TISSUES

a group of cells having similar origin working together to achieve a particular function is called a tissue.
provides defined structure, mechanical strength & division of labor.

PLANTS Λ ANIMALS

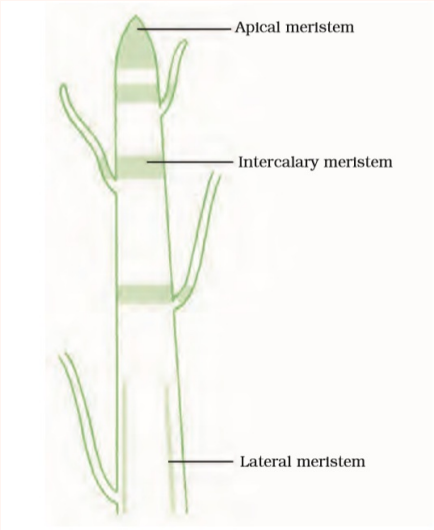
stationary	move around
autotrophs	heterotrophs
most tissues are dead	most tissues are living
growth is non-uniform and limited to certain regions	uniform growth

MERISTEMATIC TISSUES

APICAL	INTERCALARY	LATERAL
root apex, shoot apex	internodes, base of leaves	lateral side of stem, roots
root and shoot elongation	increase length of internode	increases thickness

cells are unspecialized actively dividing cells; have dense cytoplasm, prominent nuclei, thin cellulose walls, no vacuoles

Meristematic Tissues



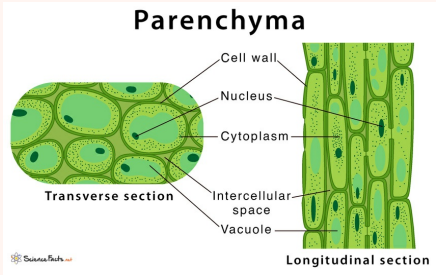
PERMANENT TISSUES

cell differentiation: process by which cells of meristematic tissues lose their ability to divide and take up a permanent shape, size and function; leads to development of various types of permanent tissues.
cells have vacuolated cytoplasm; living or dead.

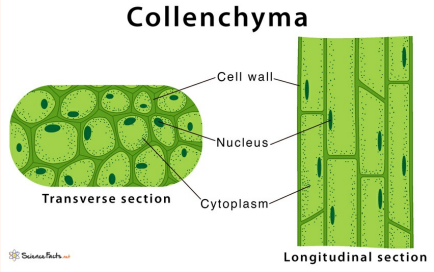
SIMPLE PERMANENT TISSUES

PARENCHYMA	CHLORENCHYMA	AERENCHYMA	COLLENCHYMA	SCLENCHY
unspecialized cells, thin CW, large interc-ellular space	PRC w/ chloro-phyll	large air cavities in PRC	living, long, thick CW at corners [pectin], little intcell space	dead, narrov thick ([lignin] intcell space
root, stems, leaves	leaves	leaves, stems, roots	leaf stalks below epidermis	stems vascu bundl veins, coveri
packaging, supporting, storage	photos-ynthesis	buoyancy	flexibility. mechanical support	mecha streng fibrou

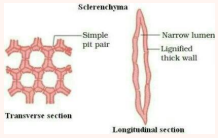
Parenchyma



Collenchyma



Sclerenchyma



SIMPLE PERMANENT TISSUES: CELL WALLS

PARENCHYMA	COLLENCHYMA	SCLERENCHYMA
primary in nature	primary in nature	secondary in nature
thin	thick at corners	thick
made up of cellulose	pectin deposition	lignin deposition

STOMATA

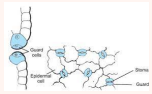
small pores present in epidermis of leaves; surrounded by two guard cells.
transpiration; exchange of gases.

EPIDERMIS

AERIAL PARTS	LEAVES	ROOTS	DESERT PLANTS
protection against loss of water, mech injury, invasion by parasitic fungi	gaseous exchange, transpiration [stomata]	water absorption	[cutin] to reduce water loss thru transp-iration

usually made of a single layer of cells. primary protective tissue to underlying tissues; no intercellular space; roots, stems, leaves & flowers.
cells are flat with waxy coating on outer walls; outer and side walls are thicker than inner walls.

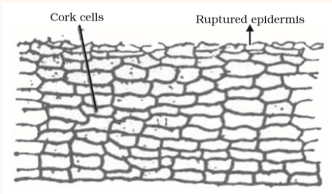
Guard cells and Epidermal cells



CORK

secondary protective tissue; replaces epidermis of older cells.
dead. no intercellular space.
[suberin] on walls make them impervious to gases and water; protects underlying tissues from desiccation, infection & mechanical injury.

Cork cells

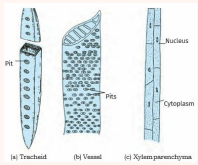


COMPLEX PERMANENT TISSUES

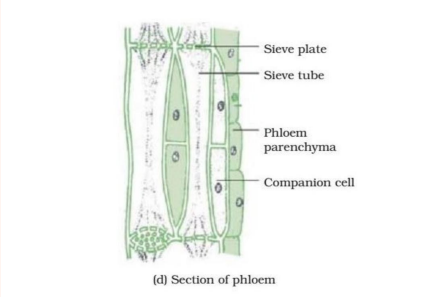
XYLEM	PHLOEM
tracheids & vessels [dead cells w/ lignified walls]: tubular structures; transport of water & minerals upwards	sieve tubes [cells w perforated walls]: conduct food in both directions
xylem parenchyma [thin CW]: stores food; sideways transport of water	companion cells: stores food; supports sieve cells
xylem fibers: provide support	phloem fibers [dead]: mechanical support

except xylem parenchyma all are dead.
except phloem fibers all are living.

Xylem components



Section of Phloem



(d) Section of phloem

XYLEM Λ PHLOEM

transports water and minerals from roots to all parts of lant	transports food from leaves to all parts of plant
conducts water and minerals in upward direction only	conducts food in both directions
consists of tracheids, vessels, xylem parenchyma & xylem fibers	consits of sieve tubes, companion cells, phloem parenchyma & phloem fibers

SPT Λ CPT

made of one type of cells	made of diff. types of cells
similar in structure; perform common function	diff. in origin & structure; perform common function
provide mechanical support	conduct food, water & minerals
ex. parenchyma, collenchyma, sclerenchyma	ex. xylem & phloem

EPITHELIAL TISSUES

cells are tightly packed with small amount of cementing material b/w them, no intercellular space. all epithelium is usually separated from the underlying tissue by an extracellular fibrous basement membrane.

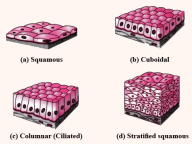
EPITHELIAL TISSUES

CUBOIDAL ET	CILIATED COLUMNAR ET	GLANDULAR ET
one layer of box-like cells	cells have air-like protrusions called cilia	single secretory cell [goblet] /group [salivary glands]
inner lining of kidney tubules, ducts of salivary glands	in respir-atory tract	lungs, uterus, pancreas, stomach
mechanical support	pushes mucous forward to clear it	present in specialized organs that make, store, /release substances like hormones, proteins, water

EPITHELIAL TISSUES

SQUAMOUS ET	STRATIFIED SQUAMOUS ET	COLUMNAR ET
cells are thin and flat, form a delicate lining	layers of flattened epithelial cells arranged on a basal membrane	tall and narrow, closely packed
oesophagus, lining of mouth, blood vessels, lung alveoli	skin	inner lining of intestine
promote the diffusion in tissues; gas exchange: lungs; exchange of nutrients and wastes at blood capillaries	protection against microorganisms from invading underlying tissue and/or protection against water loss	secretion, absorption, excretion, faciliates movement across ET

Epithelial Tissues



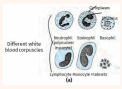
CONNECTIVE TISSUES

cells are loosely spaced in an intercellular matrix [nature: jelly/fluid/-dense/rigid - depends on tissue's function]
examples: blood, bone, ligaments, tendons, cartilage, adipose & areolar tissue

BLOOD

fluid matrix called plasma suspending RBCs, WBCs, & platelets. plasma contains proteins, salts and hormones.
blood flows and transports gases, digested food, hormones, & waste materials to diff. parts of the body

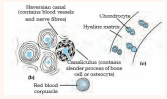
Blood cells



BONE

it is the hardest CT and aka skeletal CT. hard matrix composed of calcium & phosphorous compounds. hard, strong and non-flexible. forms the framework that supports the body, anchors the muscles & supports main organs.

Compact bone & Hyaline cartilage



CARTILAGE

solid matrix made of proteins and sugars. widely spaced cells. elastic and tough.
smoothens bone surfaces at joints. found in nose, ear, trachea and larynx

BONE Λ CARTILAGE

strong, rigid, non-flexible	soft & flexible
matrix: calcium & phosphorous	matrix: proteins & sugars
porous	non-porous
narrow cavity present in bones	cavity is absent

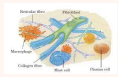
LIGAMENTS Λ TENDONS

connect two bones	connect a bone to a muscle
tough	strong & soft
slightly elastic	limited flexbility

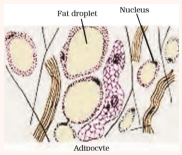
AREOLAR TISSUE & ADIPOSE TISSUE

AREOLAR TISSUE	ADIPOSE TISSUE
in animals b/w skin & muscles, around blood vessels, around nerves and in bone marrow	below skin, b/w internal organs
fills space in organs, supports internal organs, repairs tissues of skin and muslces	storage of fats, acts as an insulator for storage of extra energy

Areolar tissue



Adipose tissue



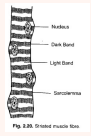
MUSCULAR TISSUES [MUSCLE FIBERS]

STRIATED MUSCLES	SMOOTH MUSCLES	CARDIAC MUSCLES
long, cylindrical, non-tapering, unbranched	long, spindle-shaped, tapering ends, unbranched	short, cylindrical, non-tapering, branched

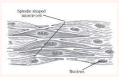
MUSCULAR TISSUES [MUSCLE FIBERS] (cont)

connected to bones [skeletal muscles], hands, legs	alimentary canal, lungs, intestine, bronchi, ureter, stomach wall	heart
voluntary, contracts rapidly, soon undergoes fatigue	involuntary, contracts slower, no fatigue	involuntary, rhythm-ically contracts and relaxes, no fatigue
striated	un-striated	striated
multi-nucleated, towards the periphery of muscle fiber	uni-nucleated, in the center	uni-nucleated, in the center

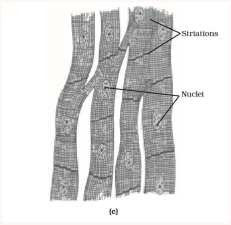
Striated muscle



Smooth muscle



Cardiac muscle



NERVOUS TISSUE

cell body [neuron; may be up to a meter long] has nucleus and cytoplasm from which long, thin hair-like parts arise. single long part: axon [transmits impulses away from cell body], many small, short branched parts: dendrites [receive impulses].
found in the brain, spinal cord and nerves.
receives and transmits stimuli to brain.

Neuron