



Practical Biology -1

Organization Levels of the Bod

Prof . Dr. Younis A. Alkhafaji



Introduction

objectives:

- Understand the hierarchical structure of the human body.
- Relate each level to its function.
- Appreciate how dysfunction at one level impacts others.
- Quote: “The whole is more than the sum of its parts.” – Aristotle

الأهداف:

- فهم البنية الهرمية لجسم الإنسان.
- ربط كل مستوى بوظيفته.
- تقدير كيف أن الخلل في مستوى واحد يؤثر على المستويات الأخرى.
- اقتباس: "الكل أكبر من مجموع أجزائه." – أرسطو

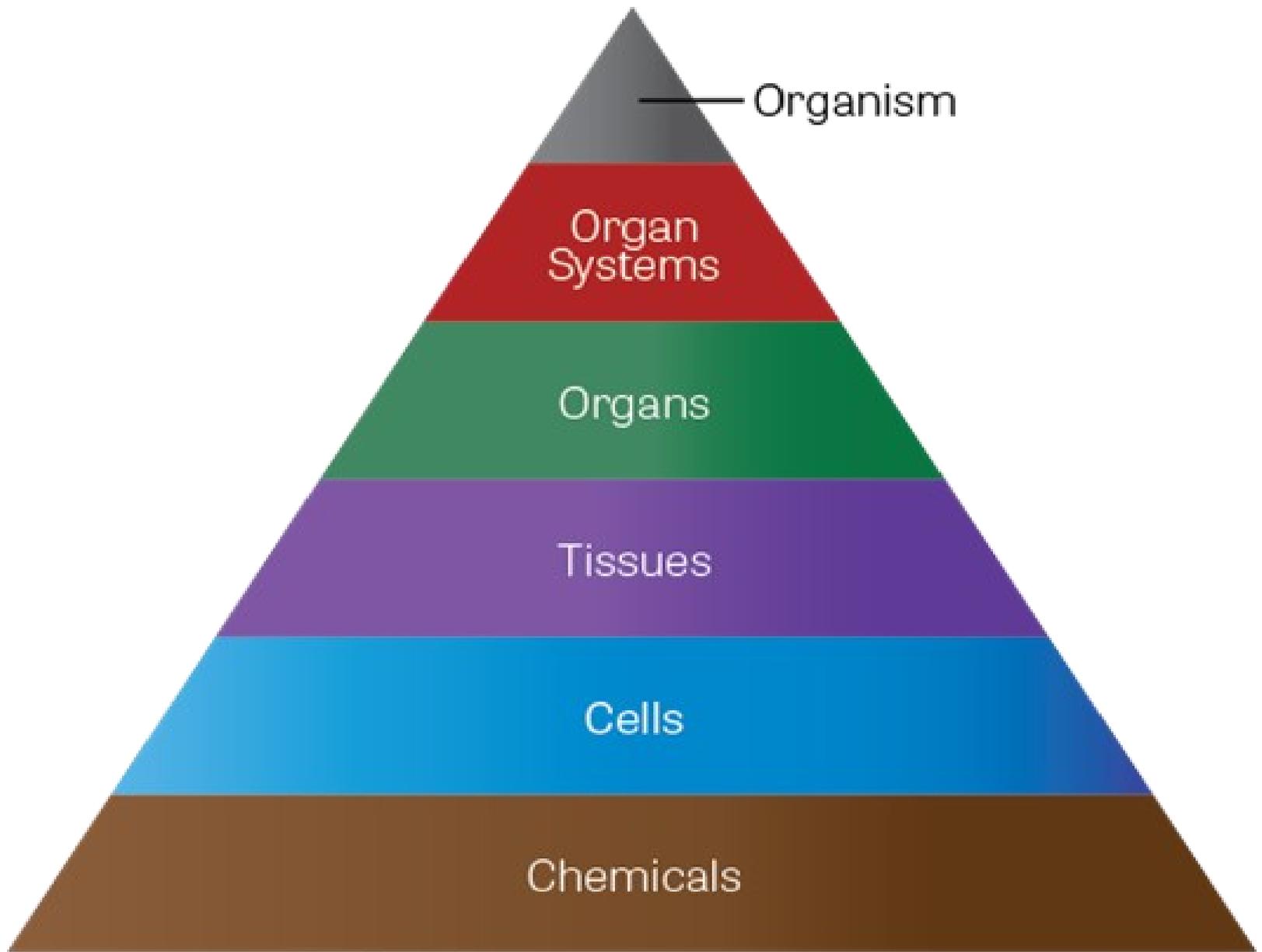
The 6 Levels of Organization (Overview)

From smallest to largest:

- 1. Chemical Level**
- 2. Cellular Level**
- 3. Tissue Level**
- 4. Organ Level**
- 5. Organ System Level**
- 6. Organism Level**

Level 1 – Chemical Level

- **Building blocks: Atoms → Molecules → Macromolecules**
- **Examples:**
 - **Atoms: Carbon (C), Hydrogen (H), Oxygen (O)**
 - **Molecules: Water (H₂O), glucose (C₆H₁₂O₆)**
 - **Macromolecules: Proteins, DNA, carbohydrates, lipids**
- **Function: Provides the foundation for all body structures and functions.**



Chemical Level

- **Building blocks:** Atoms → Molecules → Macromolecules
- **Examples:**
 - **Atoms:** Carbon (C), Hydrogen (H), Oxygen (O)
 - **Molecules:** Water (H₂O), glucose (C₆H₁₂O₆)
 - **Macromolecules:** Proteins, DNA, carbohydrates, lipids
- **Function:** Provides the foundation for all body structures and functions.

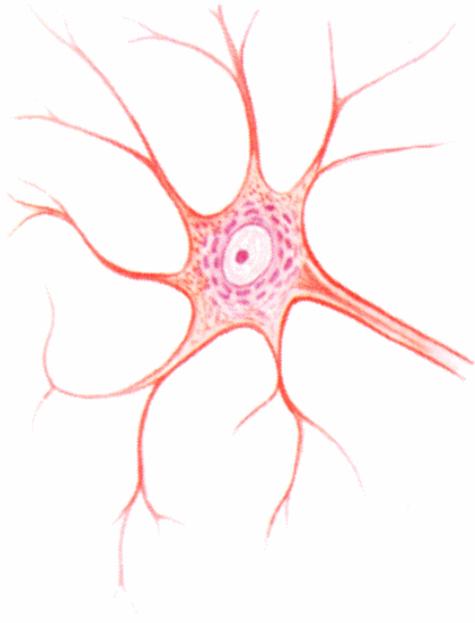
Activity: Quick quiz – “Which is larger: a protein molecule or a water molecule?”

Cellular Level

- **Definition:** The smallest living unit of the body.
- **Structure:** Cells are composed of organelles (mitochondria, nucleus, etc.).
- **Examples:**
 - **Red blood cells** (carry oxygen)
 - **Neurons** (transmit signals)
 - **Muscle cells** (contract for movement)

TYPES OF CELLS

NERVE CELL



MUSCLE CELLS



Striated (voluntary)

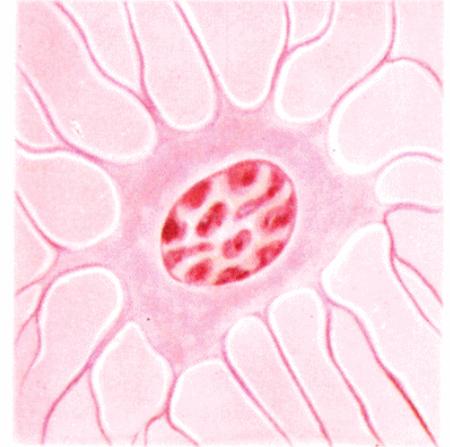


Smooth (involuntary)

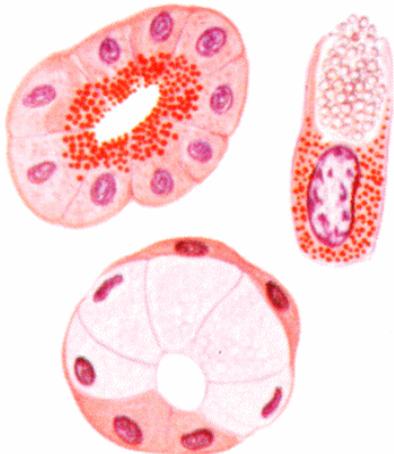


Cardiac

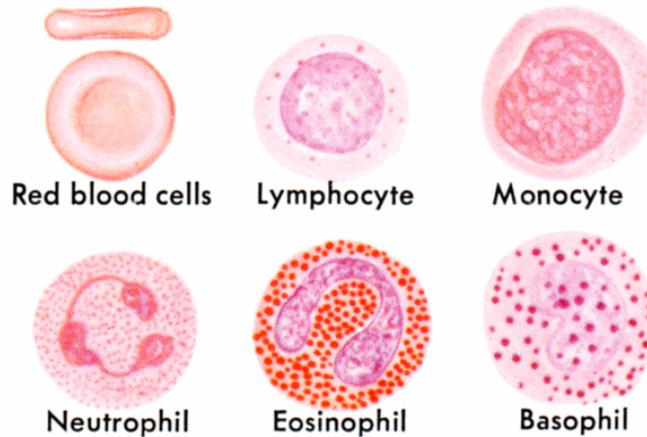
BONE CELL



GLAND CELLS



BLOOD CELLS



White blood cells

Red blood cells

Lymphocyte

Monocyte

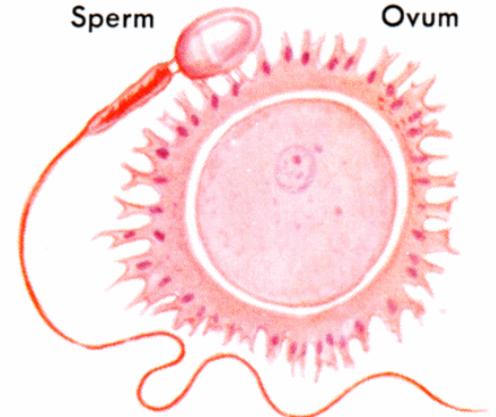
Neutrophil

Eosinophil

Basophil

Sperm

Ovum



REPRODUCTIVE CELLS

Tissue Level

- **Definition:** A group of similar cells working together for a specific function.
- **Four primary types:**
 1. **Epithelial:** Covers surfaces (e.g., skin, lining of gut).
 2. **Connective:** Supports and binds (e.g., bone, blood).
 3. **Muscle:** Enables movement.
 4. **Nervous:** Transmits information.

Tissues are classified into four basic types: epithelium, connective tissue (includes cartilage, bone and blood), muscle, and nervous tissue.

The Cell

Epithelium

Connective Tissue

Muscle

Cartilage and Bone

Nervous Tissue

Peripheral Blood

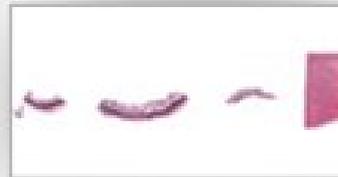
Hematopoiesis

Cells and Tissues

Tissues are classified into four basic types: epithelium, connective tissue (includes cartilage, bone and blood), muscle, and nervous tissue.



The Cell



Epithelium



Connective Tissue



Muscle



Cartilage and Bone



Nervous Tissue



Peripheral Blood



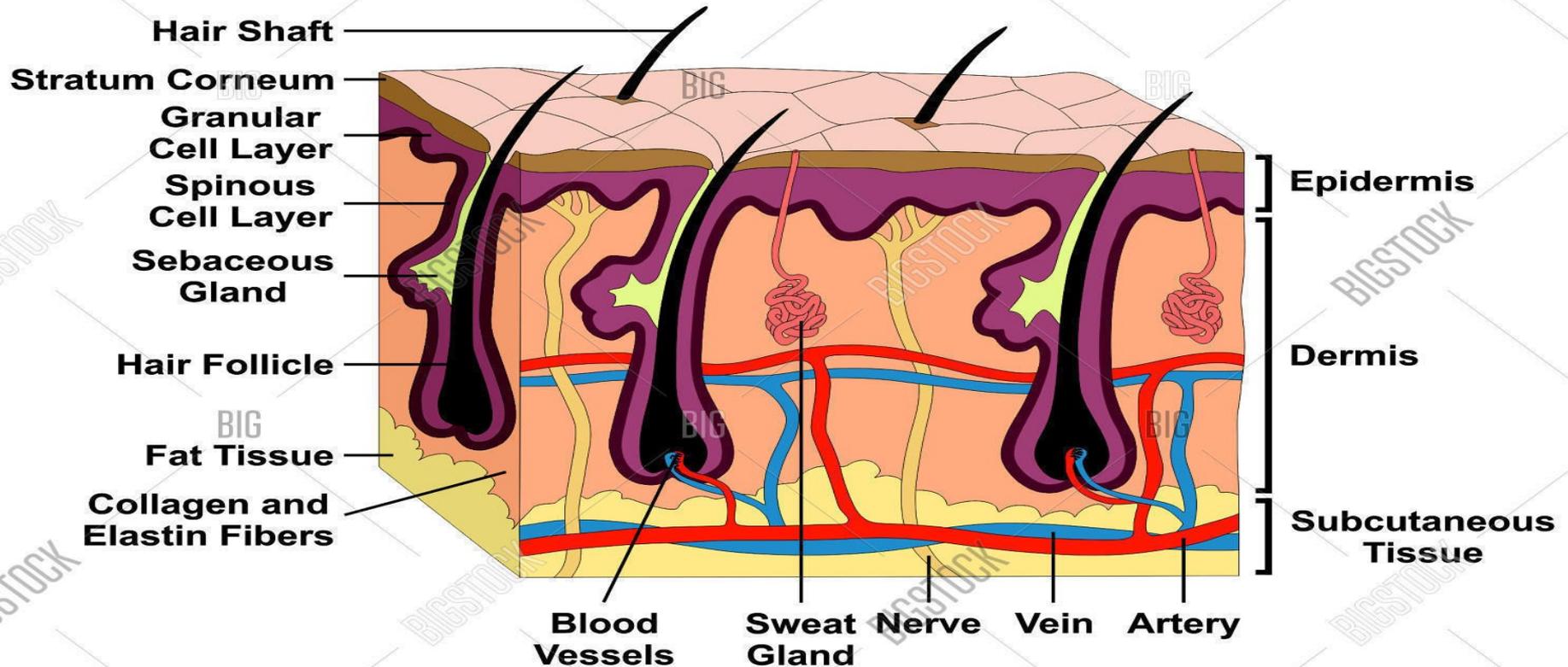
Hematopoiesis

□

Organ Level

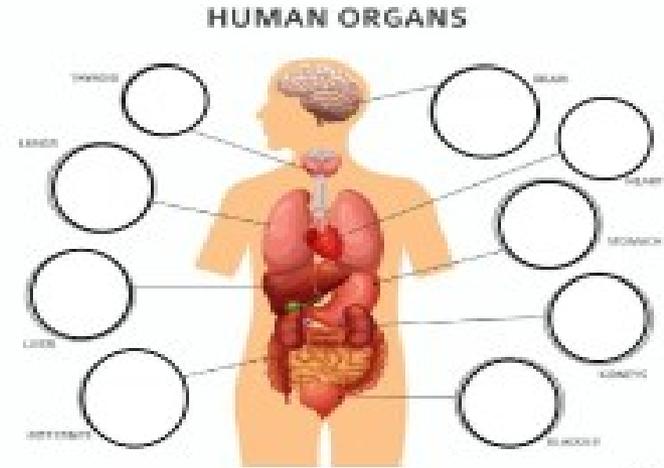
- **Definition:** Two or more tissue types combined to perform a specific task.
- **Examples:**
 - **Heart:** Muscle tissue + connective + nervous + epithelial.
 - **Stomach:** Epithelial lining + muscle layers + nervous tissue.
- **Function:** Organs perform complex tasks (e.g., heart pumps blood).

Human Skin Anatomy



Organ System Level

- **Definition:** A group of organs working together for a major physiological function.
- **Examples of systems:**
 - **Digestive system:** Mouth, stomach, intestines, etc.
 - **Nervous system:** Brain, spinal cord, nerves.
 - **Circulatory system:** Heart, blood vessels, blood.



Drag the organs to the correct circle.
Label the organs. The first letter is done for you.

| | |
|--------------------------------|--|
| <input type="text" value="B"/> | |
| <input type="text" value="K"/> | |
| <input type="text" value="H"/> | |
| <input type="text" value="S"/> | |
| <input type="text" value="I"/> | |
| <input type="text" value="T"/> | |
| <input type="text" value="L"/> | |
| <input type="text" value="L"/> | |
| <input type="text" value="I"/> | |

Organism Level

- **The whole individual:** All systems integrated to maintain life.
- **Homeostasis:** The body's ability to maintain stable internal conditions.
- **Example:** Regulation of body temperature (involves skin, nervous system, circulatory system, etc.).

Discussion: “What happens if the respiratory system fails? How does it affect other systems?”

Clinical Correlation – Diabetes Example

- **Chemical level:** Insulin (a protein) is deficient or ineffective.
- **Cellular level:** Pancreatic beta cells dysfunction.
- **Organ level:** Pancreas fails to secrete enough insulin.
- **System level:** Endocrine system imbalance → affects circulatory, nervous, etc.
- **Organism level:** Symptoms (fatigue, thirst, organ damage).

Take-home message: Understanding levels helps diagnose and treat diseases.

Questions & Discussion

- Open floor for questions.
- Suggest further reading:
 - Human Biology by Sylvia Mader
 - Anatomy & Physiology by Elaine Marieb

T
h
a
n
k
s
a
l
o
n
g
l
y

