

LEC. 1 INTRODUCTION TO HUMAN BIOLOGY & CELLS

**1ST YEAR-BIOLOGY SUBJECT –LABORATORY SCIENCE
DEPARTMENTS**

ALZAHRAA UNIVERSITY – COLLEGE OF PHARMACY

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BIOLOGY

Biology Is the science that studies the life from all its aspects

Biology includes many branches, such as:

- 1. Anatomy:** is the study of the basic structure of the body of the organisms and their parts.
- 2. Histology:** is the study of the microscopic structure of tissues
- 3. Physiology:** is the branch of biology that deals with the normal functions of living organisms and their parts

Biochemistry: is the study of chemical nature and sequence of biochemical reactions in organisms.

Microbiology: is the science that studies the microorganisms.

Genetics: the branch of biology that studies the inherited characteristics of the organisms. It is also studying the variation of inherited characteristics.

HUMAN BIOLOGY

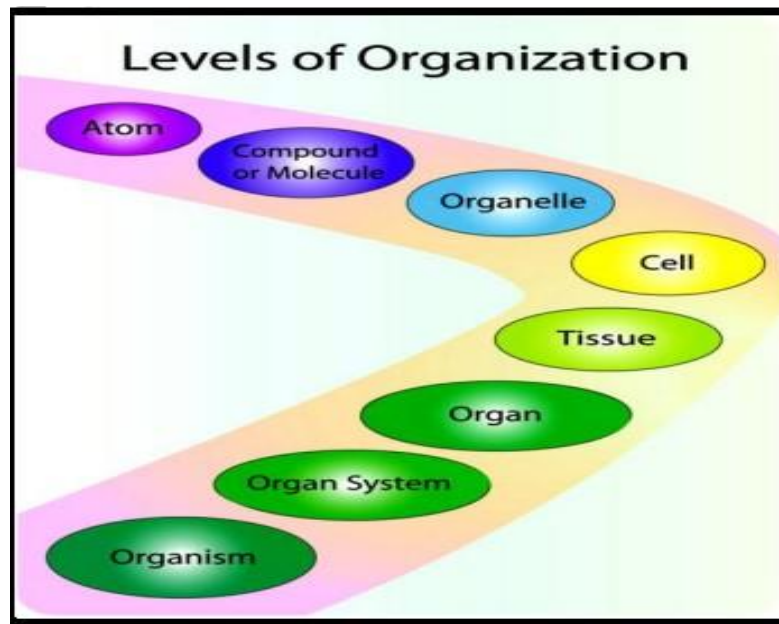
Human Biology Is the study of the anatomy and all the human activities such as growth, nutrition, reproduction, respiration, digestion, excretion, secretionetc

Organization of the Human Body The human body is organized at different levels, starting with the cell and ending with the entire organism (see the figure).

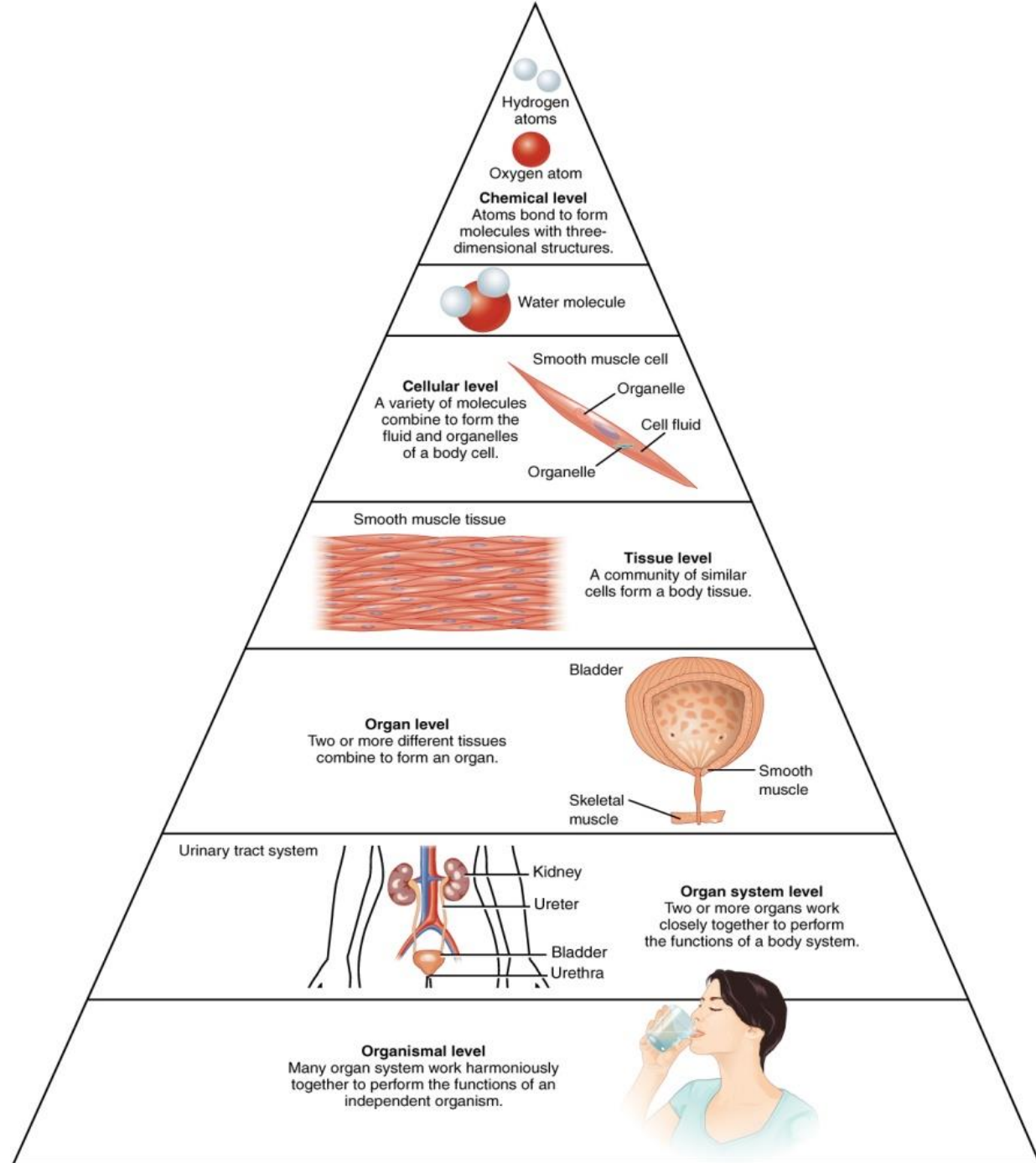
At each higher level of organization, there is a greater degree of complexity.

ORGANIZATION

The organization of the human body begins at the very small and basic and come together to form the complete body whose different parts work in unison. This can be seen as a kind of ladder going from the basic to the very complex. At the simplest level, the body is comprised of atoms.



LEVEL OF ORGANIZATION



The most basic parts of the human body are cells, an amazing 100 trillion of them by the time the average person reaches adulthood.

The human body is composed of many different types of cells that together create tissues and subsequently, organ systems.

They ensure homeostasis and the viability of the human body.

Generally, the human body comprises a head, neck, trunk (which includes the thorax and abdomen), arms and hands, legs and feet.

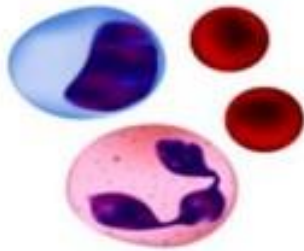
CELLS

Cells are the basic units of structure and function in the human body, as they are in all living things. Each cell carries out basic life processes that allow the body to survive.

Many human cells are specialized in form and function, as shown in the figure below.

Each type of cell in the figure plays a specific role. For example, nerve cells have long projections that help them carry electrical messages to other cells. Muscle cells have many mitochondria that provide the energy they need to move the body

EXAMPLES OF CELLS TYPE



Blood cells



Surface skin cells



Bone cell



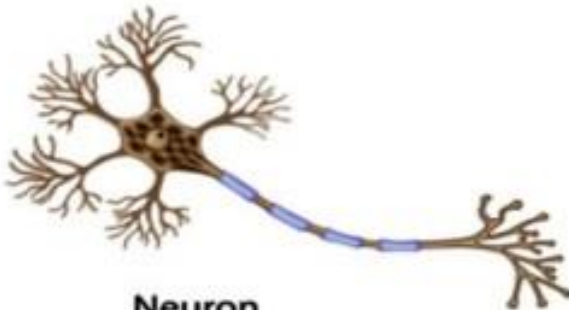
Columnar epithelial and Goblet cells



Cardiac muscle cell



Skeletal muscle cells



Neuron



Smooth muscle cells

TISSUES

After the cell, the tissue is the next level of organization in the human body.

A tissue is a group of connected cells that have a similar function.

There are four basic types of human tissues: epithelial, muscle, nervous, and connective tissues. These four tissue types make up all the organs of the human body.

- **Connective tissue is made up of cells that form the body's structure. Examples include bone and cartilage**

- **Epithelial tissue** is made up of cells that line inner and outer body surfaces, such as the skin and the lining of the digestive tract.

Epithelial tissue protects the body and its internal organs, secretes substances such as hormones, and absorbs substances such as nutrients.

- **Muscular tissue** is made up of cells that have the unique ability to contract or become shorter. Muscles attached to bones enable the body to move.

- **Nervous tissue** is made up of neurons (or nerve cells) that carry electrical messages

ORGANS AND ORGAN SYSTEMS

After tissues, organs are the next level of organization of the human body. **An organ is a structure that consists of two or more types of tissues that work together to do the same job.** Examples of human organs include the brain, heart, lungs, skin, and kidneys

An organ system is a group of organs that work together to carry out a complex overall function.
Each organ of the system does part of the larger job.

Human Organ System



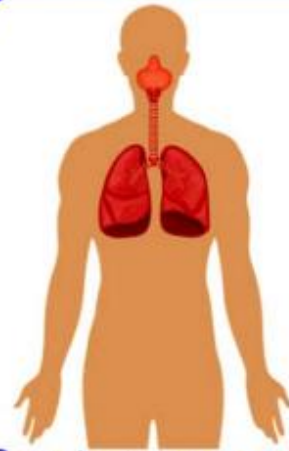
Skeletal system
provides structure to the body and protects internal organs



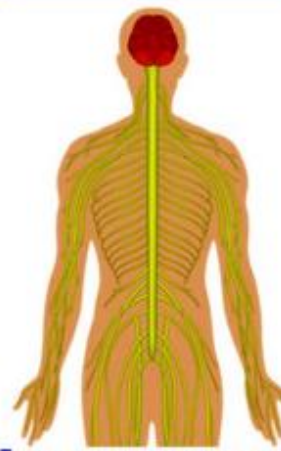
Muscular system
supports the body and allows it to move



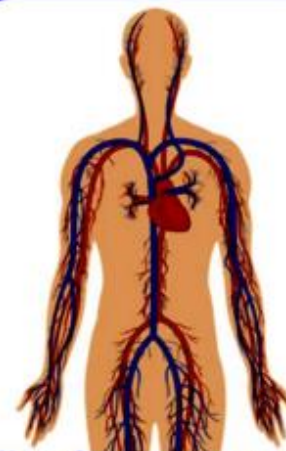
Digestive system
breaks down food and absorbs its nutrients



Respiratory system
takes in oxygen and releases waste gases



Nervous system
controls sensation, thought, movement, and virtually all other body activities



Circulatory system
transports oxygen, nutrients, and other substances to cells and carries away wastes

DEVELOPMENT

Development of the human body is the process of growth to maturity.

The process begins with fertilization, where an egg released from the ovary of a female is penetrated by sperm.

The egg then lodges in the uterus, where an embryo and later fetus develop until birth.

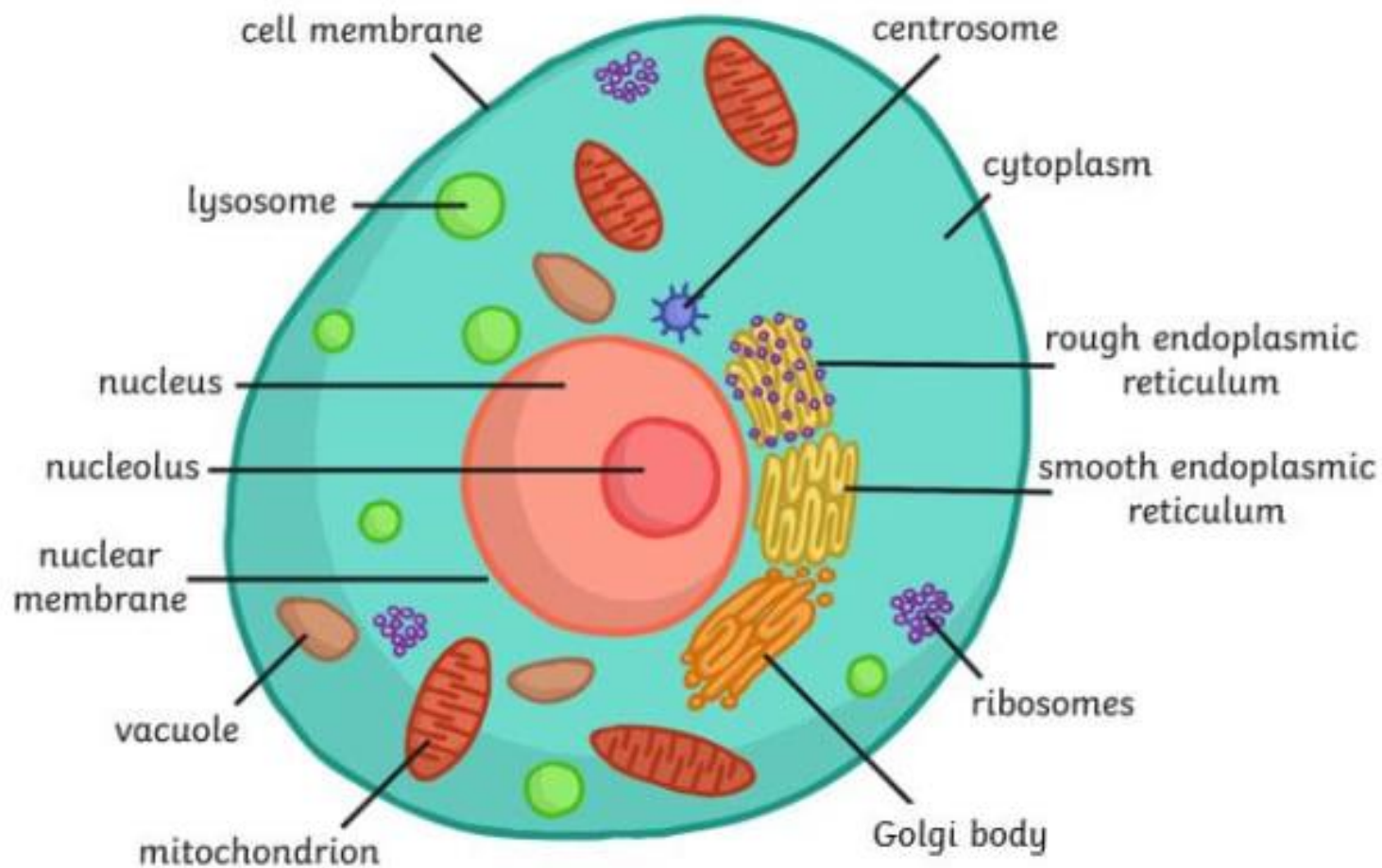
Growth and development occur after birth, and include both physical and psychological development, influenced by genetic, hormonal, environmental and other factors. Development and growth continue throughout life, through childhood, adolescence, and through adulthood to senility (ageing).

THE CELL

Introduction to Human Cells

Definition: Cells are the basic structural, functional, and biological units of all living organisms.

Importance: Cells are the building blocks of the human body, performing various functions essential for life.



STRUCTURE OF A HUMAN CELL

1- Plasma Membrane : Semi-permeable barrier made of a phospholipid bilayer.

Functions: Protection, communication, and selective transport of substances.

2- Cytoplasm Contains:

- 1. Cytosol:** Gel-like matrix where cellular processes occur.
- 2. Organelles:** Specialized structures performing distinct tasks

STRUCTURE OF A HUMAN CELL

3 -Nucleus: Houses DNA, the genetic material.
Controls cell activities through gene expression.

Nucleus consist of

- 1. Nuclear Envelope:** Double membrane with pores for RNA and protein transport.
- 2. Nucleolus:** Produces ribosomes.
- 3. Chromatin:** DNA + proteins (histones) that condense into chromosomes during cell division.

ORGANELLES:

4- Organelles:

1- Mitochondria: Powerhouse of the cell, site of ATP production.

Characterized by

- 1. Double-membraned.**
- 2. Contains its own DNA.**
- 3. Produces ATP via oxidative phosphorylation.**

ORGANELLES

2- Endoplasmic Reticulum (ER):

- Rough ER: Studded with ribosomes; synthesizes proteins.
- Smooth ER: Synthesizes lipids and detoxifies toxins.

3-Golgi Apparatus:

function

- 1. Modifies proteins and lipids from the ER.**
- 2. Packages them into vesicles for transport.**

ORGANELLES

4- Lysosomes: Contain enzymes for breaking down waste.

5- Ribosomes: Sites of protein synthesis.

6- Cytoskeleton: Provides structural support and aids in movement.

7- Centrioles: Important for cell division.

TYPES OF HUMAN CELLS

Human cells can be grouped into the following broad categories based on their function:

- 1. Epithelial Cells**
- 2. Connective Tissue Cells**
- 3. Muscle Cells**
- 4. Nerve Cells**
- 5. Blood Cells**

EPITHELIAL CELLS:

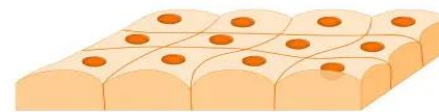
Epithelial Cells:

- Line surfaces of organs and skin.

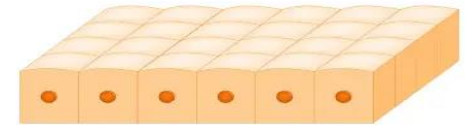
Functions:

1. Protection
 2. secretion,
 3. absorption.
- Example: Skin cells, intestinal lining cells.

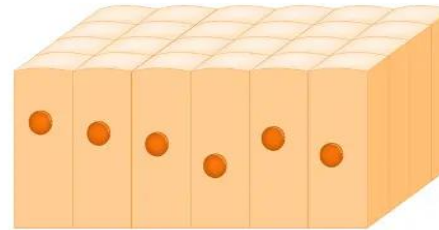
EPITHELIAL CELLS



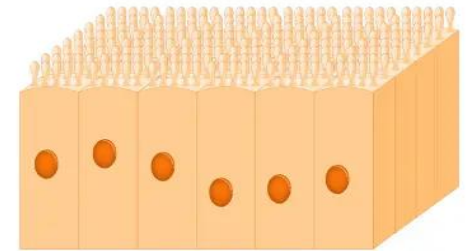
Simple squamous



Simple cuboidal



Simple columnar



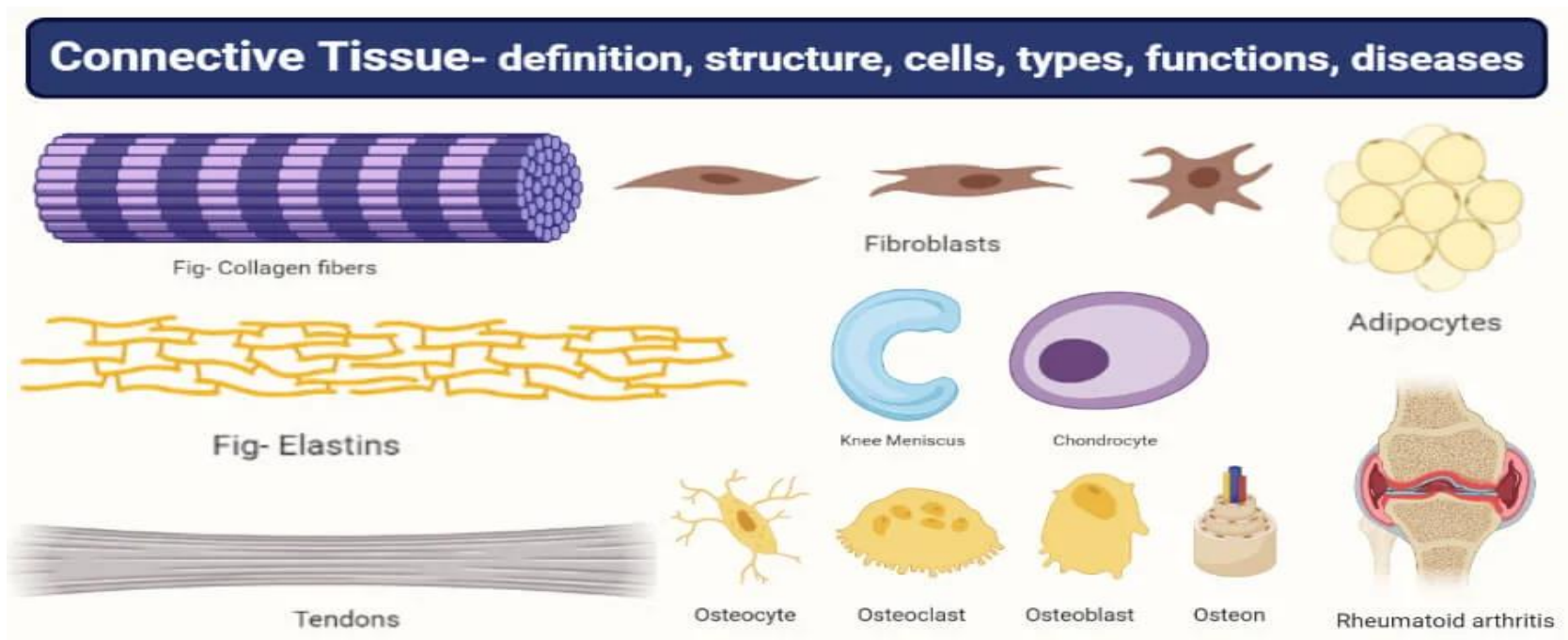
Ciliated columnar

CONNECTIVE TISSUE CELLS:

Connective Tissue Cells:

Provide structural support and connect tissues.

Examples: Bone cells (osteocytes), fat cells (adipocytes).



MUSCLE CELLS:-

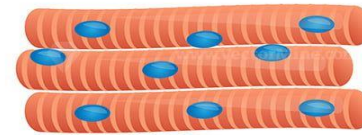
TYPES OF MUSCLE CELLS

Muscle Cells:-

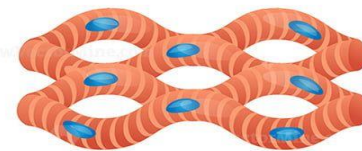
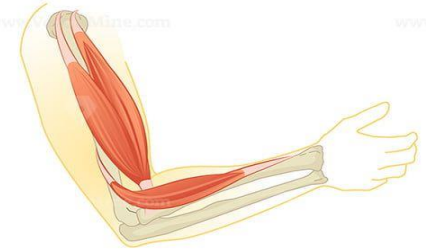
Specialized for contraction and movement.

Types:

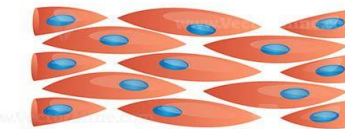
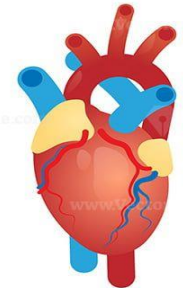
1. **Skeletal muscle** cells: Voluntary movement.
2. **Cardiac muscle cells**: Found in the heart, involuntary.
3. **Smooth muscle cells**: Involuntary movements in organs like the stomach.



Skeletal Muscle



Cardiac Muscle



Smooth Muscle



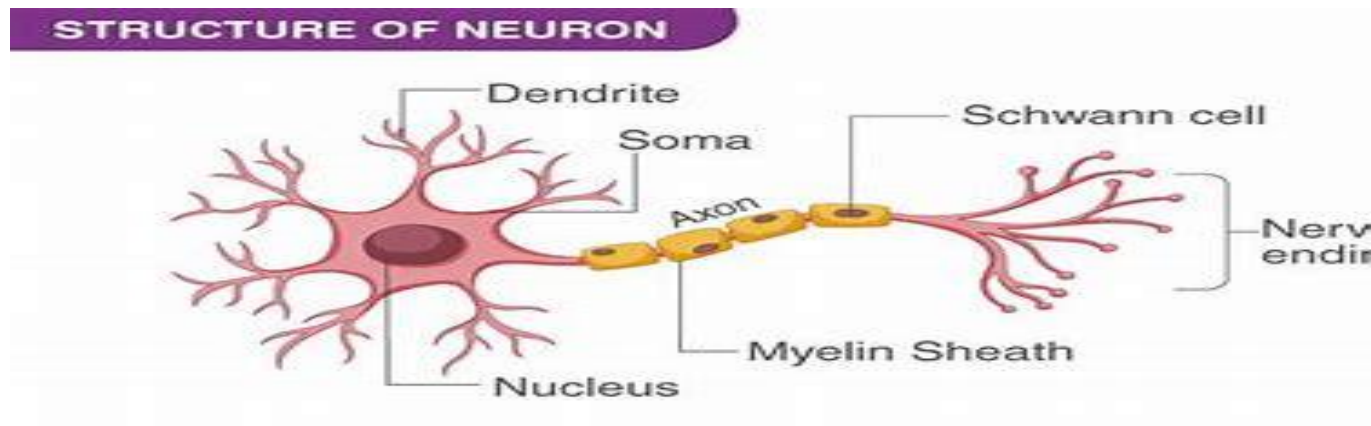
NERVE CELLS (NEURONS)

Nerve Cells (Neurons):

Transmit electrical signals throughout the body.

Components:

- Dendrites: Receive signals.
- Axon: Sends signals.
- Synapse: Connection point between neurons.



BLOOD CELLS:

Blood Cells:

Red blood cells (RBCs): Transport oxygen using hemoglobin.

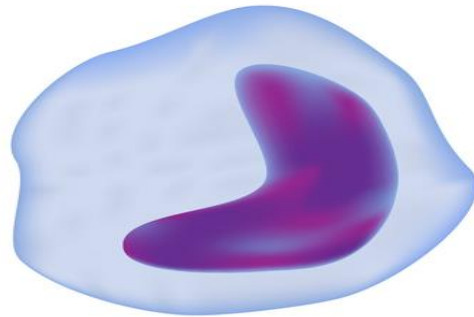
White blood cells (WBCs): Fight infections.

Platelets: Help in blood clotting

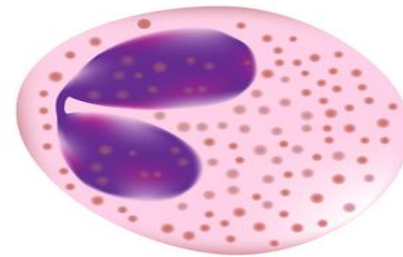
BLOOD CELL TYPES



Erythrocytes



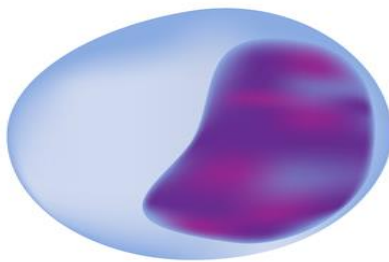
Monocyte



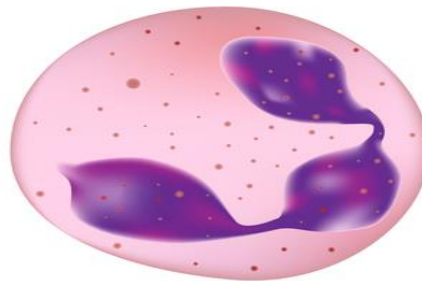
Eosinophil



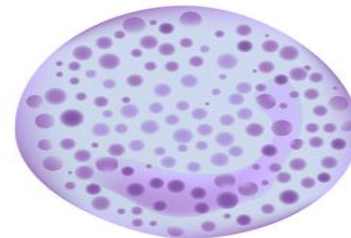
Platelets



Lymphocyte



Neutrophil



Basophil

SUMMARY

- 1. Biology Is the science that studies the life from all its aspects**
- 2. Cells :-smallest independently functioning unit of all organism**
- 3. Tissue group of similar or closely related cells that act together to perform a specific function**
- 4. Organ :-functionally distinct structure composed of two or more types of tissues**
- 5. organ system :-group of organs that work together to carry out a particular function**

Thank you
Any questions