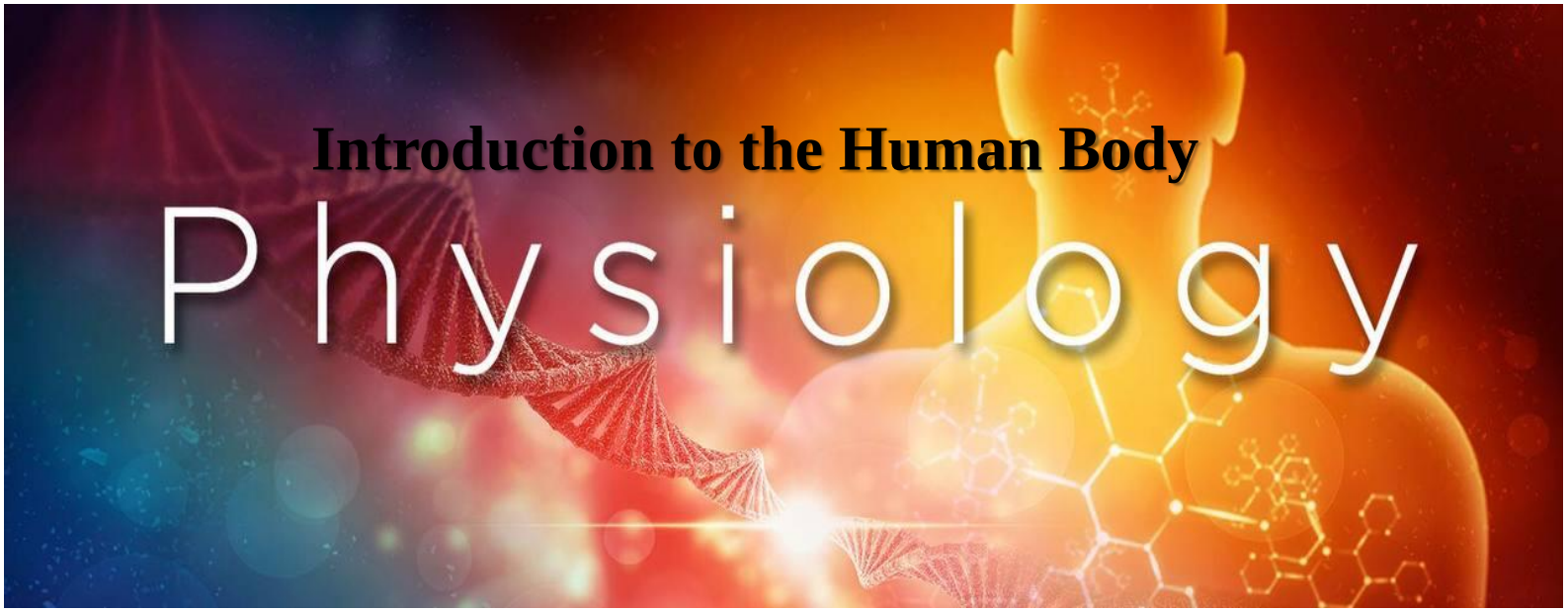
University of Al- Mustaqbal
College Of Nursing

First stage/2nd semester

Lecture one



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Physiology

This term is a combination of two Greek words

Physis = nature Logos = science or study

•**Physiology**: is the science that deals with the study of body functions and its part. Or it Simply states that how body works.

Two approaches to explain body functions:

a)Mechanistic approach - asks **(How)** a function occurs.

How do **red blood cells carry** oxygen?

b)Teleological approach - asks **(Why)** a function occurs.

Why do red blood cells carry oxygen?

Physiology

Physiology can be subdivided according to

A).The type of organisms, such as human physiology or plant physiology.

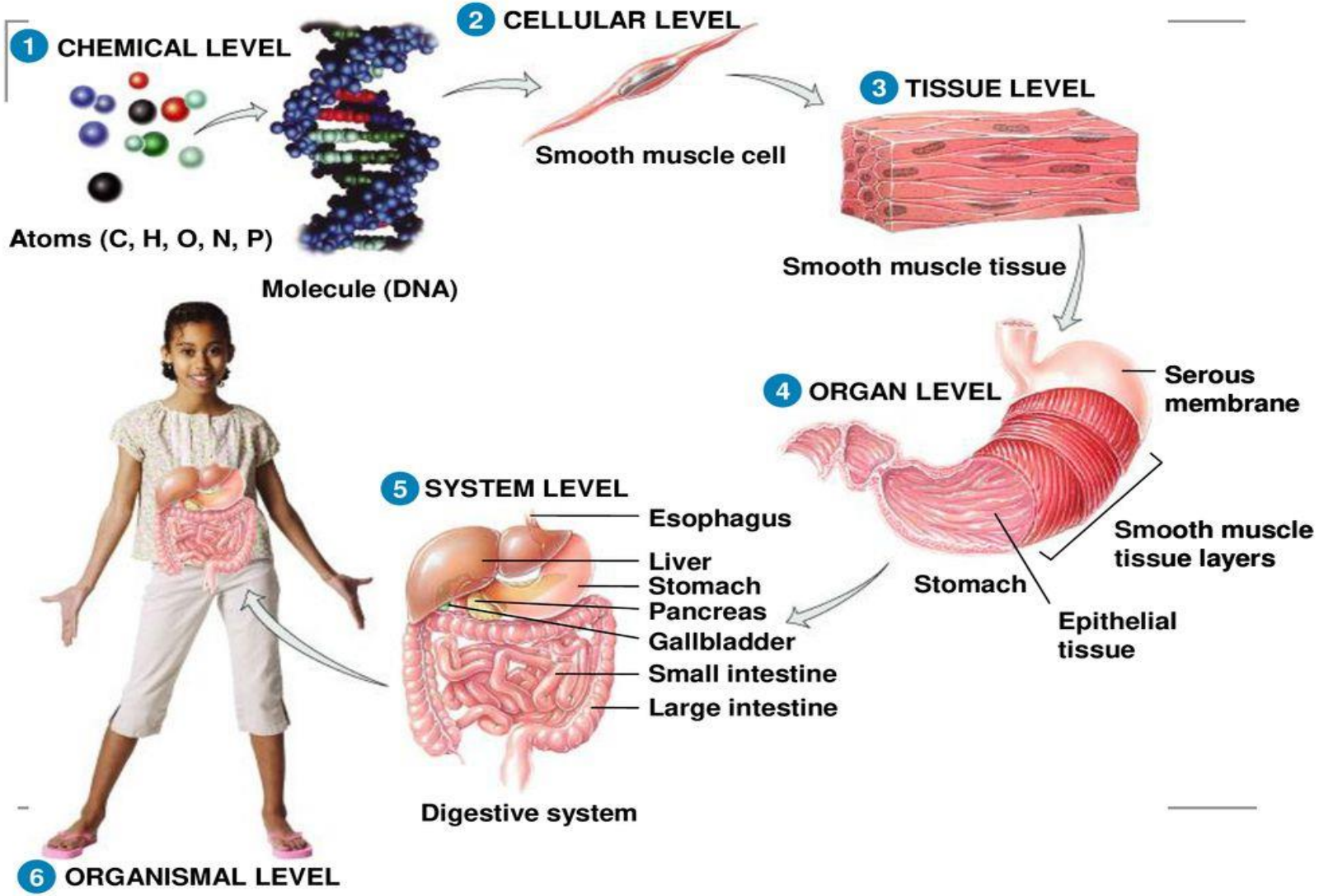
B). Organization level, such as cellular level.

C).Specific or systemic functions, such as cardiophysiology.

Organization Levels of Body

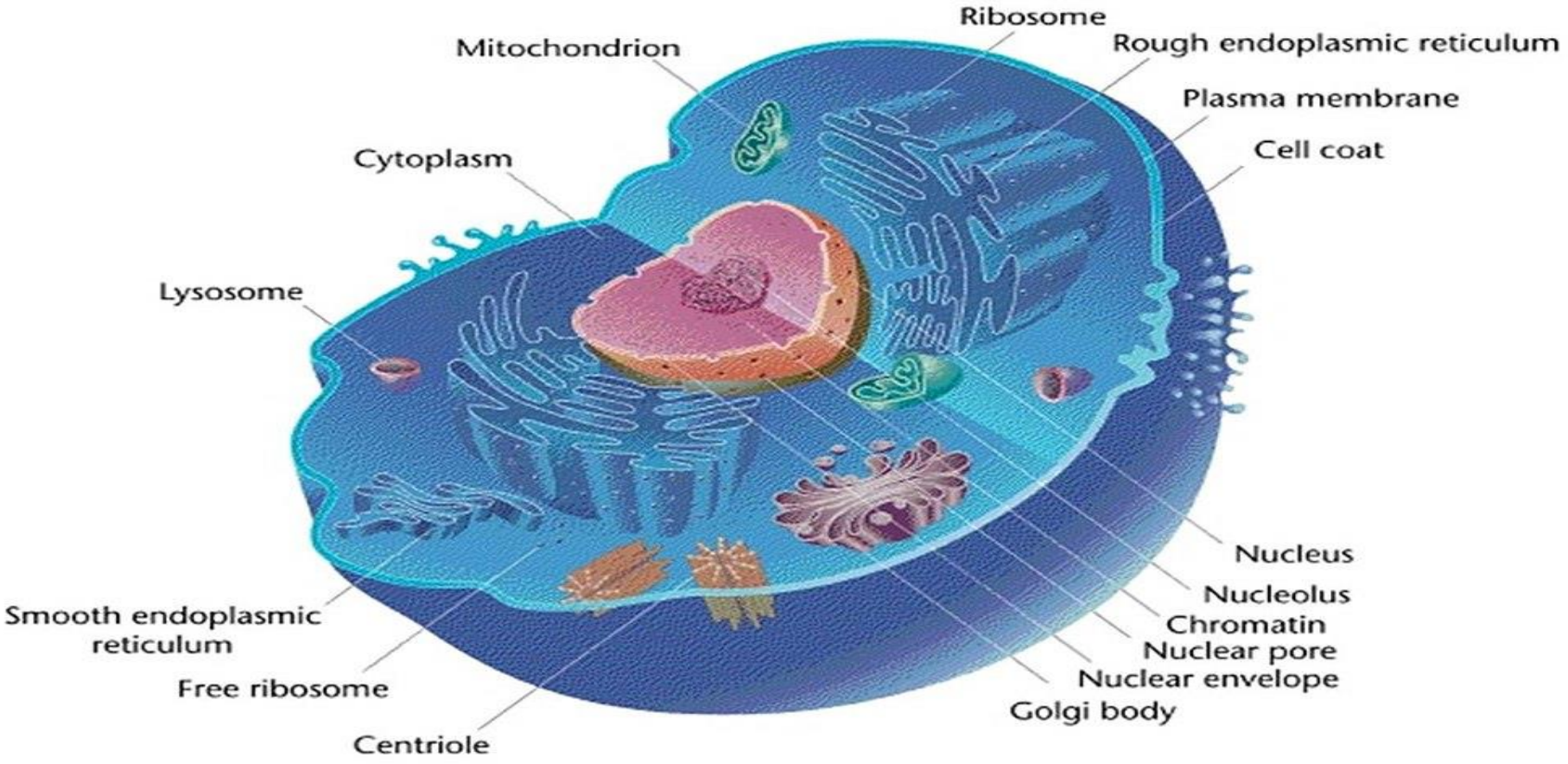
- **Chemical level**: atom, Molecules, organelles.
  - ❖ **Atom** :tiny particles that make chemicals(H,O2,…).
  - ❖ Molecules: a particles of atom joined together(water…).
  - ❖ Organelles : functional part of cell (mitochondria).
- **Cellular level** : Cells are basic unit of life.
- **Tissue level** : layer or mass of cell with specific function.
- **Organ level** : group of different tissue with function.
- **Organ system** :group of organs that work(function) closely together.
- **Organism level**: composed of organ system interacting(human).

Organization levels of body



Cell

The “Inner Life of a Cell”



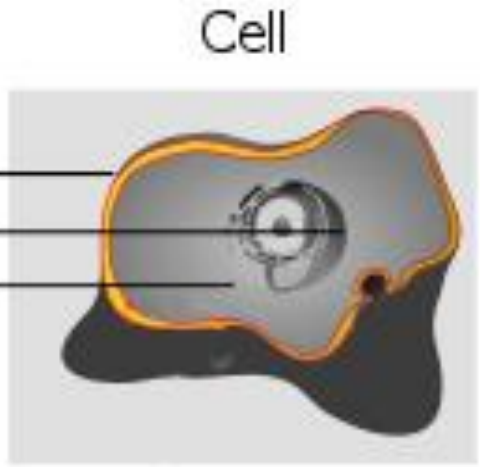
Basic Cell Functions

- Obtain nutrients and oxygen from surrounding environment .
- Perform chemical reactions that provide energy for the cell.
- Eliminate carbon dioxide and other wastes to surrounding environment.
- Synthesize needed cellular components.
- Control exchange of materials between cell and its surrounding environment.
- Sensing and responding to changes in surrounding environment.
- Reproduction.

Cell

- What are the basic components of a cell?

- cell membrane
- nucleus
- cytoplasm
  - cytosol
  - organelles



Cell Components

1.The Cell Membrane

- **What does the cell membrane do?**
  - Creates separation between ECF vs. ICF
    - Creates fluid compartments(Homeostasis)
  - Regulates ECF – ICF exchange
  - Provides structural support for cell and tissues

Structure: Phospholipid bilayer with embedded proteins and cholesterol.

Cell Components 2.The Cytoplasm

- **Cytoplasm**: Gel-like matrix where organelles are suspended; site of many metabolic reactions.
- **Structure :**

a).Cytosol(water, ions, proteins)

- Site of many chemical reactions. e.g.:(Cell signaling, Cytokinesis (division of cytoplasm of a cell divides into two daughter cells), Protein synthesis, Glycolysis) .

b).Membranous Organelles

- Functional units of the cell.
- Adenosine triphosphate (ATP) generation.

Cell Components

3.The Nucleus

3. Nucleus

Function: Stores genetic material (DNA) and controls cellular activities.

Substructures:

- Nuclear Envelope: Double membrane with pores.
- Nucleolus: Produces ribosomes.
- Chromatin: DNA-protein complex (condenses into chromosomes during division).

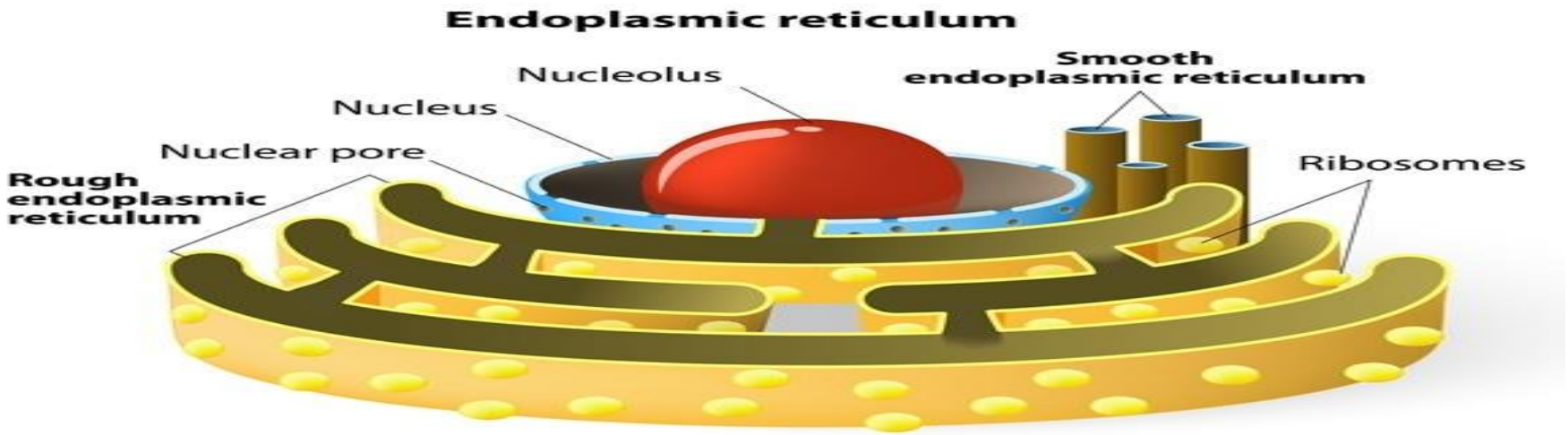
4.The endoplasmic reticulum (ER)

ER are continuous with the outer nuclear membrane.

Two types of endoplasmic reticulum:

a)rough endoplasmic reticulum: is Covered with ribosomes that are **the sites of protein synthesis.**

b)The smooth endoplasmic reticulum: lacks ribosomes and functions in **lipid manufacture and metabolism.** detoxification, and calcium storage.



Cell Components 5. Mitochondria

Mitochondria

- **Structure:**
  - folded membrane (cristae) within an outer membrane.
- **Function:**
  - converts energy stored in food into usable energy (ATP)
  - Allows aerobic cellular respiration

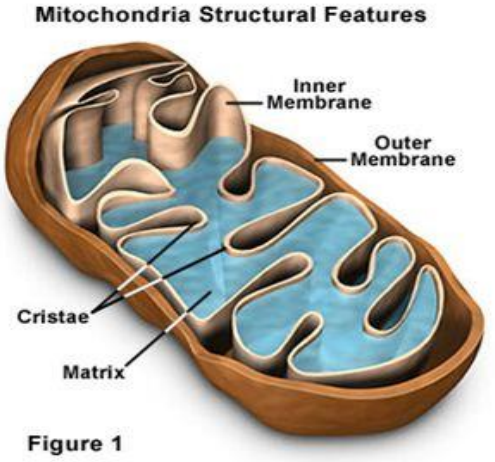
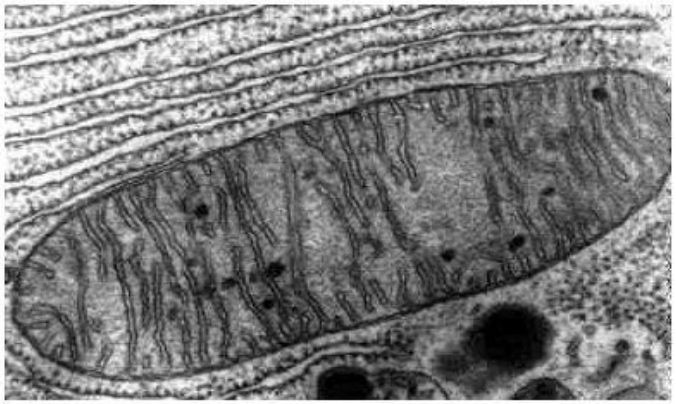


Figure 1



Cell Components

6. Golgi Apparatus

- Function: Modifies, sorts, and packages proteins/lipids into vesicles for secretion or transport.

7. Ribosomes

- Function: Synthesize proteins.

- Location: Free in cytoplasm or attached to rough ER.

8. Lysosomes

- Function: Contain digestive enzymes to break down waste, pathogens, or damaged organelles.

Tissues

Tissue : Groups of cells with similar structure and specialized function.

What tissues are formed?

1. Epithelial
2. Connective
3. Muscular
4. Nervous

Tissues

1. **Epithelial Tissues**
   - Form of single or multiple layers of cells and glands. Covers body surfaces (eg :skin), lines internal organs and blood vessels.
   - **Functions in:**
     - Absorption(intestine)
     - Secretion(skin)
     - Protection & defense
     - Communication,

Tissue

2. Connective tissue: Connective tissues are the most common tissue type in the body.

- Many different types.(Examples: Tendons, Bone, Blood).

- **Functions :**
  - Defense & Protection(bone),
  - Support and connects other tissues.
  - Transportation materials (blood).
  - Storage fat.

Tissues

3. Muscle tissue : Specialized for contracting which generate tension and produce movement.

Functions

- Movement . Heat generation
- Protection

Types of muscle:

a)Skeletal muscle: voluntary movement (eg. arm muscle). Moves the skeleton(30-35 % of the body is a skeletal muscle).

b) Cardiac muscle: involuntary. Pumps blood out of the heart.

c) Smooth muscle : involuntary(stomach, blood vessels). Encloses and controls movement of contents through hollow tubes and organs.

Tissues

4. Nervous Tissue: Consists of cells specialized for initiating and transmitting electrical impulses .

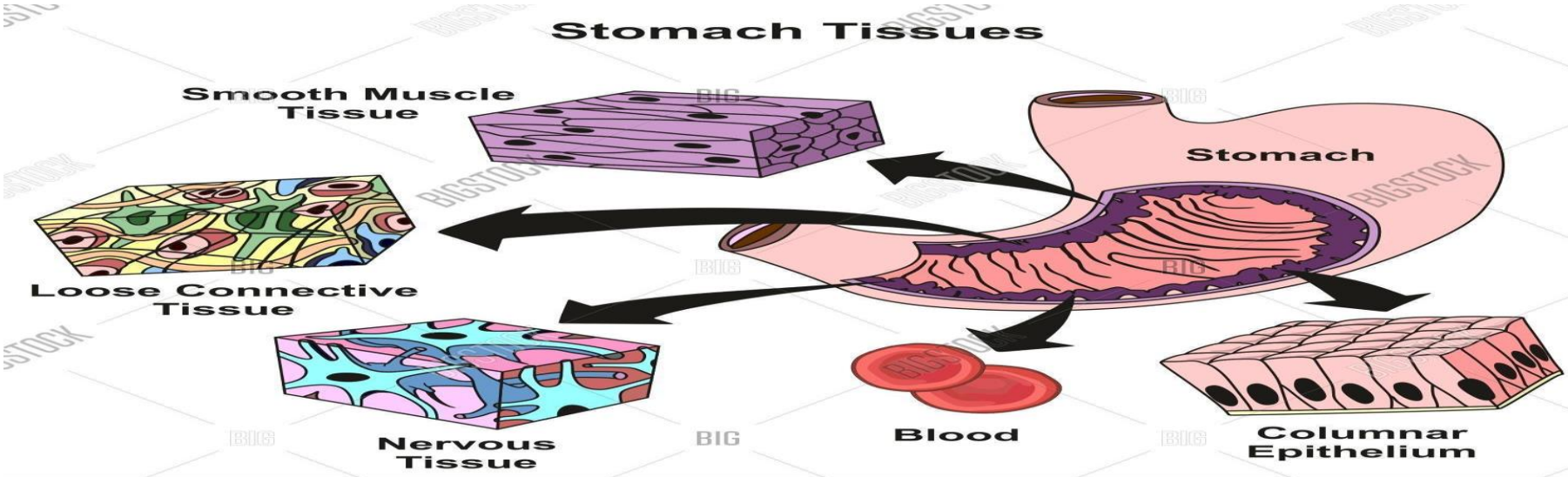
- **Found** in brain, spinal cord, and nerves.
  - **Functions**
    - Communication!

Organ

- Consist of two or more types of primary tissues that function together to perform a particular function or functions.

Example :

Stomach Inside of stomach lined with epithelial tissue. Wall of stomach contains smooth muscle. Nervous tissue in stomach controls muscle contraction and gland secretion. Connective tissue binds all the above tissues together



Body Systems

- **Body Systems**: Groups of organs that perform related functions and interact to accomplish a common activity essential to survival of the whole body. Do not act in isolation from one another.
- These systems work together to maintain homeostasis and overall health.
- **Human body has 11 systems.**

The human body systems

1. **Circulatory System**: Transports blood, nutrients, and oxygen throughout the body.
2. **Respiratory System**: Responsible for breathing and gas exchange.
3. **Digestive System**: Breaks down food and absorbs nutrients.
4. **Nervous System**: Controls body functions and responds to stimuli.
5. **Musculoskeletal** System: Supports the body and enables movement.

Continue

6. **Endocrine System**: Regulates bodily functions through hormones.

7. **Immune System**: Defends against pathogens and diseases.

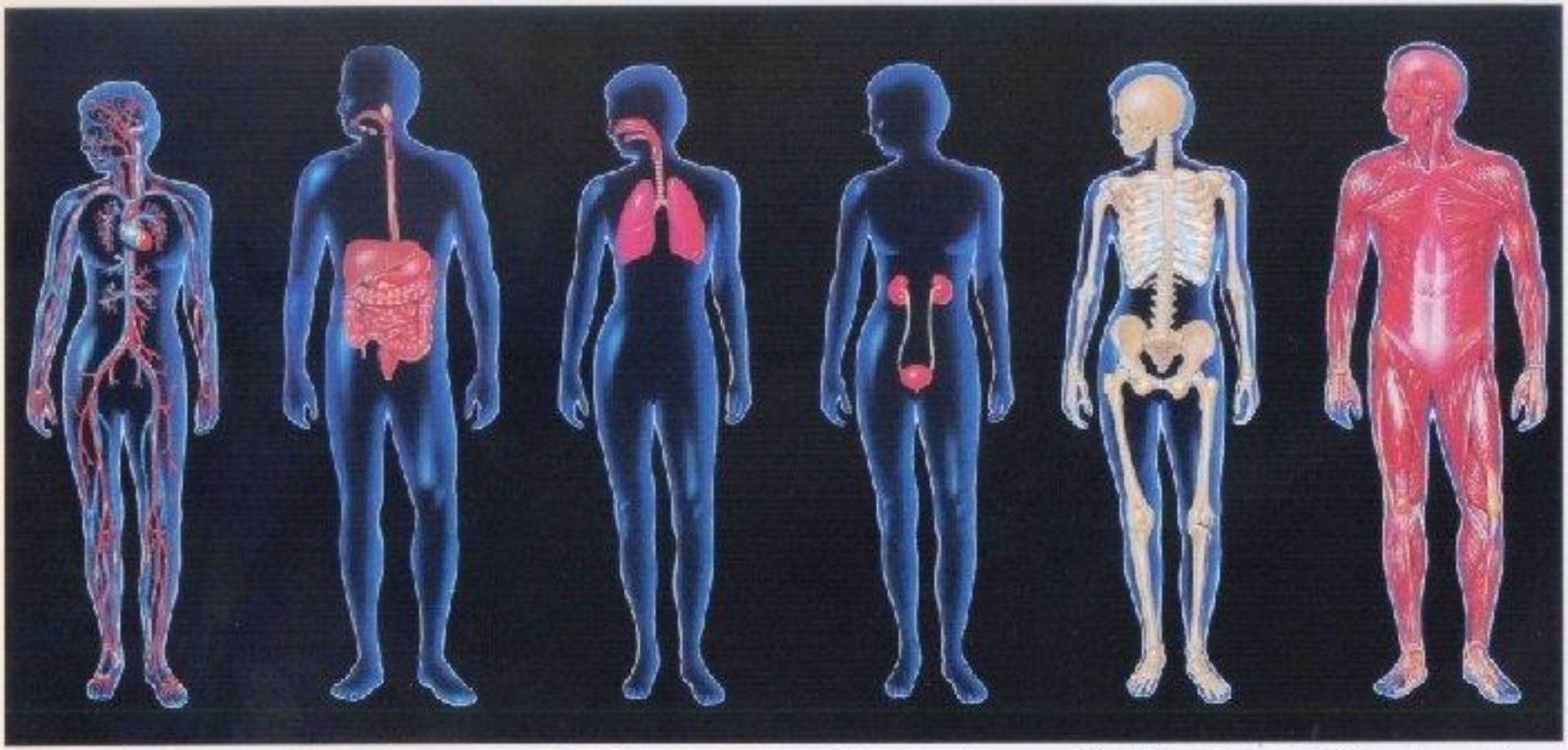
8. I**ntegumentary System**: Protects the body and regulates temperature.

9. **Urinary System**: Eliminates waste and regulates fluid balance.

10. **Reproductive System**: Responsible for producing off spring.

11. **Lymphatic System**: Supports immune function and fluid balance.

Eleven organ systems of the human body, part 1



Circulatory system
heart, blood, blood vessels

Digestive system
mouth, pharynx, esophagus, stomach, small intestine, large intestine, salivary glands, exocrine pancreas, liver, gallbladder

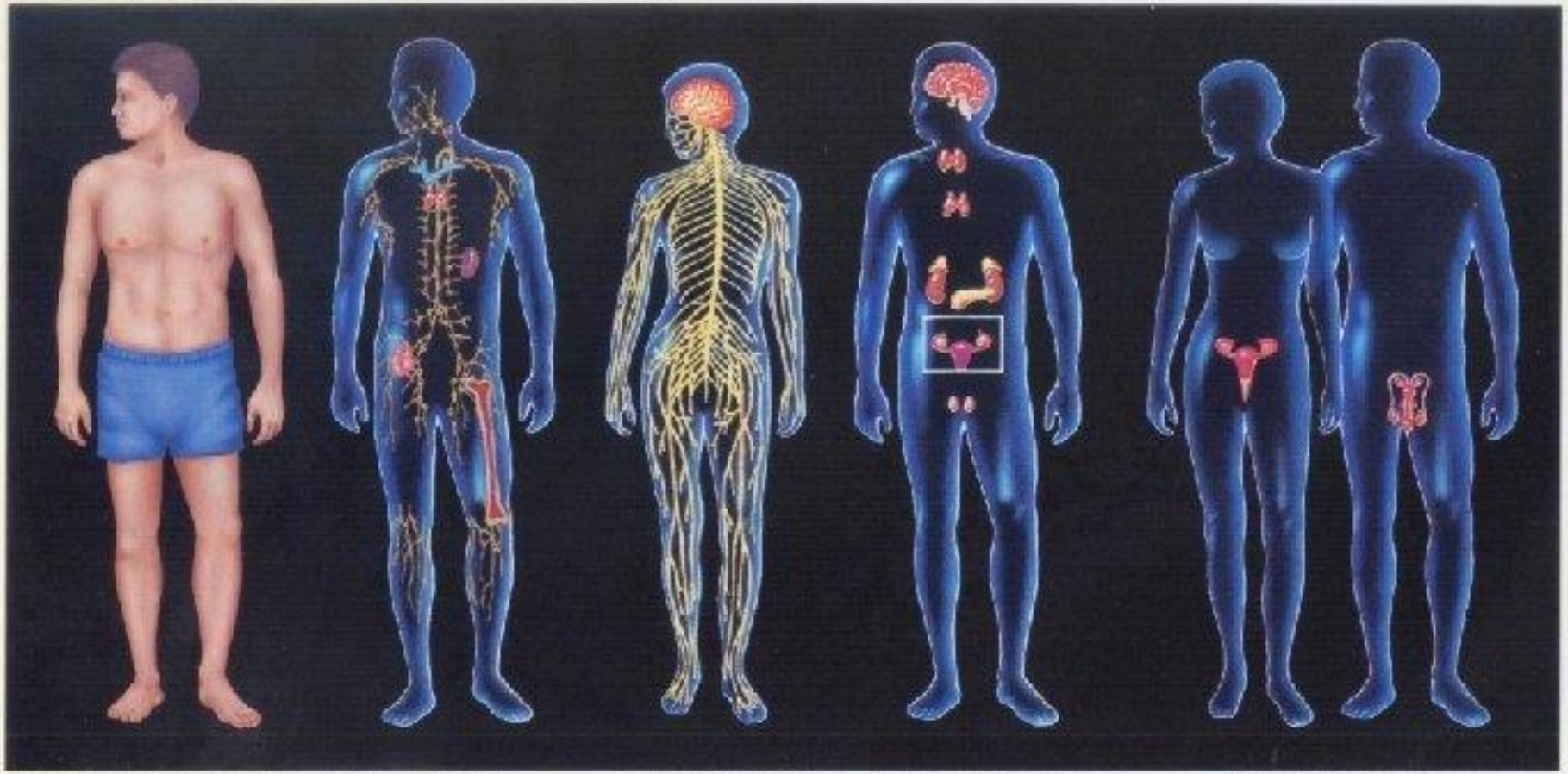
Respiratory system
Nose, pharynx, larynx, trachea, bronchi, lungs

Urinary system
kidneys, ureters, urinary bladder, urethra

Skeletal system
bones, cartilage, joints

Muscular system
skeletal muscles

Eleven organ systems of the human body, part 2



Integumentary system
skin, hair, nails

Immune system
lymph nodes, thymus, bone marrow, tonsils, adenoids, spleen, appendix, and, not shown, white blood cells, gut-associated lymphoid tissue, and skin-associated lymphoid tissue

Nervous system
brain, spinal cord, peripheral nerves, and, not shown, special sense organs

Endocrine system
all hormone-secreting tissues, including hypothalamus, pituitary, thyroid, adrenals, endocrine pancreas, gonads, kidneys, pineal, thymus, and, not shown, parathyroids, intestine, heart, and skin

Reproductive system
Male: testes, penis, prostate gland, seminal vesicles, bulbourethral glands, and associated ducts

Female: ovaries, oviducts, uterus, vagina, breasts