

# Lecture 2

## "Body Structures"

levels of organization [cell → tissue → organ → system → organism].

Large group of specialized cells

[that perform the same role]

TISSUES [e.g. muscle, blood, bone]

Group of tissues

Cellular level

Tissue level

Organ level

System level

ORGANS [e.g. brain, heart, liver]

[ORGANS + TISSUES] integrated into

Body systems

eg. central nervous system, digestive system.

## The Cell Organelles

Nucleus	Mitochondria	Ribosomes & endoplasmic reticulum	The Golgi apparatus	Lysosomes
<p>Function:-</p> <p>1- stores (DNA) deoxyribonucleic acid [genetic materials]</p> <p>2- responsible for cellular reproduction or division.</p>	<p>Function:-</p> <p>- Production of adenosine triphosphate [ATP] the high energy molecule that fuels cellular activity.</p>	<p>Function:-</p> <p>- Synthesis of proteins and metabolism of fat within the cell.</p>	<p>Function:-</p> <p>- Holds enzyme systems that assist in completing the cellular metabolic functions.</p>	<p>Function:-</p> <p>- Contain enzymes that allow cytoplasmic digestion.</p>

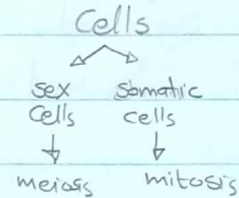
\* **Nucleus** :- derived from Latin word (nucleus) which means [kernel (i.e. core or seed)].

\* **Mitochondria** :- the cell's power plant [power house]

Cell division and reproduction ~

✓ Cells reproduce to replace cells that are lost by wear and tear.

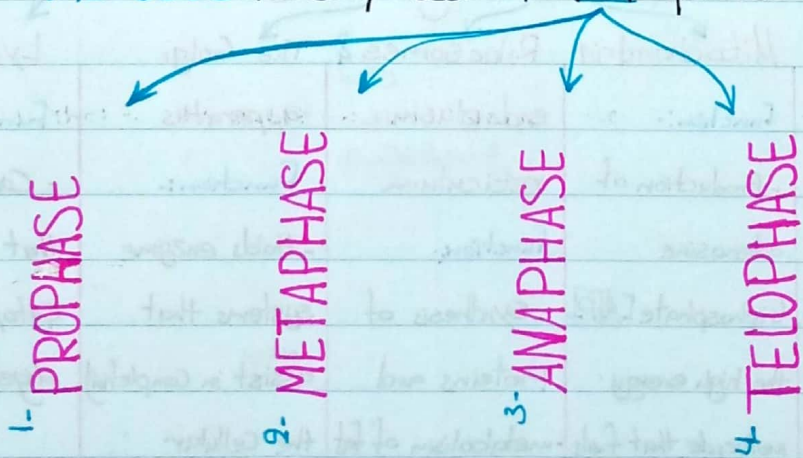
✓ Cells reproduce by splitting into two separate daughter cells by [mitosis].



✓ Before getting into mitosis, the cellular mass double and chromatin begins to form.

**Mitosis**  
↳ mitos (Greek) means thread  
Suffix = osis means action or state.

**MITOSIS** is composed of four phases



## 1. PROPHASE

- chromosomes coil and shorten
- nuclear membrane dissolve
- chromatids and centromeres appear

↳ binding between two chromatids.

## 2. METAPHASE

- Centromeres divide and align themselves in the middle of the spindle.

## 3. ANAPHASE

- Centromere <sup>انقسمت</sup> separate - pull chromosomes toward opposite sides of the cell - 46 chromosomes are present on each side of the cell.

## 4. TELOPHASE

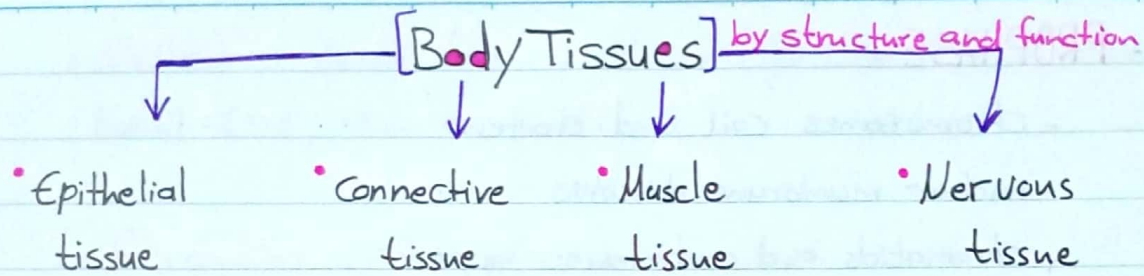
- Spindle fibers <sup>تختفي</sup> disappear.
  - Cytoplasm divides.
  - an new membrane forms around each set of 46 chromosomes.
- note: Telo- (greek) means <sup>النهائية</sup> ultimate end.

• MEIOSIS only occurs in gametes [ova & spermatozoa].

- the number of chromosomes in the four daughter cells is reduce to half [i.g. 23 chromosomes].

- consists of two divisions separated by a resting phase.

note: meiosis (greek, meaning <sup>التقليل</sup> lessening).



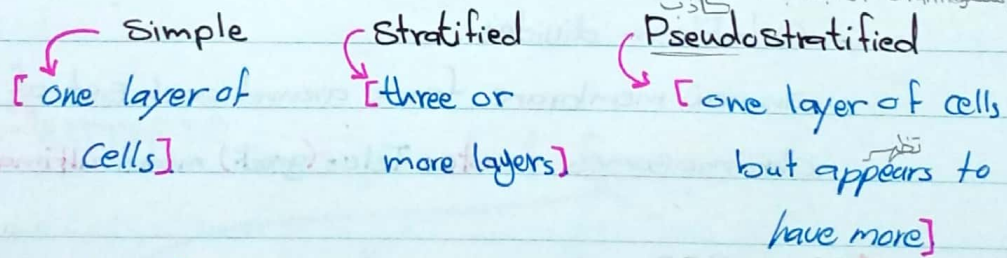
• ~~Epithelial tissue~~

Epithelium [continuous cellular sheet], "covers the body's surface, 2. lines body organs, 3. forms certain glands."

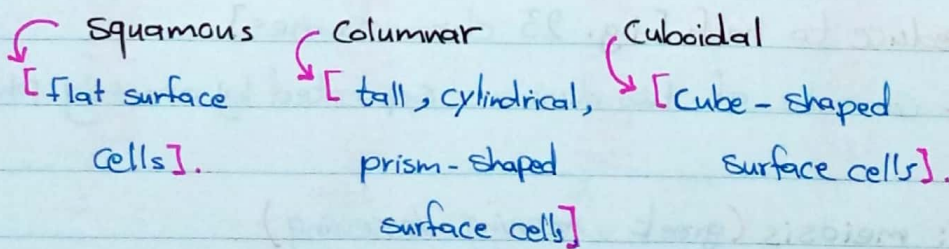
■ Endothelium single layer of squamous cells attached to basement membrane. [e.g. blood vessels].

■ Mesothelium lines the surface of serous membranes, such as [pleura, Pericardium, and Peritoneum].

• Epithelial [recognized by number of layers]



• Epithelial [classified by shape]



• Connective tissue [متصلب] <sup>Connective</sup>

Includes bone, cartilage, and dipose (fatty) tissue.

[bonds together and support structure]

LOOSE connective tissue

DENSE connective tissue

• has large spaces that separate the fibers and cells with much intercellular fluid.

• has greater fiber concentration  
• provides structural support.

**NOTE** :- specialized type of loose connective tissue?! **Adipose** tissue [cushions internal organs and acts as a reserve supply of energy].

• Muscle tissue

1- skeletal muscle tissue [striated and voluntary].

2- Cardiac muscle tissue [striated and involuntary].

3- Smooth muscle tissue [non-striated and involuntary].

\* Lines the wall of many internal organs and other structures such as walls of arteries and veins.

**Striated** ⇒ repeating units of [sarcomere].

• Nervous tissue

[reactive tissue], [function: communication], [Nervous tissue cells may be Neurons or Neuroglia].

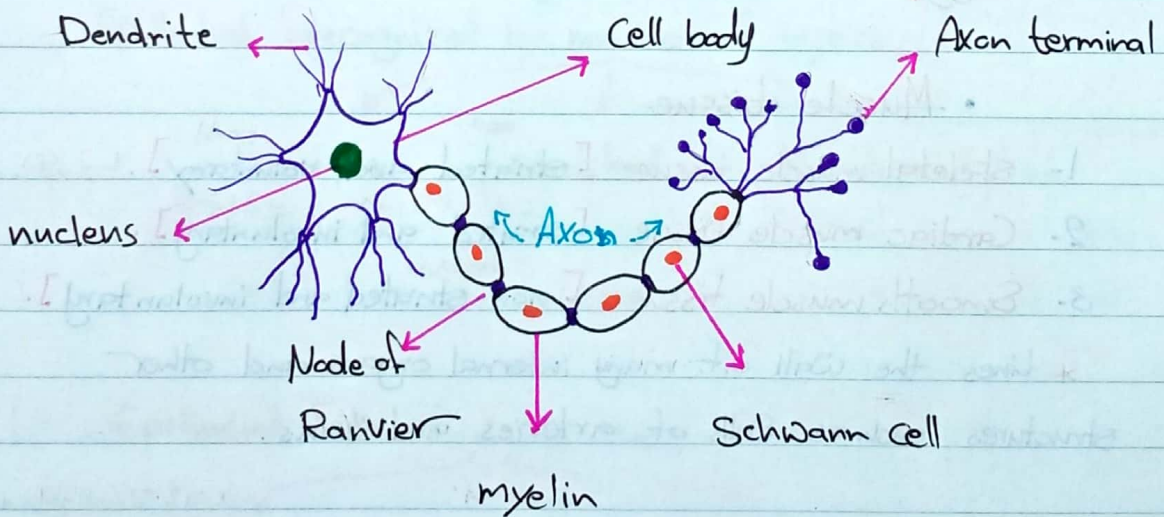
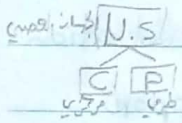
خلايا وظيفتها دعم ما هي تسمى

~ Neurons ~

- cell body
- Axons
- Dendrites

~ Neuroglia ~

- form the support structure of nervous tissue.
- found only in the central nervous system. brain spinal cord
- insulate and protect neurons.



## Body organs and systems

A body system :- Composed of varying numbers of organs and accessory structures that have similar or related functions.

- 1- The hemopoietic and immune system. <sup>الدموي المناعي</sup>
- 2- The nervous system and special senses.
- 3- The genitourinary system. <sup>الجهاز البولي التناسلي</sup>
- 4- The gastrointestinal system. <sup>الهضمي</sup>
- 5- The cardiovascular system. <sup>القلبي الوعائي</sup>
- 6- The respiratory system. <sup>التنفس</sup>
- 7- The endocrine system. <sup>الغدد الصماء</sup>
- 8- The musculoskeletal system. <sup>العضلي الهيكلي</sup>
- 9- The integumentary system [skin, hair, nails, and sweat glands] • Protects the body • helps regulate body tem.

note :- 1- the suffix [-Poesis] = to make.

2- Integumentum in Latin means [to cover].

## Directional terms

- Superior :- above • Inferior :- below
- Anterior :- in front [Ventral]. • Posterior :- in back [Dorsal].
- Medial :- toward the center • Lateral :- away from the midline.
- Proximal :- nearest to • Distal :- a point farthest from point of origin.
- Superficial :- a point nearest the body surface.
- Deep :- away from the surface.
- Inversion :- in ward / inside out • Eversion :- outward

• Parietal :- Pertaining to the outer wall of the body cavity.

• Visceral :- Pertaining to the viscera, or internal organs, especially the abdominal organs.

## Body Plans and Sections

Sagittal Plane

• It runs lengthwise from [front to back] and divides the body into [right and left] sides, each containing an arm and a leg.

frontal Plane

• It runs lengthwise from side to side, dividing the body into [ventral and dorsal] (front and back) sections.

Transverse Plane

• horizontal Plane cuts the body into [upper and lower] parts. [Cranial (head)] [Caudal (tail)] Parts.

## [Body cavities]

Ventral cavity

<sup>(chest)</sup> Thoracic cavity

Pleural cavities

mediastinum cavity.

Pelvic cavity

Abdominopelvic

Abdominal cavity.

Dorsal cavity

Cranial cavity

Spinal cavity



✓ What is the difference between [a region] and [quadrant]?!  
 [The quadrants] of the abdomen are used primarily to identify topographical sites.

The abdominopelvic [regions] are used mainly to identify the location of underlying body structures and visceral organs.

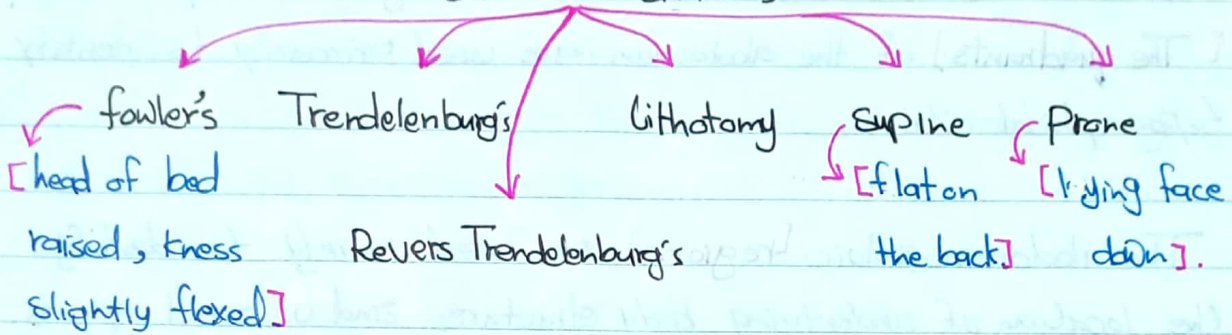
Right upper quadrant	Left upper quadrant	Right hypochondriac region	Epigastric region	Left hypochondriac region
Right lower quadrant	Left lower quadrant	Right lumbar region	Umbilical region	Left lumbar region
		Right inguinal (iliac) region	Hypogastric region	Left inguinal (iliac) region

### ~ Anatomical Position ~

Anatomical position :- body posture used to locate anatomical parts in relation to each other.

- 1- the body is erect.
2. the eyes are looking forward.
- 3- the upper limbs hang to the sides, with the palms facing forward.
- 4- the lower limbs are parallel, with toes pointing straight ahead.

## Other Positions ~



• Trendelenburg's Position :- lying flat with the head lower than the body or legs.

• Reverse Trendelenburg's Position :- lying flat with the head higher than the body or legs.

• Lithotomy Position :- lying on the back with the hips and knees flexed and the thighs abducted and externally rotated.