



Anatomy is the scientific discipline concerned with the structural organization of the human body, ranging from microscopic components to macroscopic systems.

Physiology is the branch of biological science that studies the **normal functions of living organisms and their component parts**, particularly the mechanisms by which cells, tissues, organs, and organ systems carry out life-sustaining activities. *While anatomy focuses on structure, physiology emphasizes function, and together they provide a comprehensive understanding of the human body.*

Any alteration in normal physiological processes due to disease or injury is studied under **pathophysiology**.

The term originates from the Greek word *pathos*, meaning disease, and thus pathophysiology focuses on the mechanisms underlying **abnormal or diseased functioning** of cells, tissues, organs, and organ systems.

Structural Organization of the Human Body

The human body is organized in levels, starting from simple chemical components and gradually forming complex biological structures. This organized arrangement allows the body to work efficiently, with each part having a specific role while all parts function together as one system.



1. Chemical Level (**Atoms**)

- **Atoms** are the smallest units of matter and serve as the fundamental building blocks of the body.
- Atoms combine through chemical bonds to form **molecules**, such as water, proteins, lipids, carbohydrates, and nucleic acids, which are essential for cellular structure and metabolism.

2. Cellular Level

- **Molecules** assemble to form **organelles**, which are specialized structures within the cell that perform metabolic and regulatory functions.
 - ☞ **mitochondria** generate adenosine triphosphate (ATP), the primary energy source for cellular activities.
 - ☞ The **nucleus** contains genetic material (DNA) and regulates gene expression and cell division.
- Organelles collectively form **cells**, which are the **smallest living units** capable of carrying out all vital life processes.

3. Tissue Level

- Groups of structurally and functionally similar cells, along with their extracellular products, form **tissues**.
- The four basic tissue types in the human body are:
 1. Epithelial tissue
 2. Connective tissue
 3. Muscle tissue
 4. Nervous tissue

Each tissue type is specialized to perform specific roles essential to survival.

4. Organ Level

- **Organs** are composed of two or more different tissue types working together to perform a specific physiological function. **include:**
 - ☞ The **heart**, which pumps blood
 - ☞ The **stomach**, which participates in digestion
 - ☞ The **kidneys**, which regulate fluid balance and waste excretion



5. Organ System Level

- Organs function cooperatively within **organ systems** to accomplish complex physiological tasks.
- The human body consists of **11 organ systems**, each contributing to homeostasis and overall body function.

6. Organismal Level

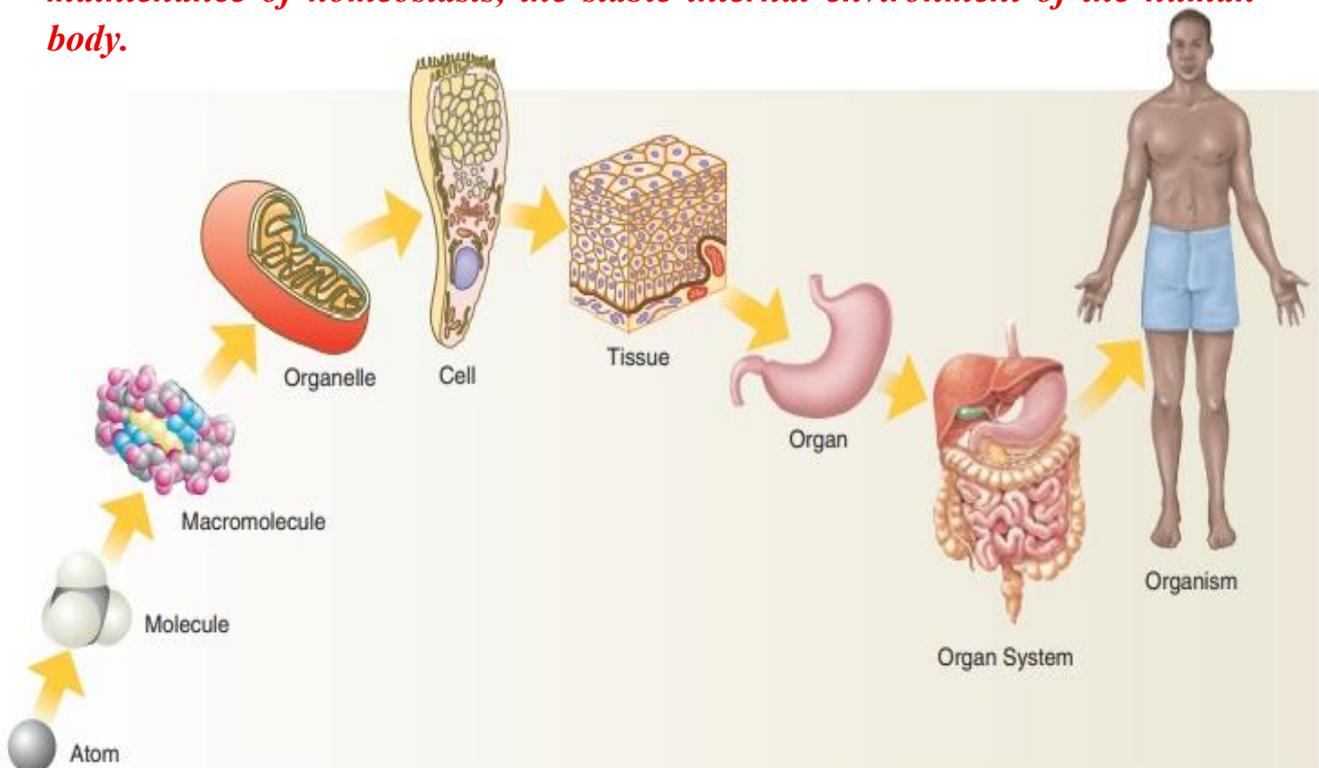
- All organ systems integrated together constitute a **human organism**, representing one complete and functioning individual.

Organ Systems of the Human Body

The organs of each system contribute to a particular function. However, some organs belong to more than one system. Specifically:

- The **pharynx** functions in both the **respiratory system** (air passage) and the **digestive system** (food passage).
- The **male urethra** serves roles in both the **urinary system** (urine excretion) and the **reproductive system** (semen transport).

This structural and functional integration ensures coordinated regulation and maintenance of homeostasis, the stable internal environment of the human body.





Anatomy and Physiology



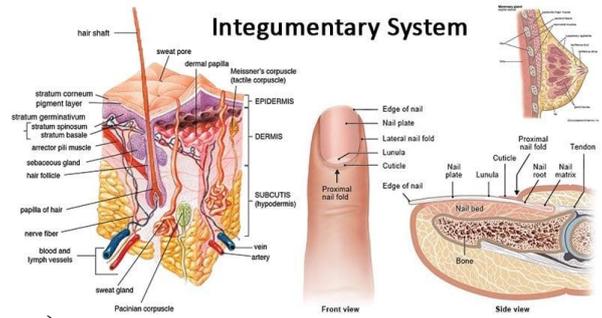
Organ Systems of the Human Body (Simplified)

1. Integumentary System

Includes: skin, hair, nails

Protects the body

- Regulates body temperature
- Prevents water loss
- Allows sensation (touch, pain, temperature)

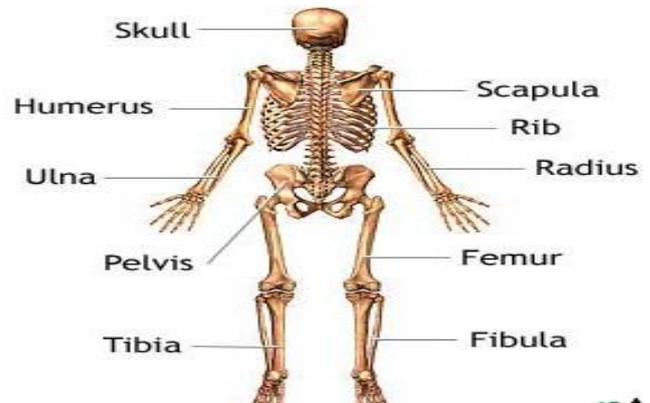


2. Skeletal System

Includes: bones, cartilage, ligaments

Functions:

- Protects vital organs
- Supports the body
- Helps movement
- Produces blood cells



3. Muscular System

Includes: skeletal muscles

Functions:

- Enables movement
- Maintains posture
- Produces body heat

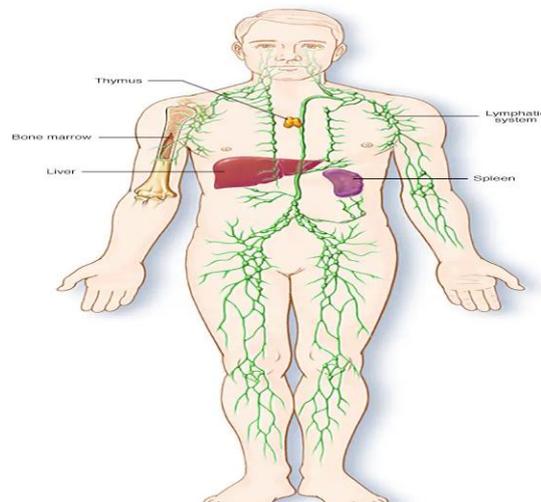


4. Lymphatic (Immune) System

Includes: lymph nodes, lymph vessels, lymph, thymus, spleen, tonsils

Functions:

- Maintains fluid balance
- Produces immune cells
- Protects against disease





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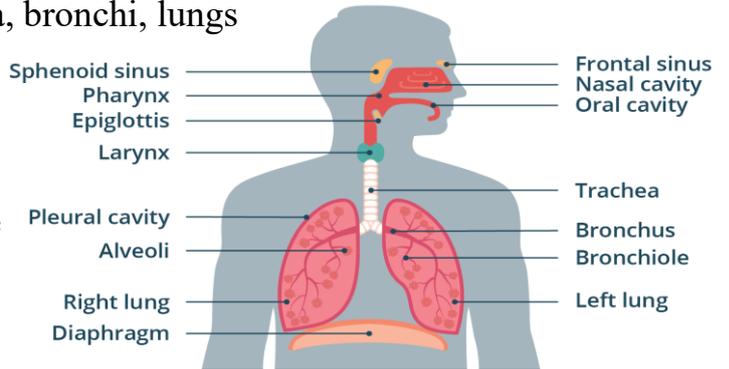


5. Respiratory System

Includes: nose, pharynx, larynx, trachea, bronchi, lungs

Functions:

- Takes in oxygen
- Removes carbon dioxide
- Helps maintain acid–base balance
- Enables speech

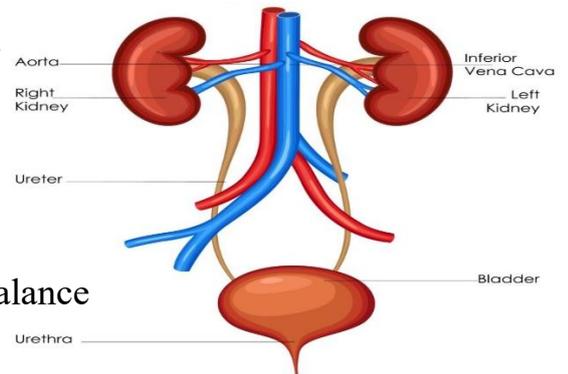


6. Urinary System

Includes: kidneys, ureters, urinary bladder, urethra

Functions:

- Removes waste products
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- Regulates blood volume and pressure
- Maintains fluid, electrolyte, and acid–base balance

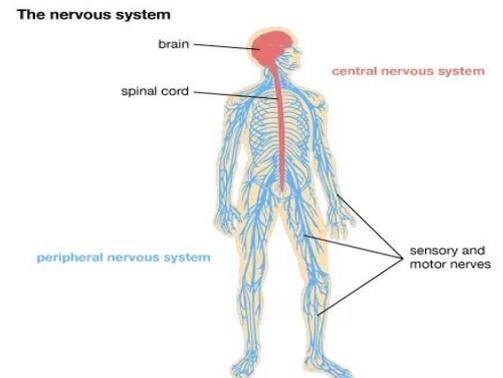


7. Nervous System

Includes: brain, spinal cord, nerves, sense organs

Functions:

- Controls and coordinates body activities
- Enables sensation
- Responsible for memory and thinking

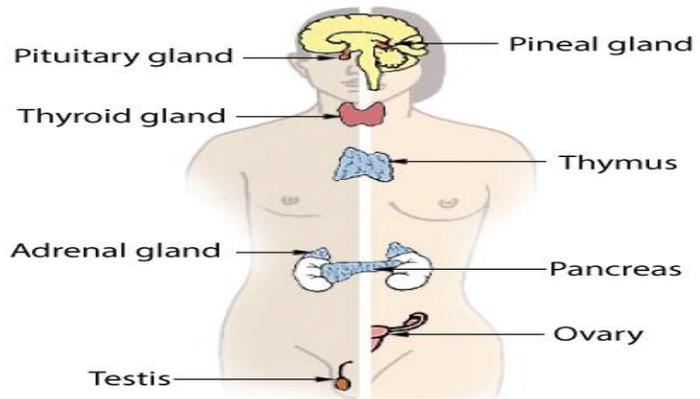


8. Endocrine System

Includes: pituitary, thyroid, parathyroids, adrenal glands, pancreas, and others

Functions:

- Produces hormones
- Regulates growth, metabolism, and other body systems





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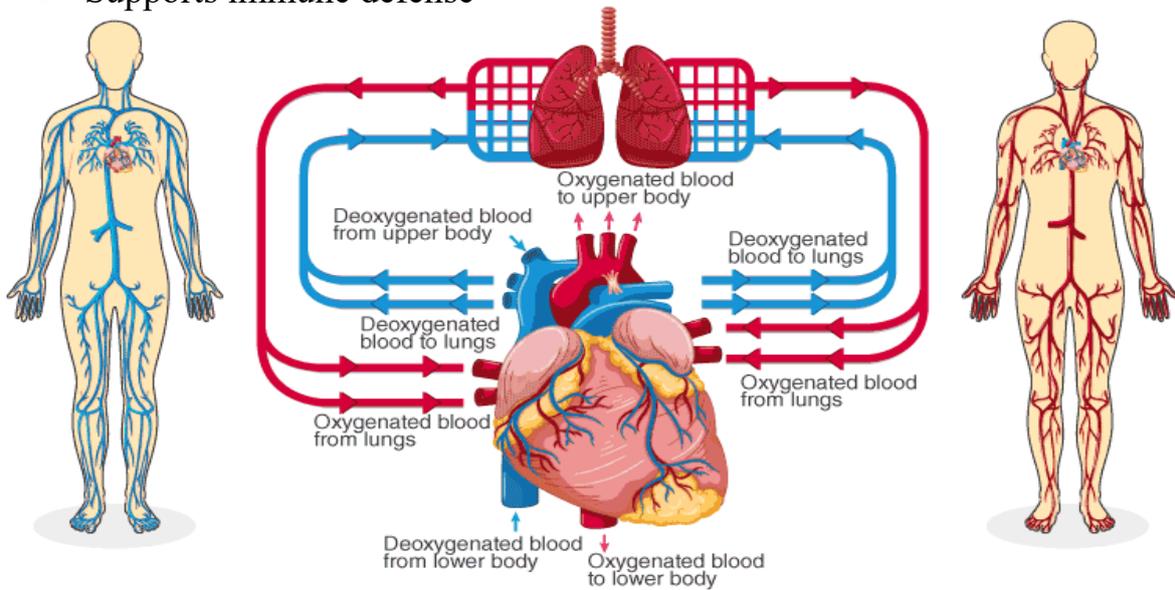


9. Cardiovascular (Circulatory) System

Includes: heart, arteries, veins, capillaries

Functions:

- Transports oxygen, nutrients, wastes, and hormones
- Helps maintain fluid and acid–base balance
- Supports immune defense

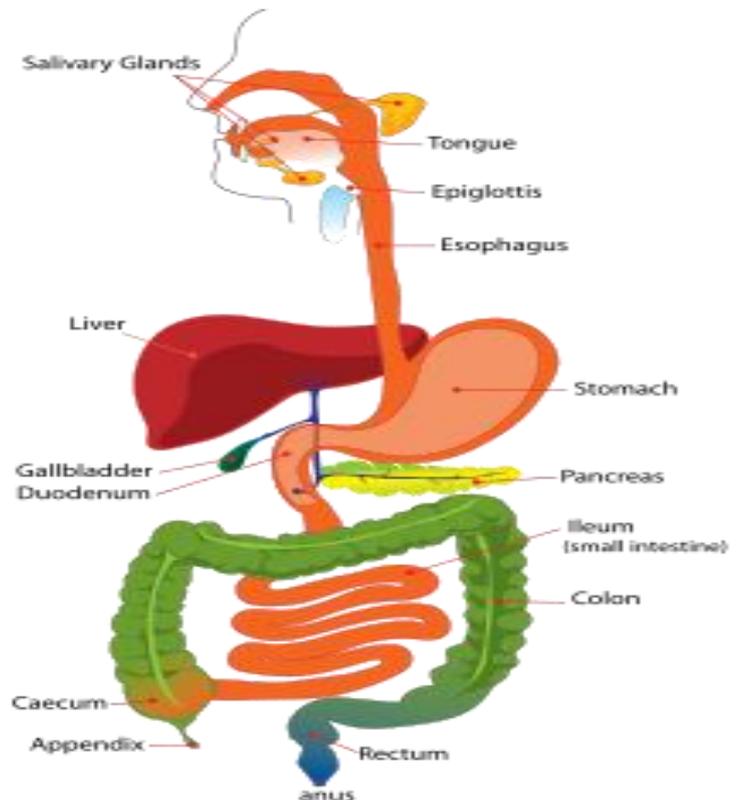


10. Digestive System

Includes: mouth, esophagus, stomach, small intestine, large intestine, liver, pancreas

Functions:

- Breaks down food
- Absorbs nutrients
- Eliminates solid wastes



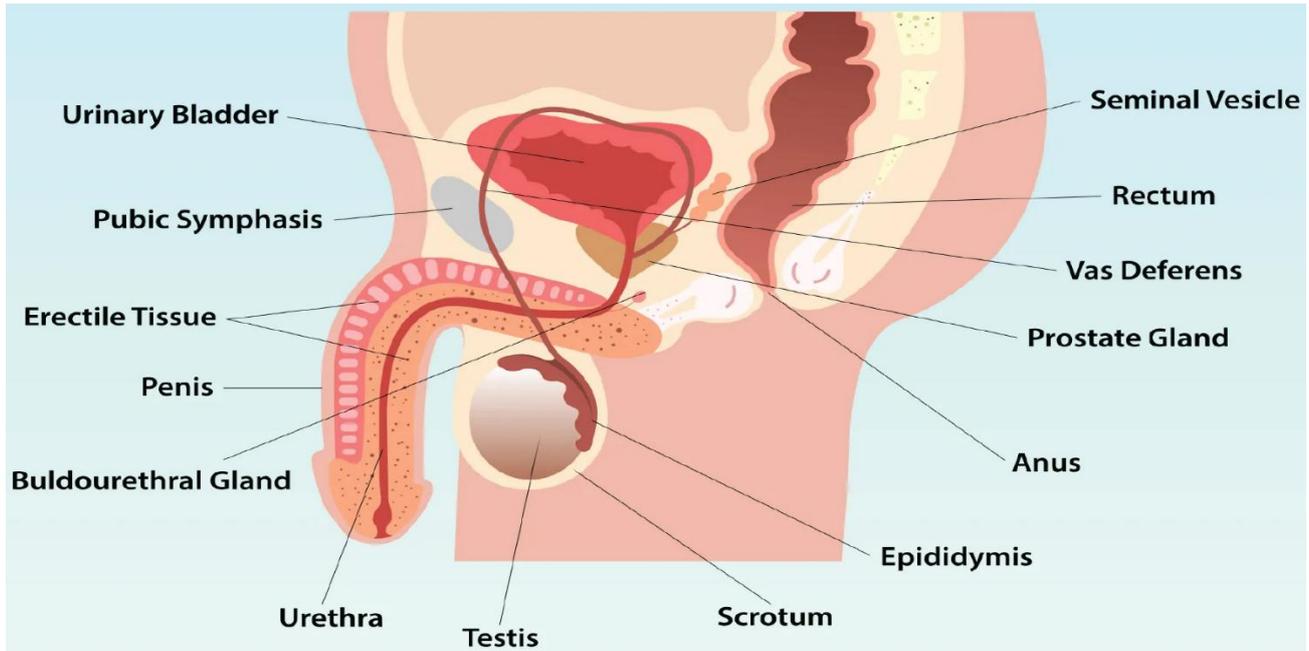


11. Male Reproductive System

Includes: testes, vas deferens, prostate, seminal vesicles, penis

Functions:

- Produces and delivers sperm
- Secretes male sex hormones



12. Female Reproductive System

Includes: ovaries, fallopian tubes, uterus, vagina, breasts

Functions:

- Produces eggs
- Site of fertilization and fetal development
- Enables birth and lactation
- Secretes female sex hormones

