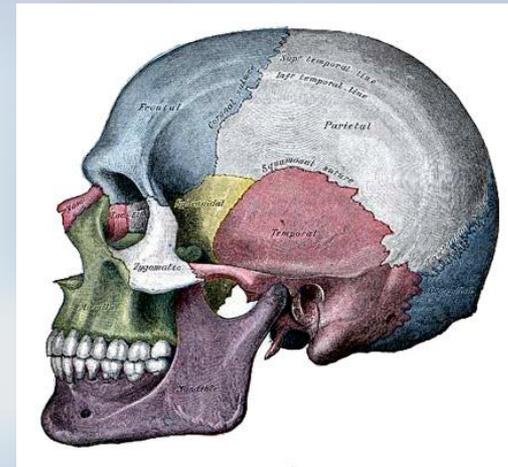




HUMAN BODY HISTOLOGY AND PHYSIOLOGY

**BY
PROF. DR. MOHAMMED QAIS**





Overview of Human Anatomy and Physiology

- Anatomy – the study of the *structure* of the body and the relationships of the various parts of the body
 - Gross or macroscopic (visible structures)
 - Microscopic (cytology, histology)
 - Developmental – structural changes over time (embryology)
- Physiology – the study of the *functions* of the parts of the body, includes specific organ systems and molecular and cellular levels (neurophysiology, cardiovascular physiology, electrophysiology)



Levels of Structural Organization

Chemical – atoms combine to form molecules

Cellular – molecules interact to make up cells

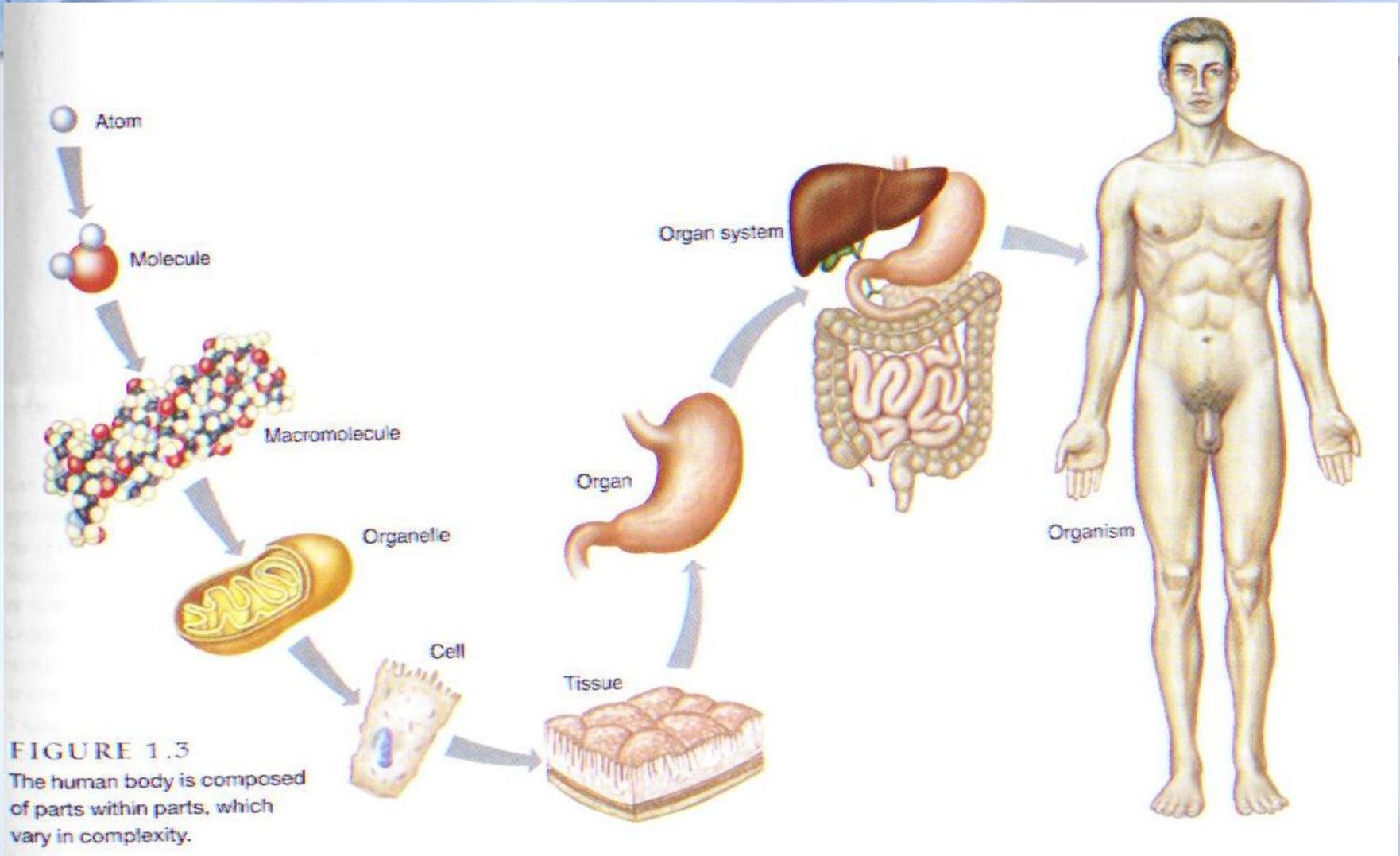
Tissue – cells are grouped into tissue

Organ – tissues compose organs

Organ system – organs function together to form organ systems

Organism (individual) – made up of the organ systems

Levels of Structural Organization



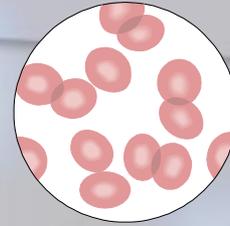


Levels of Organization in the Body

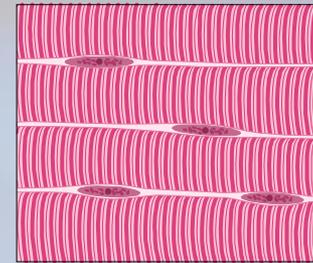
- Cells
- Tissues
 - Epithelial, connective, muscular, nervous
- Organs
 - Examples include stomach, liver, heart
- Organ Systems
 - Examples include digestive and circulatory systems

Tissues in the Human Body

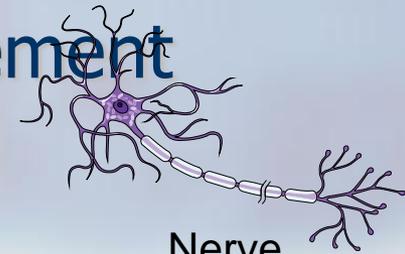
- **Epithelial**
 - Covering or lining tissue
- **Connective**
 - Joins, stores and supports
- **Muscle**
 - Internal and external movement
- **Nerve**
 - Conducts electrical signals



Blood



Muscle



Nerve



Human Organ Systems

Skeletal

Circulatory

Respiratory

Excretory

Nervous

Integumentary

Muscular

Immune

Digestive

Reproductive

Endocrine



Basic Structures of the Human Body

- Tissue – A group of similar cells that performs a specific function
- Organ – A structure consisting of a group of tissues with a specialized function
- Organ System – Organs working together to allow the body to perform a function.



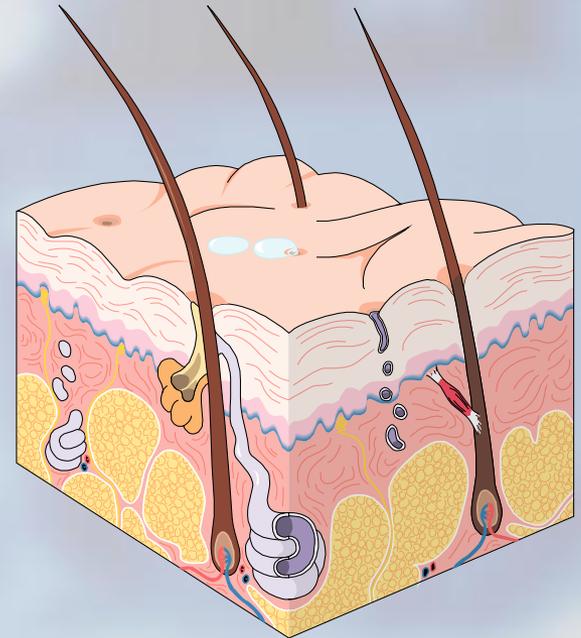
Organ Systems

- **Integumentary system**
 - Forms the external body covering
 - Composed of skin, sweat glands, oil glands, hair, and nails
 - Protects deep tissues from injury and synthesizes vitamin D

Human Integumentary System

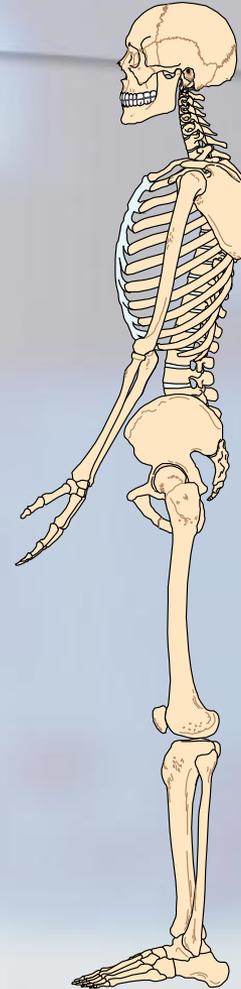


- Consists of the skin, hair, and nails
- Skin
 - Epidermis
 - Dermis
- Subcutaneous tissue
- Hair and nails

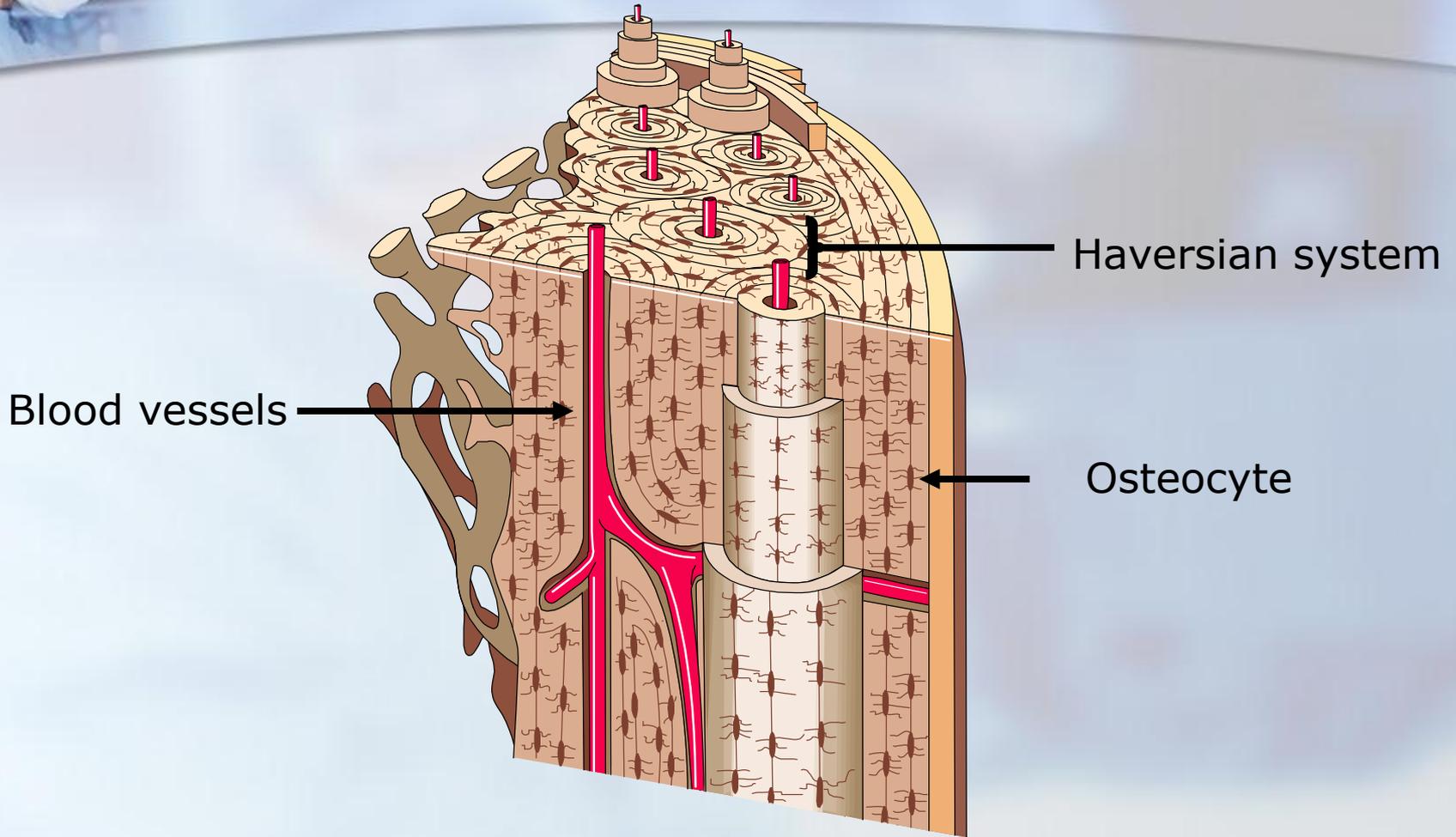


Human Skeletal System

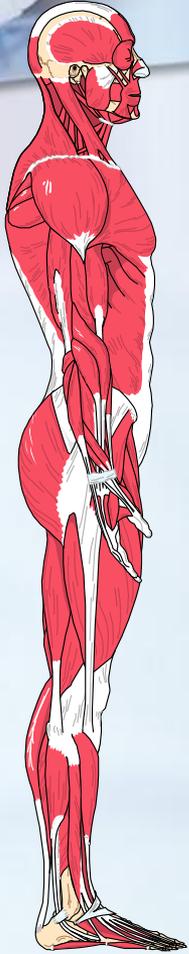
- **Functions**
 - Framework and support
 - Protection
 - Storage
- Bone structure
- Joints and ligaments



Compact Bone Tissue



Human Muscular System

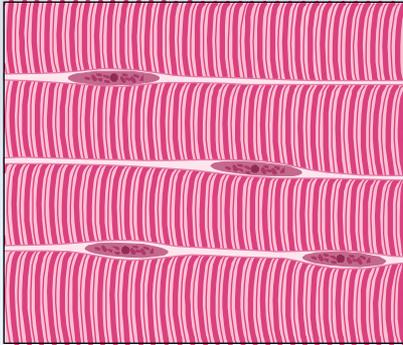


- Functions
 - Movement
 - Warmth
 - Posture
- Muscle Properties
 - Ability to contract
 - Ability to be stretched
 - Ability to respond to a stimulus
- Muscle Types
 - Skeletal
 - Smooth
 - Cardiac

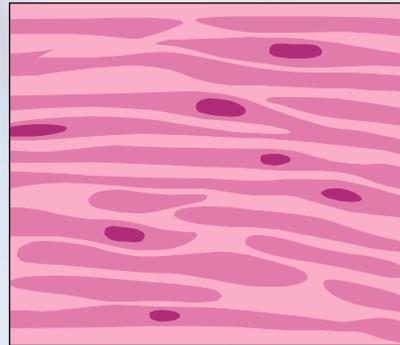
Three Types of Human Muscle Tissue



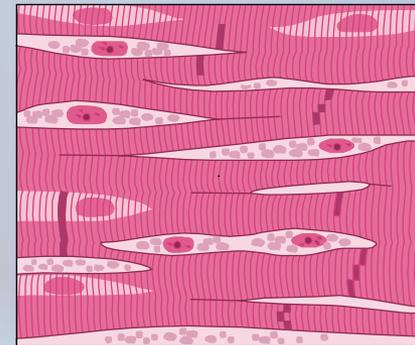
Skeletal



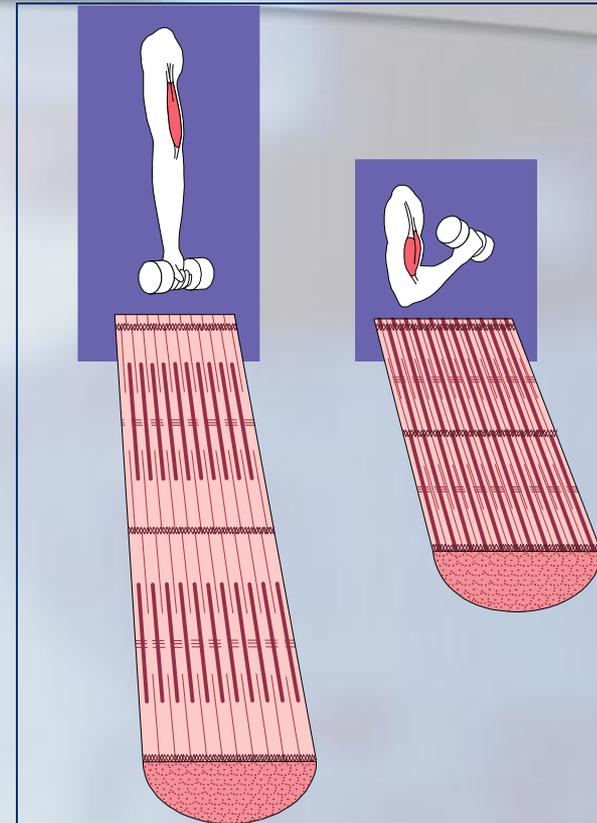
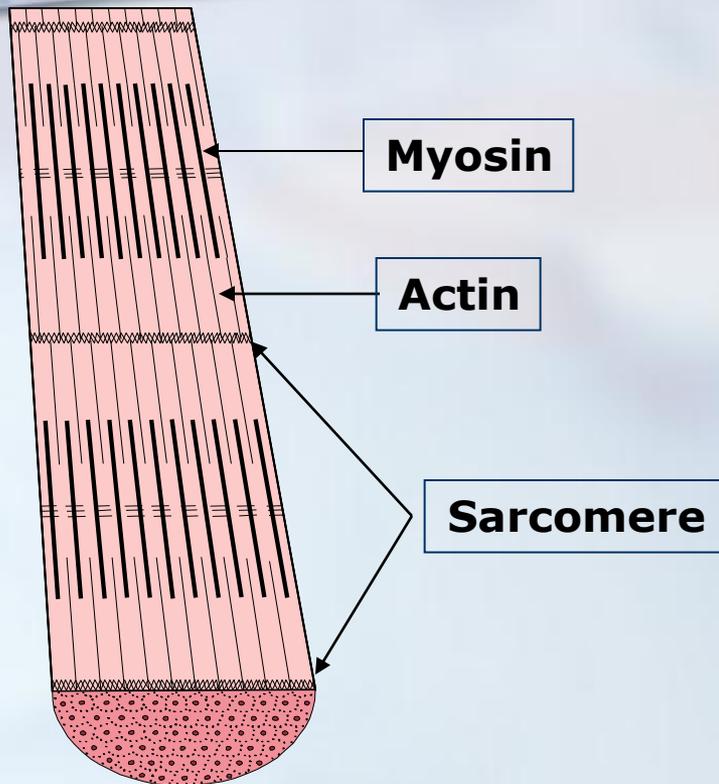
Smooth



Cardiac



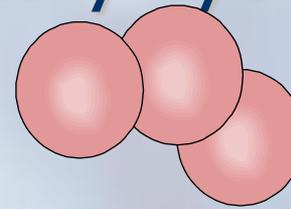
Skeletal Muscle Contraction



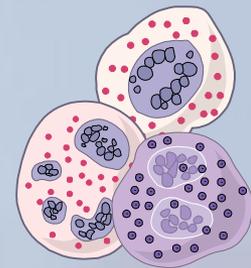


Human Circulatory System

- Transports nutrients, gases, wastes, water, and hormones and also distributes heat
- Structures of circulatory system
 - Heart
 - Vessels
 - Blood
- Lymphatic system

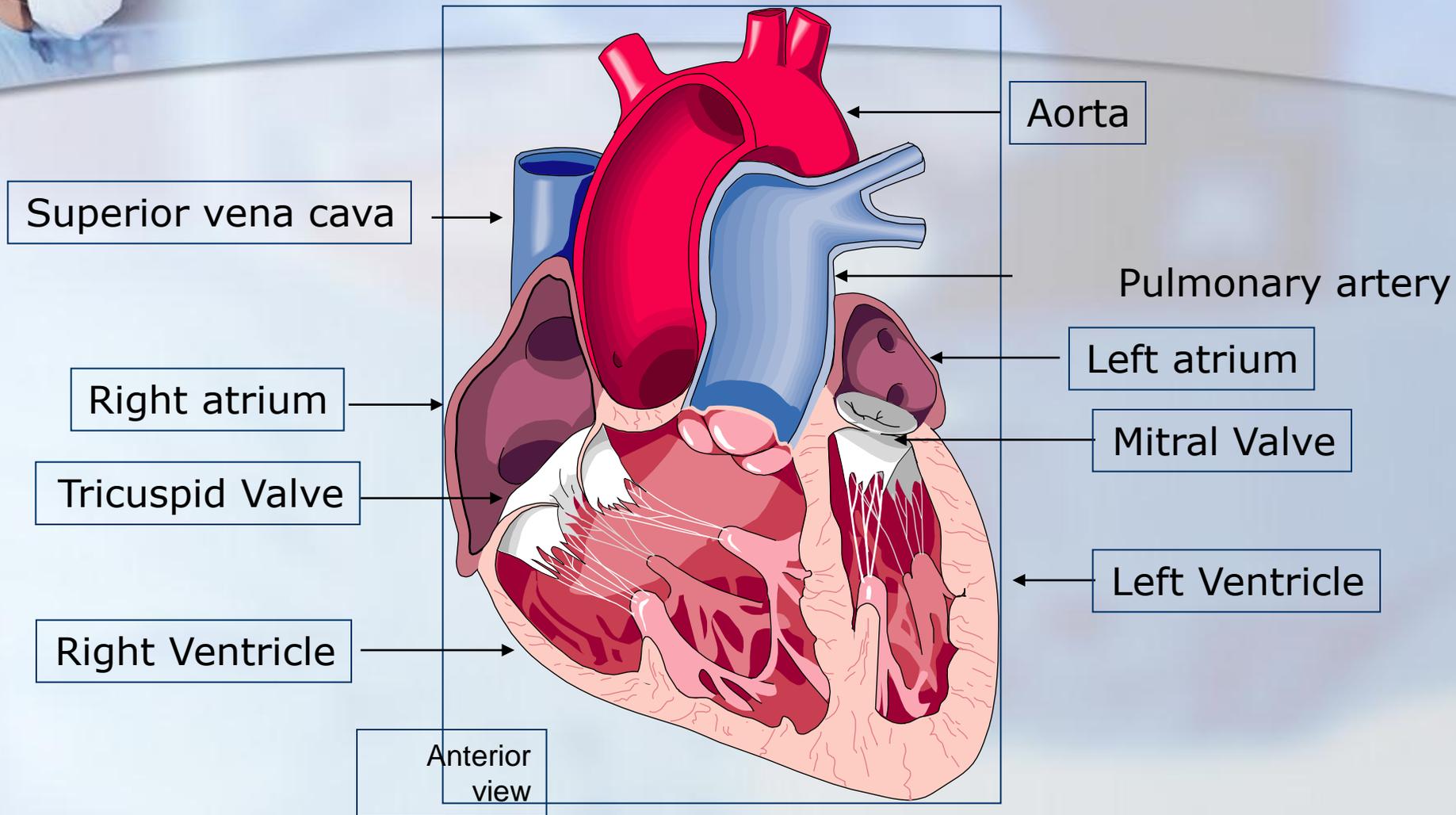


Erythrocytes



White blood cells

Diagram of Human Heart





Human Immune System

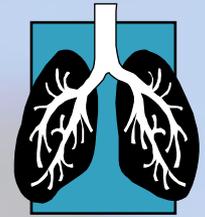
- **Nonspecific defense responses**
 - Skin and mucous membranes
 - Inflammatory response
 - Temperature
 - Proteins
 - White blood cells
- **Specific immune responses**
 - Humoral immunity
 - Cell-mediated immunity



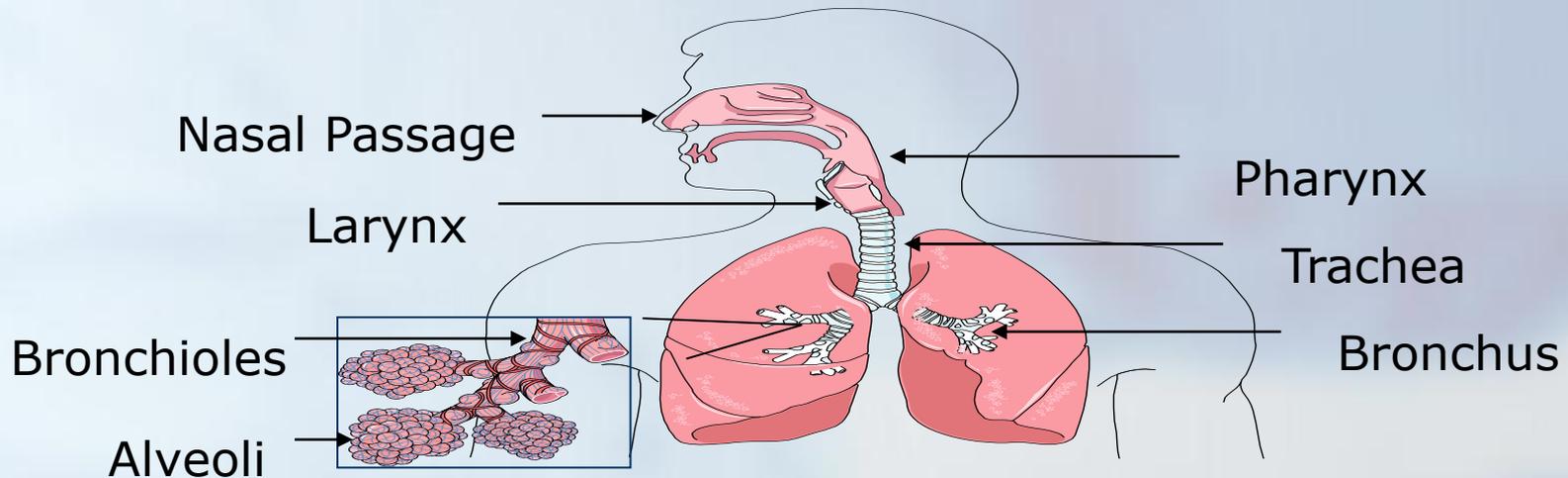
Disease Prevention in Humans

- Identifying Pathogens - Koch's Postulates
- Vaccination - Edward Jenner
- Disorders
 - Allergies
 - Autoimmune disease
 - Acquired Immune Deficiency Syndrome

Human Respiratory System



- Respiration is gas exchange between an organism and the environment
- Respiratory structures include the nose, pharynx, larynx, trachea, bronchi, bronchioles and alveoli

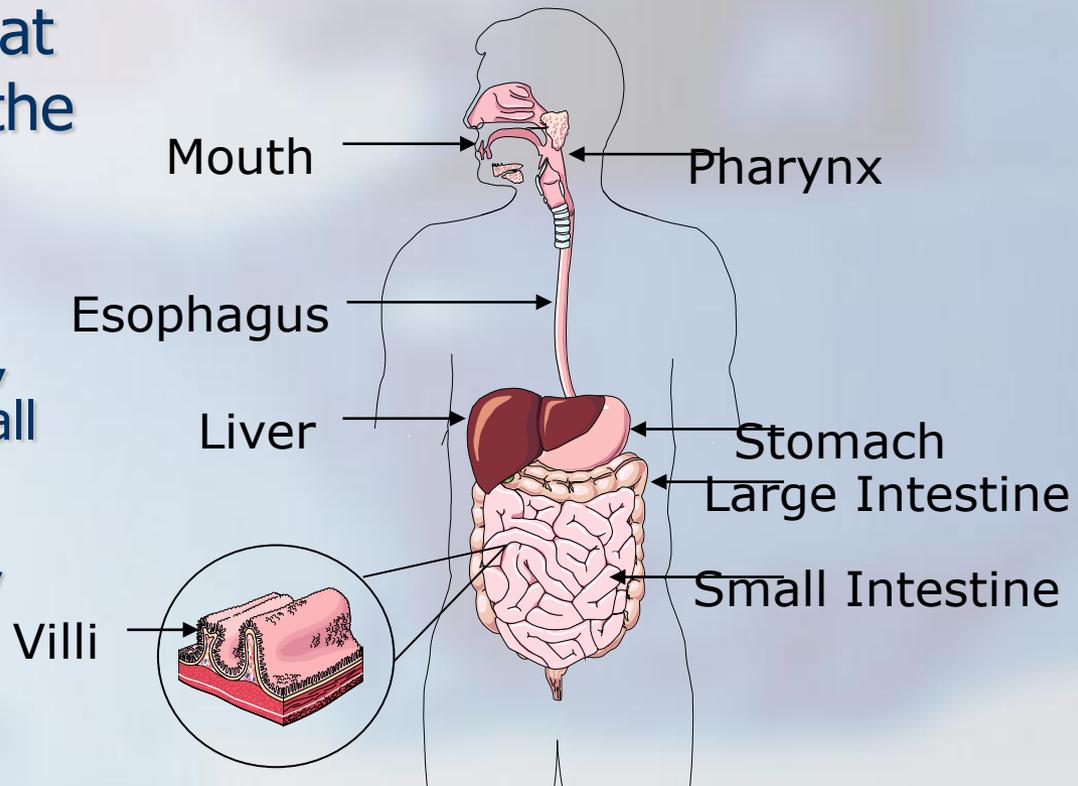




Human Digestive System



- Digestion is the breakdown of nutrients to a level that can be used by cells of the body.
- Structures
 - GI tract (mouth, pharynx, esophagus, stomach, small intestine, large intestine)
 - Accessory (teeth, tongue, salivary glands, liver, gall bladder, pancreas)
- Nutrition

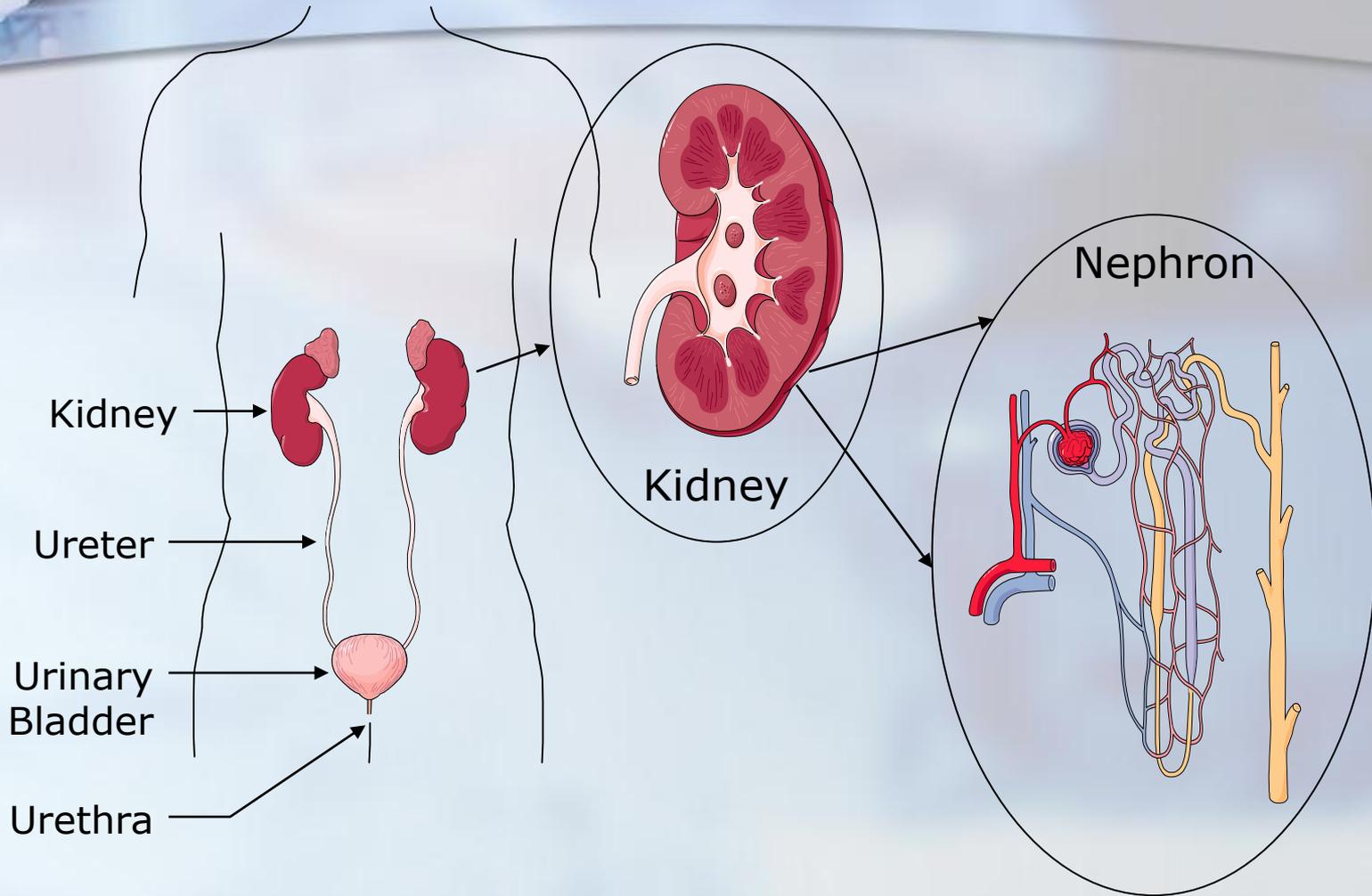




Human Excretory System

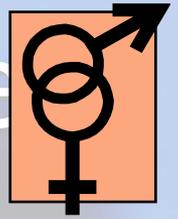
- Excretion is the removal of metabolic wastes from the body, including toxic chemicals, excess water, carbon dioxide and salts.
- Excretory Organs
 - Skin
 - Lungs
 - Kidneys

Human Urinary System Diagram



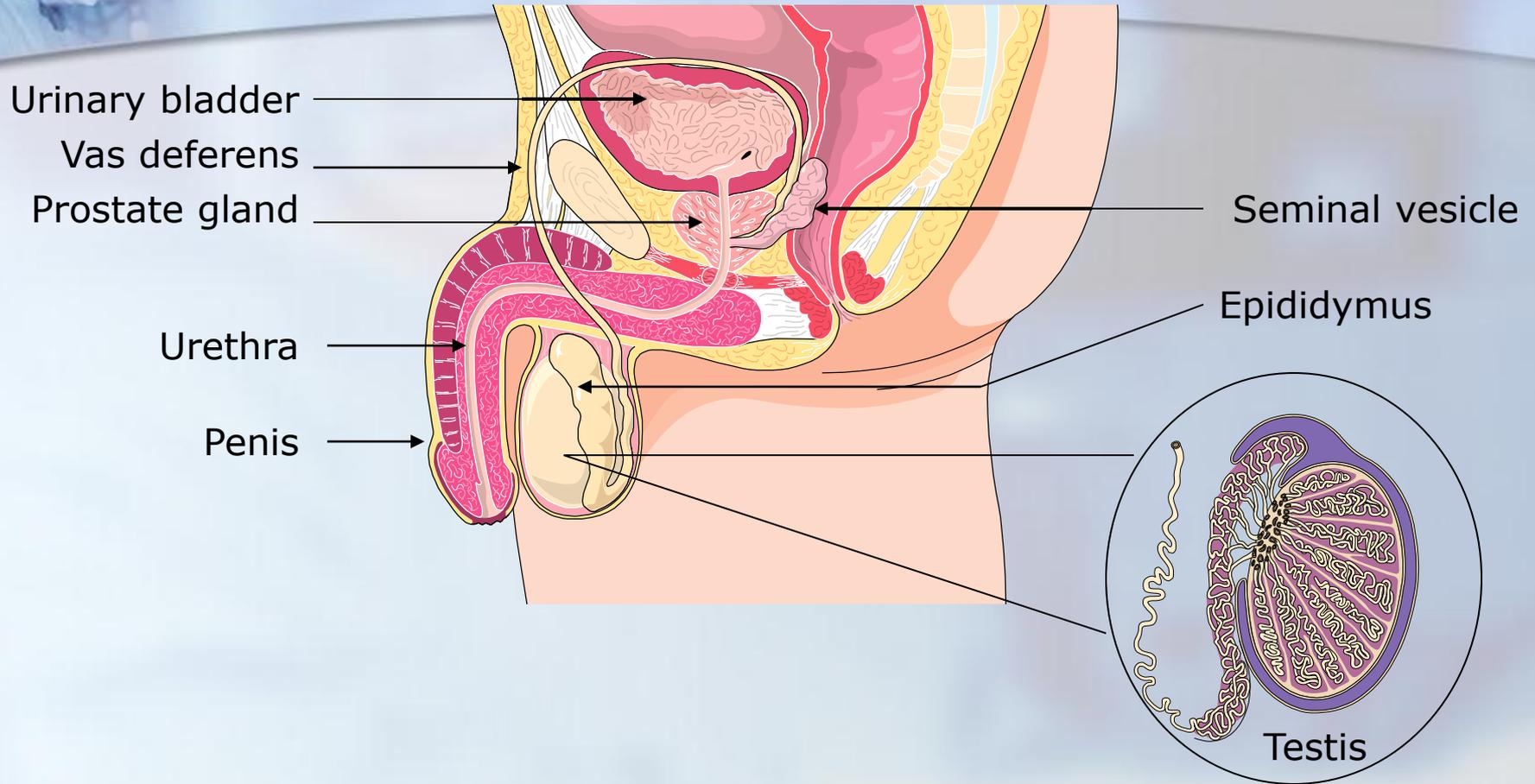


Human Reproductive System

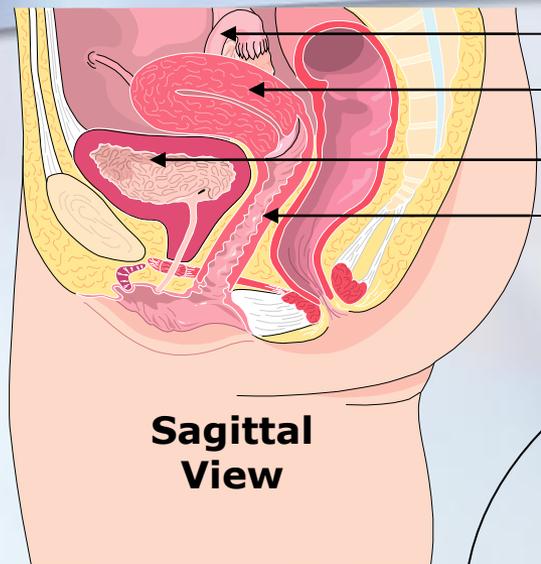


- Produces gametes (eggs and sperm)
- Fertilization – produce zygote
- Male Reproductive System
 - Testes
 - Epididymus, vas deferens, urethra, seminal vesicle, prostate gland, Cowper's gland
- Female Reproductive System
 - Ovary
 - Fallopian tubes, uterus, vagina

Human Male Reproductive System

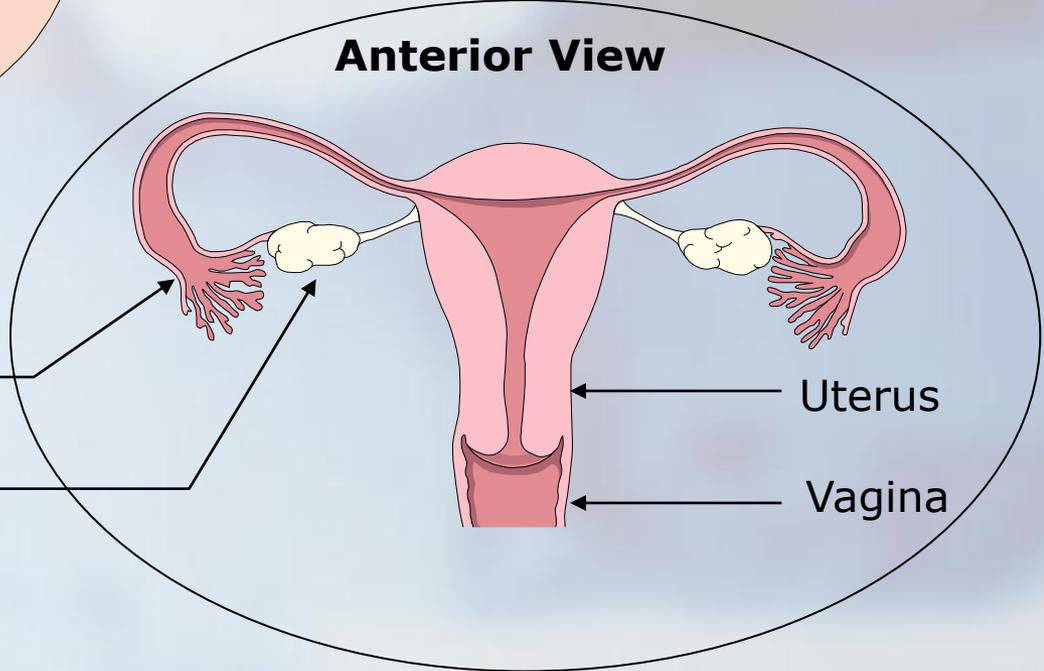


Human Female Reproductive System



Sagittal View

- Fallopian tube
- Uterus
- Urinary bladder
- Vagina



Anterior View

- Fallopian tube
- Ovary

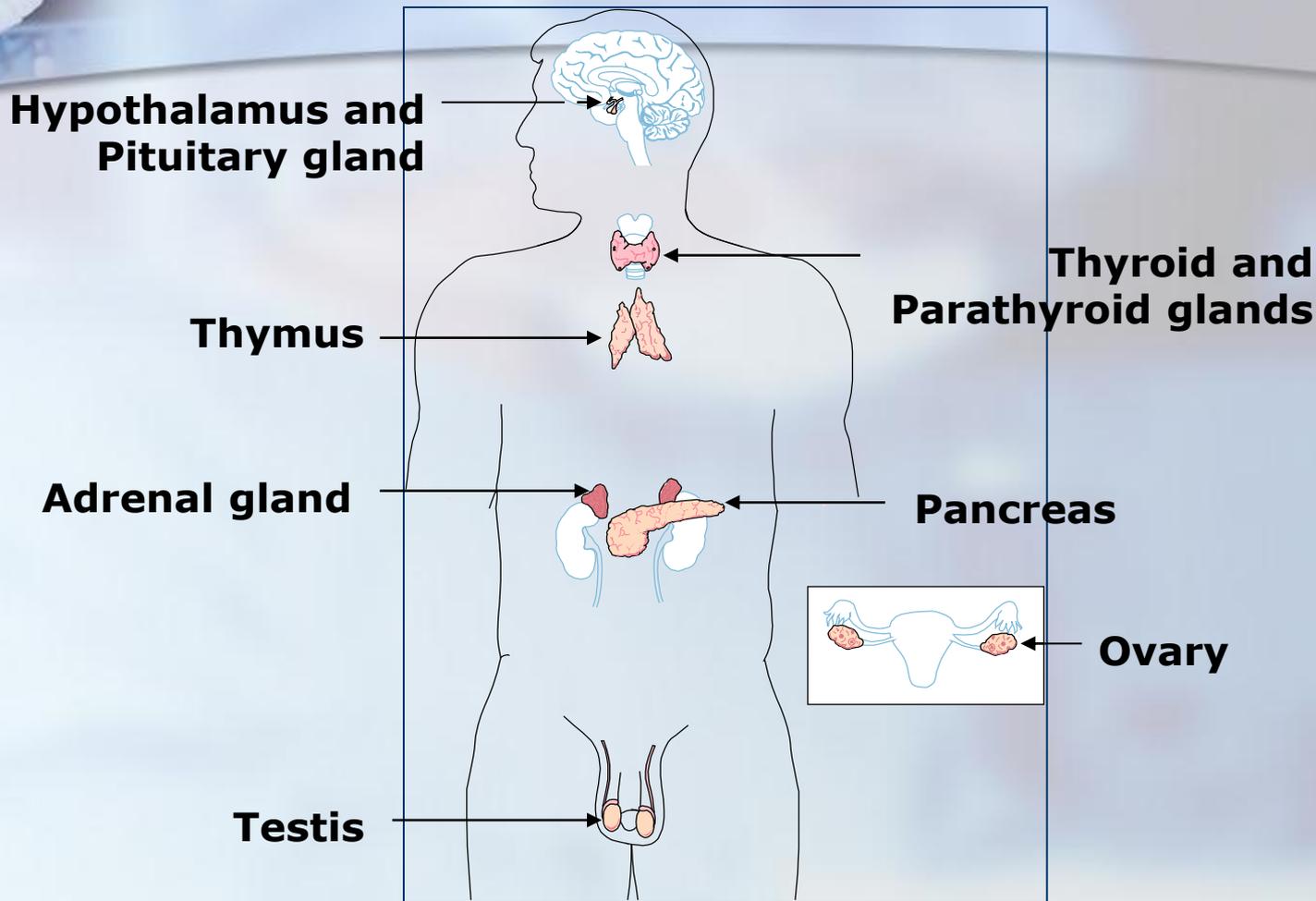
- Uterus
- Vagina



Human Endocrine System

- The endocrine system consists of ductless glands that produce hormones.
 - Hypothalamus, pituitary, pineal, thyroid, parathyroid, thymus, adrenal, pancreas, ovary, testes
- Hormones are chemical messengers that travel through the blood stream and affect activities throughout the body.
 - Steroid hormones
 - Nonsteroid hormones

Human Endocrine System Diagram





Human Nervous System



- Controls and coordinates functions throughout the body
- Neurons are specialized cells that transmit impulses throughout the body.
- Nervous System
 - Central Nervous System
 - Peripheral Nervous System

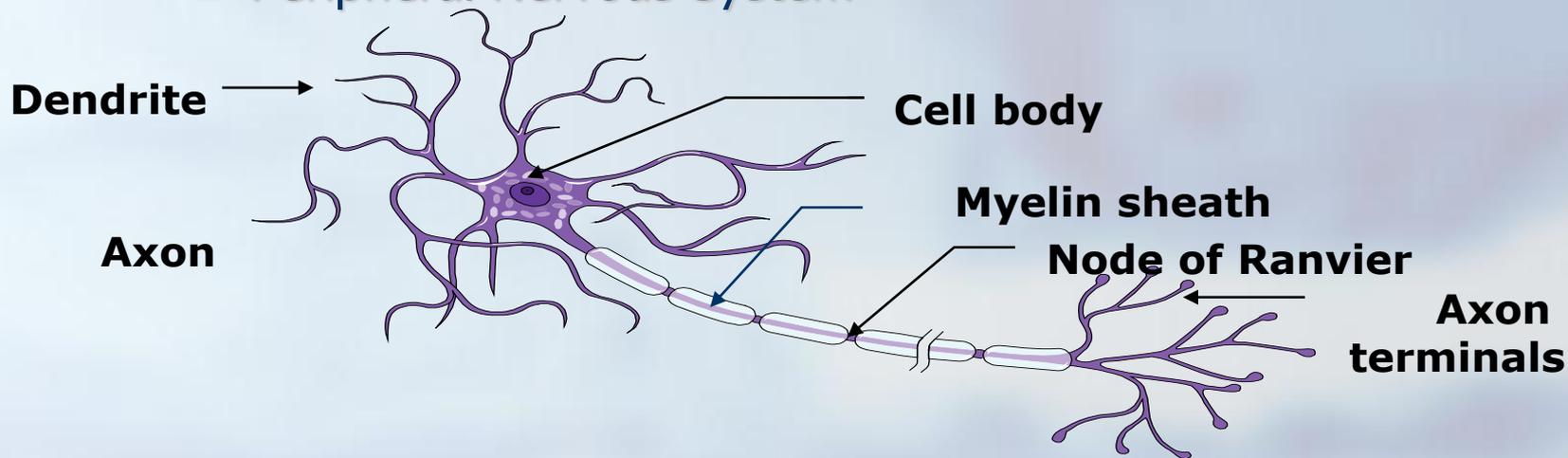
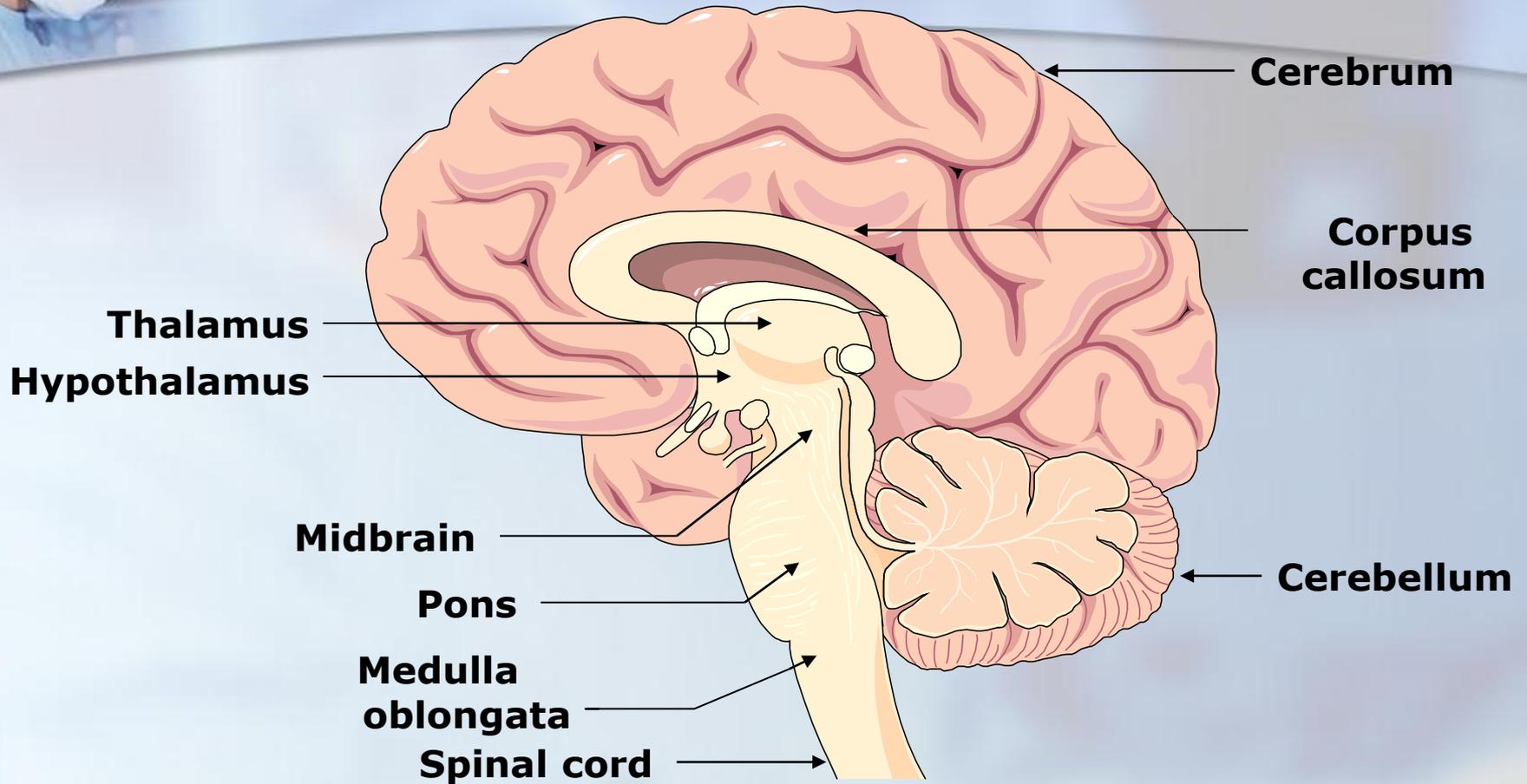


Diagram of Human Brain





Homeostasis: Regulating the Internal Environment

- A controlled, stable internal environment
- Gains and losses must balance
- Control systems
 - Receptor, control center, effector
 - Feedback loops
 - Negative feedback
 - Positive feedback



Organ Systems of the Body

■ Skeletal system

- Composed of bone, cartilage, and ligaments
- Protects and supports body organs
- Provides the framework for muscles
- Site of blood cell formation
- Stores minerals



Organ Systems of the Body

- **Muscular system**
 - Composed of muscles and tendons
 - Allows manipulation of the environment, locomotion, and facial expression
 - Maintains posture
 - Produces heat



Organ Systems of the Body

■ Nervous system

- Integrates and coordinates body functions
- Composed of the brain, spinal column, and nerves
- Is the fast-acting control system of the body
- Responds to stimuli by activating muscles and glands



Organ Systems of the Body

- **Endocrine System**
 - Integrates and coordinates body functions
 - Includes all glands that secrete chemical messengers, also called hormones
 - Hormones alter the metabolism of target cells
 - Examples of organs of the ES are the pituitary, thyroid, parathyroid, adrenal glands, pancreas, ovaries, testes, pineal gland, and thymus gland



Organ Systems of the Body

- **Cardiovascular system**
 - Composed of the heart and blood vessels
 - The heart pumps blood
 - The blood vessels transport blood throughout the body



Organ Systems of the Body

■ Lymphatic system

- Composed of red bone marrow, thymus, spleen, lymph nodes, and lymphatic vessels
- Picks up fluid leaked from blood vessels and returns it to blood
- Disposes of debris in the lymphatic stream
- Houses white blood cells involved with immunity



Organ Systems of the Body

- **Respiratory system**
 - Composed of the nasal cavity, pharynx, trachea, bronchi, and lungs
 - Keeps blood supplied with oxygen and removes carbon dioxide



Organ Systems of the Body

■ Digestive system

- Composed of the oral cavity, esophagus, stomach, small intestine, large intestine, rectum, anus, and liver
- Breaks down food into absorbable units that enter the blood
- Eliminates indigestible foodstuffs as feces



Organ Systems of the Body

■ Urinary system

- Composed of kidneys, ureters, urinary bladder, and urethra
- Eliminates nitrogenous wastes from the body
- Regulates water, electrolyte, and pH balance of the blood



Organ Systems of the Body

- Male reproductive system
 - Composed of prostate gland, penis, testes, scrotum, and ductus deferens
 - Main function is the production of offspring
 - Testes produce sperm and male sex hormones
 - Ducts and glands deliver sperm to the female reproductive tract



Organ Systems of the Body

- Female reproductive system
 - Composed of mammary glands, ovaries, uterine tubes, uterus, and vagina
 - Main function is the production of offspring
 - Ovaries produce eggs and female sex hormones
 - Remaining structures serve as sites for fertilization and development of the fetus
 - Mammary glands produce milk to nourish the newborn



Organ System Interrelationships

- The integumentary system protects the body from the external environment
- Digestive and respiratory systems, in contact with the external environment, take in nutrients and oxygen



Necessary Life Functions I

- *Maintaining boundaries* – the internal environment remains distinct from the external
 - Cellular level – accomplished by plasma membranes
 - Organism level – accomplished by the skin
- *Movement* – locomotion, propulsion (peristalsis), and contractility
- *Responsiveness* – ability to sense changes in the environment and respond to them
- *Digestion* – breakdown of ingested food



Necessary Life Functions II

- *Metabolism* – all the chemical reactions that occur in the body
- *Excretion* – removal of wastes from the body
- *Reproduction* – cellular and organism levels
 - Cellular – an original cell divides and produces two identical daughter cells
 - Organism – sperm and egg unite (fertilization) make possible the formation of a new person
- *Growth* – increase in size of a body part or of the organism



Medical and Applied Sciences

- Cardiology – study of the heart and vascular system
- Dermatology – study of the skin
- Endocrinology - study of hormones , hormone-secreting glands, and associated diseases.
- Epidemiology – study of the factors that contribute to determining the distribution and frequency of health-related conditions.



Medical and Applied Sciences

- Gastroenterology – study of the stomach and intestines
- Geriatrics – Branch of medicine dealing with older individuals and their medical problems
- Gynecology – study of the female reproductive system
- Hematology – study of blood and blood diseases.



Medical and Applied Sciences

- Histology – study of the structure and function of tissues (microscopic anatomy)
- Immunology – study of the body's resistance to disease
- Neonatology – study of newborns and the treatment of their disorders
- Nephrology – study of the structure and function of the kidneys



Medical and Applied Sciences

- Neurology – study of the brain and nervous system
- Obstetrics – branch of medicine dealing with pregnancy and childbirth
- Oncology – study of cancer
- Ophthalmology – study of the eye and eye disease
- Otolaryngology – study of the ear, throat, larynx, and their diseases



Medical and Applied Sciences

- Pathology – study of structural and functional changes within the body associated with disease
- Pediatrics – branch of medicine dealing with children and their diseases
- Pharmacology – study of drugs and their uses in the treatment of disease
- Podiatry – study of the care and treatment of the feet



Medical and Applied Sciences

- Psychiatry – branch of medicine dealing with the mind and its disorders
- Radiology – Study of X rays and radioactive substances
- Toxicology – study of poisonous substances and their effects on physiology
- Urology – branch of medicine dealing with the urinary and male reproductive systems and their diseases