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 may be defined as:

The study of the *structures* of the *human body* that can be seen by the naked eye how the body is organized.

**Anatomy = Structures**
Physiology may be defined as:

The study of the functions and activities performed by the body’s structures.

Physiology = Functions
Histology is defined as: The study of tiny structures found in living tissues. Also known as microscopic anatomy.
The cell is the smallest and most simple living unit of the human body. The human body or “organism” is the largest and most complex unit.
The **CELL** is the **basic unit of living organisms**. Cells carry out all life processes and reproduce.

- They vary in size, shape, and purpose.
Cell Composition

- **Protoplastm** is the colorless jelly-like material making up the living parts of a cell, including the cytoplasm, nucleus, and other organelles.

The protoplasm outside of the nucleus is called the cytoplasm.

The nucleus is made of dense protoplasm near the center of the cell.
Cell Structure

- **Nucleus** – center of cell - directs all activities

- **Cytoplasm** – controls **transportation** of substances within the cell and provides **support** for other structures

- **Centrosome** - active in cell division

- **Cell membrane** – allows substances to move into and out of the cell
Cell Mitosis

- Cell Reproduction and Division needs:
  - Adequate food, oxygen, water, waste elimination and proper temperature
Cell Metabolism

METABOLISM : all the CHEMICAL PROCESSES that take place in the human body.

- **Anabolism** – building up larger molecules from smaller ones (construction phase)
- **Catabolism** – breaking down of complex compounds within cells to smaller ones
- **Homeostasis** – the balance between 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; ex: lines the lungs and digestive system

- Muscular tissue – contracts and moves various body parts. Covers, shapes, and supports skeletal tissue

- 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, releases CO$_2$
- Liver – remove toxins from digestion
- Skin – protective body covering
- Stomach/Intestines – digests food
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, allows movement and supports skeletal tissue
- **Nervous** – controls/coordinates all systems
- **Reproductive** – produces offspring
- **Respiratory** – enables breathing
- **Skeletal** – provides physical body foundation
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.”

Osteoporosis in an 89 year old woman.

Osteocyte is a bone cell
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
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) “cheek bones”
- **Maxilla** – 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 Bones** – protect 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 in each hand)
Bones of the Arm and Hand (continued)

Carpus – bones of wrist (8 irregular bones)

Metacarpus – bones of palm (5)

Phalanges – bones of the fingers (14 in each hand)
Bones of the Leg

• Femur – long bone above knee - Largest in the leg

• 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)
Muscular Tissue

- **Striated muscles** – skeletal muscles
- **Smooth muscles** – no striations
- **Cardiac muscle** – the heart

Myology – the study of the structure, function, and diseases of the muscles

Over 600 muscles in the human body.
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

- **Epicranius** or occipitofrontalis – covers top of skull
- **Occipitalis** – back part of scalp
- **Frontalis** – front part of scalp; raises eyebrows
- **Epicranial aponeurosis** – connects occipitalis and frontalis
Muscles of the Ear

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

Muscles that help chew!

• Masseter
• Temporalis
• Medial pterygoid
• Lateral pterygoid
• **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
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
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
Muscles of the Hand

**Abductor** – separates fingers

**Adductor** – draws fingers together
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
**Peroneus brevis** – bends foot down and out

**Gastrocnemius** – attached to lower rear surface of heel and pulls foot down (calf muscle)

**Soleus** – bends foot down
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
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 (brain & spinal cord)

- **Peripheral nervous system** – carries messages to/from central nervous system

- **Autonomic nervous system** – controls involuntary muscles; regulates smooth muscles
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
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

- **Largest of the cranial nerves:** Chief sensory nerve of the face and motor nerve to control chewing
- **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)
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

• The main motor nerve of the face and controls muscles for facial expressions.

• 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 – membrane that encloses the heart

- Resting heart rate – 60 to 80 times/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 away from heart
- **Arterioles** – (tiny arteries) 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)

Veins take oxygen poor blood from the body to the heart.

The pumping action of the heart is less in the veins so valves keep blood from back flowing or pooling.
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
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: 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

**Diagram:**
- a - brachiocephalic vein
- b - internal jugular vein
- c - subclavian vein
- d - external jugular vein
- e - right common carotid
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
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

- Gland-like 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

At least once a day your immune system destroys a cell that would have become cancer if it lived.
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** such as insulin, adrenaline, and estrogen stimulate functions or additional 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.
• 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
Digestive System

- Also known as the gastrointestinal system. It is responsible for breaking down foods into nutrients and waste.
- Enzymes 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 9 hrs to complete.
- Includes stomach, intestines, salivary and gastric glands, and other organs.
Excretory System

• A group of organs, that are responsible for purifying the body by eliminating waste matter

Kidneys – excrete urine

Liver – discharges toxins

Skin – eliminates waste through perspiration

Large intestine – eliminates decomposed and undigested food

Lungs – exhale carbon dioxide

The metabolism of body cells forms toxic substances that, if retained, could poison the body.
Respiratory System

• System consisting of the **lungs** and air passages that enables respiration or “breathing”; the **exchange of carbon dioxide** and **oxygen** in the lungs and within each cell

Inhalation: breathing in oxygen

Exhalation: breathing out carbon dioxide
• The lungs (located within the chest cavity) are made of spongy tissues where inhaled air is exchanged for carbon dioxide during one breathing cycle.
• The lungs are protected on both sides by the ribs.

The muscular wall (diaphragm) separates the thorax from the abdominal region and helps control breathing.
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

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

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

The reproductive system produces hormones (primarily estrogen - females, testosterone - males).

Hormones affect change in skin, loss of scalp hair, facial hair growth, pigmentation, and much more.