

TISSUE LEVEL OF ORGANISATION

CHAPTER - 3RD **UNIT - 1ST**

Classification of Tissue

Tissues are classified into four major types based on their structure and functions.

Syllabus:

Classification of tissue, structure location and functions of epithelial, muscular, Nervous and connective tissue.

Tissue:

It is a group of some cells which have similar structure and functions.

each tissue carries out a unique functions in body.

They are only found in multicellular organism.

Histology → It is the branch of science that

deals with the study of tissue.

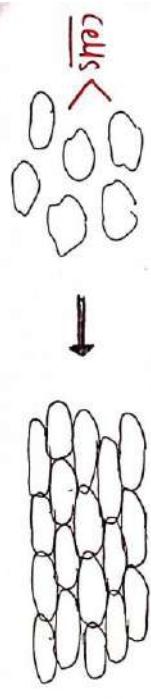
functions:

① Epithelial tissue - provides covering and protection to the body.

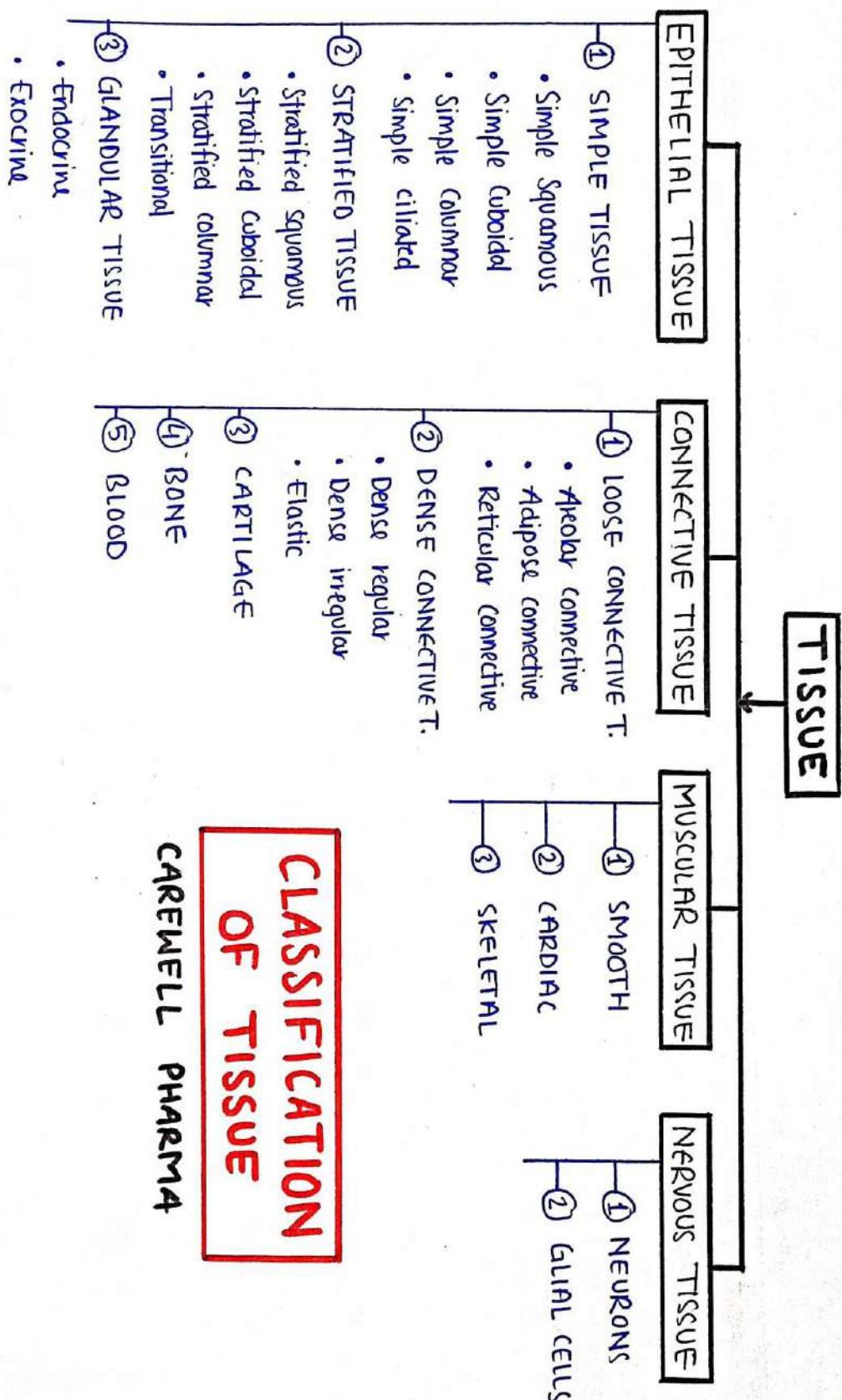
② Connective tissue - provides structural framework to the body.

③ Muscular tissue - provides movement to body.

④ Nervous tissue - responsible for coordination and communication.



organs. ④ heart, kidney, lungs etc..

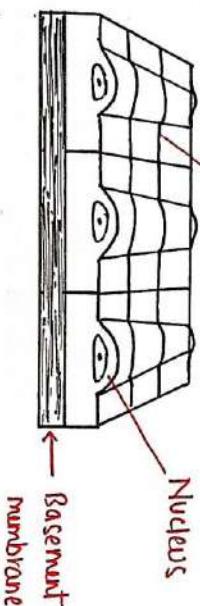


1. EPITHELIAL TISSUES

Also known as 'vascular tissue' or 'Epithelium'.

- These are those tissue which are made up of closely packed cells and form continuous sheet.
- They contain minimal extracellular space but they are arranged on basement membrane which is made up by thin sheet of connective tissue.
- They mainly form outer covering of skin/ body and internal organs like kidney, lungs, glands etc.

flat scale-like cells



• fig. Simple Squamous Epithelial tissue

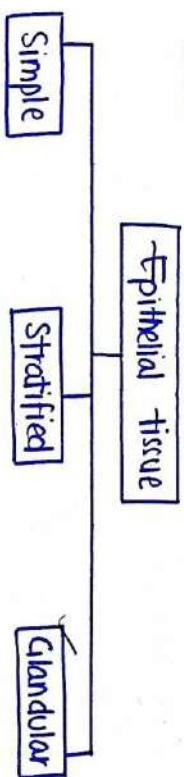
FUNCTIONS :-

- They provide covering to our body and various internal organs.
- They provide protection to our body from mechanical injury, harmful chemicals, loss of water.
- They helps in secretion of various hormones and chemicals through glands.
- They helps in absorption of nutrients from food.
- They also helps in excretion of waste products.

CLASSIFICATION :-

They are classified on the basis of their

structure:



- Simple squamous
- Simple cuboidal
- Simple columnar
- Simple ciliated
- Transitional
- Stratified squamous
- Stratified cuboidal
- Stratified columnar
- Endocrine
- Exocrine

i) SIMPLE EPITHELIAL TISSUE

These are those tissue which are made up with single layer of cells.

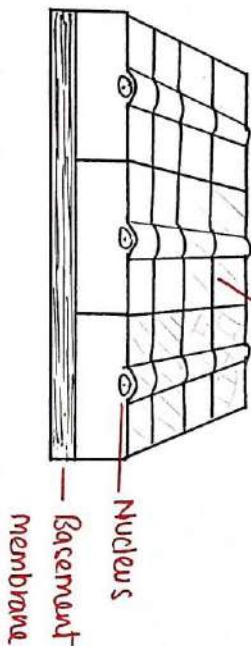
i) Simple Squamous epithelium

It is made up of only a single layer of flat, scale like cells.

The nucleus of each cell is oval / spherical.

• Location - Heart, blood vessels, Lymphatic vessels, Airsacs of lungs, lining of kidney.

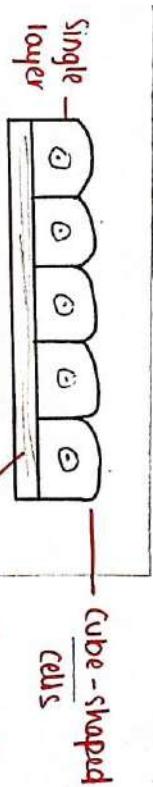
• functions - Blood filtration in kidney, Diffusion of O_2 to blood vessels, exchange of gases [O_2/cO_2], secreting substances.



ii) Simple Cuboidal Epithelium

It is made up of a single layer of cube shape cells, that rest on a basement membrane.

• location - Surface of ovary liner, kidney tubules, thyroid glands, duct of many glands



• functions - provide mechanical support, secretion and excretion.

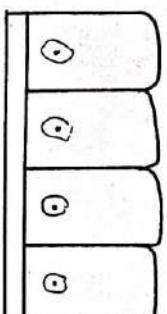
iii) Simple columnar Epithelium

It is made up of single layer of rectangular cells arranged on basement membrane

If contain goblet cells, cilia and microvilli.

• Location - lining of stomach, intestine, uterus, uterine tubes and some parts of respiratory tract.

SIMPLE COLUMNAR



— Rectangular cells
— Basement membrane

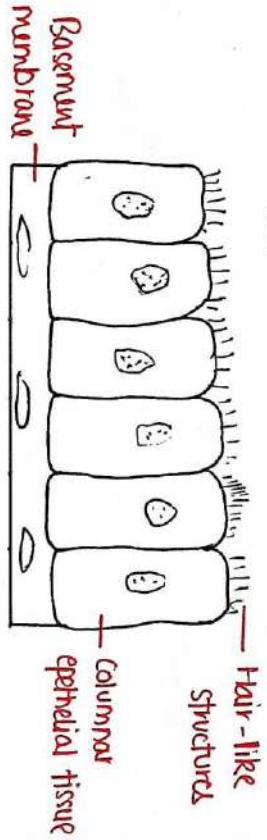
- functions — secretion and absorption

excretion and protection

iv) Simple Ciliated epithelium

Also known as pseudostratified columnar epithelium. It is made up of only a single layer and have irregularly shaped columnar cells.

- location — few portion of upper respiratory tract, ventricles of the brain, spinal cord.



• functions — protection and secretion, moves mucus and other substances by ciliary action.

(2) STRATIFIED EPITHELIAL TISSUE

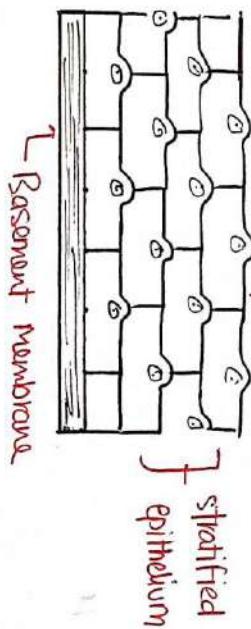
These are those tissue in which cells are arranged in multiple layers. i.e. one over another.

i) Stratified squamous epithelium

It is made up of multiple layers of flattened squamous cells.

- location — skin, oesophagus, pharynx, lining of mouth, tongue, vagina

/ flat scale-like cells



- It is of two types:

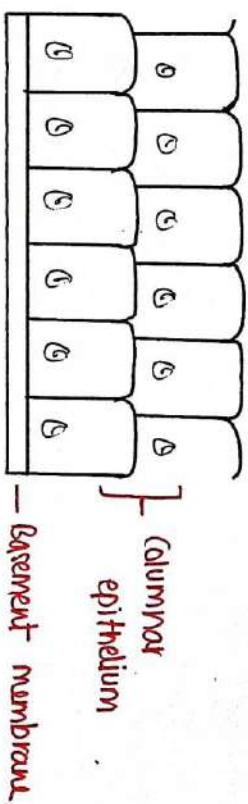
Keratinised - contain keratin fibres, provides protective qualities to the skin.

Non-keratinised - It remains moist, such as vagina, mouth and oesophagus.

iii) Stratified Columnar Epithelium

It is made up of multiple layers of rectangular shaped cells.

• Location - Urethra, oesophageal gland, mucus membrane, lining of eyelids



iv) Transitional Epithelium

It is presented at the sites which are subjected to changes in stress and tension.

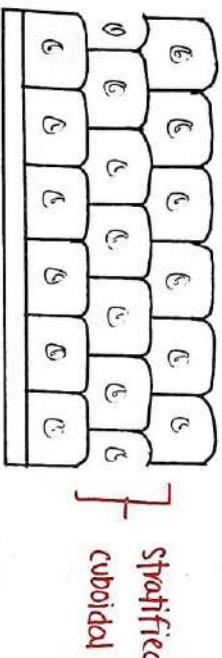
• Location - urinary bladders, their lining.



• Functions - provide contraction.

• Functions - walls of urinary bladders.

← Basement membrane



ii) Stratified Cuboidal Epithelium

It is made up of two or more layers of cube shaped cells.

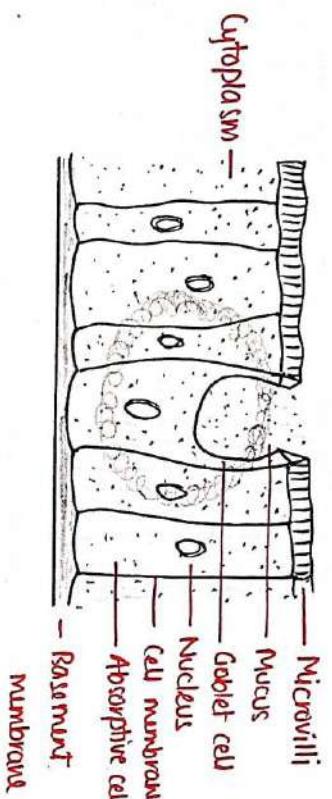
• Location - sweat gland, salivary glands and mammary glands.

• Functions - protection, secretion of saliva, sweat, and milk.

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③. GLANDULAR EPITHELIUM

- These are those tissue which are used for their secretion action, in which they excrete various hormones and chemicals.
- They secrete into ducts, surface of the body, or directly into the blood.



ii) Exocrine glands

These are those glands / tissue that discharge their secretory products (enzymes, sweat) into ducts, which further reach into its target sites.(organs)

④ secretion of saliva from salivary glands into mouth via salivary duct.

i) Endocrine glands

These are those tissue that discharge their secretory products (mostly hormones) directly into the blood via ductless glands.

⑤ Pituitary gland, thyroid and adrenal glands.

2. CONNECTIVE TISSUE

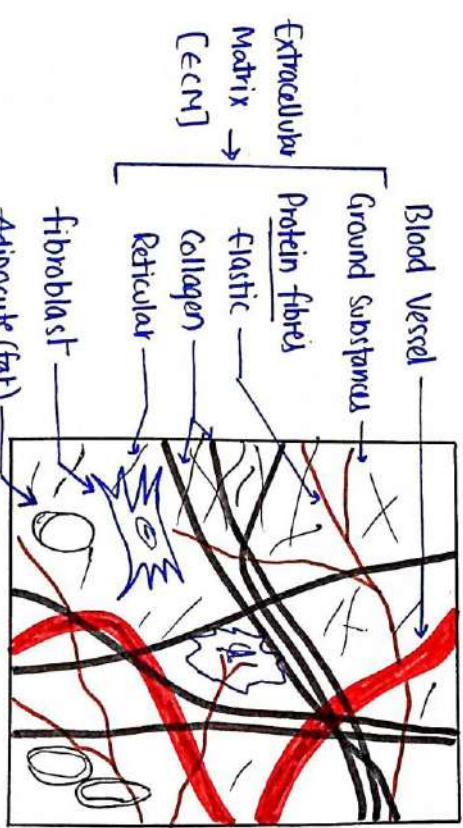
These are those tissue which connects or bind different organs or different parts of an organs.

- It is the most diverse and widespread tissue in the human body, found in almost every organ of the body.
- It arises from the mesoderm layer of embryonic [stem cell tissue].

Connective tissue is composed of large amount of extracellular matrix (ECM), limited number of cells, fluids and number of fibres. These all collectively known as ground substances.

- They comprise of cells i.e. plasma cells, WBC, mast cells, adipocytes (fat cells), macrophages, fibroblast

- Contain fibres:
 - Collagenous fibres are tough and strong
 - Elastic fibres are elastic and extensible in nature (Branches... elasticity)
 - Reticular fibres are delicate / fragile in nature, provide support.
- Connective tissue present in the form of soft, gel-like to firm, flexible and hard type.



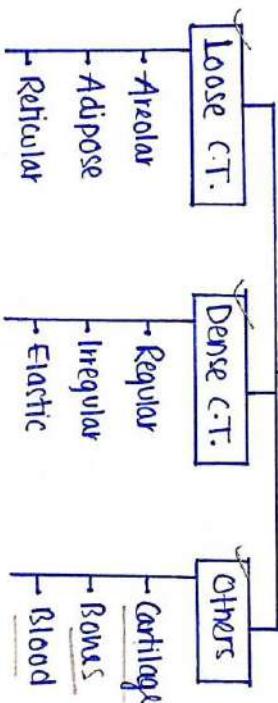
- Diagram of connective Tissue

• FUNCTIONS:

- It connects different tissue of body.
- muscles are connected with bones by tendon.
- It supports various tissue, organs and structures of the body.
- Blood helps in transportation of O₂ and nutrients, and also provide defence system for body.
- It work as structural framework of body.

• TYPES OF CONNECTIVE TISSUE:

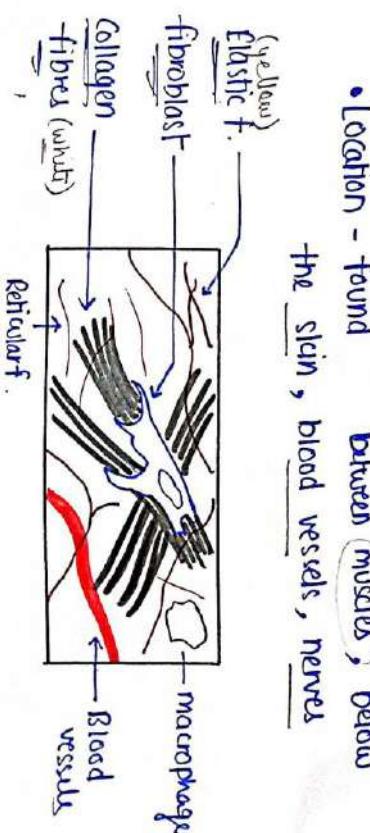
Connective tissue



• Areolar Connective Tissue: → strength, connectivity

If connects the skin to the underlying structures.
It works same as loose connective.

• Location - found between muscles, below the skin, blood vessels, nerves



① Loose connective tissue :-

These are those tissue in which cells are loosely arranged with fibres or ground substances in matrix.

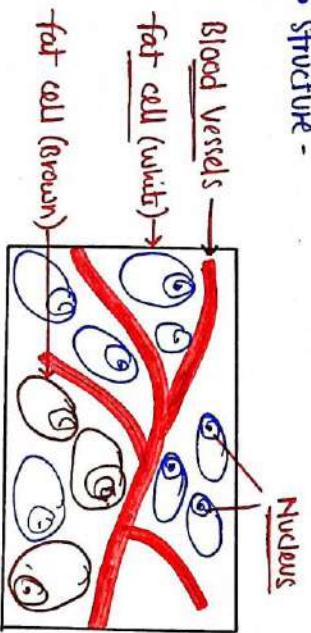
It is well vascularized and provides blood supply to nearby epithelial tissue.

It is one of the most widely distributed tissue which connects several body structure by acting as elastic glue which allow movement.

• Adipose connective tissue:

- It contains adipocytes (fat cells), which store energy (glucose) for the body.
- Location - under the skin, b/w internal organs, bone marrow

• Structure -



- functions - store energy in the form of fat,
- support and protection, Brown fat produces heat generation.

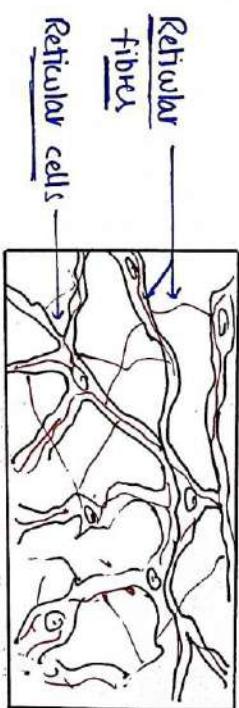
• Reticular tissue:

The term reticular means 'like a net'.

The reticular network is formed by thin, branched reticular fibers.

• Location - found in spleen, lymph nodes, and bone marrow.

- functions - provide protection and helps in the production of blood cells.



(2) Dense connective tissue / Dense fibrous:

These are those tissues which are densely packed and form rope like structure. They mainly contain fibrocytes, fewer fibroblast cells, and fibres in large amounts.

• Dense (Regular) Tissue:

In this, collagen fibres are arranged in regularly (random).

It is arranged in the form of thick

mar like strong connective tissue.

(Eq) Dermis layer of skin, outer covering of

organs such as kidney, spleen etc..

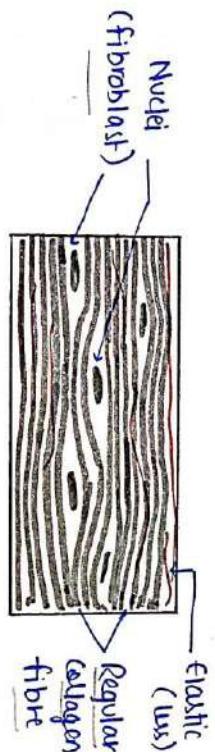


• Dense regular tissue:

In this, collagen fibres are arranged in parallel, regular.

they provide strong attachment, flexibility.

(Eq) It is present in tendons (attach muscles to bone) and ligaments (attach bone to bone).



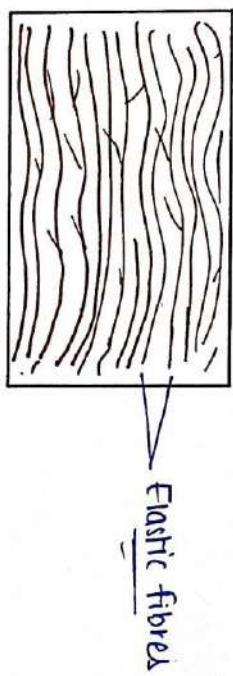
• Elastic Dense Tissue:

In this, elastic fibres are arranged parallel to each other.

It provides elasticity with strength.

(Eq) Trachea, bronchi, lungs and ligaments

Arterial walls are also made up of elastic fibrous tissue.



③ Cartilage :-

It is strong, flexible connective tissue.

It contain only one type of cell i.e. chondrocyte which produces the fibre and the tough, rubbery ground substance of cartilage - It protects joints and bones.

- It is present at the end of bones and helps in the formation of bones.

- It is of three types :-

i) Hyaline cartilage tissue - It forms the

covering of ends of bones and it

found in rings of trachea.

ii) fibro cartilage tissue - The strongest and

most durable tissue, It forms

intervertebral disc of vertebral column.

It also present in knee joint and

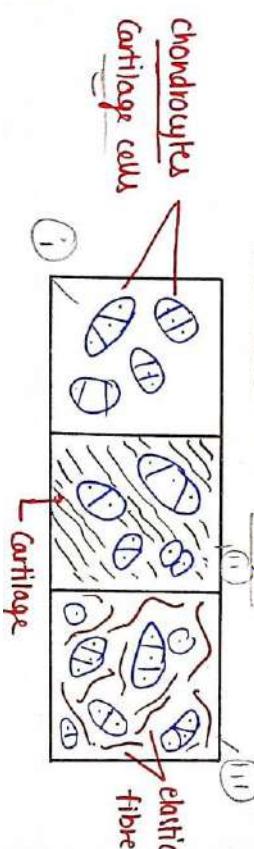
work as shock absorber.

iii) Elastic cartilage tissue - It contain less amount

of collagen fibre and large elastic fibres,

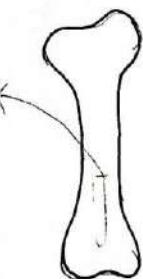
which provides flexibility. It present in

external ear and larynx.



(4) Bone : (osseous tissue)

It is the hard connective tissue, that contain a high concentration of salts like calcium phosphate and calcium carbonate (mineral). It also consists of collagen fibres. It present in arms, legs, ribs etc..



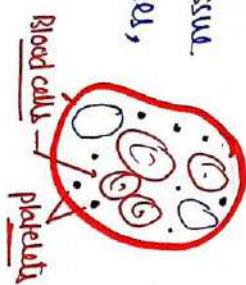
(5) Blood :

It is liquid connective tissue which are formed in the bone marrow and other tissue.

- It is composed of plasma and cells

- Blood cells are - RBCs (Red blood cells), WBCs (White blood cells), platelets.

- Helps in connect different tissue.
- helps in transportation of gases, nutrients, drugs etc..
- body defence system.



3. MUSCULAR TISSUE

These are those tissue which is made up from muscle fibres and helps in the movement of body.

- The main functions of this tissue is contraction and relaxation, which helps in movement.

• FUNCTIONS:

- They allow movement of bones and joints.
- Helps in the production of a large amount of heat.
- It maintain body posture.
- It forms protective layer around organs.
- It play a major role in pumping of blood by the heart, peristaltic movement of stomach, movement of food in GIT etc..
- It helps to express feeling.

• TYPES OF MUSCULAR TISSUE:

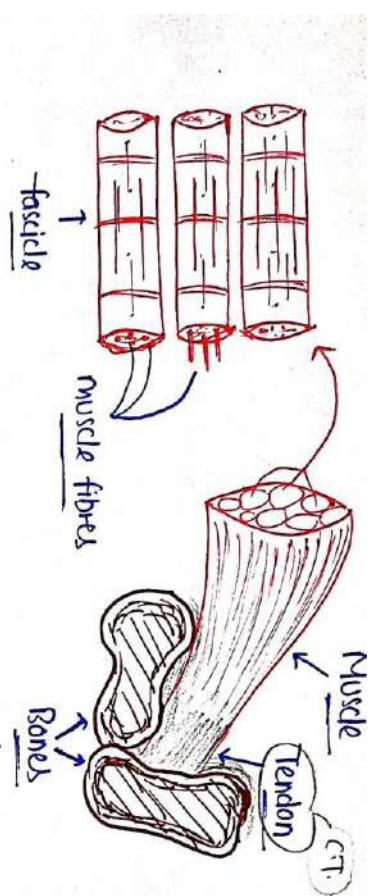
Based on the location, muscular tissue divided into three parts :-

- Skeletal muscles
- Smooth muscles
- Cardiac muscles

(i) skeletal Muscles:

These are those muscles which are attached to the bones and helps in the movement of bones and joints.

- These are cylindrical shaped, multinucleated cells having a group of muscle fibrils.
- Also known as striated as they contain strips.
- These are voluntary in nature which is controlled by somatic Nervous system.
- It comprises 40% of body mass.



(ii) Smooth Muscles:

These muscles are thin and spindle shape. They consists of actin (thin) and myosin (thick) filaments sliding over each other and provide contraction → Blood vessels, GI Tract, stomach, urinary bladder

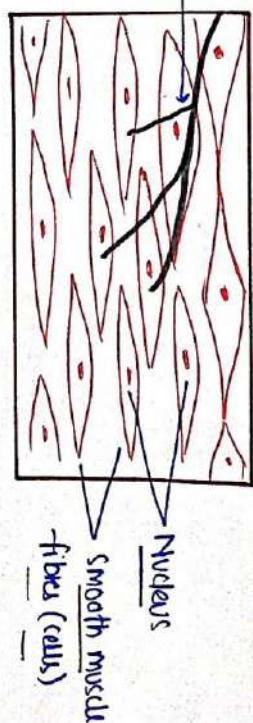
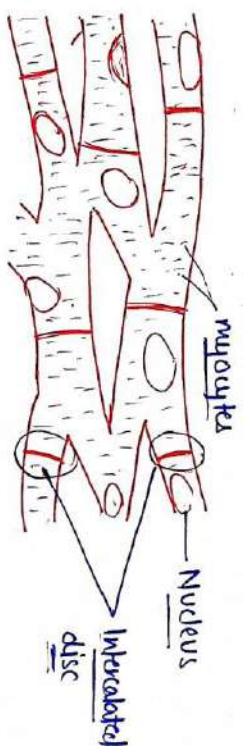
- they are unstriated muscle fibres, having a single nuclei.
- Involuntary in nature and are controlled by autonomic Nervous system.

(iii) Cardiac Muscles:

These are those muscles which are found in heart

- It consist of branched striated fibres with one or two centrally located nuclei

They have involuntary control which have automatic and rhythmic contraction of muscles.



- functions :- pump blood to all part of the body, helps in generating contraction, work as protective layer for heart.

4. NERVOUS TISSUE

These are those which are found in the brain, spinal cord and nerves and are responsible for coordinating and controlling many body activities.

- The main function of nervous tissue is to receive information from stimuli, analyze with brain/spinal cord and send response.

• FUNCTIONS:

- Responsible for coordination and communications.
- Regulate and controls body functions.
- send and receive impulses (information).
- stimulates muscle contraction
- play major role in emotions, memory.

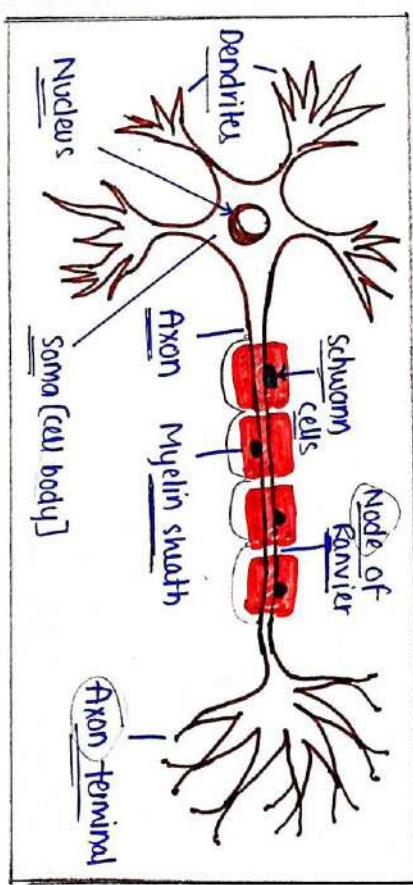
• TYPES:

It consists of two types of cells

- ① Neurons / Nerve cells
- ② Cilial cells / Neuroglia cells.

① Neurons / Nerve cells:

It is the structural and functional unit of Nervous tissue. It is responsible for all the functions provided by Nervous tissue



It contains various parts:

- cell body → main body contain nucleus + dendrites.
- Dendrites → Branches, receive signals + pass.

- Axon → passes signal
- Myelin sheath → jump the message / fast.
- Axon terminal → end part, transmit signal.

Unit 1 completed

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(ii) Neuroglia / Glial cells:

These are supporting cells which provides connects, support and regulate the functioning of neurons.

It is of three types -

- Astrocytes - regulates the functions and protection
- Microglia - destroy pathogens
- Oligodendrocytes - enhance conduction speed.

