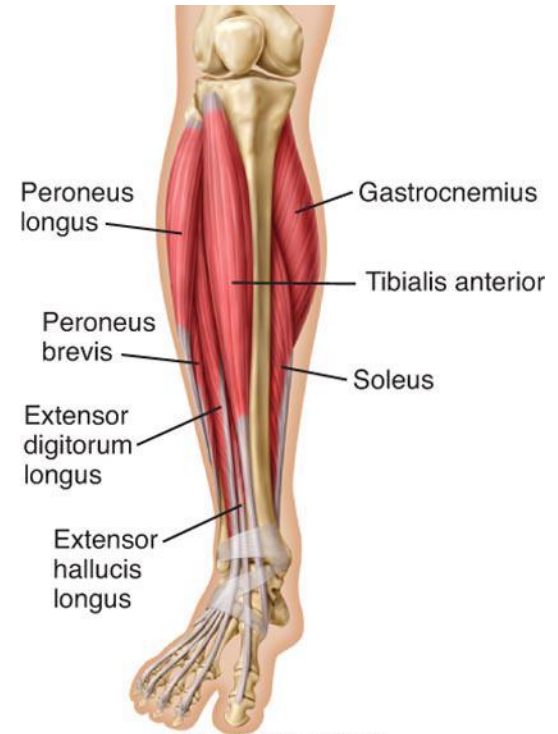
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Lower Leg Muscles

- Extensor digitorum longus – bends foot up and extends toes
- Extensor hallucis longus – extends big toe and flexes foot
- Tibialis anterior – bends foot upward and inward
- Peroneus longus – inverts foot and turns it downward

Lower Leg Muscles (*continued*)

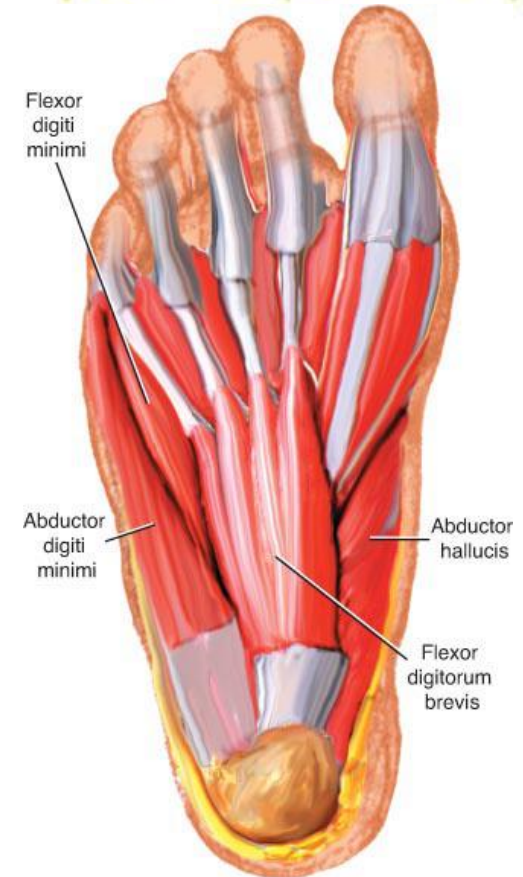
- Peroneus brevis – bends foot down and out
- **Gastrocnemius** – attached to lower rear surface of heel and pulls foot down
- Soleus – bends foot down



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Foot Muscles

- Flexor digiti minimi brevis – moves little toe
- Flexor digitorum brevis – moves toes for balance while walking and standing
- Abductor hallucis – moves toes and for balance while walking and standing
- Abductor digiti minimi – separates toes



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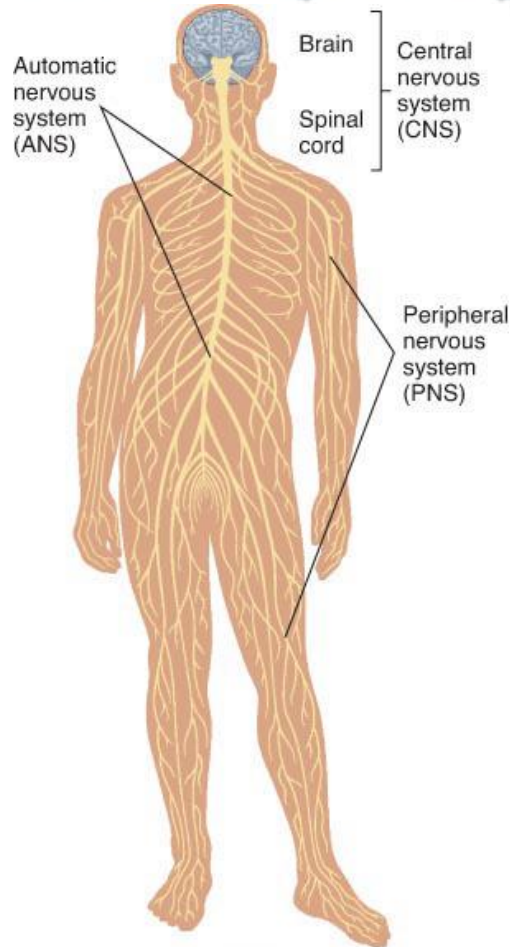
Nervous System

- Neurology – the scientific study of the structure, function, and pathology of the nervous system
- Nervous system – controls and coordinates the functions of other systems, making them work harmoniously and efficiently

Divisions of the Nervous System

- Cerebrospinal system – central nervous system
- Peripheral nervous system – carries messages to/from central nervous system
- Autonomic nervous system – controls involuntary muscles; regulates smooth muscles

Divisions of the Nervous System (continued)



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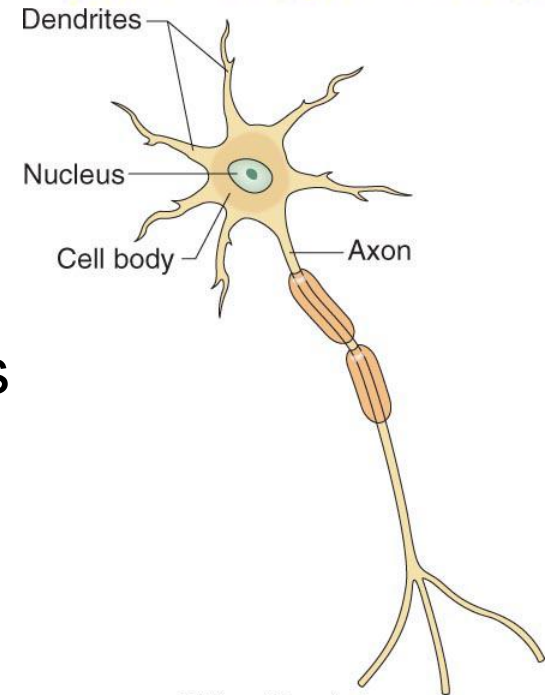
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Brain and Spinal Cord

- Brain largest mass of body tissue
- Average weight: 44 to 48 ounces
- Brain contains 12 pairs of cranial nerves
- Spinal cord originates in brain
- 31 pairs of spinal nerves

Nerve Cell Structure and Function

- Neuron or Nerve cell – primary unit
- Dendrites – receive impulses from neurons
- Axon and Axon terminal – send impulses to other neurons, glands, muscles
- Nerves – used to transmit impulses



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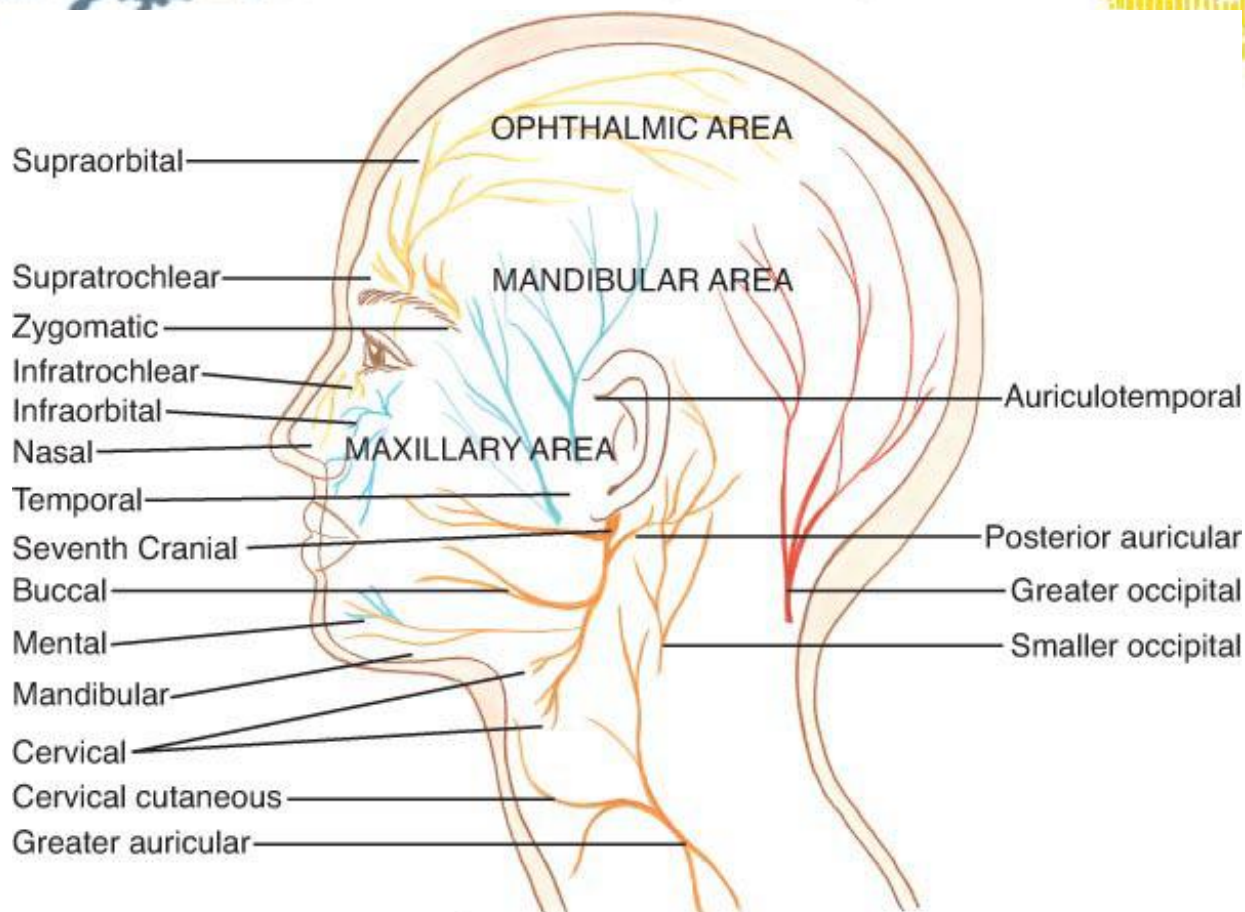
Types of Nerves

- Sensory – carry impulses from sense organs to brain
- Motor – carry impulses from brain to muscles
- Reflex – automatic response to a stimulus (removal of hand from a hot object)

Fifth Cranial Nerve

- Ophthalmic – supplies impulses to forehead, eyelids, interior scalp, orbit, eyeball, and nasal passage
- Mandibular – affects muscles of chin, lower lip, and external ear
- Maxillary – supplies impulses to upper part of face

Fifth Cranial Nerve (continued)



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Fifth Cranial Branches Affected by Massage

- *Auriculotemporal* – affects external ear and skin above temple
- Infraorbital – affects lower eyelid, side of nose, upper lip, and mouth
- Infratrochlear – affects membrane and skin of nose
- Mentalis – affects skin of lower lip and chin

Fifth Cranial Branches Affected by Massage (continued)

- Nasal – affects point and lower side of nose
- Supraorbital – affects skin of forehead, scalp, eyebrow, and upper eyelid
- Supratrochlear – affects skin between eyes and upper side of nose
- Zygomatic – affects muscles of upper part of cheek

Seventh Cranial Nerve

- Posterior auricular – affects muscles behind ear at base of skull
- Temporal – affects muscles of temple, side of forehead, eyebrow, eyelid, and upper part of cheek
- Zygomatic – affects muscles of upper part of cheek

Seventh Cranial Nerve (*continued*)

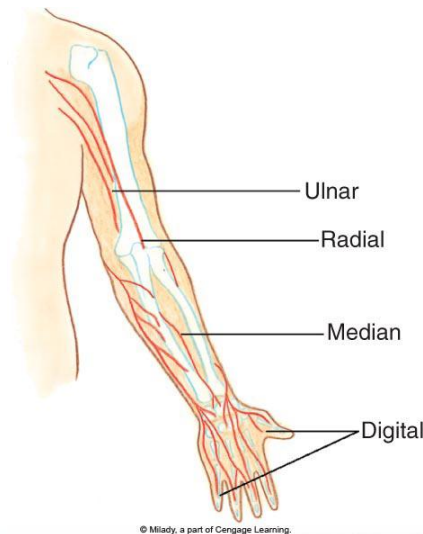
- Buccal – affects muscles of the cheek
- Marginal mandibular – affects muscles of the chin and lower lip
- Cervical – affects side of neck and platysma

Cervical Nerves

- Greater occipital – affects scalp
- Lesser occipital – affects scalp and muscles at base of skull
- Greater auricular – affects face, ears, neck, and parotid gland
- Cervical cutaneous – affects front and sides of neck to breastbone
- Eleventh cranial – controls neck and shoulder motion

Nerves of Arm and Hand

- Digital – supplies fingers of hand
- Radial – supplies thumb side of arm and back of hand
- Median – supplies the arm and hand
- Ulnar – affects little-finger side of arm and palm of hand



Nerves of Lower Leg and Foot

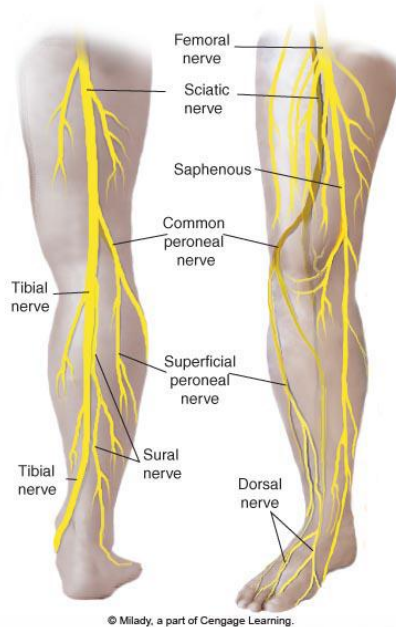
- Tibial – supplies impulses to the knee, calf muscles, skin of leg, soles of feet, and underside of toes
- Common peroneal – extends from behind knee around fibula to front of leg
- Deep *peroneal* (anterior tibial) – extends down front of leg behind muscles

Nerves of Lower Leg and Foot (continued)

- Superficial peroneal (musculocutaneous) – supplies impulses to muscles and skin of leg and toes and top of foot
- Dorsal cutaneous – begins with superficial peroneal; supplies impulses to toes and top of foot

Nerves of Lower Leg and Foot (continued)

- **Saphenous** – supplies impulses to the skin of inner side of leg and foot
- **Sural** – supplies impulses to the skin of outer side and back of leg and foot



Circulatory System

- Also known as the cardiovascular system or vascular system
- Controls steady circulation of the blood through the body by means of the heart and blood vessels
- Consists of the heart, arteries, veins, and capillaries that distribute blood throughout the body

Heart

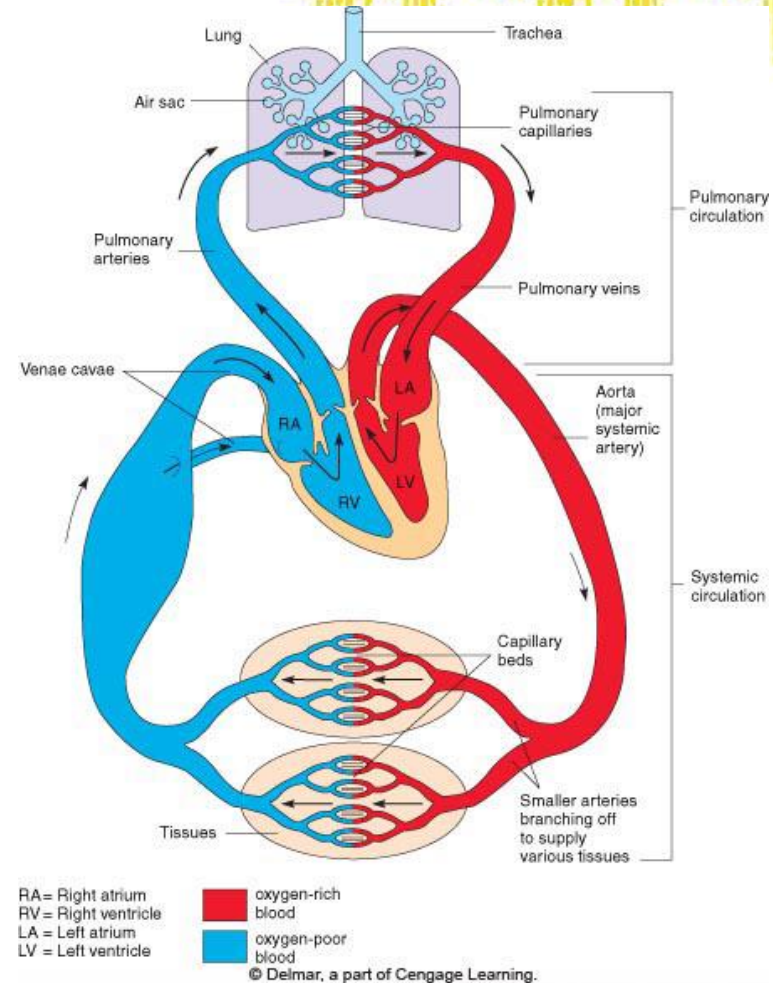
- A muscular, cone-shaped organ that keeps blood moving through the body
- The size of a closed fist, weighing approximately 9 ounces
- Pericardium – encloses the heart
- Resting heart rate – 60 to 80 times per minute

Heart Chambers and Valves

- Right and left atrium – upper, thin-walled chambers that pump blood to ventricles
- Right and left ventricle – lower, thick-walled chambers
- Valves – temporarily close a passage or permit blood flow

Blood Circulation

- Pulmonary circulation – brings blood from heart to lungs for purification
- Systemic or general circulation – carries blood from heart through body and back to heart

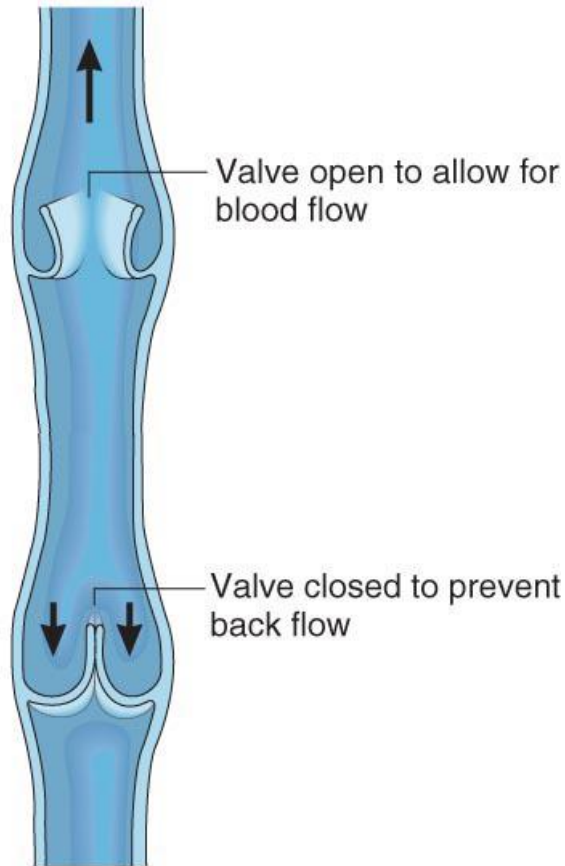


Blood Vessels

- Arteries – transport blood to/from heart
- Arterioles – deliver blood to capillaries
- Capillaries – connect smaller arteries to veins
- Venules – collect blood from capillaries and drain it into veins
- Veins – contain valves to prevent back flow of impure blood to heart

Blood Vessels (*continued*)

Blood flow toward the heart



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Blood

- Sticky, salty fluid
- Temperature of 98.6
- 1/20th of body weight
- 8 to 10 pints in adults
- Bright red in arteries
- Dark red in veins (except pulmonary)

Blood Composition

- Red blood cells – carry oxygen to cells
- White blood cells – destroy disease-causing germs
- Blood platelets – important to clotting
- Plasma – carries food to cells and carbon dioxide away from cells

Blood Functions

- Carries water, oxygen, food, secretions to cells
- Carries away carbon dioxide and waste
- Helps equalize body temperature
- Works with immune system
- Clotting

Arteries of Head, Face, and Neck

- Common carotid
- Internal division
- External division
 - Superficial temporal artery
 - Occipital artery
 - Posterior auricular artery

Arteries of Head, Face, and Neck (continued)

- Facial (external maxillary artery) – supplies blood to lower region of face, mouth, nose
 - Submental: supplies blood to chin and lower lip
 - Inferior labial: supplies blood to lower lip
 - Angular: supplies blood to side of nose
 - Superior labial: supplies blood to upper lip and region of nose

Superficial Temporal Artery

- Frontal – supplies blood to forehead and upper eyelids
- Parietal – supplies blood to side and crown of head
- Transverse facial – supplies blood to skin and masseter
- Middle temporal – supplies blood to temples
- Anterior auricular – supplies blood to front of ear

Branches from External Carotid Artery

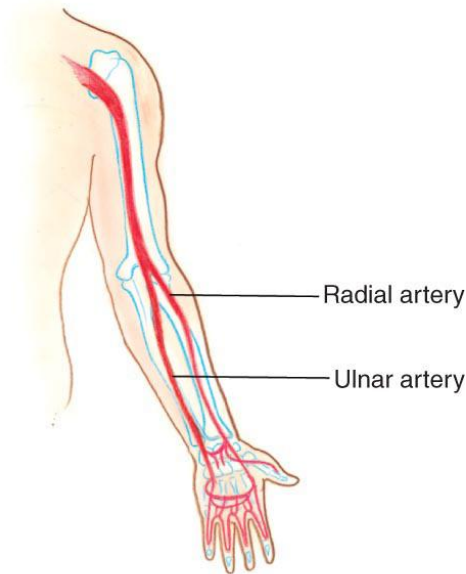
- Occipital – supplies blood to skin and muscles of scalp and back of head up to crown
- Posterior auricular – supplies blood to scalp behind and above ear and skin behind ear

Veins of Head, Face, and Neck

- Internal jugular – located at side of neck to collect blood from brain and parts of face and neck
- External jugular – carries blood returning to heart from head, face, and neck

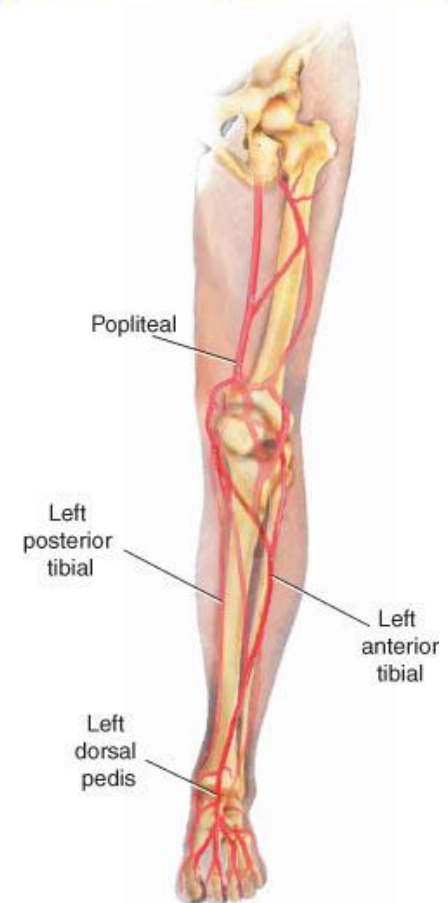
Blood Supply for Arm and Hand

- Ulnar arteries – supply the little-finger side of arm and palm of hand
- Radial arteries – supply the thumb-side of arm and back of hand



Blood Supply for Foot and Leg

- Popliteal artery – supplies blood to foot
 - Anterior tibial: supplies blood to lower leg muscles and skin on top of foot
 - Posterior tibial: supplies blood to ankles and back of lower leg.
- Dorsalis pedis – supplies blood to foot



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Lymphatic/Immune System

- Made up of lymph, lymph nodes, thymus gland, spleen, and lymph vessels

Function of Lymphatic System

- Carries waste and impurities away from cells
- Protects body from disease by developing immunities and destroying disease-causing microorganisms
- Drains tissue spaces of excess interstitial fluid (blood plasma found in spaces between tissue cells)

Connection to Cardiovascular System

- Both transport streams of fluids throughout body.
- Lymphatic vessels start as tubes that are closed at one end.

Lymph Capillaries

- Blind-end tubes that are the origin of lymphatic vessels
- Distributed throughout most of the body (except the nervous system)

Lymph Nodes

- Glandlike structures found inside lymphatic vessels
- Filter lymphatic vessels, which helps fight infection.

Primary Functions of Lymph Nodes

- Carry nourishment from blood to cells
- Act as defense against toxins and bacteria
- Remove waste material from cells to blood
- Provide fluid environment for cells

Endocrine System

- A group of specialized glands that affect the growth, development, sexual functions, and health of the entire body
- Glands – specialized organs that remove certain elements from the blood to convert them into new compounds

Types of Glands

- Exocrine (duct) – produce a substance that travels through small, tubelike ducts. Sweat and oil glands belong to this group.
- Endocrine (ductless) – release hormonal secretions directly into the bloodstream. Thyroid and pituitary glands belong to this group.

Hormones

- Secretions such as insulin, adrenaline, and estrogen that stimulate functional activity or other secretions in the body and influence the welfare of the entire body

Endocrine Glands and Functions

- Pineal – impacts sexual development, sleep, and metabolism
- Pituitary – affects almost every physiologic process (growth, blood pressure, breast-milk production, etc.)
- Thyroid – controls the body's metabolism

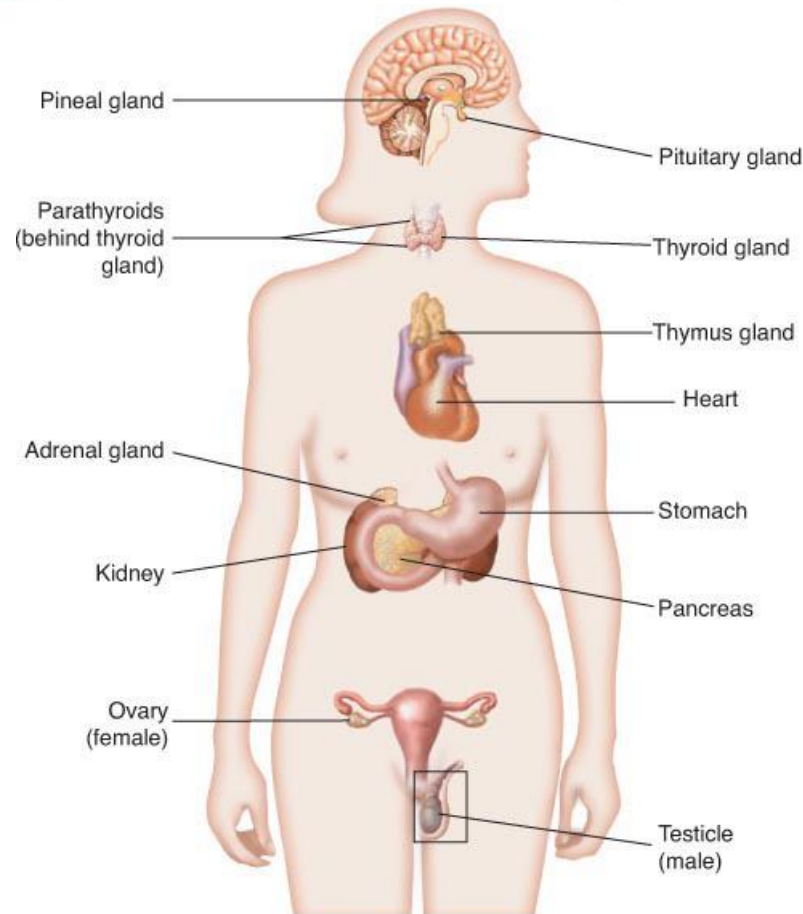
Endocrine Glands and Functions (continued)

- Parathyroid – regulates blood calcium and phosphorus to aid nervous and muscular system
- Pancreas – secretes enzyme-producing cells responsible for digesting carbohydrates, proteins, and fats

Endocrine Glands and Functions (continued)

- Adrenal – secrete about 30 steroid hormones and control metabolic processes of the body
- Ovaries – female sexual glands that function in reproduction
- Testes – male sexual glands that function in reproduction

Endocrine Glands and Functions (continued)



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Digestive System

- Also known as the gastrointestinal system. It is responsible for breaking down foods into nutrients and waste. It consists of the stomach, intestines, salivary and gastric glands, and other organs.

Digestive Enzymes

- Chemicals that change foods into a soluble form that can be used by the body. The food is then transported by the bloodstream and used by the body's cells and tissues. The process takes about nine hours to complete.

Excretory System

- A group of organs, including the kidneys, liver, skin, large intestine, and lungs, that are responsible for purifying the body by eliminating waste matter
- The metabolism of body cells forms toxic substances that, if retained, could poison the body.

Assisting Organs

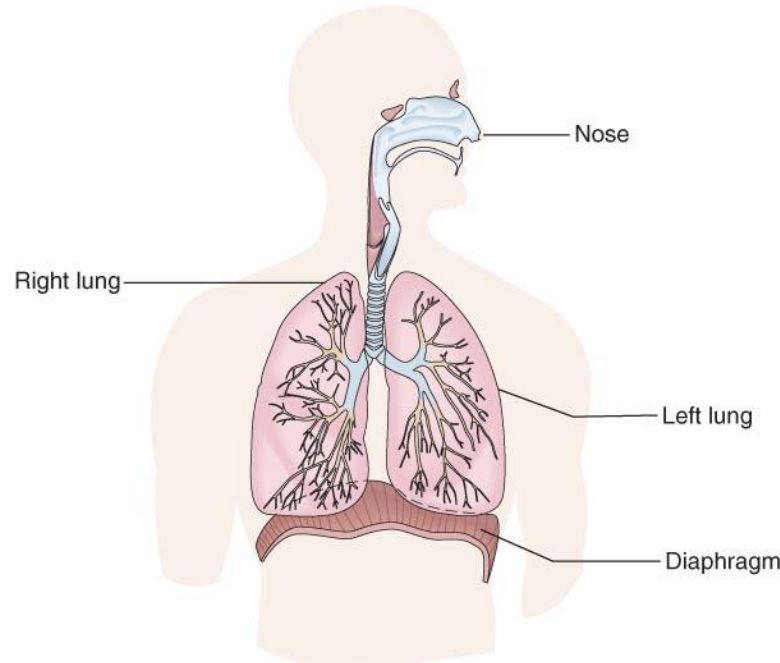
- Kidneys – excrete urine
- Liver – discharges toxins
- Skin – eliminates waste through perspiration
- Large intestine – eliminates decomposed and undigested food
- Lungs – exhale carbon dioxide

Respiratory System

- System consisting of the lungs and air passages that enables respiration, supplies the body with oxygen, and eliminates carbon dioxide as a waste product

Respiration

- The act of breathing; the exchange of carbon dioxide and oxygen in the lungs and within each cell



Respiratory System
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Lungs

- Spongy tissues composed of microscopic cells in which inhaled air is exchanged for carbon dioxide during one breathing cycle. These organs of respiration are located within the chest cavity and are protected on both sides by the ribs.

Diaphragm

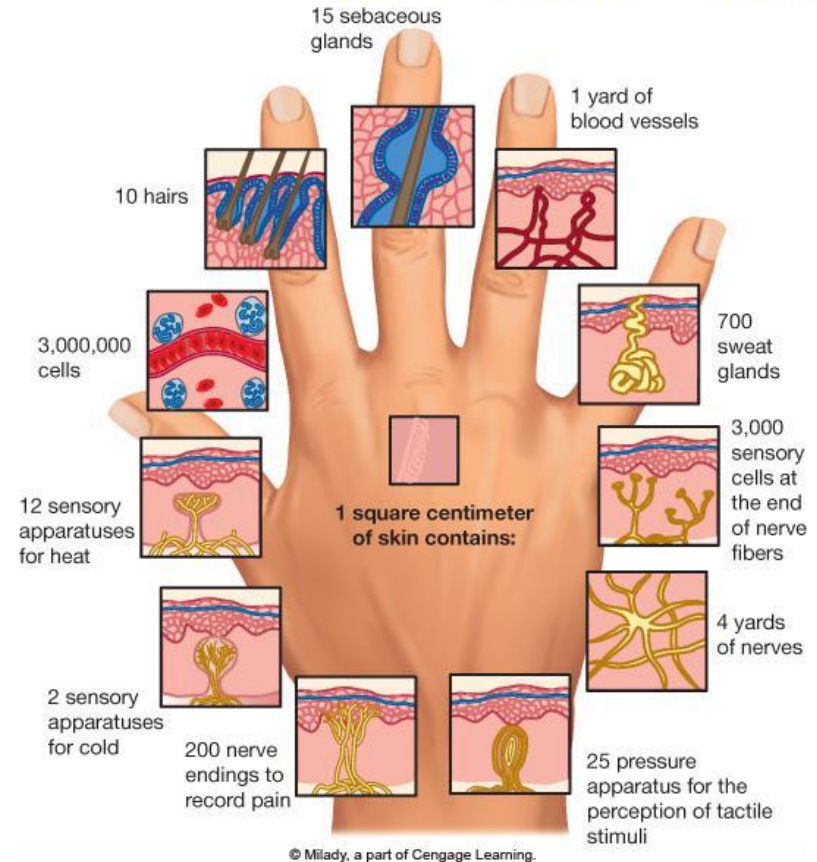
- The muscular wall that separates the thorax from the abdominal region and helps control breathing

Diaphragm (*continued*)

- Inhalation – breathing inward through nose or mouth, during which oxygen is passed to blood
- Exhalation – breathing outward, during which carbon dioxide is expelled from lungs

Integumentary System

- Made up of the skin and its accessory organs such as the oil and sweat glands, sensory receptors, hair and nails
- Serves as a protective covering and helps regulate the body's temperature



Reproductive System

- Includes the ovaries, uterine tubes, uterus, and vagina in the female and the testes, prostate gland, penis, and urethra in the male

Purpose of Reproductive System

- The reproductive system produces offspring and passes on the genetic code from one generation to another.

Function of the Reproductive System

- The reproductive system produces hormones (primarily estrogen in females and testosterone in males).
- Hormones affect change in skin, loss of scalp hair, facial hair growth, pigmentation, and much more.

Summary and Review

- Why is the study of anatomy, physiology, and histology important to cosmetologists?
- Define anatomy, physiology, and histology.
- Name and describe the basic structures of a cell.

Summary and Review (*continued*)

- Explain cell metabolism and its purpose.
- List and describe the functions of the four types of tissue found in the human body.
- What are organs?

Summary and Review (*continued*)

- List and describe the functions of the main organs found in the body.
- Name the 11 main body systems and their functions.
- List the primary functions of the skeletal system.

Summary and Review (*continued*)

- Name and describe the three types of muscle tissue found in the body.
- Name and describe the types of nerves found in the body and how they work.
- Name and briefly describe the types of blood vessels found in the body.

Summary and Review (*continued*)

- List and describe the composition of blood.
- Name and discuss the two main types of glands found in the human body.
- List the organs of the excretory systems and their functions.

Congratulations!

You have completed one unit of study
toward course completion.

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