

Tishk International University
Faculty of Applied Science
Nutrition and Dietetics Department



An Introduction to the Human Body

Human Biology / 1st Lecture
1st Grade / Fall Semester
December 22. 2025

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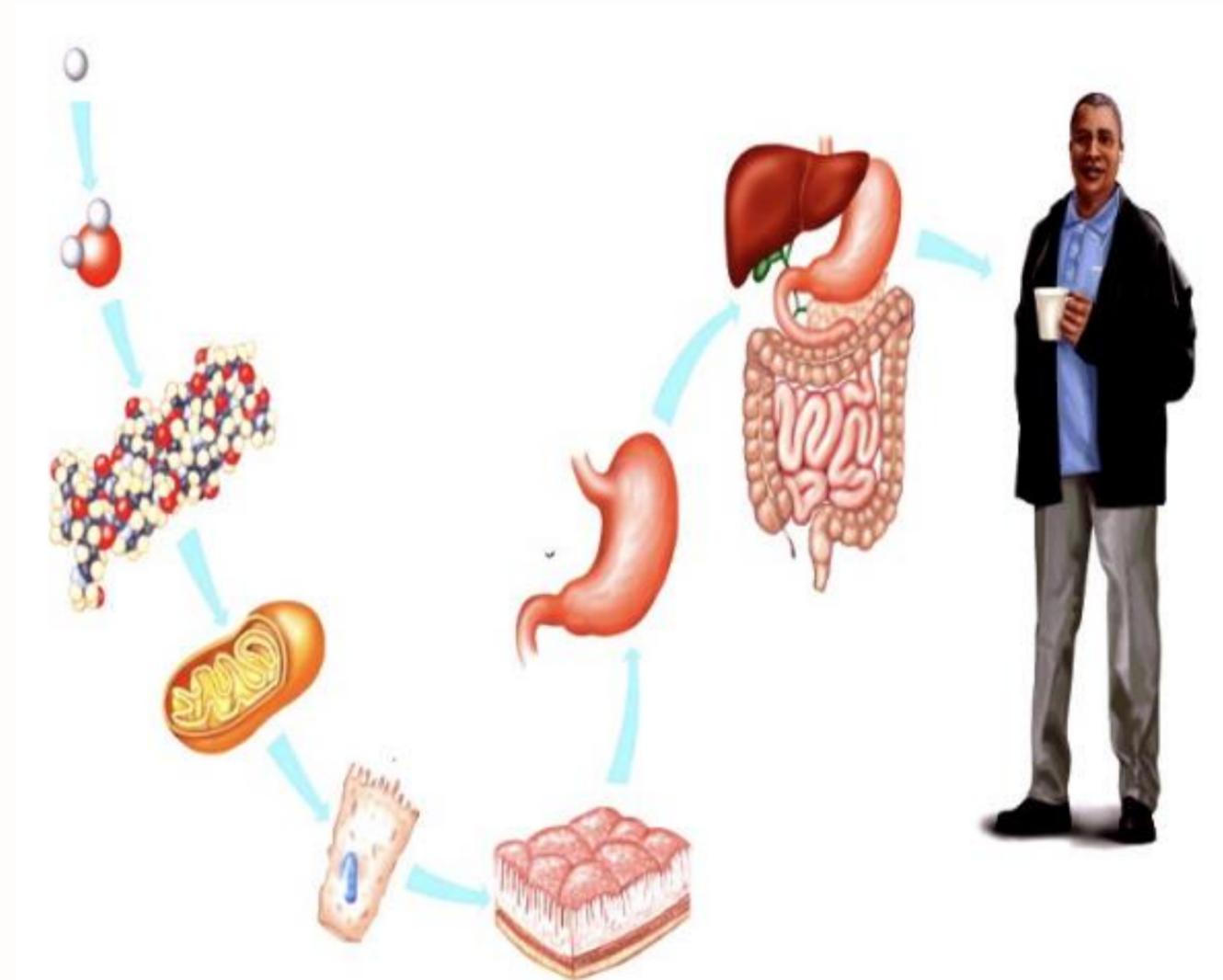
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Outline

- Levels of Structural Organization
- Characteristics of the Living Human Organism
- Basic Life Processes

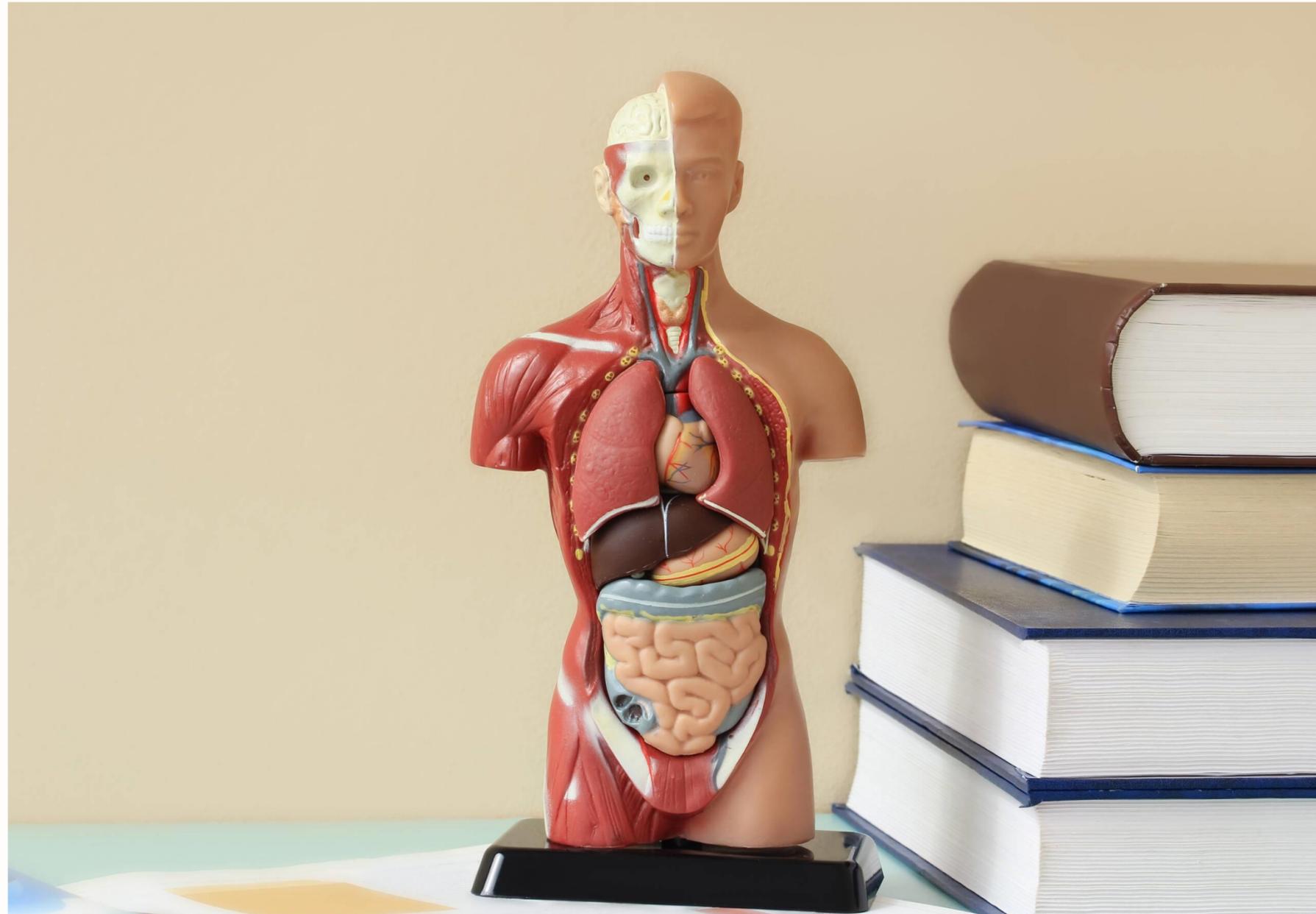


Upon completion of this lecture, the students will be able to:

1. Describe the body's 6 levels of structural organization.
2. Enumerate the important life processes of the human body.
3. Describe the processes that distinguish living organisms from nonliving things.

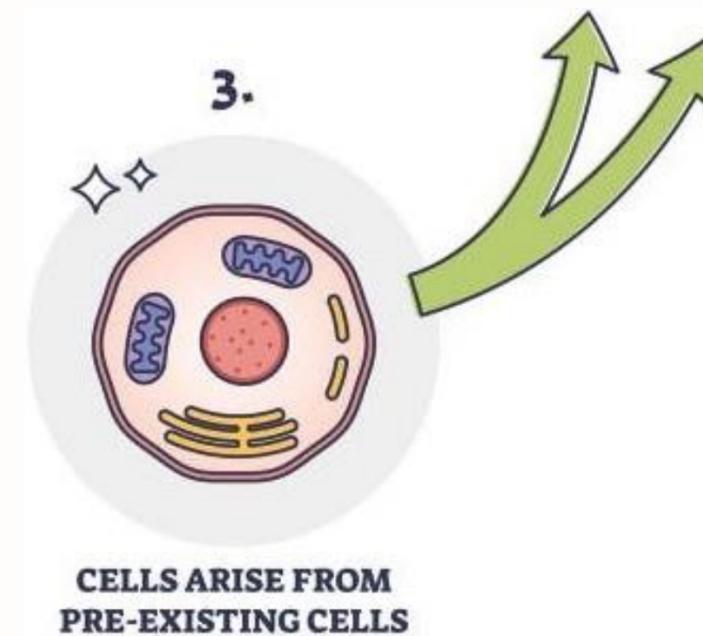
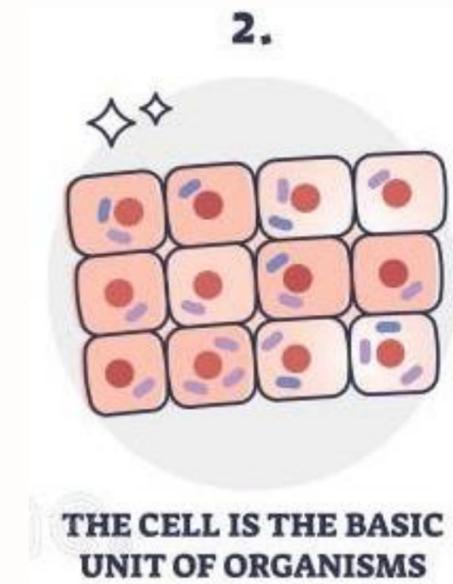


Human Biology

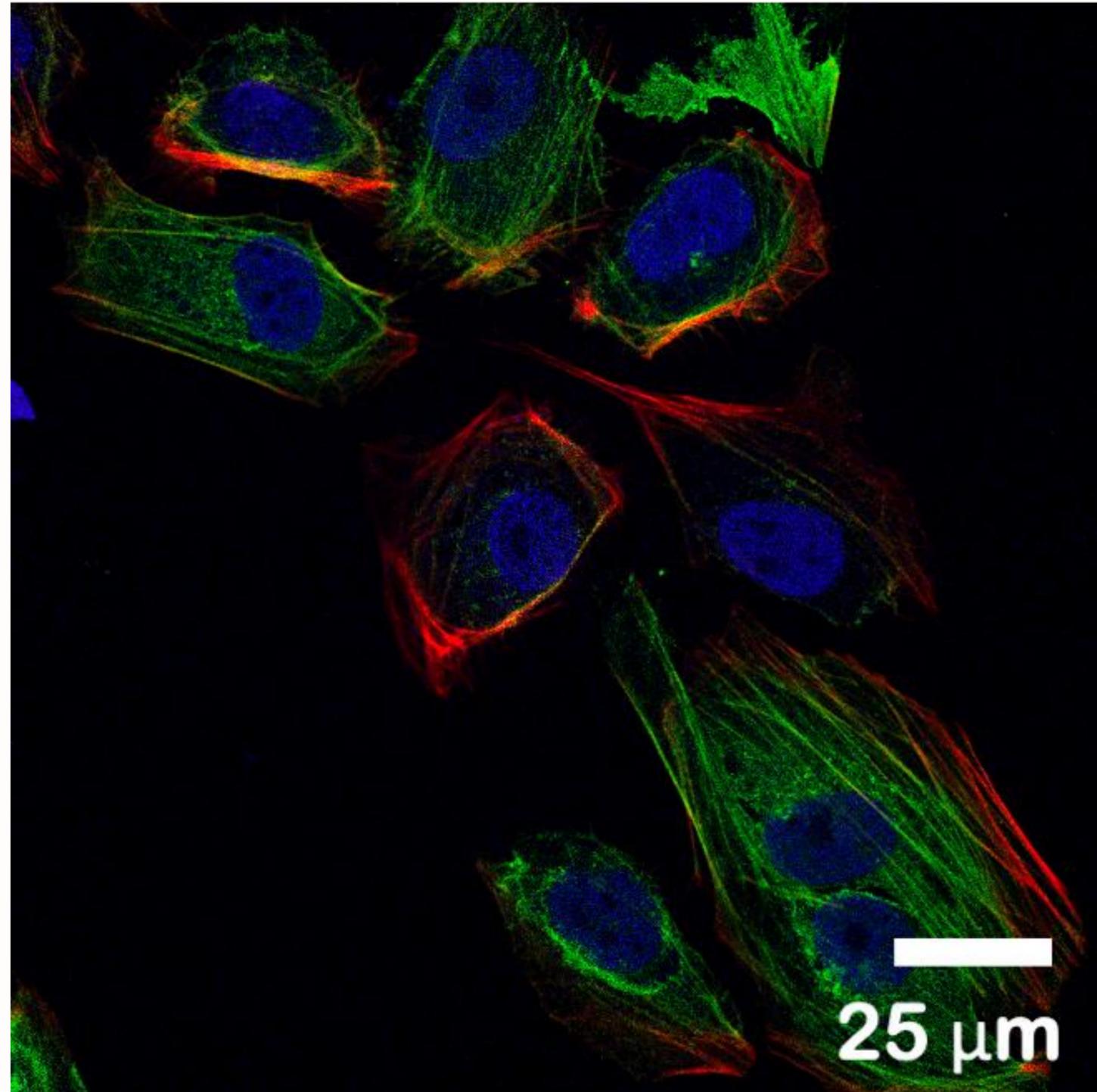


The cell theory

CELL THEORY



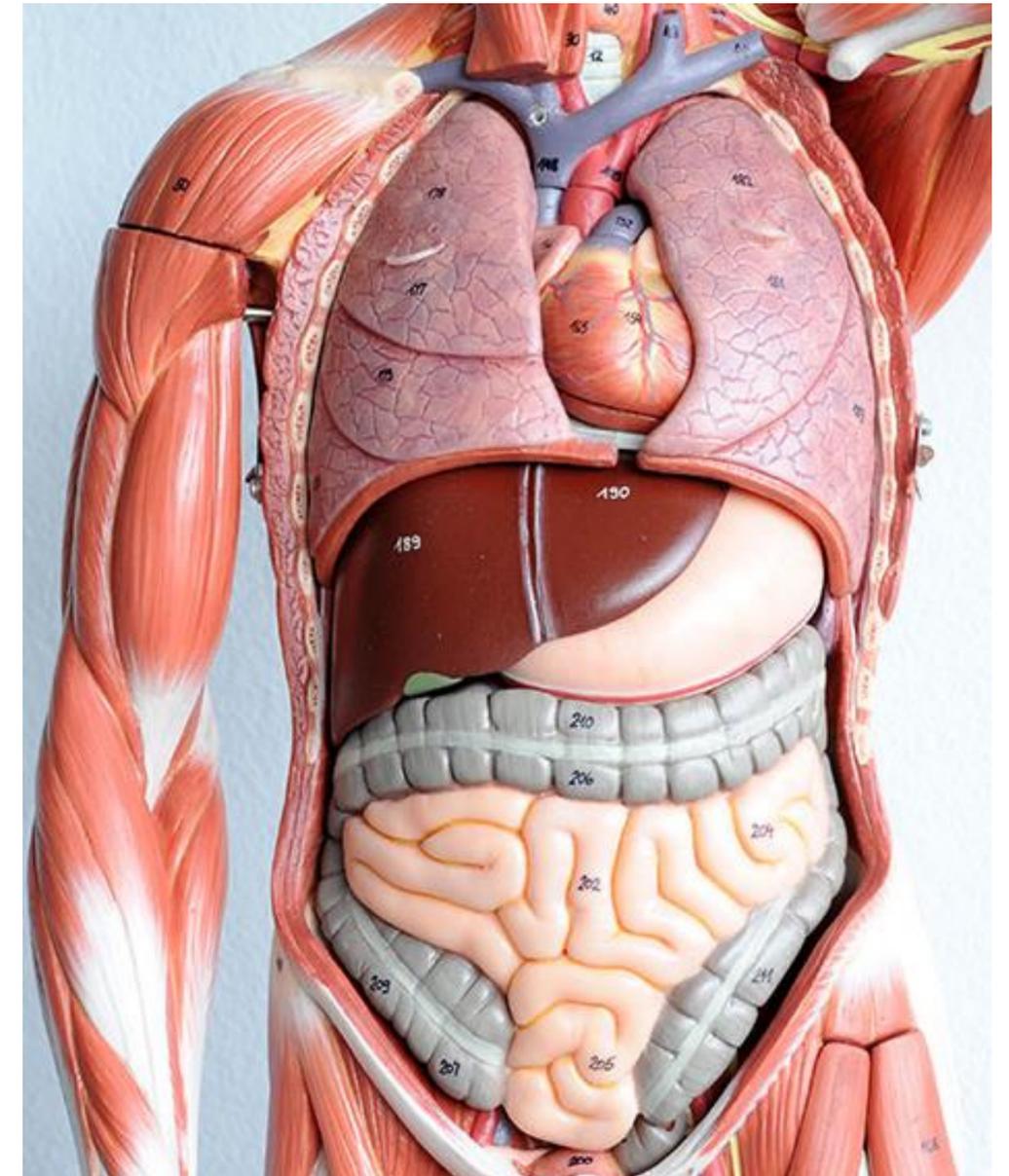
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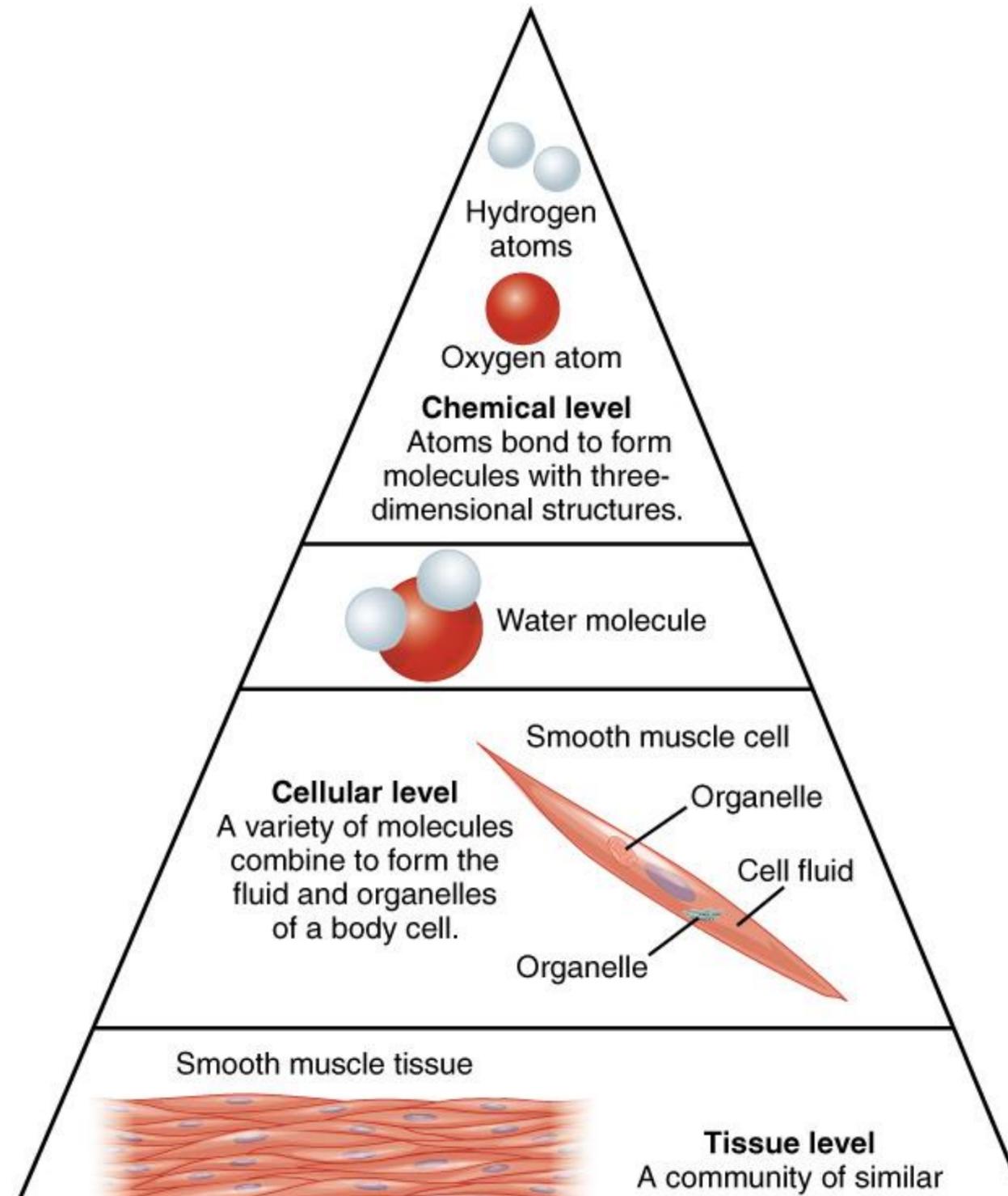
❖ **Two Important terms need to learn and understand:**

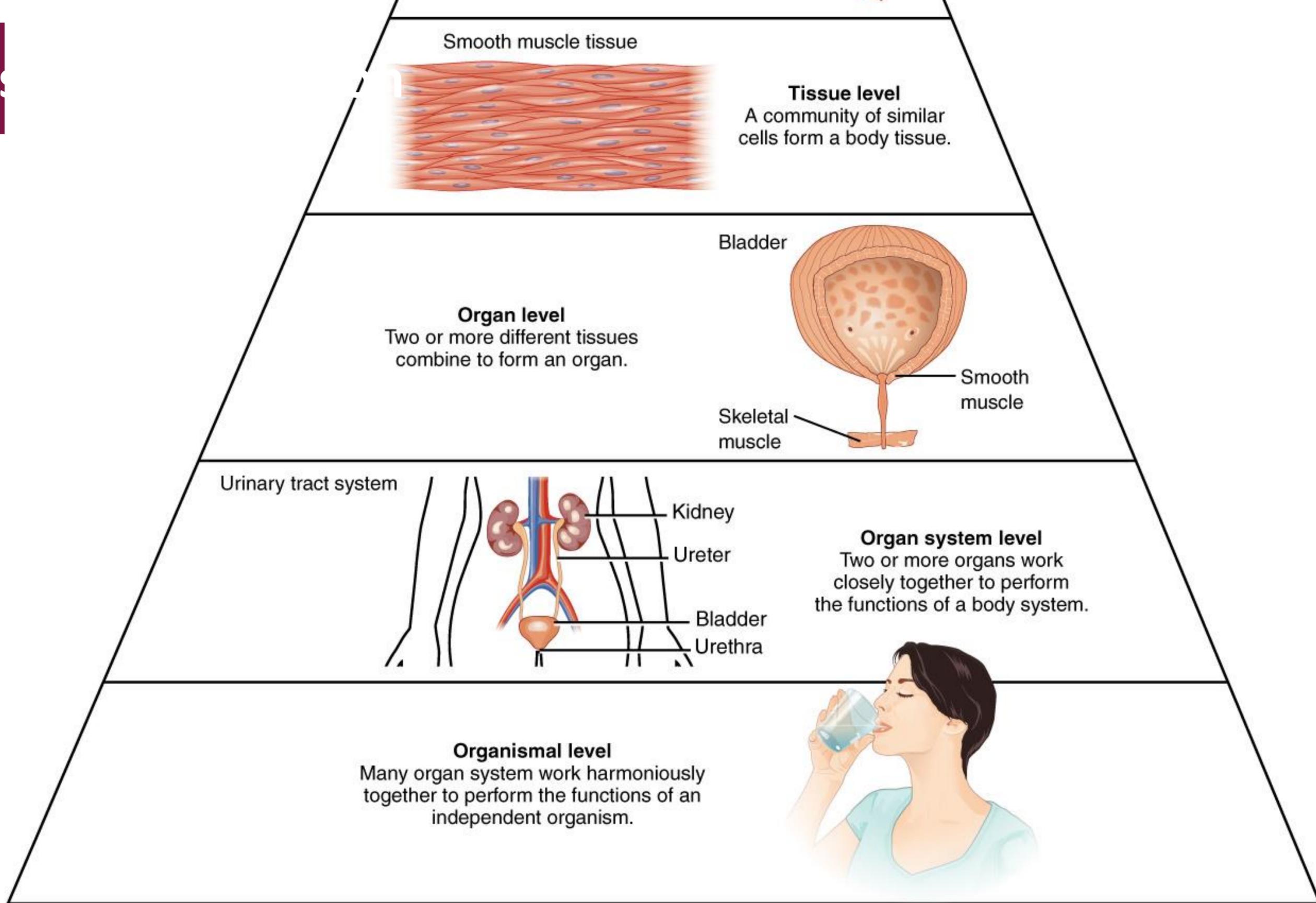
- **Anatomy:** The study of **structure**.
- **Physiology:** The study of **function**.

❖ **Structure is always related to function because the structure determines the function.**



Levels of Organization

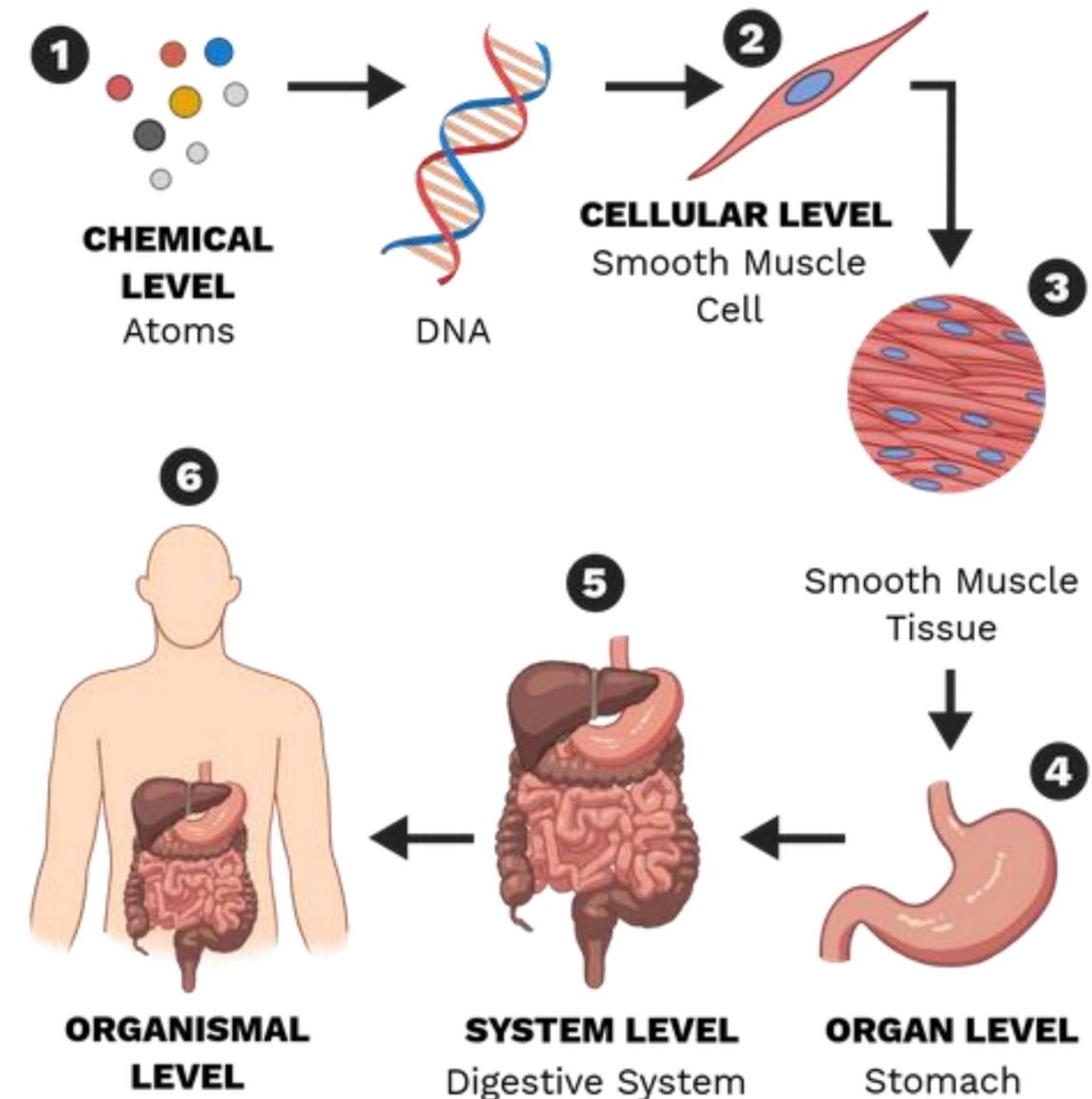




❖ The levels of organization of a language are:

Letters, words, sentences, paragraphs, and so on, can be compared to the levels of organization of the human body.

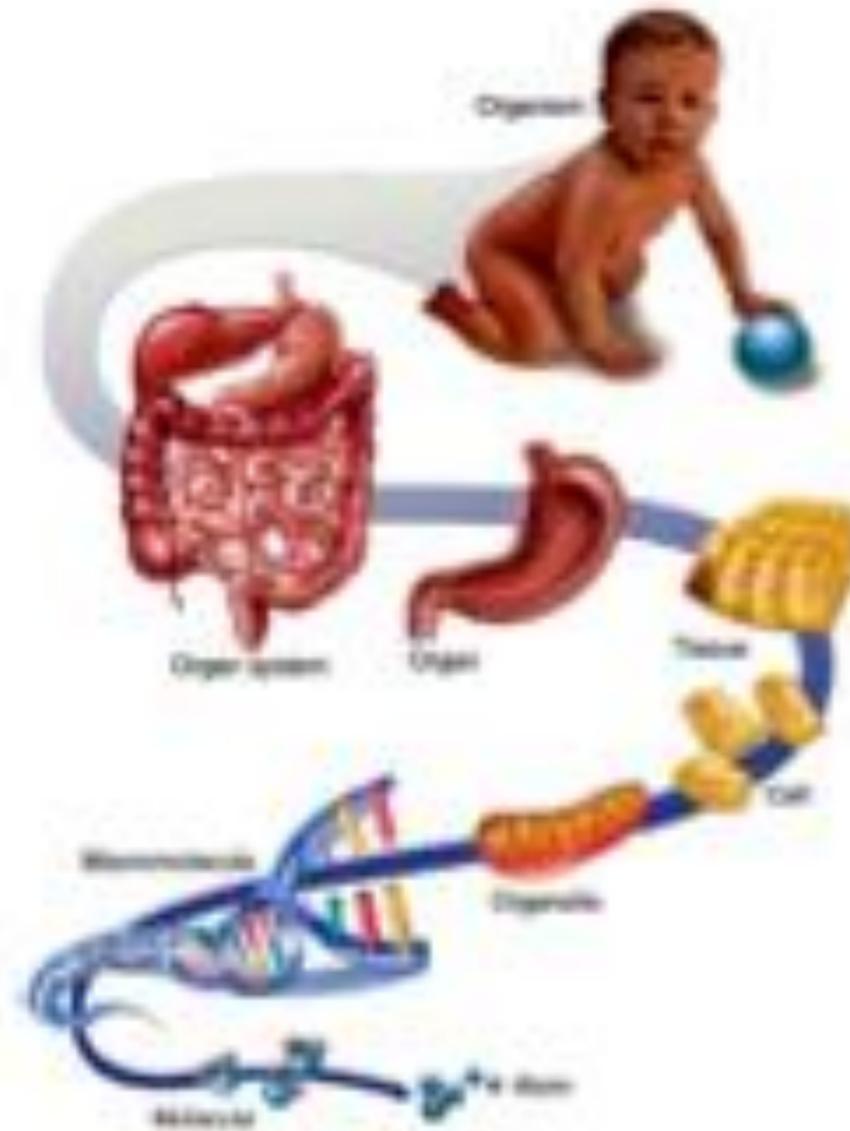
❖ Exploration of the human body will extend from **atoms and molecules** to the whole **person**.



Levels of Structural Organization and Body Systems:

- From the smallest to the largest, 6 levels of organization will help us to understand **anatomy** and **physiology**: they are, the:

- Chemical,
- Cellular,
- Tissue,
- Organ,
- System, and
- Organism.



Levels of organization and Body system



Chemical level:

A very basic level can be compared to the letters of the alphabet and includes:

❖ **Atoms:**

- The smallest units of matter that participate in chemical reactions, C, H, O, CA are essential for maintaining life.

❖ **Molecules:**

- Two or more atoms joined together. DNA, (The genetic material), and glucose (blood sugar).

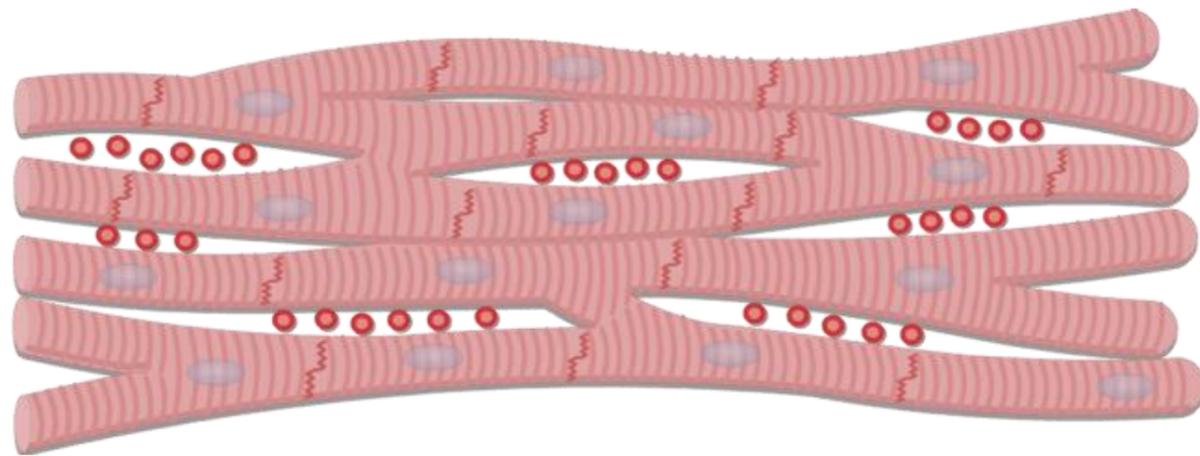


Levels of organization and Body system



Cellular level:

- Molecules combine to form cells, the basic structural and functional units of an organism that are composed of chemicals.
- Just as words are the smallest elements of language that make sense, cells are the smallest living units in the human body.
- Examples: Muscle cells, Nerve cells, and bone cells.



Levels of organization and Body system



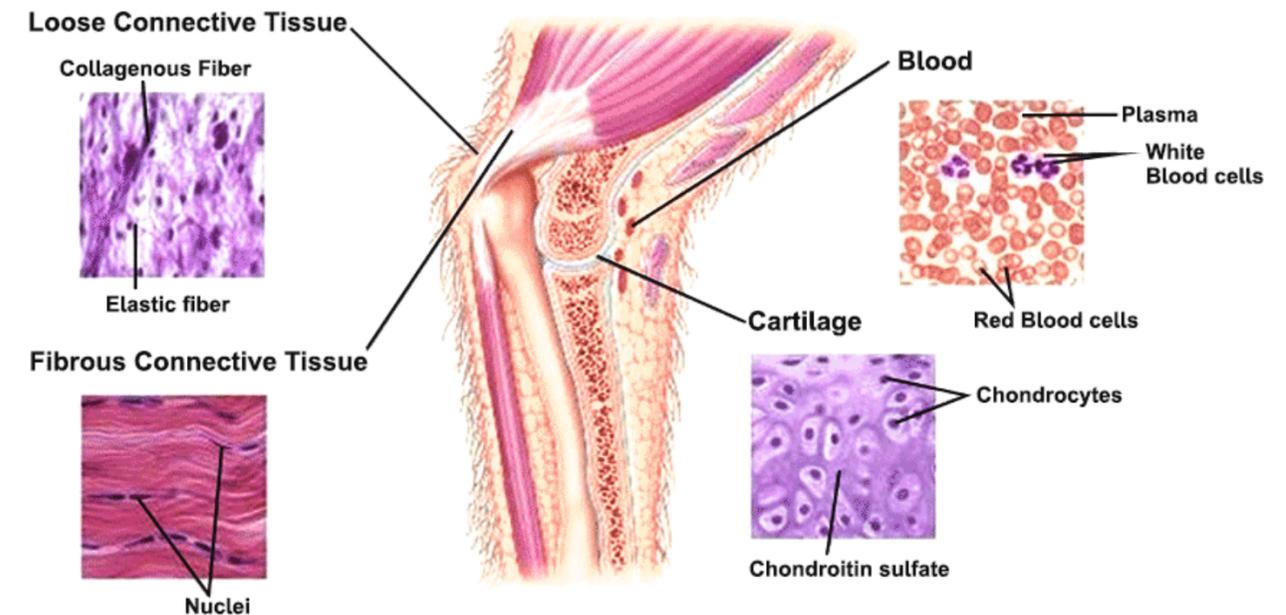
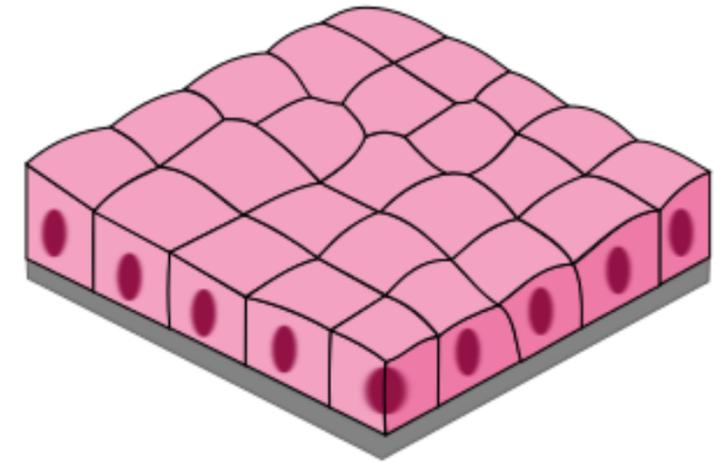
Tissue level:

- **Tissues** are **groups of cells** and the materials surrounding them work together to perform a particular function.
- Similar to the way words are put together to form sentences.
- There are **4 types** of tissues in our body:
 - **Epithelial tissue**
 - **Connective tissue**
 - **Muscular tissue**
 - **Nerve tissue**



Tissue level:

- **Epithelial Tissue:** Covers body surface, lines hollow organs and cavities, and form glands.
- **Connective Tissue:** Connects, supports, and protects body organs while distributing blood vessels to other tissues.



Tissue level:

- **Muscular Tissue:** Contracts to make body parts move and generate heat.
- **Nervous Tissue:** Carries information from one part of the body to another through nerve impulses.

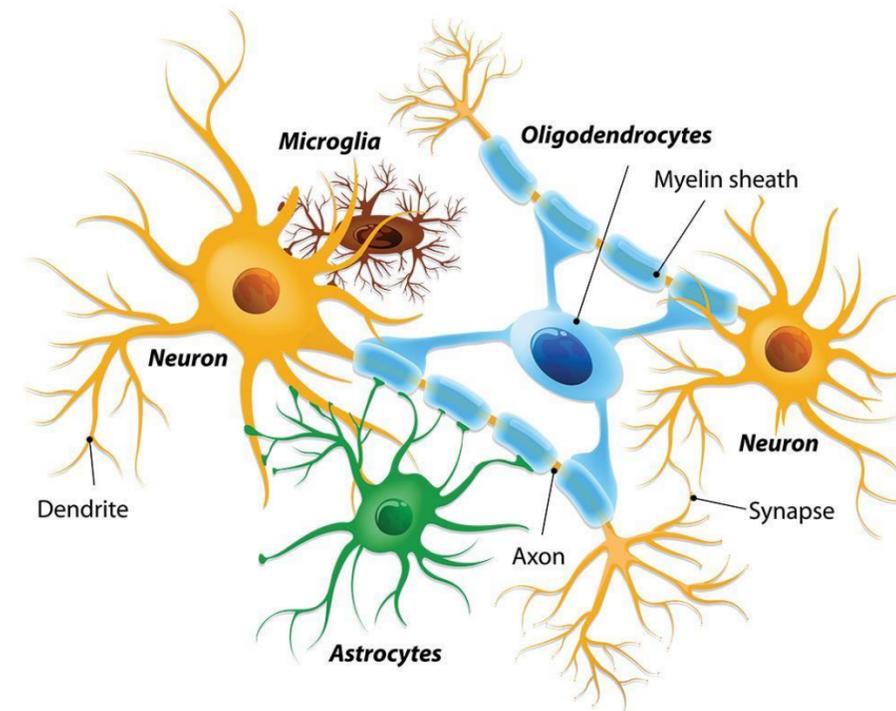
Skeletal muscle



Smooth muscle



Cardiac muscle



Levels of Structural Organization and Body Systems:

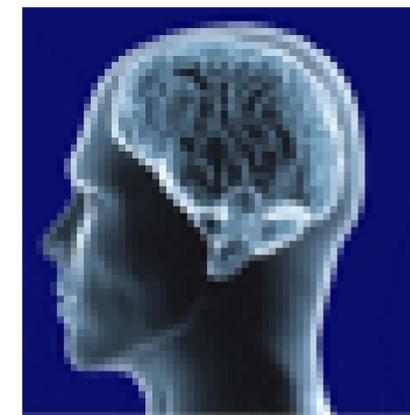
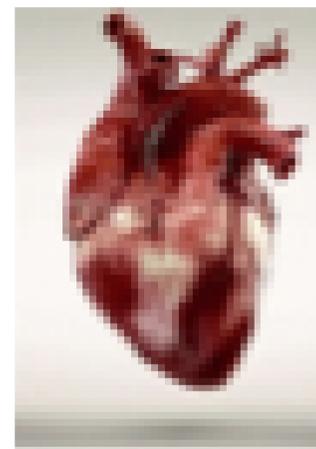
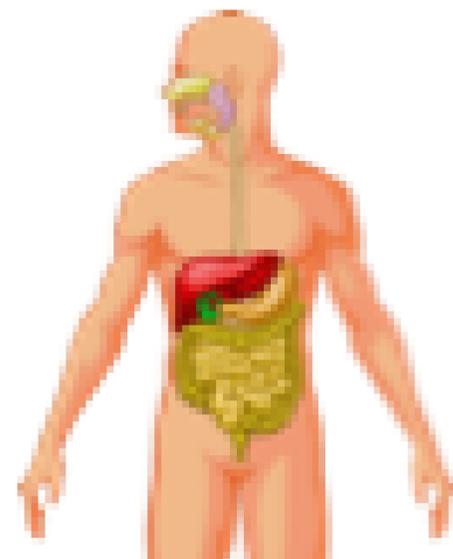


■ Organ level:

- At the organ level, **different types of tissues** are joined together.
- Similar to the relationship between **sentences** and **paragraphs**, organs are structures that are composed of two or more different types of tissues; they have specific functions and usually have recognizable shapes.

■ Examples:

- stomach,
- skin,
- heart,
- liver,
- brain.... etc.



Levels of Structural Organization and Body Systems:



■ Organ level:

- The stomach's outer covering layer: **epithelial tissue and connective tissue** that reduces friction when the stomach moves and rubs against other organs.
- Underneath are three layers of a type of muscular tissue called **smooth muscle tissue**, which contracts to churn and mix food and then push it into the next digestive organ, the small intestine.
- The innermost lining layer: **epithelial tissue** that produces fluid and chemicals responsible for digestion in the stomach.



Levels of Structural Organization and Body Systems:



■ **System (organ-system) level:**

- A **system** (or **chapter**, in our language analogy) consists of related organs (**paragraphs**) with a common function.
- The **digestive system** (breaks down and absorbs food). Its organs include the **mouth**, **salivary glands**, **pharynx** (throat), **esophagus** (food tube), **stomach**, **small intestine**, **large intestine**, **liver**, **gallbladder**, and **pancreas**.
- The **pancreas**: an organ is part of more than one system (digestive system and endocrine system).



Levels of Structural Organization and Body Systems:



- **Organismal level:**
- An **organism**, any living individual, can be compared to a **book** in our analogy.
- All the parts of the human body functioning together constitute the **total organism**.



Characteristics of the Living Human Organism:

- **Basic Life Processes:** Certain processes distinguish organisms (living things) from nonliving things.
- **Following are the six most important life processes of the human body:**
 1. **Metabolism**
 2. **Responsiveness**
 3. **Movement**
 4. **Growth**
 5. **Differentiation**
 6. **Reproduction**



Characteristics of the Living Human Organism:



1. Metabolism:

- The sum of all chemical processes that occur in the body.
- Catabolism, the breakdown of complex chemical substances into simpler components.
- Anabolism, the building up of complex chemical substances from smaller, simpler components.

For example:

- digestive processes catabolize proteins in food into amino acids.
- These amino acids are then used to anabolize (build) new proteins that make up body structures such as muscles and bones.



Characteristics of the Living Human Organism:

2. Responsiveness:

- is the body's ability to detect and respond to changes.
- **For example:**
- an increase in body temperature during a fever represents a change in the internal environment (within the body), and turning your head toward the sound of squealing brakes is a response to a change in the external environment (outside the body) to prepare the body for a potential threat.



Characteristics of the Living Human Organism:

2. Responsiveness:

- Different cells in the body respond to environmental changes in characteristic ways.
- Nerve cells respond by generating electrical signals known as nerve impulses (action potentials).
- Muscle cells respond by **contracting**, which generates force to move body parts.



Characteristics of the Living Human Organism:



3. Movement:

- It includes motion of the whole body, individual organs, single cells, and even tiny structures inside cells.
- **For example:**
- the coordinated action of leg muscles moves your whole body from one place to another when you walk or run.
- When a body tissue is damaged or infected, certain white blood cells move from the bloodstream into the affected tissue to help clean up and repair the area.



Characteristics of the Living Human Organism:

4. Growth:

- is an increase in body size that results from an increase in the size of existing cells, an increase in the number of cells, or both. In addition, a tissue sometimes increases in size because the amount of material between cells increases.
- In a growing bone, for example, mineral deposits accumulate between bone cells, causing the bone to grow in length and width.



5. Differentiation:

- is the development of a cell from an unspecialized to a specialized state. **Such precursor cells**, which can divide and give rise to cells that undergo differentiation, are known as **stem cells**.
- each type of cell in the body has a specialized structure or function that differs from that of its precursor (**ancestor**) cells.
- **For example**, Through differentiation, a single fertilized human egg (ovum) develops into an **embryo**, and then into a **fetus**, an **infant**, a **child**, and finally an **adult**.



Characteristics of the Living Human Organism:

6. Reproduction:

- Is the formation of new cells for tissue growth, repair, or replacement.
- Or is the production of a new individual.
- The formation of new cells occurs through cell division. The production of a new individual occurs through the fertilization of an ovum by a sperm cell to form a zygote, followed by repeated cell divisions and the differentiation of these cells.



Characteristics of the Living Human Organism:

- When any one of the life processes ceases to occur properly, the result is death of cells and tissues, which may lead to death of the organism.
- **For example:**
- Clinically, loss of the heartbeat, absence of spontaneous breathing, and loss of brain functions indicate **death in the human body.**





Thank You

