

Mitochondrion (plural: Mitochondria)

- rod-shaped / spherical
- consists of 2 layers of membrane
 - smooth outer membrane
 - folded inner membrane
- contains enzymes that play a role in cellular respiration
- Function:
 - generates energy thru the glucose oxidation process during cellular respiration
 - energy released in the form of ATP molecules (adenosine triphosphate) to be used by the cell
- Centriole
 - small cylindrical components that exist in pairs in animal cells
 - Made up of complex arrangement of microtubules
- Function:
 - forms spindle fibre during cell division in animal cells

Lysosome

- small spherical sac
- enclosed in a single membrane
- contains hydrolytic enzymes
- Function:
 - hydrolyses complex organic molecules such as:
 - protein
 - nucleic acid
 - lipid
 - breaks down bacteria + components of damaged cells

Ribosome

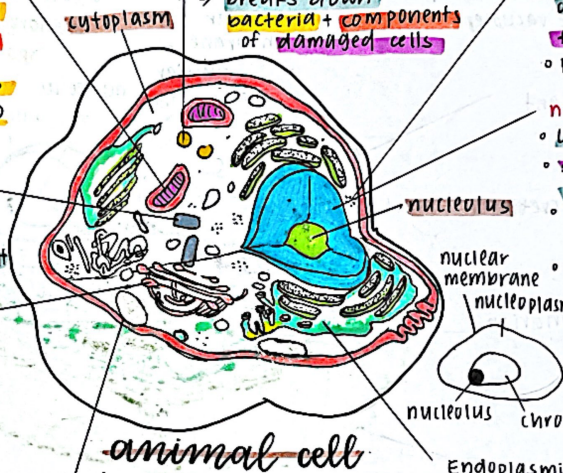
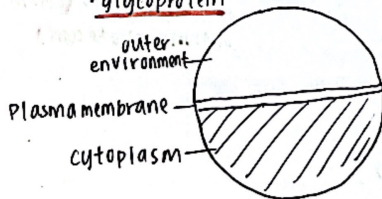
- small, compact + spherical granules
- consists of protein + ribonucleic acid (RNA)
- Ribosomes are present on the surface of endoplasmic reticulum, exist freely in the cytoplasm
- Function:
 - site for protein synthesis

nucleus (plural: nuclei)

- Largest component in the cell
- spherical, compressed + enclosed in a nuclear membrane w/ many pores
- contains chromosomes, nucleolus + nucleoplasm
- Function:
 - controls all cell activities
 - chromosomes contain deoxyribonucleic acid (DNA)
 - ↳ determines cell characteristics + metabolic function

Golgi apparatus

- consists of a stack of parallel flattened sacs that are coated by a single cell membrane
- New membrane is added at one end of the Golgi apparatus + vesicles bud off from the other end
- Function:
 - processes, modifies, packs + transports chemicals:
 - protein
 - carbohydrates
 - glycoprotein



animal cell

- Plasma membrane
 - outer membrane that surrounds the entire content of cell
 - made of proteins + phospholipids
 - thin + elastic film
 - partially permeable
 - Function:
 - separates content of cells from the external environment
 - controls movement of substances into + out of cell
 - allows exchange of nutrients, respiratory gases + waste materials btw cells + their surroundings

Endoplasmic reticulum

- consists of syst. of interconnected folded flattened sacs
- ER membrane is continuous w/ the nuclear membrane
- 2 types of ER:
 - ① rough ER → has ribosomes attached to the surface
 - ② smooth ER → x ribosomes
- Function:
 - SER synthesises + transports glycerol
 - transport cyst. within the cell (+ lipids, & carries out the detox. of drugs + metabolic products)
 - provides a surface for enzyme attachment + biochem. reactions
 - RER transports proteins synthesised by ribosomes

- Vacuole**
- mineral salts
 - enzymes
 - liquid-filled sac
 - cell sap - contains
 - water
 - organic acids
 - sugars
 - metabolic by-products
 - amino acids
 - surrounded by tonoplast membrane
 - Young plant cells → many small vacuoles
 - mature plant cells → a large vacuole
 - animal cells → small
 - Function:
 - absorbs water in the vacuole plant cell → cell becomes **turgid**
 - unicellular animals
 - vacuole contracts during
 - osmoregulation
 - osmosis
 - excretion

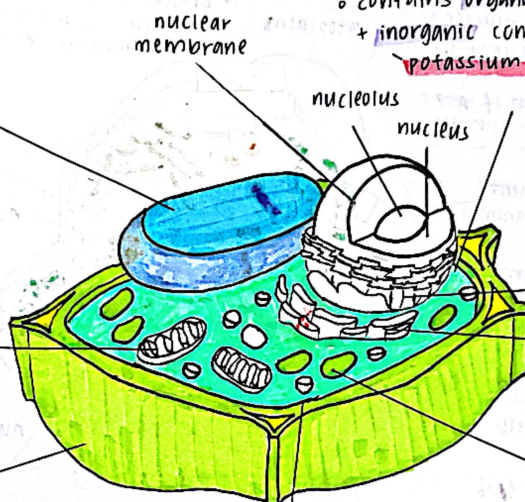


tonoplast
mitochondrion

Cytoplasm

- consists of jelly-like medium that contains components of the suspended cells
- contains organic compounds
 - protein
 - lipid
 - carbohydrate
- + inorganic compounds
 - potassium ions

- Function:
 - act as a medium for biochemical reactions in cell

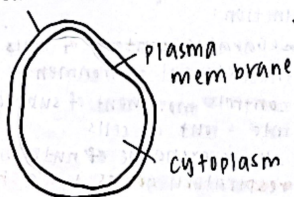


plant cell

cell wall

- strong + rigid outer layer
- made from cellulose fibre
- fully permeable
- Function:
 - maintains the shape of plant cells
 - provides mechanical support to plant cells

cell wall



plasma membrane

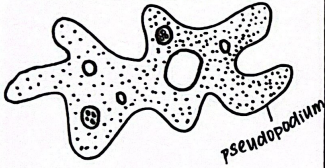
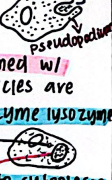
plasma membrane

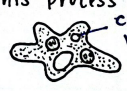
cytoplasm

chloroplast

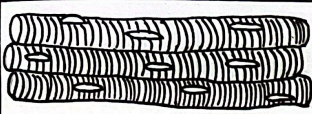
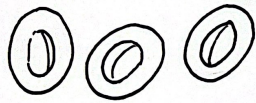
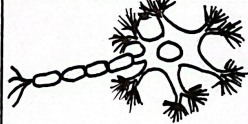
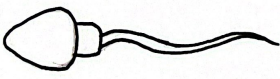
- oval shape
- consists of 2 layers of membrane
- contains chlorophyll pigments in the grana → gives plants a green colour
- Function:
 - chlorophyll absorbs sunlight + converts it to chemical energy during photosynthesis

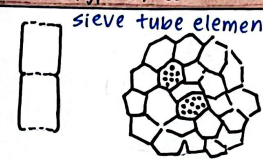
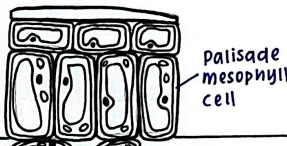
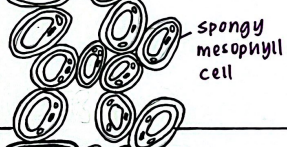
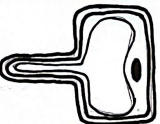
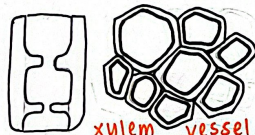
living processes of unicellular organisms

	Amoeba sp.	Paramecium sp.
Movement	- constantly changes its shape when it encounters obstacles - moves by extending out its pseudopodium (false feet) - then, this is followed by the flow of cytoplasm into the extended pseudopodium 	moves using rhythmic cilia beats 
	moves towards food by extending its pseudopodium to trap food particles by food phagocytosis The food vacuole combined w/ lysosome + food particles are hydrolysed by the enzyme lysozyme Nutrients are absorbed into cytoplasm Undigested food is discharged when Amoeba sp. moves 	The presence of cilia beat helps transfer food particles into the oral groove The food vacuole combined w/ lysosome + food particles are hydrolysed by the enzyme lysozyme Nutrients are absorbed in cytoplasm Undigested food is discharged thru the anus 
Nutrition		

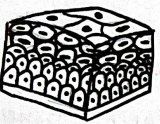
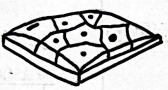
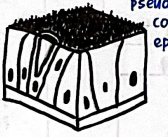
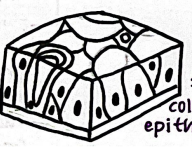
growth	grow by synthesising new cytoplasm
Responding to stimuli	respond to stimuli such as chemicals, touch / bright light by moving away from the stimuli 
Respiration	exchange of O₂ and CO₂ gases occur thru the plasma membrane by simple diffusion on the surface of the cell
Excretory	- waste such as CO₂ + ammonia are removed by diffusion - water will diffuse by osmosis + fill the contractile vacuole as organisms live in fresh water environment - when the vacuole expands to its max. size, contraction occurs + water is excreted from time to time - This process is called osmoregulation  
Reproduction	- when the conditions are suitable + there is plenty of food - binary fission thru mitosis - asexual reproduction - when the environmental conditions are not suitable such as: - dry conditions - low temperature - food storage - forms spores that will only germinate when the environment improves - when the conditions are suitable + there is plenty of food - binary fission thru mitosis - asexual reproduction - when environmental conditions are not suitable - conjugation - sexual reproduction

living processes in multicellular organisms

Human	
Type of cell	Specialisation
 muscle cell	- arranged as multinuclear striated fibre contract + relax to generate movt.
 white blood cell	- can change shape - functions in destroying pathogens
 red blood cell	x nucleus - shaped as a biconcave disc - functions to optimise transportation of O₂
 nerve cell	long and thin in shape - functions in sending nerve impulses
 epithelial cell	thin + flat cells coats the surface of organs such as the digestive tract
 sperm cell	- has a long tail - enable it to swim towards the ovum in the Fallopian tube - the head carries a set of chromosomes from male

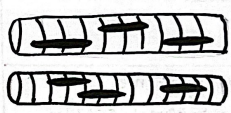
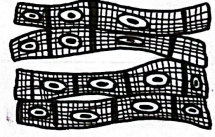
Plants	
Type of cell	Specialisation
 sieve tube element	long cylindrical tubes arranged from end to end transports organic materials from leaves to storage organs such as fruits
 palisade mesophyll cell	- consists of long cylindrical cells, arranged vertically + close to each other - allows max. absorption of sunlight for photosyn. - contains high chlorophyll density
 spongy mesophyll cell	- cells are loosely arranged w/ a lot of air space b/w - allows exchange of gas from the inside of the leaves to the palisade mesophyll cell
 Guard cells	- modified lower epidermal cells w/ thicker cell wall on the inner side - controls the opening + closing of stoma - allows the exchange of O₂ + CO₂
 Root hair cell	has a long projection which adds surface area for the absorption of water + mineral salts.
 xylem vessel	long, continuous hollow tube - functions in transporting water + mineral salts from roots to the other parts of the plant

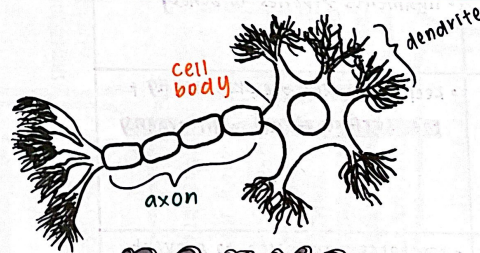
epithelial tissue

Diagram	Functions
 stratified squamous epithelium	- covers the surface of the mouth + oesophagus - protect against infections + injuries
 simple squamous epithelium	- covers the surface of lungs, body cavities + blood vessels - allow gaseous exchange in alveoli and blood capillaries
 pseudostratified columnar epithelium	- covers the surface of the trachea + bronchus - consist of cilia, has elongated cells to secrete mucus → traps dust
 simple cuboidal epithelium	- lines tubules, glands + kidney ducts - modified to form sweat glands, sebaceous glands
 simple columnar epithelium	- covers the small intestine - absorbs nutrients after digestion - has goblet cells to secrete mucus

muscle

- tissue -

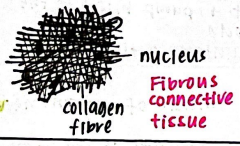
Diagram	Description
 smooth muscle tissue	- found in oesophagus, ileum, stomach, blood vessels - contract slowly - enable involuntary activities such as: → peristalsis along the digestive tract
 skeletal muscle tissue	- attached to bones - involved in control movement - contracts + relax to generate moment in bones + limbs
 cardiac muscle tissue	- found in contractile wall of the heart - builds walls of the heart - contract + pump blood to the whole body → involuntary action



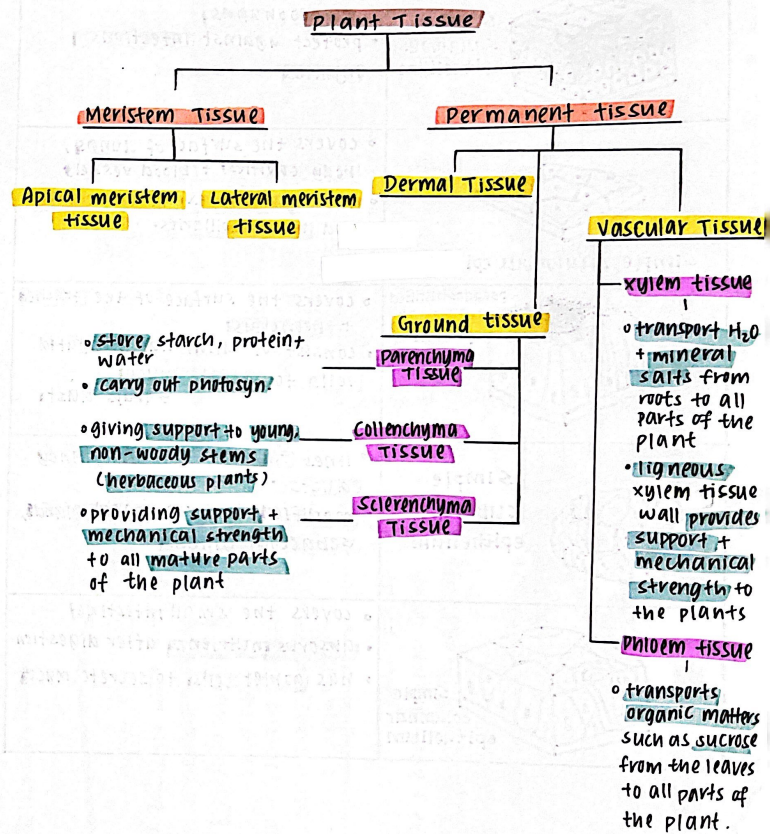
nerve tissue

- made of neuron / nerve cells
- consists of cell body + nerve fibre called dendrite + axon
- detect stimuli + send info in the form of electrical signal (nerve impulses) to the muscles, glands
- regulates + controls body actvt.

connective tissue

Diagram	Description
 Blood Tissue	Plays a functional role in regulation, transportation + protection
 Loose connective tissue	links the epithelial tissue to the tissue below it fixes the organs in their positions.
 bone	- forms the body frame protects the internal organs
 nucleus collagen fibre Fibrous connective tissue	- form tendons + ligaments - tendon → connects bones + muscles - ligaments → bones to bones
 adipose tissue	Keep fat under the skin dermis + the surface of all main organs
 cartilage	encloses bone tips to prevent the bone from wearing out

tissue organisation in plants



main organ system in the human body

endocrine system

- organs: **endocrine gland**
↳ **secretes hormones**
- function: **coordinates** body activities w/ the **nervous system**

nervous system

- organs: **brain, spinal cord** + **peripheral nerves**
- function: **detects + sends info** in the body, as well as **coordinates** body activities

Respiratory system

- organs: **trachea, nose, lungs** + **diaphragm**
- function: **exchange of O_2 + CO_2** gases b/w the body + external environment

Blood Circulatory System

- organs: **heart, artery, vein** + **blood capillary**
- function: **transport nutrients, respiratory gases** + **waste products**

Digestive system

- organs: **mouth, esophagus, stomach, liver, pancreas, small intestine** + **large intestine**
- function: **digests food** in a simpler form for easy absorption

muscular system

- organs: **skeletal muscles, smooth muscles** + **cardiac muscles**
- function: **contracts + relaxes** to produce **movts.** in **body** different parts of the body

urinary system

- organs: **kidney, urethra, ureter, bladder**
- function: **eliminates waste products** such as **urea** + **uric acid** from the body

Lymphatic system

- organs: **spleen, lymph nodes** + **lymph vessels**
- function: **maintains balance** of **bodily fluids** + **prevents infectious diseases**

male reproductive system

- organs: **testes, prostate gland** + **penis**
- function: produces **sperm** + **male sex hormone**

Integumentary system

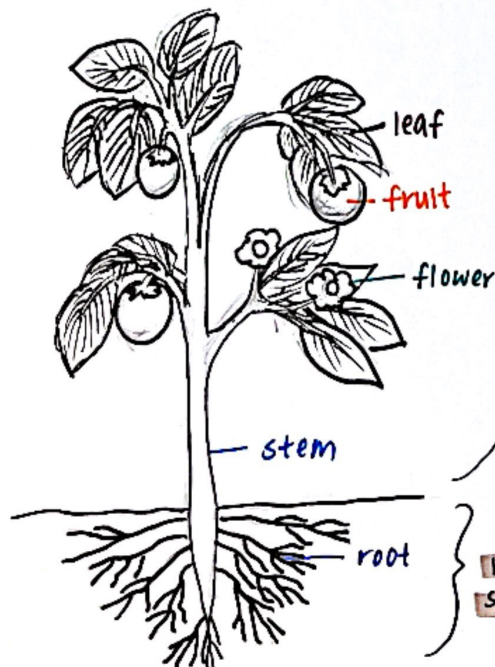
- organ: **skin**
- function: **protects** the body from **physical injury, infection** + **dehydration**

Skeletal system

- organs: **bone, cartilage, ligament, tendon**
- function: **supports body, protects the internal organs** + **provides a base** for **muscle adhesion**

female reproductive system

- organs: **ovary, uterus, Fallopian tube, vagina, cervix**
- Function: produces **ovum** + **female sex hormones**



2 main systems in plants

- shoot system**
 - stems + twigs → **support syst.**
 - support the **leaves** at a **vertical position** to allow **max. absorption** of **sunlight** during **photosyn.**
 - flowers

- root system**
 - **absorbing water + mineral salts**
 - **providing support** for plants

