see pictures ----

4 The Cell

Cell theory: - every living organism is made of one or more cells.
- the smallest living organisms are single cells, they are functional units of multicellular organisms - All cells arise by division of pre-existing cells.

All cells have ⇒ plasma membrane: delineate the border of the cell ... func to regulate passage of materials into and out of the cell ⇒ DNA, Nucleus: Contains the genetic instructions for the cell ⇒ ribosomes: site of protine synthesis. ⇒ Cytoplasm: which refers to the components enclosed by the plasma m.

Types of Cells:

⇒ Prokaryotic: (befor nucleus) & don't have an organized nucleus surrounded by an envelope and relatively small (1-10 μm).
Typical of bacteria, which compos the domains Eu bacteria and Archaebacteria.

⇒ Eukaryotic: (true nucleus) have organized nucleus enclosed by a nuclear envelope, and much larger.

Four Kingdoms: Animals // Plants // protists // Fungi
All of them have nuclei and other membrane-bound organelles.

"Prokaryotic"

oldest kind of organisms ⇒ 3.5 billion years.
All prokaryotics are members of the domains Archae bacteria & Eubacteria
Eubacteria ⇒ bacteria and Cynobacteria (blue green bacteria)

Bacteria.... most numerous organisms on Earth, 10 million to 5 bilion species.
They utilize all kinds of ~~organisms~~ habitats and live on scare resources (don't support other kind of organisms)
Smallest known organisms "with exception of viruses" ..
size ⇒ 0.2 μm up to few μms.
Some bacteria → heterotrophic
→ parasitic "Causing diseases to plants, animals, humans"

Five Apple

Scanned by CamScanner

Cell shapes ⇒ spirals (spirilli) ⇒ rods (bacilli) ⇒ spheres (cocci)

we used methylene blue

"Yoghurt made by the fermenation of lactose (milk suger) ⇒ bacterial enzymes.

Two bacteria used to convert ⇒ Lactobacillus bulgaricus (rod)

⇒ Streptococcus thermophilus (cocci)

Cyno bacteria .... //مركبة التمثيل الضوئي//

Live in aquatic environments ... Exist as (mostly) ⇒ Colonies (متعزز), Filaments (خيوط)

Eg: Anabaena

sometimes ⇒ Single cells

" Eukaryotic "

- Contain DNA that organized into discrete chromosomes found within the nucleus.
- The nucleus is separated from the rest of the photoplasm by a double membrane (nuclear envelope).
- They contain membrane-bound structures called organelles. Like: mitochondria // chloroplasts.

we used methylen blue

Human cheek cells:- protect the body by forming a barrier then space withen the mouth and the rest of the body.

Because protection is a tought job.. the skin is constantly making new cells to replace those that fall of from surface.

Catch this → tape

Onion epidermal cells:-

there is an underground storage structure (bulb) made up of thickened (سميكة) modified leaves called scales. The onion ~~edo~~ epidermal cells come from a thin, translucent tissue which lines the scales outer curve

(رقيق) (نصف شفاف) (أنسجة) (خارجي) (منحنى)

we used lugol's solution

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⑤ Biological macromolecules ....

* Classes of macromolecules:
- Carbohydrates //
- Lipids //
- Protines //
- Nucleic acids //

- Cause of variation : presence of specific functional groups.
- ~~ptopolemers~~ are made by joining numbers of monomers. ← show
o dehydration synthesis reaction. (Forming water molecules)
(Condencation)

we can break the ~~mopolemers~~ by a hydrolysis reaction
(adding water molecules)

→ Carbohydrates ← (suger) built from

function
- a main energy-storage molecules in most organisims.
- Important structural components for many organisms.

Way to identify .... the number of suger molecules they contain.

- Monosaccharides → glucose (6) / fructose (6) / ribose (5) / galactose (6).
- disaccharides → sucros / maltose / lactose.
- polysaccharides → starch / glycogen / Cellose / chitin

Monosaccharides can be a Keton or an aldehyde.

differences in structure .... gives the ~~from~~ monosaccarides different chemical propertie.

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Disaccharides:

→ Maltose (malt suger) 2 * glucose
→ sucrose (Cane / table suger) glucose + fructose
→ lactose (milk suger) glucos + galactose

polysaccharides: 100, 1000 of monosaccharides. (متشابهة التركيب تماماً)
used to be energy storge by animals and plants.

plants ⇒ polysaccharide ⇒ starch
animals ⇒ " ⇒ glycogen (or) (animal starch)

Plant cell walls contain the Cellulose (polysaccharide)
fungi " " and exoskeletons of arthropods contain
chitin (polysaccaride)

" Ploysaccharides are broken down as need for energy."

blue → (Benedict's test) (for reducing sugers)

* All mono- are reducing CuSO4
* dis- reducing or non- (?)

possitive reaction → changing color from light blue to orang-brown
negative reaction → stay light blue.

The final color depends on the concentration. (of the reducing suger).
green → orange → red → brown as the concentration increase

glucose ✓
maltose ✓
scrose ×
starch ×
water ×
→ contra

Conditions: boiling water path (5 minutes)

Five Apple

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Color ⇒ orange.

Iodin test (Lugol's test)

(starch)

Positive ⇒ bluish-black

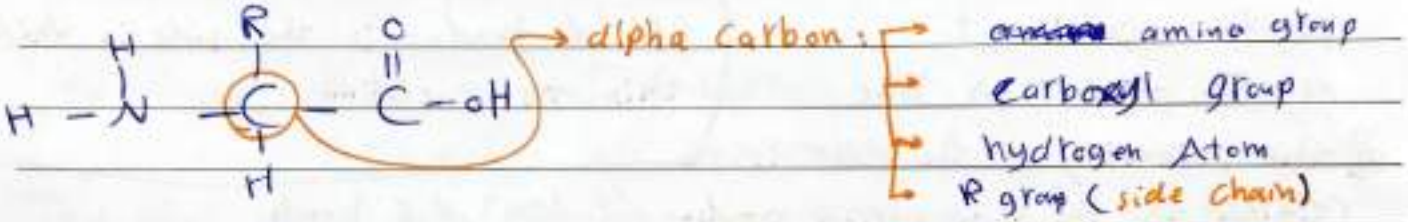
negative ⇒ yellowish-brown (orange)

Note:

the basis for this test is that starch is a coiled polymer of glucose.

→ protains ←

- made of C, H, O often S
- building block ⇒ amino acids (20 a.a).

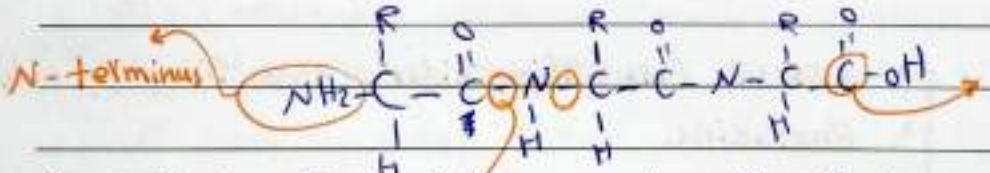


the cause of variation is the R group...

polypeptides.... (linking a.a by peptides bonds)

↳ by dehydration synthesis reaction (releasing water)

when the C-OH reacts with the NH_2 from the second a.a.



we start from the N-terminus to the C-terminus

proteines function :- → Cell processes

structural proteins / regulatory proteins / storage proteins / milk

elasting, collagen albumin (egg white) casein

return to the book 67 ← (last me)

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(Ninhydrin test) → (amino acid)

// ammonia / pr. / sec amines.... / proteins.

O. color ⇒ Colorless

Positive ⇒ purple / violet

"the proteins must be heated or digested to hydrolyze the protein into free a.a."

egg albumin ✓ milk ✓

a.a. solution ✓ glycogen ✗ water ✗

Conditions: boiling water path ..

(Biuret test) ⇒ (polypeptides) [illegible]

زي الخيط الرفيع وليس كرة..

Positive ⇒ violet

Negative ⇒ O.C ⇒ blue

peptide bond: - is the side in which this test act...

* the intensity of the color is related to the # of peptide bonds. At least 4-6 bonds

→ Lipids ←

- insoluble in water but soluble in fat solvents. = (organic liquids) (aceton, CCl_4)

Classes of Lipids:
- neutral fats (triglyceides, ~~triacyl~~ triacyl glycerols)
- phospholipids
- steroids

① **fats**: "Consists of a glycrol molecule to which are linke three fatty acids."

fatty acid: carbon chain with carboxyl group at one end, and with hydrogen bonded to the carbons at other positions in the chain.

// double bond ⇒ unsaturated fatty acid

no double bond ⇒ saturated fatty acid

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Source of diversity : → The number and position of double bonds in those Carbon chain.
→ The length of Carbon chain making the fatty acid.

Neutral fats have a higher proportion of Carbon-hydrogen bonds than othe organic substances....
→ releas a larger amount of energy upon oxidation

((∴ fats are excellent energy reserve molecules))

(II) Phospholipids:

as Fats ... Contains glycrole and fatty acids...
But .... with the glycrole we have two fatty acids and the third one is "phosphate containing group".

In water: phosphate group is hydrophilic (Two faced)
fatty acids are hydrophobic

This dual nature suits phospholipids well for their role contributors to the matric of biological membranes.
((help Control the movement of other substances into and out the cells))

(III) Steroids : ((different from the other two classes))

((planar molecules with a complex multi-ring structure))
Ex: Cholesterol → Important Component of biological membranes and some hermones like. estrogens / testosterone.

(Sudan red test for fats)

(lipid soluble dye)
also in alchohol

O.C ⇒ red ⇒ one or two layers.

\# with water ⇒ two layers....

Five Apple

Scanned by CamScanner

(Lipid solubility test)

* lipids are insoluble in polar solvents.
* " " soluble in nonpolar " .

→ Nucleic acids ←

they are two Kinds ⇒ DNA (deoxyribonucleic acid)
⇒ RNA (ribonucleic acid)

DNA → found largely in the nucleus of the cell. (Cause name nucleic)
// RNA is also found in the nucleus. but present in Cytoplasm in large amount ///

DNA / RNa ⇒ responsible for storing and implementing the genetic information of the cell.

DNA is a double stranded polymer of nucleotides.

Nucleoticles ..... one suger // phosphate functional gr // Nitrogenous base (one of four)
deoxyribose DNA ribose RNA

- These two stranded molcules is twisted into double helix

- Neucleotides in each ploymer ⇒ Covalently bonded together into //suger-phosphate backbone//
(without the Neo gr)

Nitrogenous bases in DNA ...
- purines : Two interlocking Carbon-nitrogen rings. (in both DNA/RNA)
- pyrimidines: Single Carbon-nitrogen ring.

Purines (both) → adenine A, guanine G
pyrimidines → Thymine T (Just DNA), Cytosine C (both DNA/RNA), uracil U (Just RNA)

always G ⇒ C
DNA A ⇒ T
RNA A ⇒ U

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The Dische diphenylamine Test for DNA

O.C ⇒ Colorless / positive ⇒ Green-blue
intensity of the blue Color is related to the Concentration.

diphenylamine is strong acid. (P.C)
Control ⇒ diphenylamine with standard DNA solution.
⇒ boiling water Δ ←

// // // // // // // // // // // // // // // // //

$CuSO_4$ - Benedict test : blue —boil→ red / orange-brown / green (concentration) (reducing suger)

- lugol's test : yellowish-Brown —starch→ Bluish-black just starch

Ninhydrin test : Colorless —boiling→ purple / violet [a.a]

$CuSO_4$ Biuret test : blue —x / p.bond→ purple / violet
Cu^{+2} → 6 P.bond → color
.P.bond ما في pink او لون purple اذا الناتج

Sudan red test : reddye + oil → red
else it doesn't stain.. يعني ما بلون

Lipid solubility test: Lipid + water → x 2 layers
Lipids + mineral oil → ✓ 1 layer

Dische diphenylamine test for DNA..
↙ acid
Colorless —boiling→ positive Green blue.

Scanned by CamScanner

⑥ Enzymes...

- Every chemical reaction is coordinated by an enzyme.

- Enzymes ⇒ hydrolytic , oxidizing , reducing
  " depending on the reaction"

Enzymes $\xrightarrow{\text{action}}$ substrates $\xrightarrow{\text{resulting}}$ products.

→ unique enzyme...

Catalyzed reaction: a reaction where the catalyst makes the reaction goes faster to equilibrium since it lowers the activation energy required.

// Catalyst never used up... //

→ Rennin ↩ Milk "Casein" + Rennin → $\xrightarrow[37^\circ]{\text{pH (5-6)}}$ 7 → Coagulation

- Found in the stomach of young mammals, changes (alters) the 3d structure of the milk protein "Casein".

- Rennin coagulate the casein so the milk slows down during its passage through the digestive sys. making the digestion more effective.

Factors : " T , PH , Concentration "

Temperature pre-treatment →

0° → freezing → deactivating enzyme $\xrightarrow{\text{denaturation}}$ $\xrightarrow[+\text{milk}]{\uparrow^\circ 37^\circ}$ $\xrightarrow{\text{renaturation}}$ → Coagulation

Positive result...

37° → Ideal conditions → Coagulation. (control)

100° → breaking bonds → denaturation → $\uparrow^\circ 37^\circ$ (+milk) → No Coagulation

Five Apple

Scanned by CamScanner

PH Changes: on Rennin pretreatment.

→ Acidic → + milk 37° → there is a reaction but not a Coagulatio..... because of the acidic...

Neutral → + milk 37° → Ideal → Coagulation

Basic → + milk 37° → No reaction No Coagulation

→ Catechol oxidase

O2 + Catechol + Catecol oxidase → Benzoquinone

عامل مساعد ↗ ((بني غامق))

we can test for presence of Catechol oxidase by adding its substrate → Cetachol. to the mixture.

? → ?enzyme → ? Cetachol → ?oxygen : If yes → dark brown.

⚠ fruits and vegetables have the both → enzyme and chetachol.

Cofactors. metallic Ions that bind to some enzymes as apart of their active site. making the possible formation of the enzyme-substrate Complex

※ Copper is the Cofactor for Catechol oxidase.

Phenylthiourea [PTU] inhibits the Copper as well as cetachol oxidase

When there is a PTU, there is not a dark brown Color.

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Physical Properties of the Cell.

Brownian movement: Mdecules are in Constant random motion resulting from their molecular thermal energy.

Diffusion: Movement of molecules from region of higher Concentration to region of Lower Concentration.

movement of molecules in the solution is dependent for each type in the diffusion process.

- Deffusion ends when there is an equilibrium in both regions.
  - air / Liquid / soild.
- Biologically →: Substances Can get in and out of a living cell.

7.1 we used the Carmine dye.

7.2 methylene blue faster Coloring the hotter water.

7.3 making holes in the agar "semi-solid medium" then we added a drop of either potassium Permangamate and adrop of methylene blue.
because the e.P.P is smaller in molecular weight the halo was bigger. ((moves faster)) 1 hour.

7.4 Two dialysis bags ...
one → starch → Beaker Containing ~~tag~~ lugol's →

one → phenolphthalein → beaker Containing Naoh

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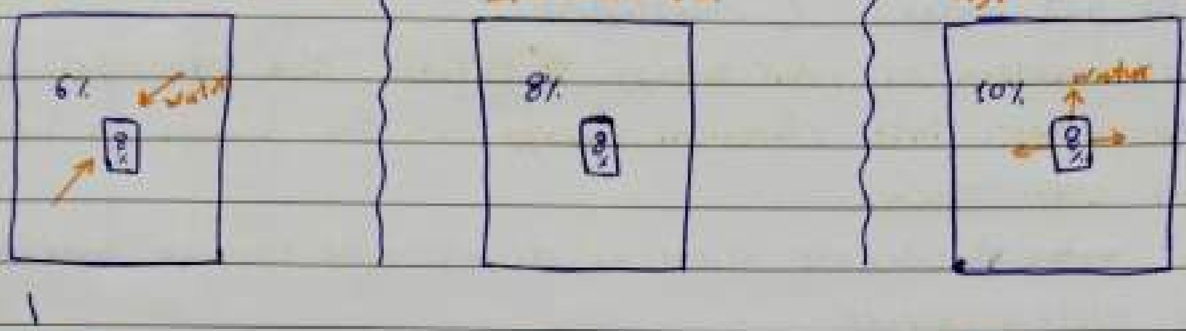
7.5 Osmosis →: ظاهرة الـ diffusion

The diffusion of water molecules across a selectively permeable membrane.

hypo tonic sol | Iso tonic sol | hyper tonic sol



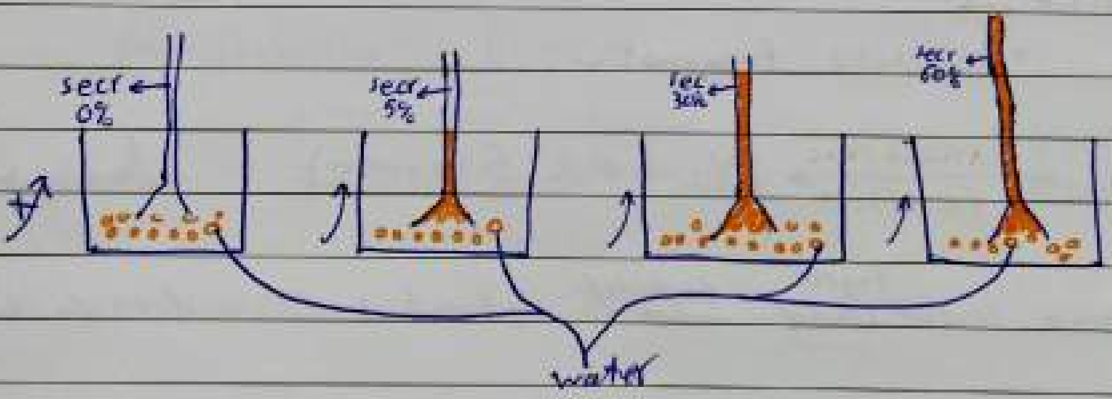
Turgid | Flasceid | Plasmolysis

[illegible]

7.6 Osmotic pressure:

→ Osmometer ⇒ measures the Osmosis

→ a hallow glass bell attached to along tube. filled with molasses or suger solution, "the large opening is Covered by a dialysis tubing and secured with a rubber ...



The liquid in the thistle tube eventually stop rising. this occurs when the gravitational pressure of the solution equals to the force exerted by the process of osmosis. this amount of force required to balance osmosis is **Osmotic pressure.**

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Metabolism

- Sunlight is the ultimate source of energy.
  - how to get energy? (Autotrophes)
    transformation of solar energy through the processes of photosynthesis into chemical energy in the bonds in hexoses sugar like glucose.
    then monosachorides are stored as di or more complex mdcules like protein, Lipids.

- Heterotrophs: Cannot use sunlight ... their diet (animals, plants, fungi, minerals) is Lipids and Proteins → energy.
- breaking down substrates to release energy → stored in bonds

Enzyme-catalyzed → metabolism = photosynthesis = anabolism
→ Catabolism → having energy through breaking...

Respiration :→
"Alcoholic fermenation"

glucose + yeast —anaerobic reaction→ (Alcoholic fermentation) Anaerobic

Glucose // other sugar singles degraded → ethanol + Carbon dioxide + 2 ATP

Lactic acid bacteria :→ "fermentation" "oxygen-stressed muscles of animals"
→ on glucose → Lactate instead of Alcohol.
"production of yoghurt and cheese. → $2C_3H_6O_3$ + ATP
yeast = saccharomyces cerevisiae

8.1 Bread making : starch → glucose

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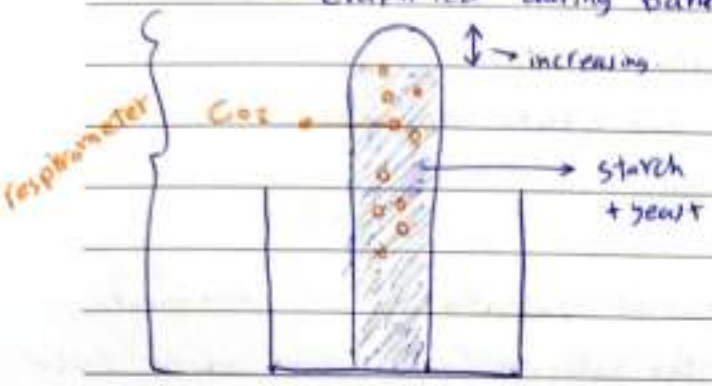
glucose + yeast → Co2 + (Methanol)

Co2 is trapped in the dough. causing rise up.

→ evaporated during baking.



to have 37° we us incubator

x 8.2

8.3 Recall: Reducing sugar: have either a free aldehyde or a Ketone group. "molcular structure"

Benedict's test....

- water
- yeast culture befor fermenation.
  " " after " .

8.4 x

8.5 photosynthesis → Elodea

Light energy —trans→ Chemical energy —used→ synthesize organic molecules

Co2 → atmosphere " the carbon source" // water → soil " hydrogen source"

Chloro phyll pigments are necessary to trap the Light energy.

$6CO_2 + 12H_2O + \text{sunlight} \longrightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$

Elodea → photosynthesis...

8.6. Increase Light ⇒ Increase photosynthesis

8.7. Increase Carbondioxide "Sodiume bicarbonate" (powder)

8.8 Paper chromatography: a process in which different chemical substances are separated by making use of their different flow rates while being transported by a flowing solvent.

depend on "retention factors R_f"

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Retention factor: the distance traveled by a solute divided by the distance traveled by the solvent.

Solvent moves up ↑ by a capillary action.

- each component will be transported at a rate depends on its differential affinity for the paper.

This transportation causes a spatial separation of components.

* Components that are soluble in the solvents (nonpolar) more faster than less soluble components (polar) and have larger (Rf)

Carotene (yellow to orange)

Xanthophyll (yellow)

Chlorophyll a (blue-green)

Chlorophyll b (yellow green)

Loading Line.

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⑪ . Plant tissue.

- group of cells that preform a common function ⇒ Tissue.

Main types ⇒ meristematic , permanent.

mrc ⇒ actively cells that assume different shapes and sizes as they mature.

Ex: shoot tip , root tip , lateral buds.

prt ⇒ Consist of mature differentiated cells that don't generally undergo any further cell division. "in the mature plant organs"

- one kind of cell : Simple prt T.
- more than one kind of cell : Complex prt T.

Ex
- xylem , phloem , periderm.
- Parenchyma , Collenchyma , chlorenchyma , sclerenchyma , Epiderms.

① Meristematic tissues..

- Embryonic , undifferentiated , unspecialized cells..
- → Plant growth.

Two types:

- Apical meristems: found at the growing tips. "stems , roots , lateral buds"

  Cause increase in ~~length~~ length. ↑

  Tissues produced by Apical meristems are called primary tissues.

- lateral meristems: found in periphery of the roots and stems. "vascular Cambium & Cork Cambium"

  Cause Increase in diameter.

  Tissues produced by lateral meristems are called secondary tissues.

11.1 Examining shoot and root (apical) meristem:

- locate cell position in the [shoot and root] : ((by low and medium lences))
- Know general features: "by high X40" ⇒ Small , dense-staining , thin cell wall, Prominent nuclei , no intercellular spaces. Small or no vacoles.

  In various stages of mitosis..

((primary growth , primary T.))

[illegible]
[illegible] meristems [illegible]
[illegible]

Five Apple

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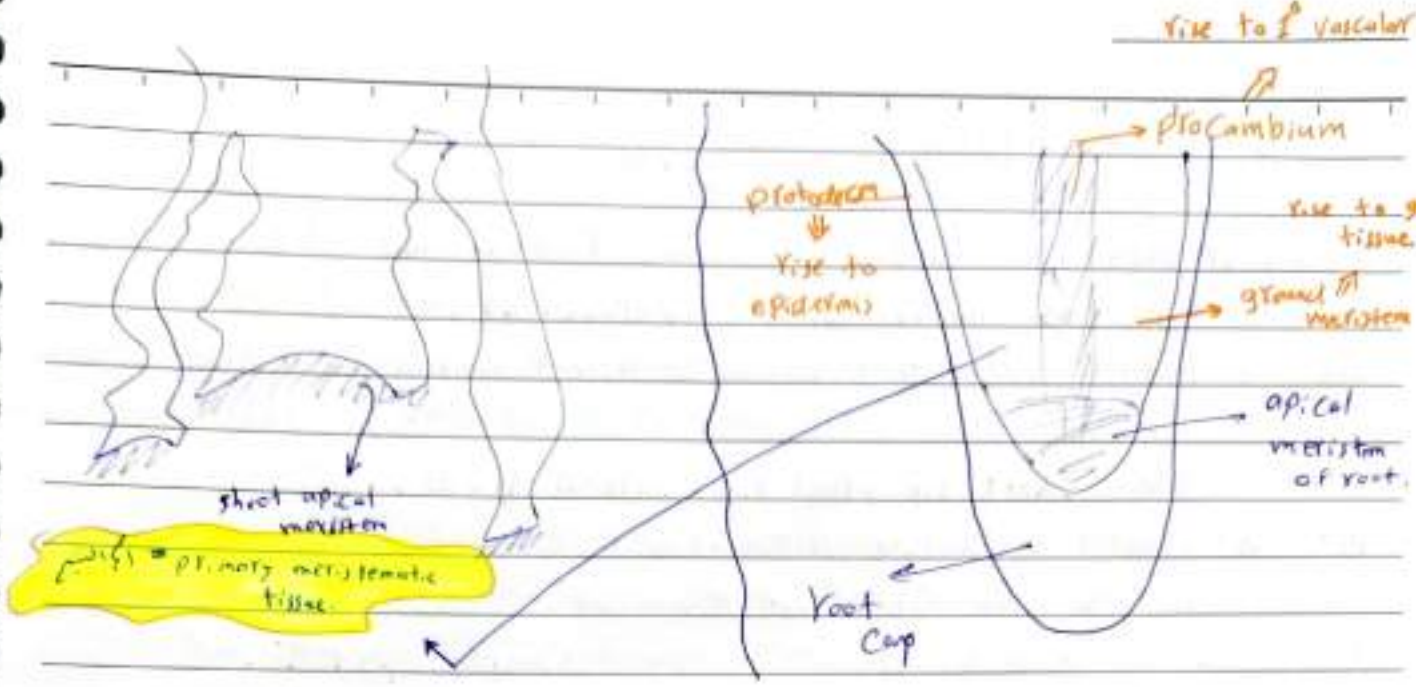


② permanent tissue

• simple ⇒ par/coll/scl/chlo/ & Comblex ⇒ xylem / Phloem / periderm

+ mature ; differentiated cells.

A.. Simple :-

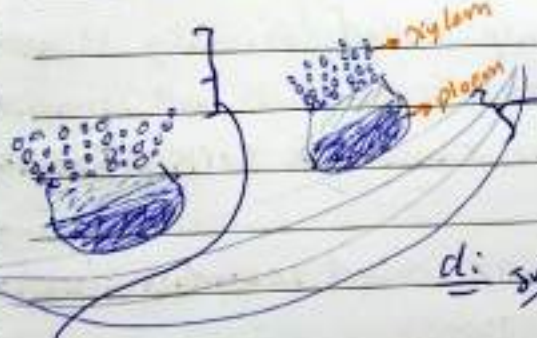
11.2 ...

Parenchyma tissue :- 1° "roots, stems, Leaves"

+ This thin i wall and no 2° walls. + there is numerous intercellular spaces.

all-purpose plant cells: photosynthesis + respiration + storage + secretion + exchanging Gases ⇒ spaces.

• the most common ground tissue.



Cortex " between the epiderms and the vascular bundle

di: just In mono the vascular bundles are scattered throughout the stem ⇒ no clear distinction between pith and cortex.

* the tissue surrounding the vascular bundles is Parenchyma.

this primary cell wall & alive.

Scanned by CamScanner

✱ Chlorenchyma tissue :→ 1° par in certain plants have Choloroplast and are photosynthetic

Location "leaves, green stems," ⇒ Chlorencyma tissue. photosynthesis

In ~~plastid~~ palisade mesophyl & spongy mesophyl

"hypodermis" "di"

11.3 ✱ Collenchyma. 1° unevenly-thickened primary cell walls "elongated"

much thicker at the corners.

In di Just

they are specialized for structral support ← function

SCN✱ → //Cylinders of tissue beneath the epidermis//

✱ support ~~on~~ elongating parts of plants.

& Flexible ⇒ ~~Plant~~ plant bend without breaking.

walls → thinner than scl and thicker than par.

//الجدار عبارة عن cellose وبكتين وبيكون سميك عند الزوايا//

Just in the di → non In mono...

In the di ⇒ cortex has collencymate tissue.

"hypodermis" "mono"

11.4 ✱ sclerenchyma tissue :→ 1° 2° rigid cells.... have lignified secondary walls.

they are dead!! at maturity

Two common types of sclerenchyma...

V.B cap di
V.B sheath mono
hypodermis mono

- sclereids : small, irregularly-shaped & occure singly - groups.
- Fibers : long, thin, occure in strands.

Main function → Protection & mechanical support →

In Zea maize

→ several layers below the epiderms.. and layer of sclerenchyma around the vascular bundle.

Cells are small → & uniformly thickened 2° wall → give support....

//Lumen "Interal space" nearly obliterated.//

11.5 ✱ Epidermal tissue → Protective outer covering of the plant body.

Just in young & herbaceous plants.

→ the principle surface tissue of the roots & stems + all leaves.

It is usual one-cell thick.

Scanned by CamScanner

It may be thicker in plants in dry habitats

• features: → // Cells are relatively flat, large vacuoles small amount of cytoplasm //

Waxy water-resistant Cuticle or cutin → protective

go to 142 two pictures---

Root hair ⇒ epidermis

B Comblex permanent tissue: → 1-Vascular tissue. → 2-Periderm.

11.6

1→ Xylem & phloem.

Xylem // (dead) // → Conducts water & dissolved minerals up the plant.
→ Composed of- parenchyma, fibers, vessel elements, tracheids.

Phloem → Composed of- fibers, sieve tubes, Companion cells, & parenchyma.

V.T in monocot stem.

↳ look Like a face. ⇒ Xylem & phloem.

"Nose" + "eyes" + "mouth" ⇒ vesseles = Xylem // "forhead" = phloem.

sheath sclereid

phloem has sieve tubes & companion cells.

large in diameter, adjacent

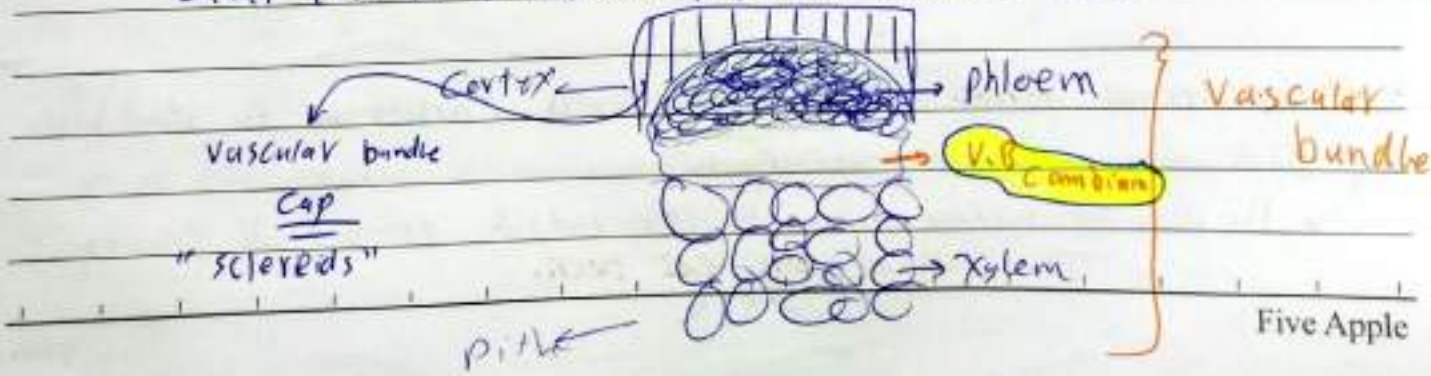
small with dense cytoplasm and distinct nucleus

Note that the parenchyma thin-walled in phloem are intermediate in size.

V.T in dicot stem.

group of Xylem cells next to the pith. "Inner part"

outer part of the bundle is phloem tissue ←



2- periderm: →

in the outer layers of woody stems & roots.

forms the bark (as)

Function

Composed of: → cork cells
→ cork cambium (or) phellogen
→ cork parenchyma (or) phelloderm

→ Cork cells
→ Cork cambium "phellogen"
→ Cork parenchyma, Phelloderm.

periderm

Hypoderms → mono → sclereids
di → Cholenchyma

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Plant Anatomy

Plant body → root system "roots" // shoot system "stem/leaves/flower/fruit"

Dicots & monocots:

- mon: One cotyledons → Di: Two cotyledons.
- mon: leave venation is parallel. Di: Net like
- mon: Flower parts are multiple of three. Di: multiples of four or five
  ↳ "(sepals, petals, stamens, pistils)"
- mon: vascular bundles are scattered in stems. Di: organized in a ring and like "Face" - Lines

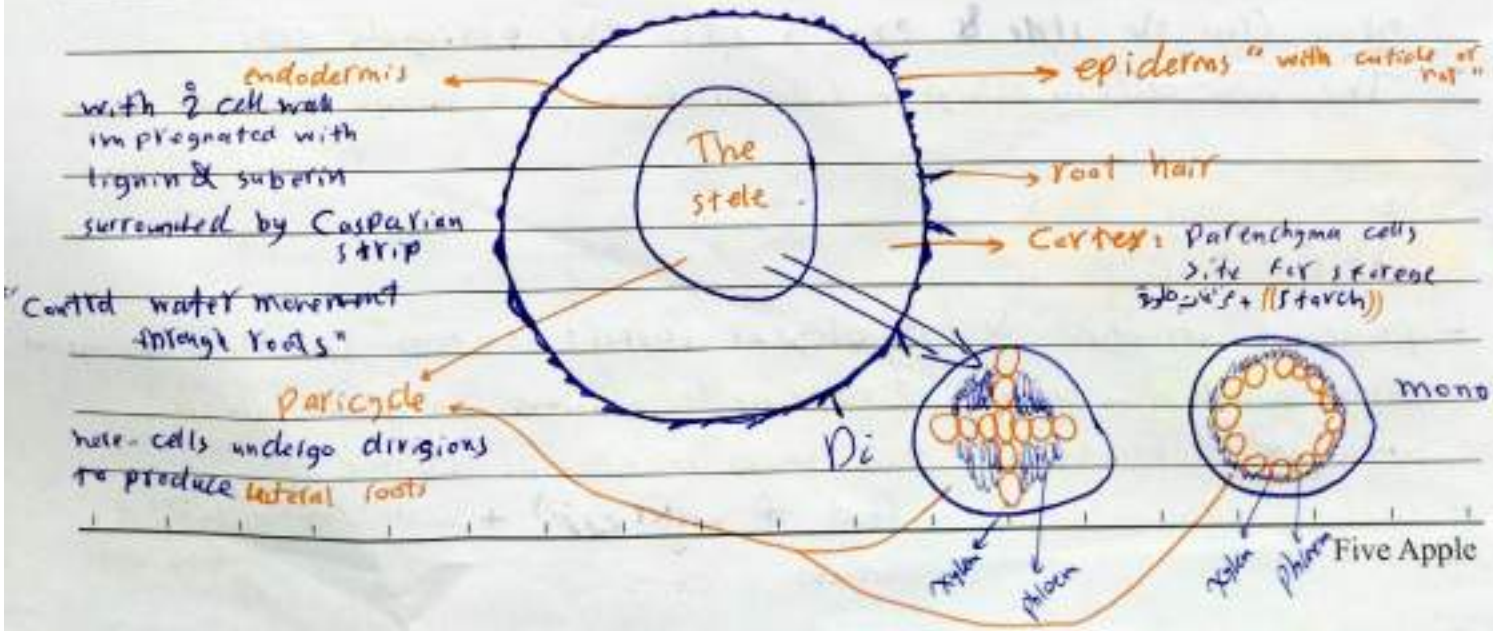
The Root:

functions:

- anchor the plant in the soil on which it grows.
- absorb water and minerals from the soil and pass them through p. organs.
- site of food storage & hormone synthesis.

mon: the primary root ceases growth early and adventitious roots develop from the base of the stem. Then lateral roots branch from these adventitious roots. forming fibrous root system.

Di: lateral roots branch from a taproot derived from the primary root of the embryo.



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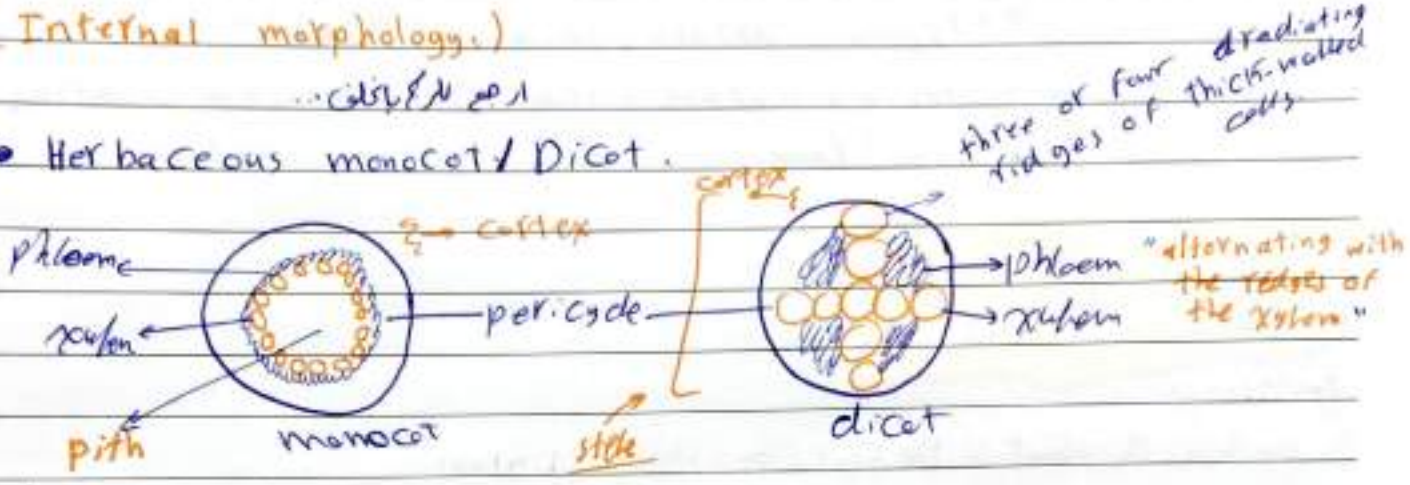
(External morphology:)

- Taproot : (di) Primary root + lateral roots } ⇒ تثبيت وامتصاص
- fibrous root : (mono) adventitious roots + " " }
- specialized root : → storage roots.
  → prop roots.

(Internal morphology:)

ارجع للرسم بالخلف..

- Herbaceous monocot / Dicot.



Another defferences....

- In monocot ... relative size of the cortex and the vascular cylinder.
  - "larg central pith"
- In dicot ... wide cortex region. small stele.

- In monocot ... Cortex → endoderms → pericycle → phloem → xylem → Pith tissue.
- In dicot ... " → " → no distiniction = no pith

- lateral roots :
  grow from the stele & exactly from the pericycle cells...
  The new cells ... enlarge + differentiate + grow through the root tissue.

The stem :

- principal structural & physiological support systems for the above-ground parts. holding → leaves ⇒ ↑ exposure to sunlight for photosynthesis.
  pollination ← flowers ↔ fruits → ↑ their chances for effective dispersal.
  Food of water لتخزين + أنابيب وأوعية لنقل المواد والمعادن +
  potato cacti

Five Apple

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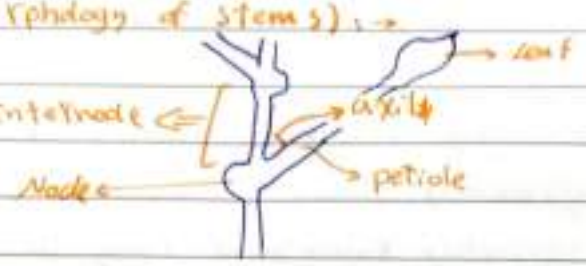
(external morphology of stems) :-



- Kinds of stems ....

(Runner) Stolons: run horizontally above ground .... "strawberry + spider plant"

Rhizomes: run horizontally below the ground surface "ment"

Tubers : enlarged, fleshy tips of certain rhizomes "potato" modified for food storage.

Bulbs : unusual below-ground structures that consist of "onion" ~~modified~~ upright stem with modified, fleshy leaves

(Internal morphology of stem) :-

Dicot stem

surrounding parenchyma tissue.
VB Cap "sclereids"

epiderms
outer layer surrounding the stem.

Cortex
cells are between — & vascular tissue
most cells R Parenchyma & 1 or more layers of collench- Just beneath the epiderms.

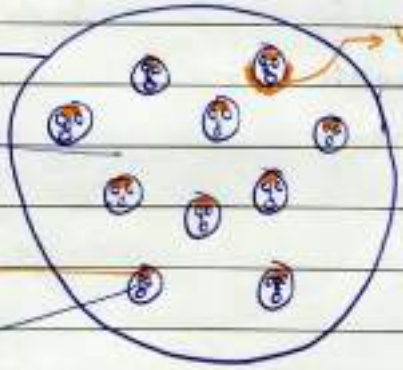
Complex tissue ← phloem ←
Parenchyma / sclerenchyma fibers
sieve tube / companion cells.
"transport dissolved materials"

Pith
Filled with Parenchyma.
+ very distinct intercellular spaces.

Complex tissue ← xylem ←
Parenchyma / sclerenchyma fibers
& transport cells → Tracheids & vessel elements.

Vascular bundles
Ring-shaped / along the stem
Transport materials through them.

Monocot stem



epiderms
Ground tissue
Sieve tube
small dense companion cells
phloem
vessels
Xylem
Thick walls
much smaller
Parenchyma cells

V.B sheath "sclerenchyma tissue"
Thick-walled cells

When stem stretch...
some vessles destroyed...
large
Causing ..." air space "
or " lacuna" "nose"

Scanned by CamScanner

Woody stem ⇒ has pith "parenchyma" ~~with...cortex~~

- Apical meristems ⇒ primery tissues. "growing tips in stem, root"
- lateral meristems ⇒ secondary tissues. "secondary growth" diameter

Annual ring ⇒ new secondary xylem "wood" ring laid down.
spring wood has many large vessel members in it. than the summer wood. "small"

A smaller increment of new secondary phloem is laid down every year, but previously-formed phloem is pushed toward the outside of the stem in the process and is crushed and finally sloughed off.

* there is much less secondary phloem than secondary xylem.

The Leaf.

leaf → petiole (stalk) & lamina (blade)

Vascular veins withen the lamina.... Two common types ..→

- Parallel venation: veins are parallel to one another "mono"
- reticulate venation: " " Interconnected with on another " di "

Arrangement of leaves. ((phyllotaxy))

(I) alternate (II) opposite (III) whorled

leaf ~~s~~ blades may be (simple) or (dissected ~~&~~ Compound)
ورقيات كثيرة على petiole
.. buds ولا يولد

Compound leaves → Pinnate ريشي
→ Palmate كفي

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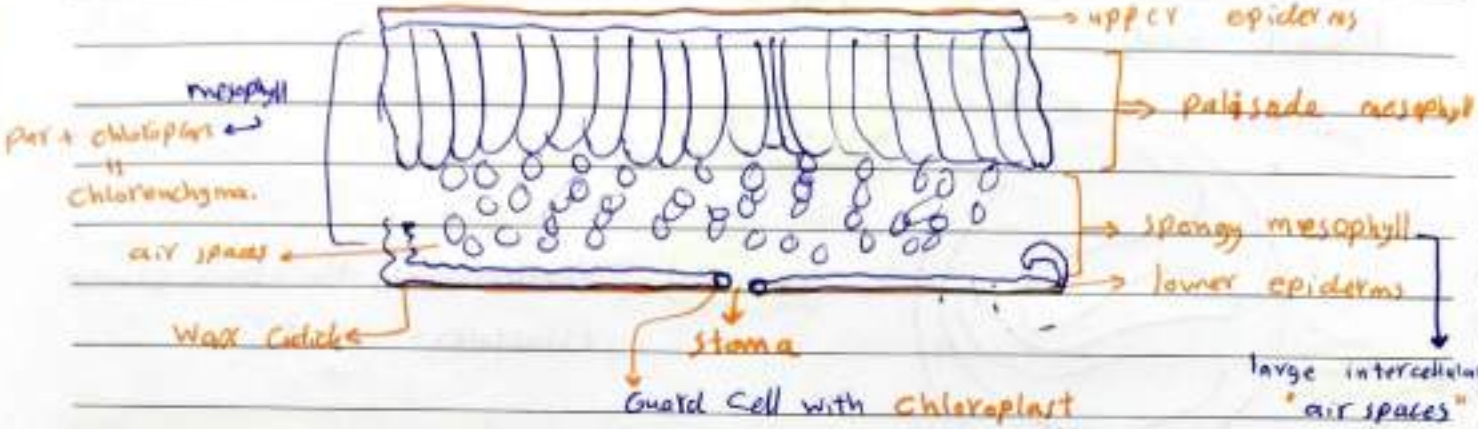
(Internal anatomy)

Dicot leaf structure

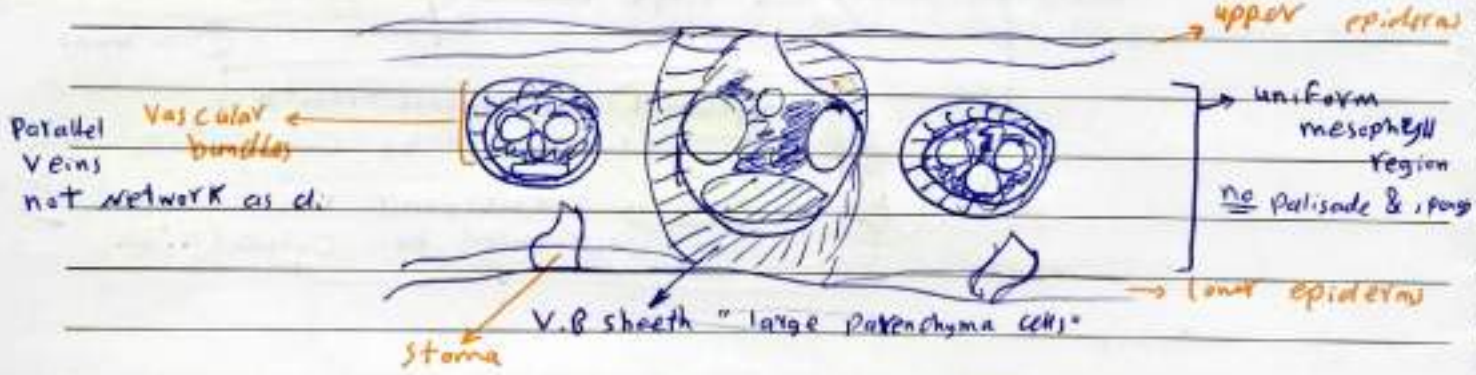


Vascular bundels are varying in size and location....

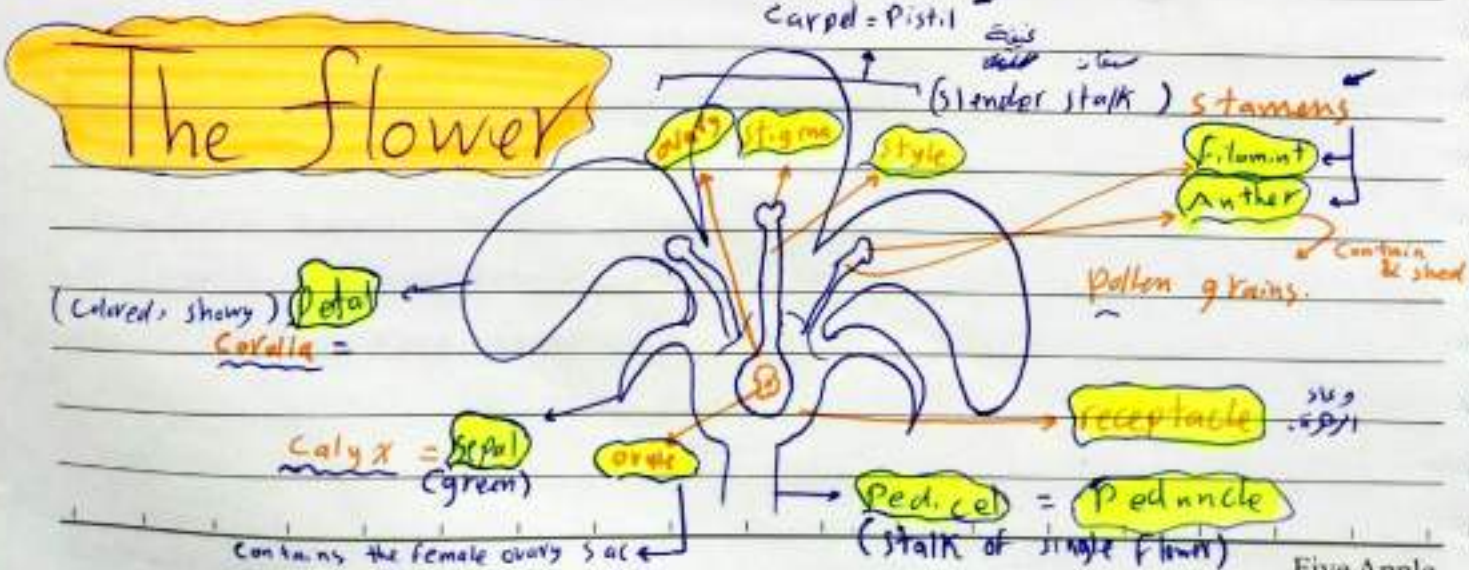
the smaller veins are surrounded by a bundle sheath...

Xylem face the top of the leaf, & Phloem face the bottom

Monocot leaf

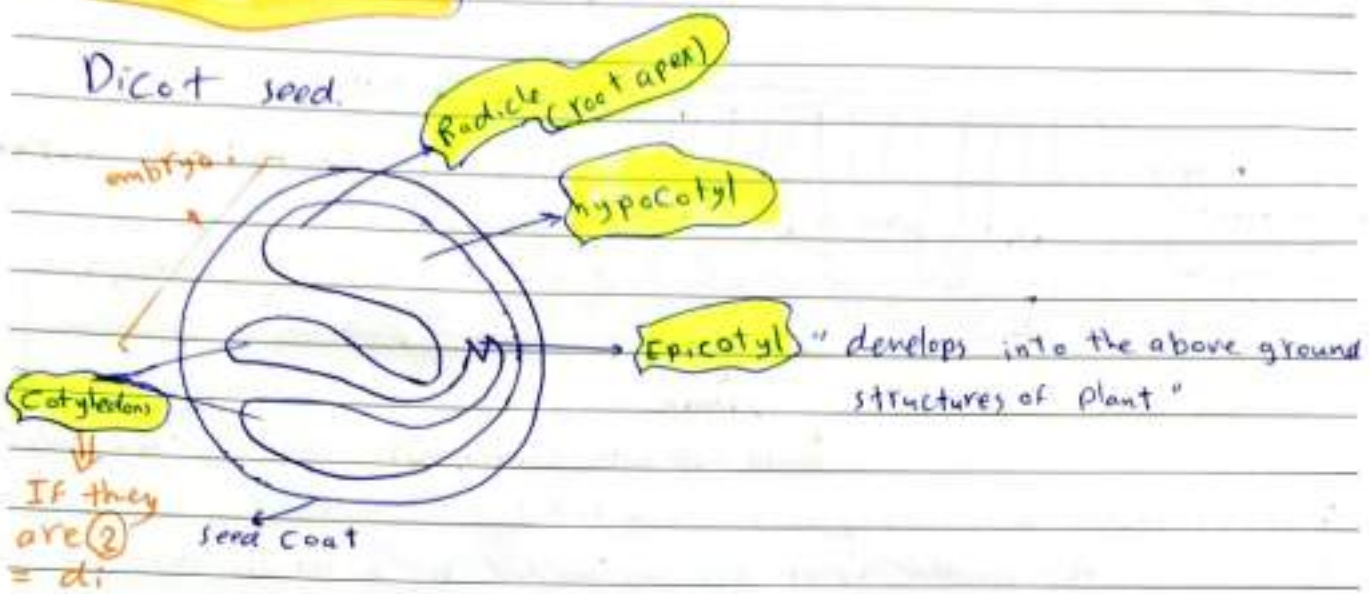


The flower

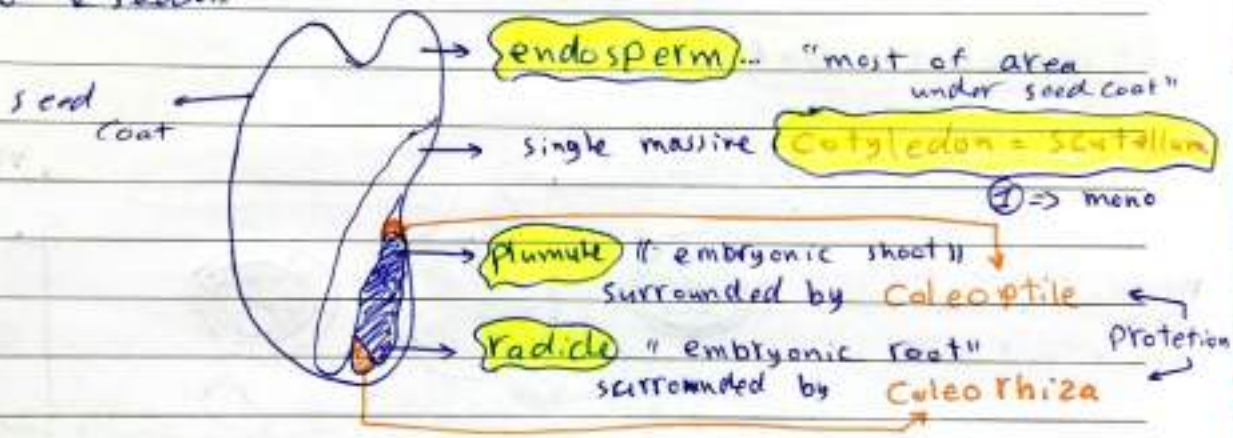


The seed...

Dicot seed



mono & seed..



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⑫ Animal tissues

Cell → tissue → organ → organ system → organism.
(nose/limbs/heart) (digestive, nervous, circulatory system)

The study of tissues is called Histology.
Suitable is to be 10 Mm thick → "slides"
They are satained with hematoxylin ⇒ nuclei ⇒ dark blue
" eosin ⇒ Cytoplasm ⇒ light red color.

Epithelial tissue: "نسيج طلائي" "6 types → 2 needed"

location: - body surfaces "epiderms of skin"
- Line tubular organs " small intestine"
function: - protection, secretion, absorption, sensation, reproduction.
Features: - ① have one free surface, ② Lack of blood vessels,
③ very little intercellular space, attach to a basement membrane.

① Simple squamous epithelium:

"Flat" cells with wide central part → contains nucleus.
function: "exchanging materials"
location: Alveoli of lungs & capillaries. "artery or a vein"
Remind: // we used methylen blue to stain // Inner layer.

② Simple cuboidal epithelium

Cells with equal sides "cube-like" & "central nuclei"
location: Kidney tubules & thyroid follicles.
Function: secretion or absorption.

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② Connective tissue

Location: all systems of the body.

Function: - Connection, defence, Cushioning (كوسيد), support, protection, storage of energy.

Consist of: Cells, Fibers & Ground substance.
- → organic compounds
- → inorganic compounds

Collagen Fibers — tough & flexible

elastic fibers — strech when pulled.

- hard "bone"
- semihard "cartilage"
- liquid "blood"
- Jelly "loose, Dense"

They are highly vascular → ~~except~~ [[except for cartilage]]

Lots of intercellular spaces.

Types:

proper → loose, dense, Adipose

specialized → bone, cartilage, blood

1 Connective tissue proper

Loose // dense // Adipose.

1-1 loose Connective tissue: "also called "areolar"" (يوجد الاثنين)

The cells are scattered in Jelly matrix ⇒ Contain Collegen & elastic.

location: Fills in the space between other tissues ⇒ ~~[illegible]~~ "mesentery"

Function: body's defence system.

Fibers:
- Collegen Fiberes: "white", wavy, Thick "bundle shape. "stained light pink"
- Elastic Fibers: "yellow", traid, branched, Thinner "darkly stained"

Common cell type: Fibroblasts ⇒ "elongated, oval-shaped nuclei"
Fibrocyte.
Process: "produce fibers".

mast cells ⇒ "oval shaped & have lots of granules which may mask the nucleus → heparin, histamine

macrophages ⇒ appear as round cells with irregular outlines & small nuclei and the cytoplasm contains dense ingested particles

Five Apple

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1-2 Dense Connective tissue "Jelly matrix"

Only Collagen fibers which are tightly packed.
making this tissue much stronger than Loose one.

- Regular : → fibers are arranged paralled to each other.
- Irregular : → Are not.

Location: Tendon "regular fibers"

"Fibrocyte nucleus" ⇒ produce fibers
fibroblast

1-3 ADipos ⇒ function cell storage for Lipids.

"large vacule which contain Lipids."

"The nucleus and cytoplasm are peripheral"

2 special Connective tissue

blood, cartilage, bone.

2-1 Blood.

- Red = erythrocytes "nonnucleated". "No fibers"
- White = leukocytes "nucleated".
- Plasma & cellular elements. "platelets"

"In which organic substances are dissolved"

plasma ⇒ extracellular fluid matrix.

white leukocytes → granular: contain granules in their cytoplasm
like neutrophils.*

agranular: lack granules in their cytoplasm
like lymphocytes.

platelets: small nonnucleated cytoplasmic fragment of large cell
called megakaryocytes "in red bone marrow"
→ function: blood clotting.

* Neutrophils: "stained light-blue colored granules and 3-5 lobed nucleus." "most abundant type of leukocytes ≈ 65-70%.

› lymphocytes: "round nucleus with very thin layer of cytoplasm around.

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has hyaline

2-2 Cartilage :

"trachea"

Location: end of long bone & most of the respiratory tube.

It derives its resilience and support from gelatinous matrix

cells → Chondrocytes secreted by ⇓ resid in "lacunae"

called → Chondrin ⇐ Collagen, elastic

The boundary is surrounded by a dense connective tissue material called perichondrium.

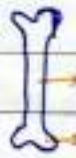
- types: hyaline, elastic, fibrous.
- Chondrocytes => found in groups of 2-4 inside spaces called lacunae.

"simi-solid matrix"

2-3 Bone:

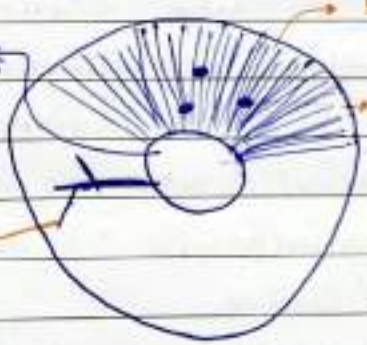
hydroxyapatite

The matrix is hard because of the "Calcium-phosphate salt"



- compact → found in long bones, as in the femur and is made of repeated unites called Haversian systems.
- spongy → found in flat bones, as in the skull and is made of a network of bar-like extensions => trabeculae.

Compact bone: "prepared by grinding"



- lamellae " concentric layers of matrix"
- lacunae " contain bone cells" osteocytes
- Haversian canals "blood vessels & nerves" and are connected by Volkmann's canal

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③ Muscle tissue

- have the ability to contract.

Function: [shorten ⇒ change in body parts' position.
[help move contents of different tubular organs in our body

Contraction ⇒ actin & myosin interaction.

Types ⇒ skeletal & smooth & cardiac

- skeletal ⇒

location: in organs which are under voluntary control.

Muscle ⇒ bundles ⇒ many muscle fibers (cells)

many filaments of actin & myosin

give the striated apparance. ← arrangement

* nuclei in the periphery of fibers.

④ Nervous tissue

Locations: in the brain, spinal cord & nerves "reach all organs"

Types of cells:

- neurons: function: specialized in transmitting impulses.

Consist of: - cell body = " nucleus + perikaryon " ← surrounding cytoplasm.

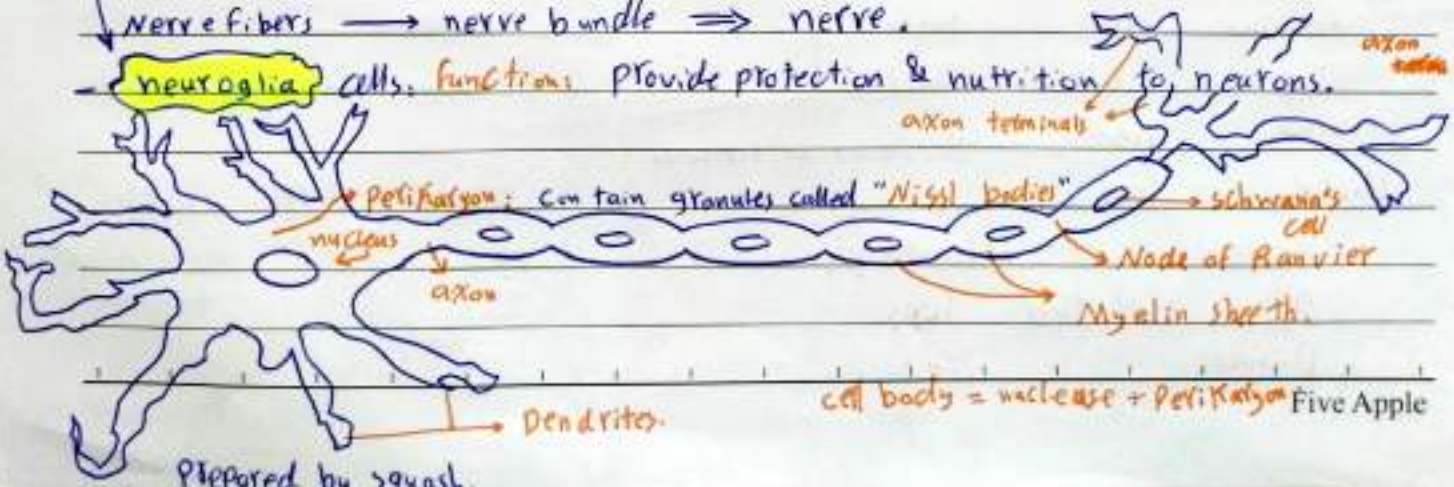
- large numbers of Golgi bodies & mitochondria "In the latter"

Types of processes: axon: long & carry impluses away from the cell body.

dendrites: short & carry impluses towards the cell body.

Nerve fibers ⟶ nerve bundle ⇒ nerve.

- neuroglia cells. functions: provide protection & nutrition to neurons.



cell body = nuclease + perikaryon

Prepared by squash.

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(13) Vertebrate Anatomy

Classification of the rat.

- Common name. albinorat
- scientific name: Rattus norvigicus.
- Family: Muridae
- order: Rodentae
- Class: Mammalia
- subphylum vertebrata
- phylum: Chordata
- subKingdom: Metazoa
- Kingdom: Animalia

Shared features with mumals:

- presence of hair. "regulate body temberature"
- Presence of Milk-producing glands "mammary glands" "feed new borns"
- endothermy & presence of placenta & diaphragm.

Charactarestics of rat:

- Can easly grown in animal houses with lettle space needed.
- 21 days to reproduce giving large number of litters.
- easly dealt with. "properly handled"

تعليمات التزلج 176 ← read.

Glossary

Dorsal	back	
ventral	belly	
lateral toward	sides	
Posterior	tail	
Caudal	tail	
Anterior	head	
median	midline	
superficial	near	surface
Deep	below	surface
Proximal	neal	thepoint of reference
Distal	Far	
Pectoral	Chest & shoulder.	
Pelvic related	hips	
Dermal	skin	

sections

sagittal	Aplane separating	Left & right
Transverse	body into	anterior & posterior
Horizontal		dorsal & ventral

~~longitud~~

- longitudinal: lenghwise

Right & Lift: to the animal not human.

Five Apple

Scanned by CamScanner

External anatomy:

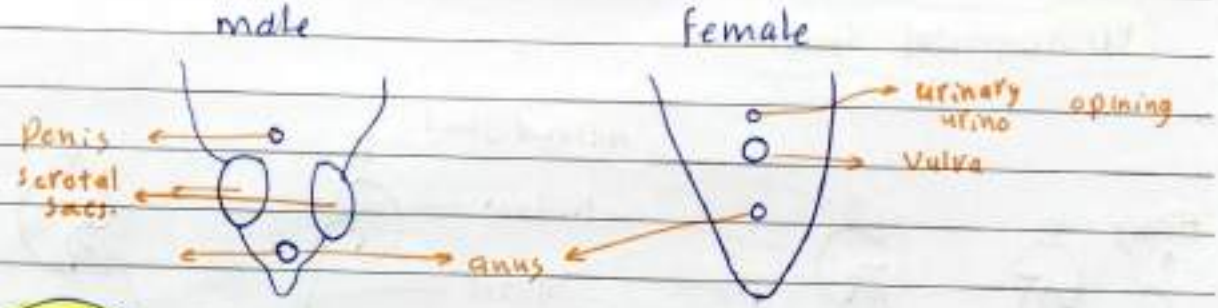
Rat has head, neck, trunk (4 limbs) & tail

Head: mouth, lips, tongue, nostrils, incisors, diastema
vibrissae, eyes, eyelids, eye lashes, nictitating membrane
ear pinnae, ~~thorax, abdomen~~

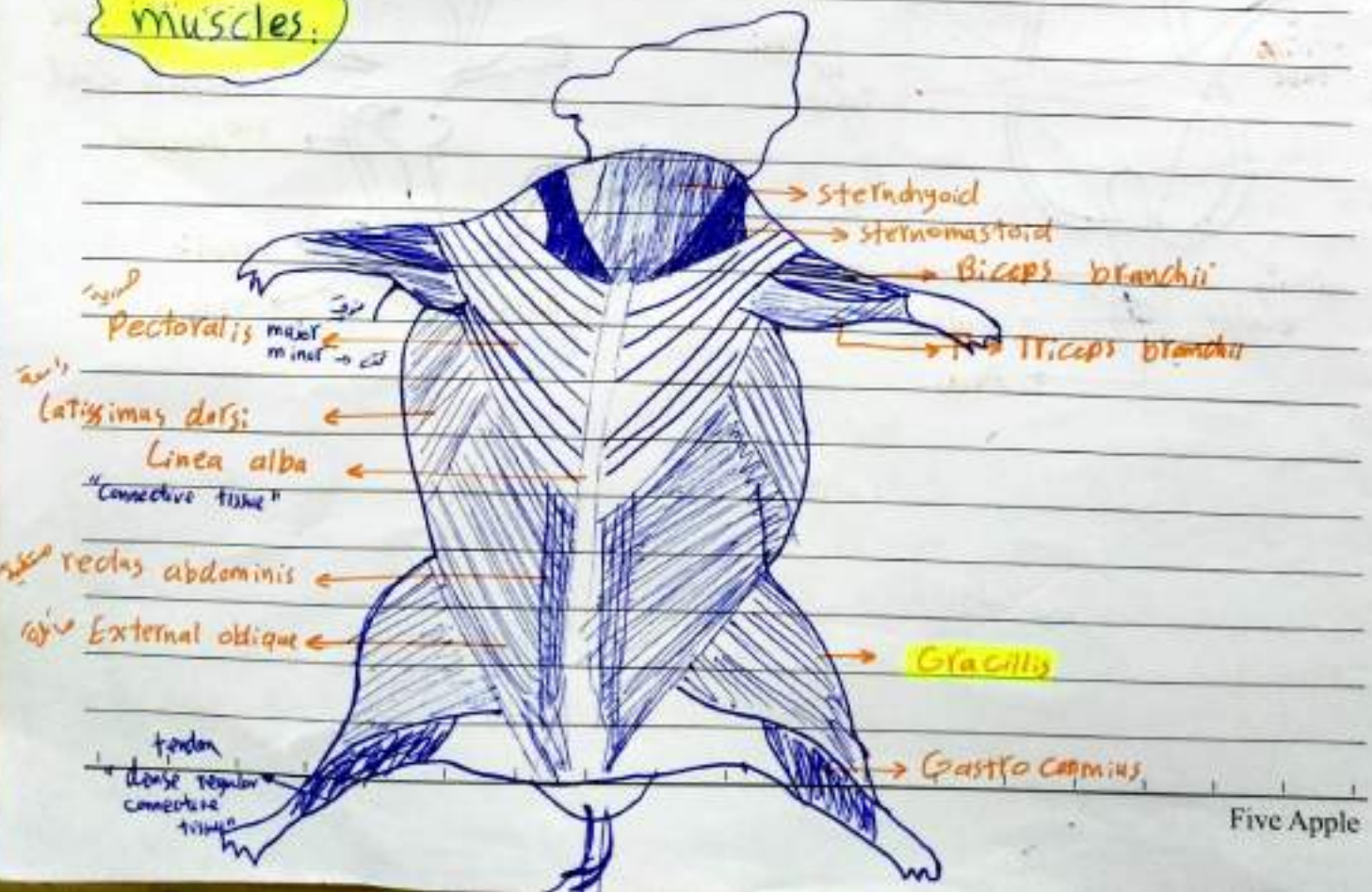
Trunk: Thorax, abdomen, scrotal sac, testes (testicles), penis
urinogenital aperture, vulva, anus & nipples "2 rows"

Tetrapod ⇒ ♂ fore limbs ⇒
♀ hind limbs ⇒

Internal anatomy:



muscles:



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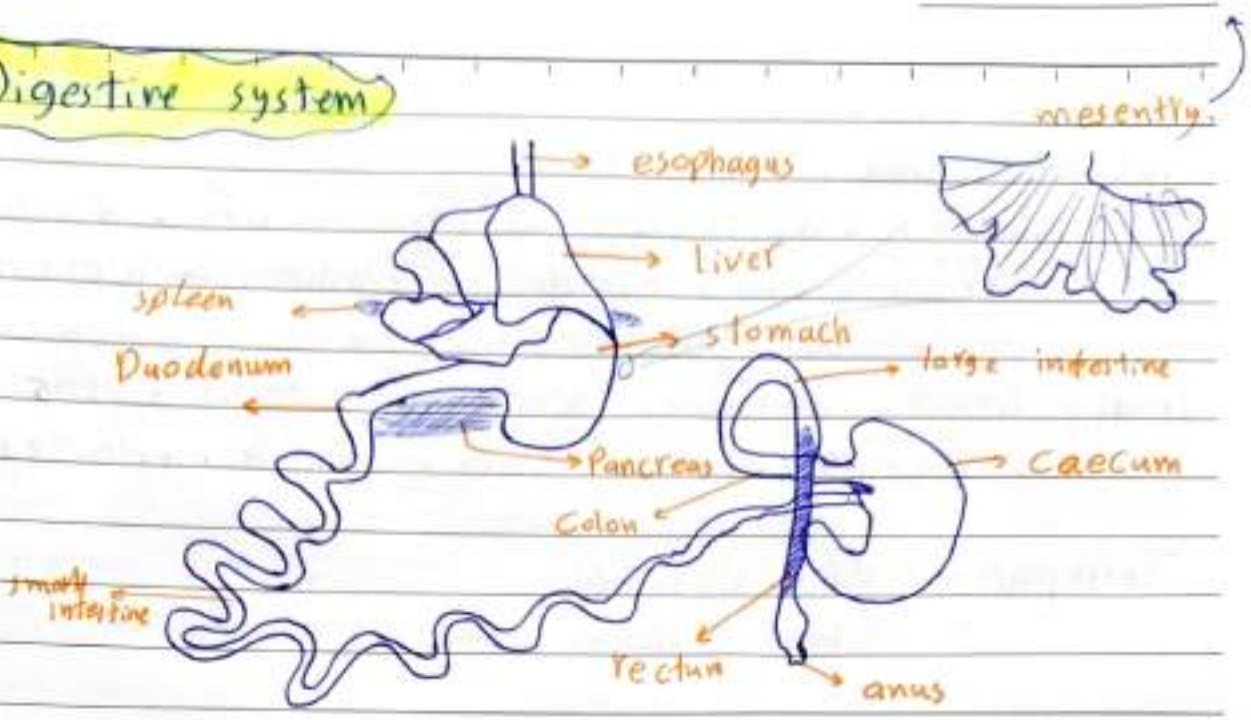
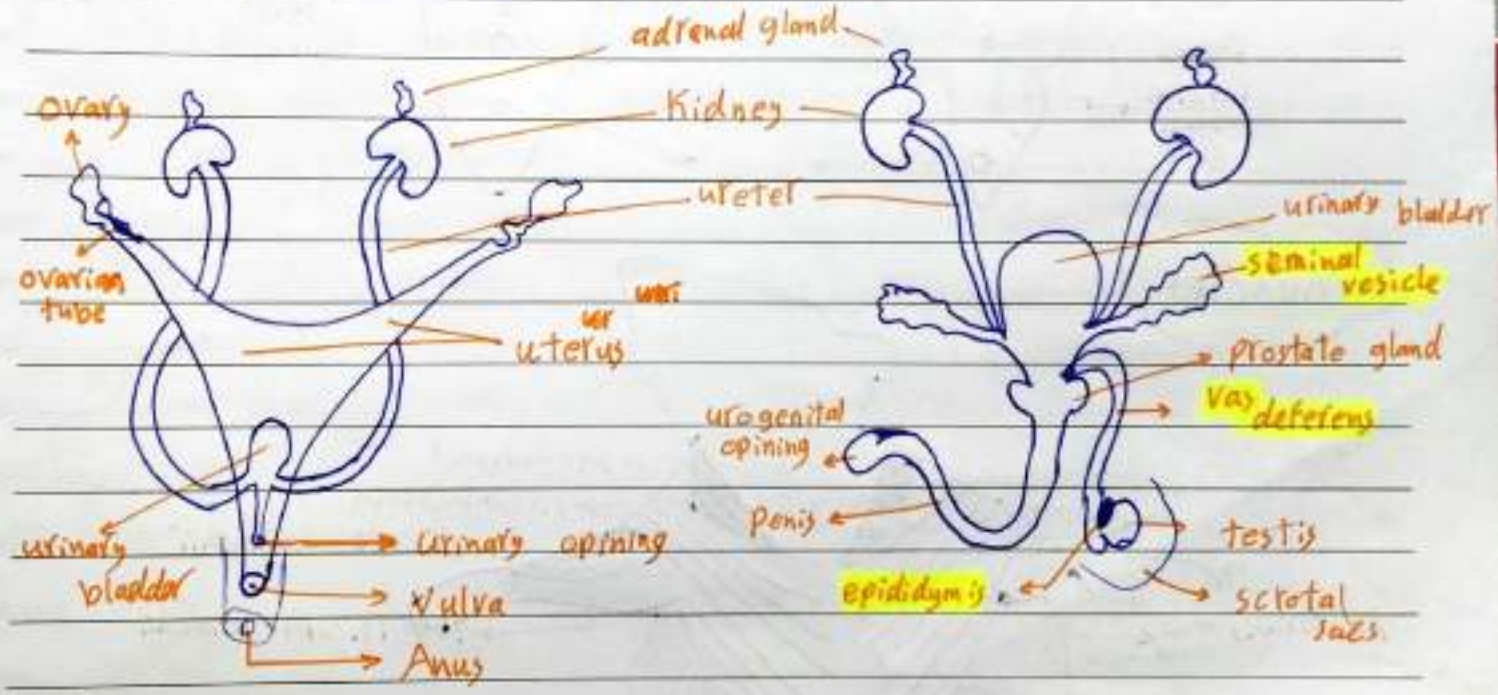
Digestive system



Urinogenital system



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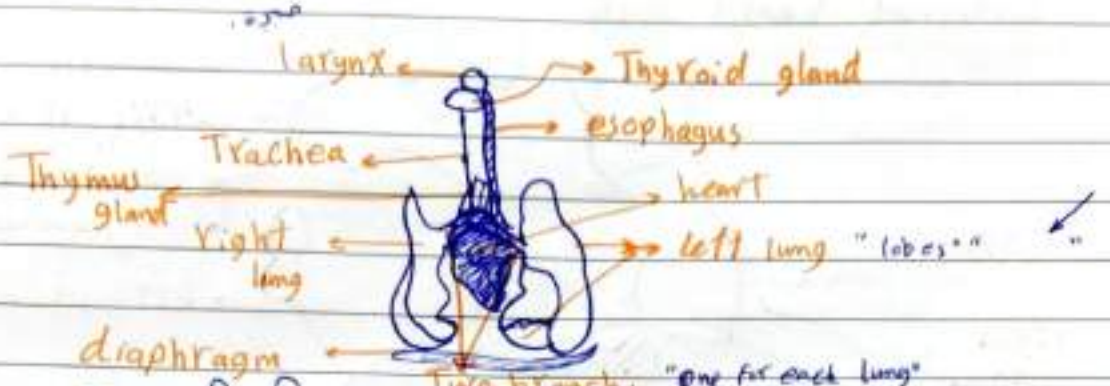
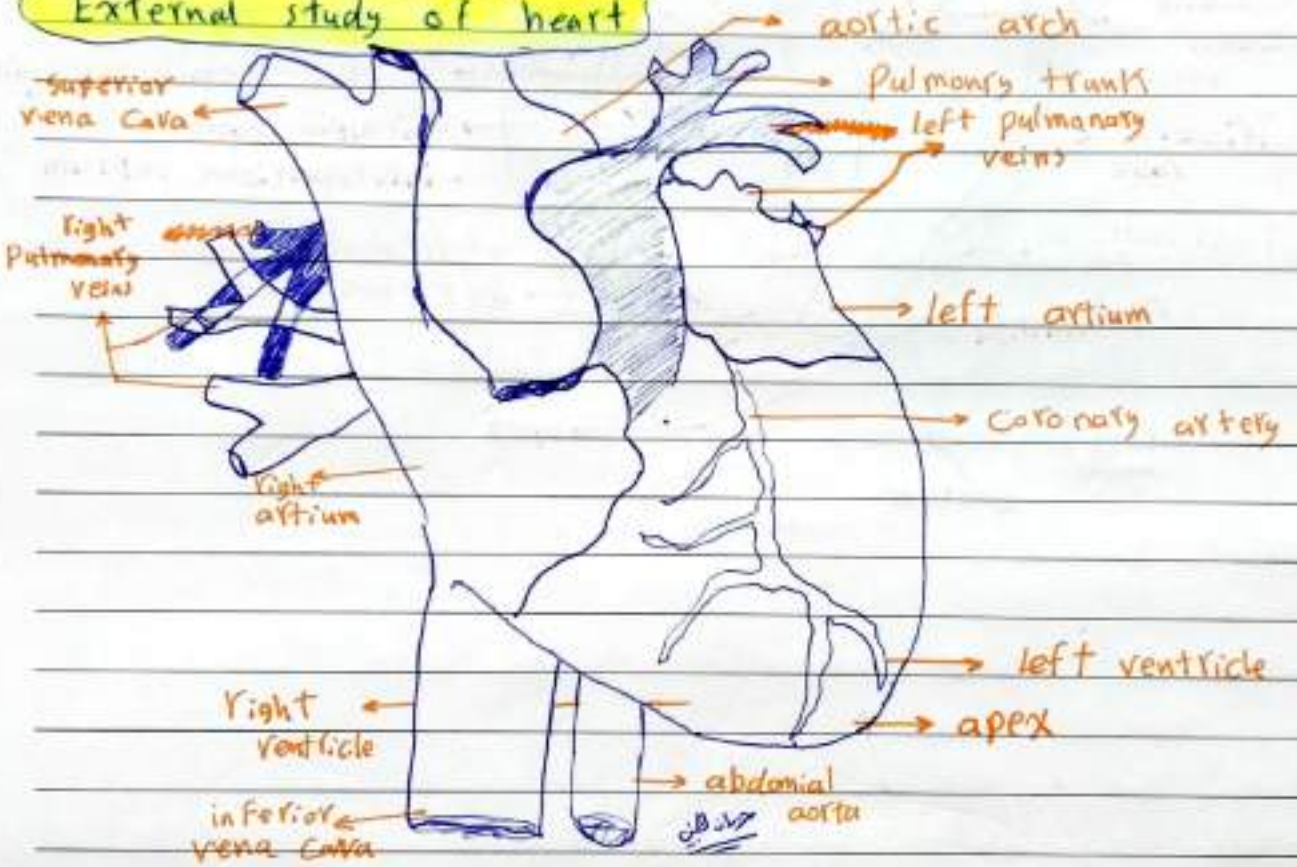
respiratory system

under the r.b cage.



External study of heart



Left & right pulmonary veins ⇒ to Left artium

Aortic arch ⇒ from Left ventricle

superior & inferior vena Cava ⇒ to right artium

Pulmonary trunk ⇒ from right ventricle.

Coronary artery ⇒ on the heart..

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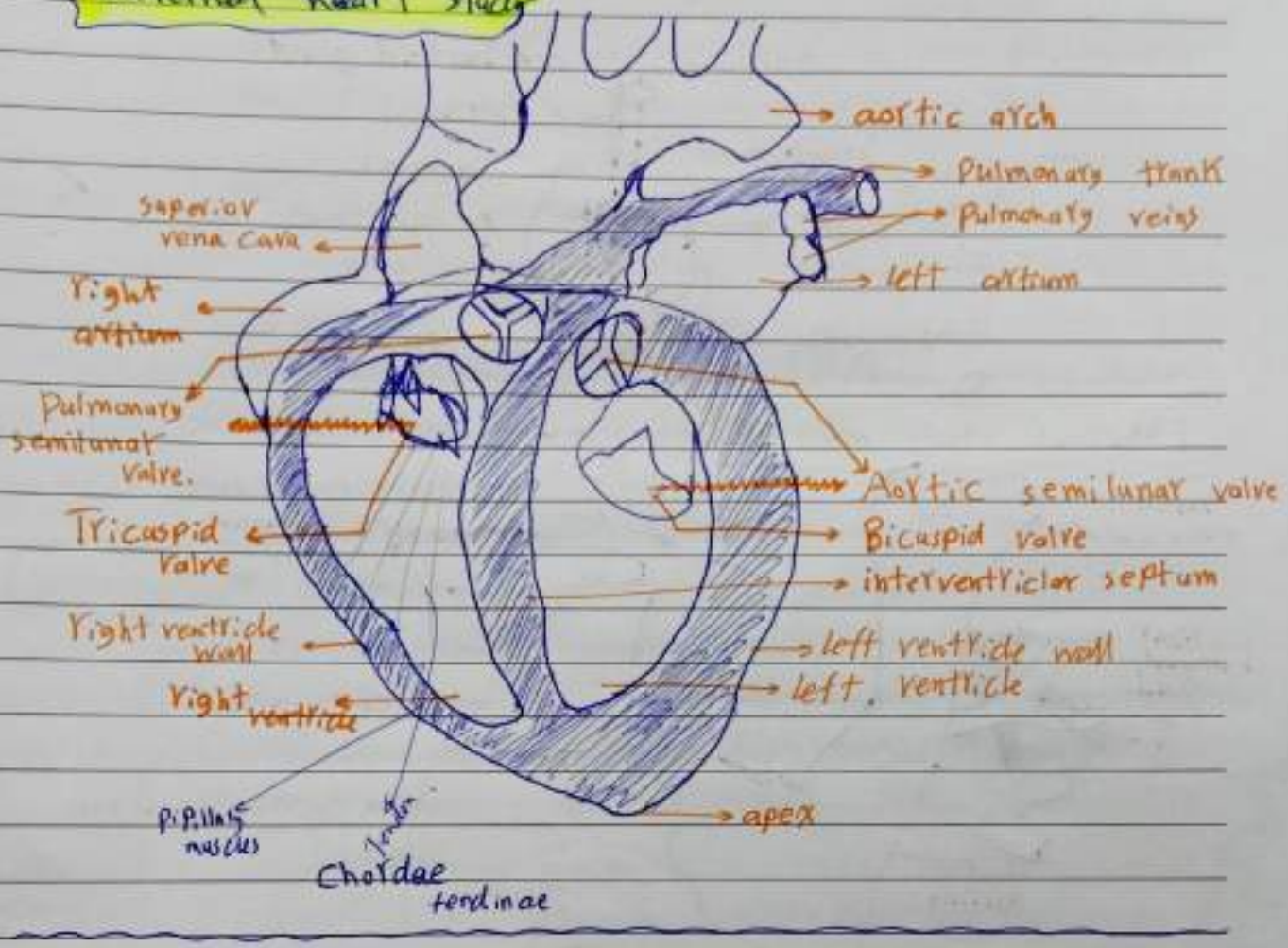
External heart study



Five Apple

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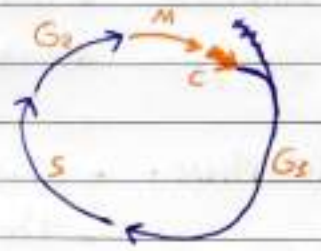
⑨

Cell division ...

skin digestive respiratory

Cells divide in order to :=>
- replace lost cells in organs which are exposed to constant friction
- signify in reproduction of living organisms.

Cell cycle: repeated sequence of events in which dividing cells undergo.
- interphase ((gab 1, synthesis S, gab 2))
- mitosis
- cytokinesis



Interphase

G1: occures after cytokinesis & during it.. most proteins & other molecules are made.

S: DNA is duplicated and at the S end, each chromosome has two identical strands called cromatids.

G2: more molecules & structure needed in ~~my~~ mitosis are made

Mitosis: it results in production of two nuclei containing identical chromosomes. It's also called equational divison => because the resulting cells have equal number of chromosomes.
stages: ((prophase, metaphase, Anaphase and telophase.))

Cytokinesis: it leads to division of original cytoplasm so that each resuting cell contains the organelles & the metabolites needed for continuity.

Mitosis in animal cells

Prophase:
- the nuclear envelope disappears.
- the chromosomes are visible and randomly placed at cell center.
- the centrioles divide and move to the opposite poles of the ~~the~~ cell.

Five Apple

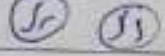
Scanned by CamScanner

- Around each centriole a number of fibers radiate to form an aster.
- some spindle fibers project from the centrioles towards the centromeres. → they are microtubules.
  ↳ "point at which chromatids attach"

Metaphase: Alignment of chromosomes along the cell center "equatorial plate" & Chromosomes attach to the spindle fibers by their centromeres.

Anaphase: • splitting the centromeres. "we can see the chromatids" separating from their homolog & moving the pole of the cell.

Telophase: • Constriction of the cytoplasm.
- the arrangement of the chromosomes into two groups to prepare for daughter nuclei formation.
- the nuclear envelope & the nuclei reappear at late telophase.
- the cytoplasm constricts completely & two daughter cells are produced. a process called cytokinesis.



Mitosis in plant cells

- The root tip contains meristem which has high miotic activity... "apical meristem"
- Recall, root cap cells are not meristematic.
- mitosis stages are basically similar in both animal & plant cells.

Two major differences...

★ The process of cytokinesis in plant is done by ⇒ cell plate not by constriction as in animal cells.

★ In plant cells... there is no centrioles and so there is no astral rays.

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Meiosis

Just in animal cells ...

It occures in reproductive organs (gonads). "Two copies of each chromosome"
It also consists of Two cell divisions : meiosis I & meiosis II.
In body cells ⇒ chromosomes are found in pairs called Homologues.
homologues chromosomes are physically similar and Contain genetic information for the same trait "maybe identical or differen for each trait
AA Aa aa"

(2n) Diploid: when all homologues chromosomes are found in the cell "2x23 in human"
(1n) Haploid when the cell has the half number of chromosomes "23 just 1 of them"

- Meiosis I involves in reduction (halving) of chromosomes number present in the parent cell. (2n)
- Meosis II ends up in daughter cells called gametes. (1n)
sexual cells "one copy of each chromosome"

♂ sperm ova (egg) ♀

* Ascaris worm cells have 4 chromosomes for each.
→ "inexpensive to get & can be available in large numbers"

Each division of meiosis is similar to what happened in mitosis ...
I mean the (pro, meta, ana, telo) phases But ther is no interphase in the second one → no "DNA duplicating"

* we have prophase I, Metaphase I, anaphase I, telophase I & Cytokinesis
then prophase II, metaphase II, Anaphase II, telophase II & Cytokinesis

* a process called "Crossing over" happen in the prophase I and this is the cause of diversity.
* The duplicated chromosomes are called sister Chromatides and still attached to each other until the second division "meiosis II"

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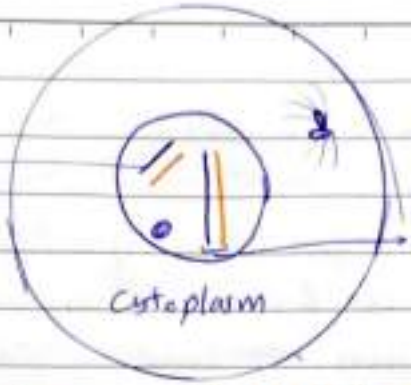
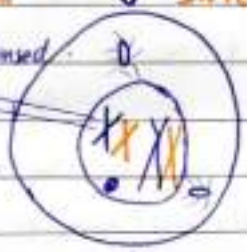
Meiosis I



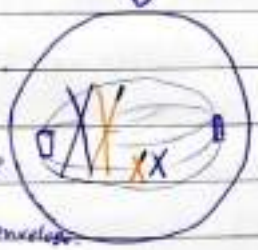
mother cell ...

There is Chromatin ...
They are actually not condensed like that but written like that for ease.

↓ Interphase (G_1 , S , G_2)



after chromosomes duplicating.
& division of Centrioles.



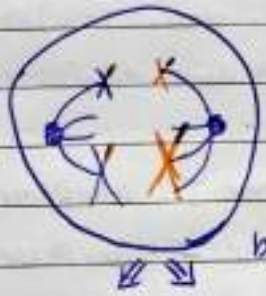
Prophase I ...

Each two homologues undergo "crossing over" "recombination" - & breaking down the nuclear envelope.

here we see the condensed chromosomes and they consists of Two sister chromatides.

Metaphase I ...

Chromosomes align at the equatorial plate.



Anaphase I ...

separating the homologues chromosomes. sister chromatides remain attached by their centromeres

Telophase I & Cytokinesis

"see details on mitosis"

Five Apple

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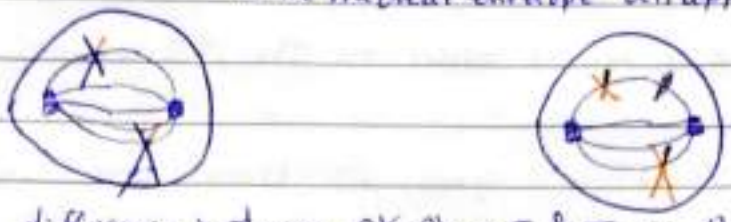
Meiosis II

Prophase II

similar to mitosis.

Again -- the Chromatin Condense
& the nuclear envelope disappears



Major difference between prophase I & II is that the daughter cells in II has just one Copy of homologues chromosomes so that there is not "Crossing over"

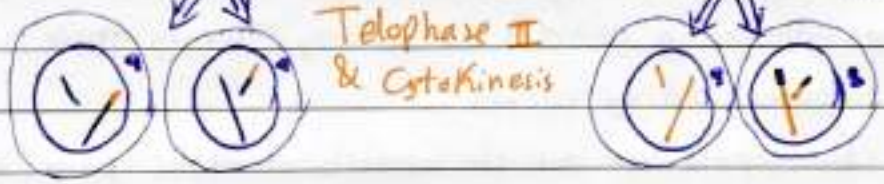
Metaphase II

the same as I & mitosis.
Recall....

Anaphase II

Shortining the microtubules...
read Anaphase in mitosis...

Telophase II & Cytokinesis



The result is four unique haploid cells at the end of meiosis.
4 Gametes....

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(10) Genetics

. Traits are determined by units of DNA called genes.
genes are located in linear order on the chromosome.

Genetics: the study of how genes are transmitted from one generation to the next & how they are expressed to produce characteristics.

* Genetic information is transferred during sexual reproduction and this involves the formation of Gametes "the egg & the sperm" and their union in fetilization.
* Diploid cells: cells that contain pairs of chromosomes.
* Haploid cells: cells contain one-half the chromosomes number of diploid cells Like "the egg & the sperm"
* Homologues / Homologous chromosomes: Chromosome pair that are similar to each other because they contain genes for the same traits.
* Alleles genes: genes that occupy identical positions on the homologues.
* Homologues separate producing gametes containing twenty-three single or unpaired chromosomes. during meiosis.
* during meiosis. The separation of the members of allelic pairs "segregation" due to segregation, the Gametes contain only one allele for each trait.
* The Zygote: a single diploid cell was re-established by the union of the sperm & the egg, it divides mitotically forming daughter cells that also undergo mitosis. ⟹ trillions of cells ⇒ organism.

* IF the two alleles for a particular trait were similar in their expression, the individual is said to be Homozygous "homozygote" for that trait.
"AA" "aa"
* IF they are different in their expression, the individual is said to be Heterozygous "heterozygote" for that trait.

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* Genotype: represented by letters symbols. "Aa" "AA" ← Fr example
* Phenotype: represented by a phrase describing the characteristic "blue-eyed & brown-haired"

"Capital letters"

* Dominant allele: The one who masks or hides the expression of its alternative
* Recessive allele: The one who is masked or hidden "small letters"

* Codominant allele: when there is no dominant allele "neither of them" & the heterozygote is different from that of either homozygotes. so when the phenotype is a combination of the two homozygous phenotypes, they are Codominant.

Example: → Blood group A & B ⇒ there is AB. "Combination"

* Incomplete dominance: occures when the phenotype of the heterozygote is intermediate between those of the two homozygots

Example → White flowers (r^1r^1) & red flowers (r^2r^2) ⇒ pink flowers (r^1r^2)

* Autosomes: The twenty-two pairs of chromosomes that do not determine sex.
* sex chromosomes: ⇒ Female = pair of x chromosomes.
  ⇒ male = x & y chromosome.
* sex-linked genes: genes located on the x chromosome.
  ↳ represented twice in the diploid cells of the female (XX), but only once in those for the male (Xy)

* In the sex-linked deseases ⇒ a heterozygous female is a carrier for sex-linked recessive alleles X^aX^a "not affected" & half of her sons will express it (X^ay)

① PTC testing: the chemical is called "phenylthiocarbamide" "PTC" "being able to test it is dominant represented by Capital T"

② Tongue-rolling: The ability to roll the tongue is dominant C.
I am "cc"

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③ Thumb - bending: "hitchhiker's thumb"
straight thumb "B" bending thumb "b"

④ Hair texture, strait hair "SS" Curly hair "HH" – incompletely dominant-
the intermediate wavy hair "HS"

⑤ Ear lobes: Free ear lobes "E" is dominant to attached ear "e"

⑥ A-B-O Blood types: are differentiated according to the presence
or absence of the A & B antigens on the r.b. cell.
typeA Contains A antigen / Type B contains B antigen
type AB " both / " O " neither.
Multiple alleles: occur when there are more than two contrasting
forms of a gene that determine a particular trait.
"where is Clumping.... this is the blood type"
See table 10-1 P227.
remember that we used sterile lancet.

⑦ Drosophila melanogaster "the Fruite fly"
Characteristics: • simple food requirements. Hardy.
• occupies little space in the laboratory.
• Completes its life cycle in about 10-12 days at room.
• produces large numbers of offspring.
• Can be immobilized readily for examination & storing.
• has many types of heredity variations that can be
observed with low magnification.
• small number of chromosomes "Four pairs"
which are eaily located in the large salivary gland cells.

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we use overdose of CO_2 or ether to kill the flies.
" used dissecting microscope to examin them.
" moved it while observing using dissecting needle or a paintbrush or a forceps.

⇒ Distanguishing between males & females.

1- only males have a sex comb, a fringe of black bristles on the foreleg.
2- The tip of the abdomen is more rounded in males than in females. The posterior part of the abdomen is quite dark in males and considerbly lighter in females.
3- Females are generally larger than males.

(Rounded ♂ y-b) (Pointed ♀ y-b-y-b-y-b)

⇒ Features of the wild-type individuals:

- Red eyes
-
- Black & yellow body

⇒ Mutant flies ...

① Flies with vestigial wings. "Cannot fly" — they have a defect in their vestigial gene.
② Yellow flies "more yellow" "no black"
③ Ebony flies "Black body"
④ White-Eyed flies.

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