MORPHOLOGY OF FLOWERING

Morphology (External Structure)				
Root	Stem	Leaves	Flower	Seed

flower

bud

fruit

stem

roots

sap

leaf (leaves)

seeds
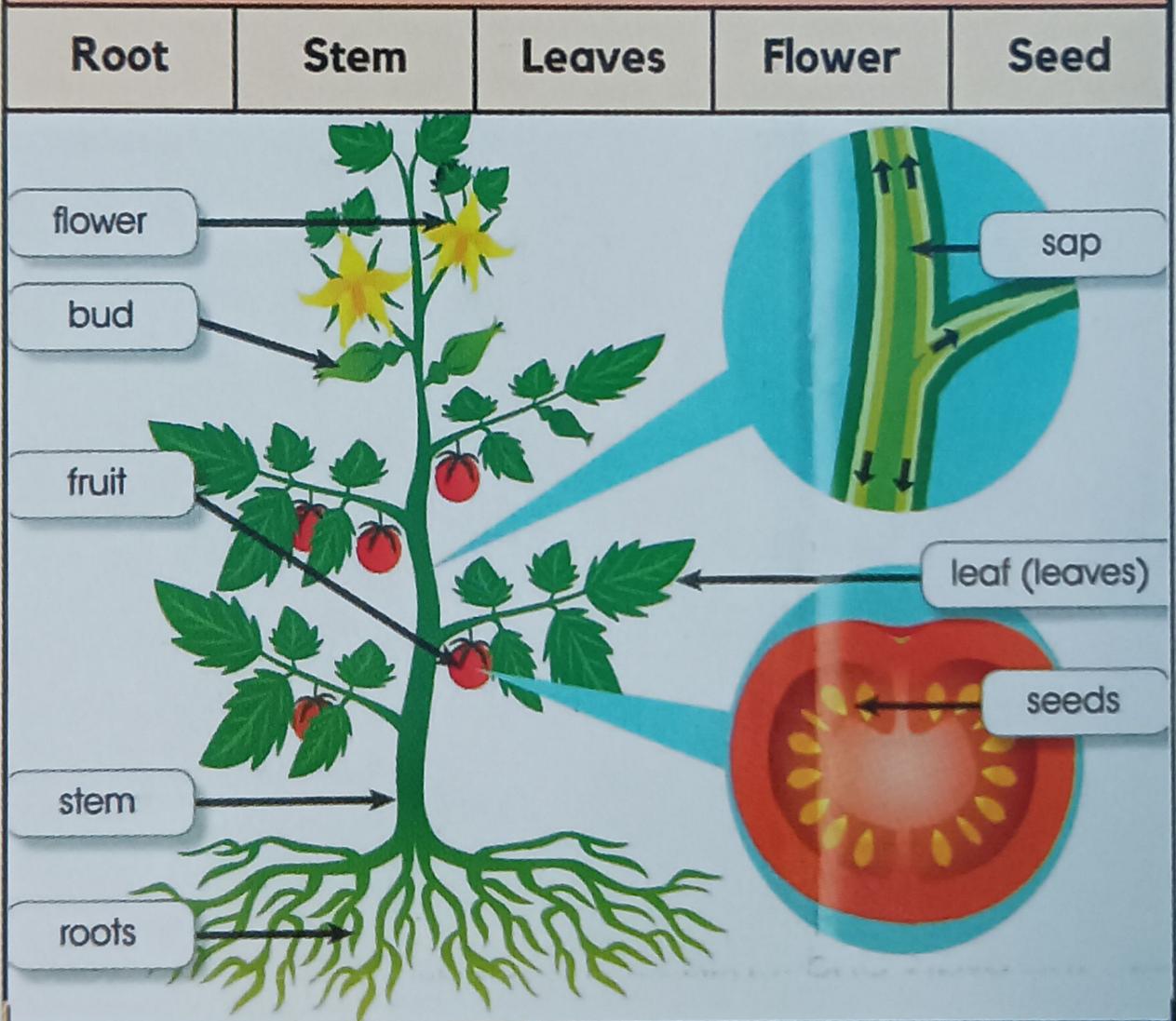
ROOT

Tap root	Fibrous root	Adventitious root
1° root + 2° branches eg- Mustard (dicots)	• Originate from base of stem • Large number Eg-wheat	Roots from part other than radicle. eg-*Monstera*, banyan tree.

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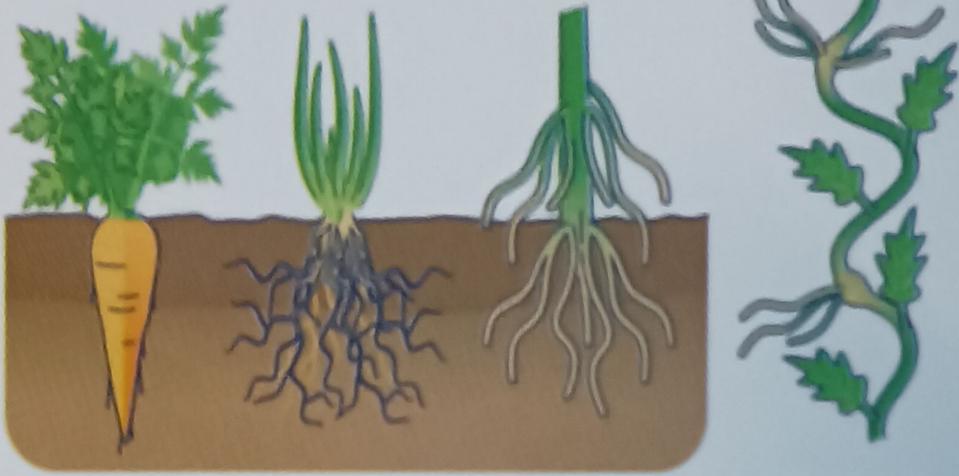
| TAP ROOT | FIBROUS ROOT | PROP ROOTS | ADVENTITIOUS ROOTS |

Function of Root

H2O absorption	Mineral uptake	Anchorage
Storage of food	Plant growth regulator synthesis	

Regions

(A) Root cap Thimble-like Protects tender apex	(B)Region of Meristematic activity -Small, thin-walled cells -Dense protoplasm -Divide rapidly
(C) Region of elongation • Cells undergo elongation & enlargement • Root growth in length.	(D) Region of Maturation • Proximal to elongation • Cells differentiate & mature • Root hair (+)-thread-like structures absorb H_2O and minerals

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STEM (ascending part of axis)

- Develops from plumule
- Bear nodes (from where leaves arise) and internodes (area b/w nodes)
- Green when young; grows to become woody.

Function of Stem

Bears fruits, flowers & Leaves	Conduction of water & minerals	Vegetative propogation.
Photosynthesis	Food storage	Support & protection

LEAF (develops to branch)

Arises from apical meristem at node, bears bud (axil)

## Parts of Leaf

Leaf base	Petiole	Lamina/leaf blade
Attachment to stem Bear stipules In monocots, it may Expand to sheath In legumes, It may swell up (pulvinus)	Holds leaf blade Maybe long flexible- help leaf flutter.	Veins/veinlets (+) Middle prominent vein-midrib Provides rigidity, transport H_2O & mineral

Venation - Arrangement of veins & veinlets on lamina

| Reticulate - Network eg - Dicots	Parallel - veins run parallel eg-Monocots

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Reticulate venation   Parallel venation
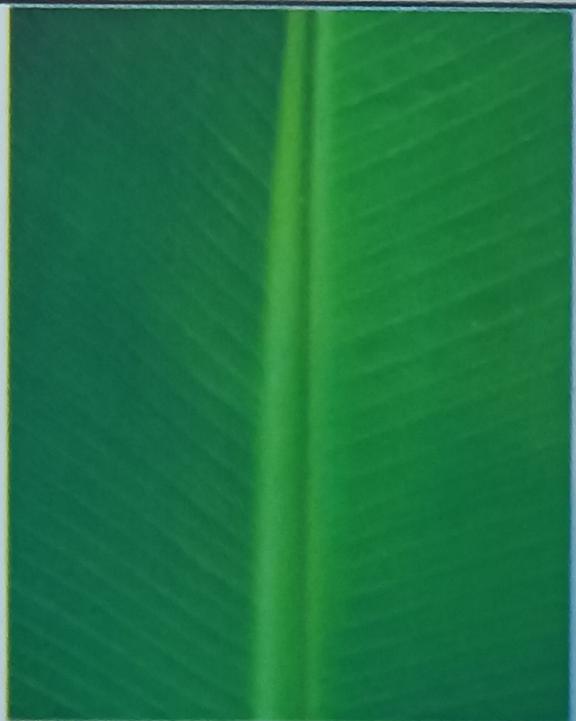
Types

Simple	Compound
• lamina is entire	• incision reaches midrib
• incision don't touch midrib	
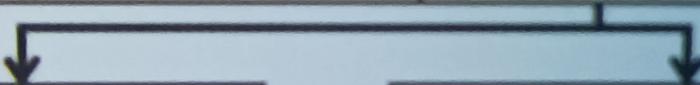
Pinnately compound	Palmately compound
No. of leaflets attached to common axis (rachis) eg- neem	leaflets attached to common point (tip of petiole) eg- silk cotton

Phyllotaxy- pattern of leaves over stem

| Alternate	Opposite	Whorled
• A leaf at a node (alternate manner) • eg – Chinarose, Mustard, Sunflower	A pair of leaves at a node eg– Calatropis, guava	More than 2 leaves on a node eg-Alstonia

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FLOWER (Reproductive Unit)

- 4 whorl (over <u>swollen end of stalk</u>/pedicel)
  - → thalamus / receptacle
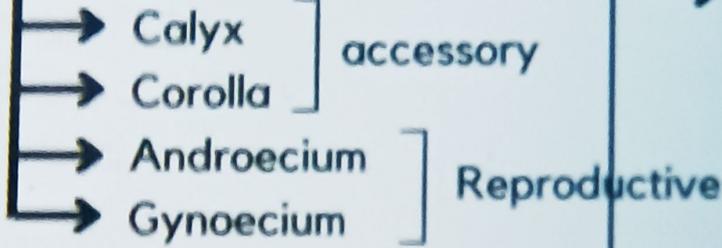
→ Calyx ⎤
→ Corolla ⎦ accessory

→ Androecium ⎤
→ Gynoecium ⎦ Reproductive

- Parienth- No distinction b/w calyx and corolla eg- lily
- bisexual-both Androecium & Gynoecium on the same flower
- unisexual- either Androecium or Gynoecium on the flower.

Symmetry

Radial (Actinomorphic)	Bilateral (zygomorphic)	Asymmetric (irregular)
Similar halves via any radial plane (touching center) **e.g.**-mustard, *datura*, chilli	Similar halves via a particular plane (vertical). **E.g.**- pea, gulmohur, bean, Cassia	Cannot be cut in similar halves e.g.-Canna

Other Classifications

(multiple of floral appendages)

→ trimerous (3x)
→ tetramerous (4x)
→ pentamerous (5x)

Leaf reduced bracts

→ bracteate-bracts (+)
→ ebracteate - (-)

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Classification based on position of whorls

Hypogynous	Perigynous	Epigynous
- Gynoecium (highest) -Superior ovary. Eg-mustard, Chinarose, Brinjal	-half inferior ovary Eg-Plum, Rose, Peach.	-Inferior ovary -Thalamus encloses gynoecium Eg - guava, Cucumber, Sunflower (ray florets)

Hypogynous
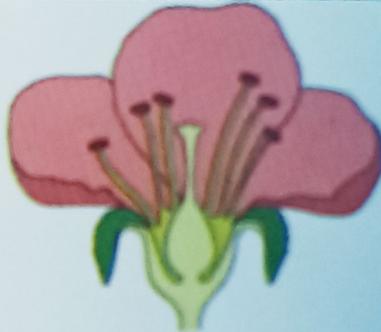
Perigynous

Epigynous

Parts of Flower (1)

| 1) Calyx	Types
• Outermost whorl • Sepals (green, leaflike) • Protect flower as bud	• Gamosepalous (united sepals) • Polysepalous (free sepals)
2) Corolla	Types
• Petals (coloured) • Pollination by insects • Varied shapes	• Gamopetalous • Polypetalous

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Aestivation - arrangement of sepals/petals

Valvate	Imbricate
-touch at margins -no overlap e.g.- *Calotropis*	- Margins overlap (directionless) e.g.- *Cassia, Gulmohur*
Twisted --One margin overlaps next eg - chinarose, ladyfinger, cotton	**Vexillary** -Largest overlaps lateral (Standard) (wings) -wings overlap anterior (keel) eg-Pea, Bean

VALVATE

IMBRICATE

TWISTED

VEXILLARY

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Parts of Flower (2)

3. Androecium - Stamen (Male reproductive organ)

Stalk/filament	Anther

- sterile stamen - staminode.
- stamens attached to petals- epipetalous eg-brinjal
- stamens attached to perianth - epiphyllous eg-lily.
- Stamen
  - Monoadelphous (1 bundle) eg- chinarose
  - diadelphous (2 bundles) eg pea.
  - polyadelphous (>2 bundles) eg- *Salvia*, mustard

4. Gynoecium - carpel (female reproductive part)

Stigma (topmost; receptive for pollens)	Style	Ovary (enlarged basal part) (Mature to Fruits)

Types
  - Apocarpous - free carpels eg- Lotus, rose
  - Syncarpous - fused carpels. eg- Mustard, tomato

*Ovules matures to seeds

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FRUITS

- Parthenocarpic - fruits develop without fertilisation

$$\text{seed} \longleftarrow \text{FRUITS} \longrightarrow \text{pericarp/wall}$$

Drupe- one seeded; develop from monocarpellary superior ovary

eg- mango , coconut

- Epicarp
- Edible Part
- Mesocarp
- Endocarp

Pericarp
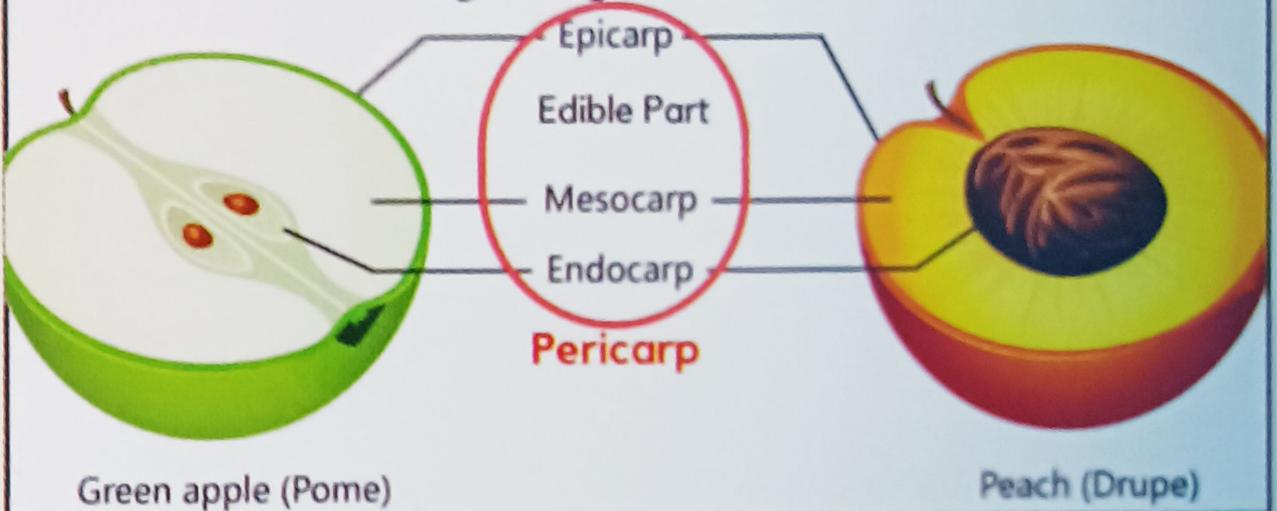
Green apple (Pome)   Peach (Drupe)

SEEDS

DICOT SEED

- Cotyledon
- Plumule
- Hypocotyl
- Radicle
- Seed Coat
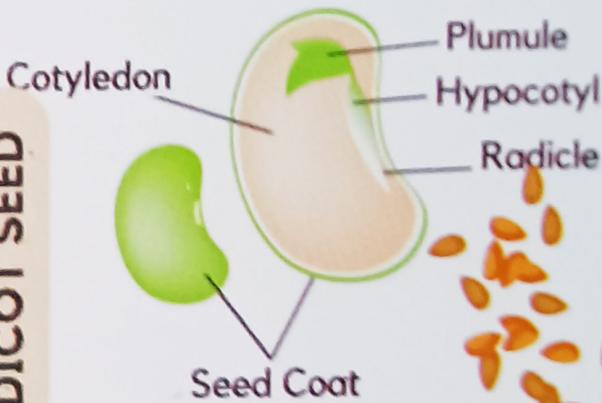
- Embryo
(inside seed coat)

  - 1 embryonal axis
  - 2 cotyledons
  fleshy (store food)

- **Coat**-outermost covering.
  Outer- testa
  Inner- tegmen

- **Hilum**- scar via which seed attaches to the fruit

- **Micropyle**- pore above hilum

- **Endosperm**- Food storing tissue (formed due to double fertilisation)
  eg- Castor

- **Non endospermous** endosperm (-)
  eg- Pea, bean, gram

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- generally endosperm (+) (except orchids)
- memberanous seed coat in cereals (fused to fruit wall)
- Aleurone layer- covering of endosperm
- Scutellum – shield – shaped Cotyledon

Scutellum

→ Plumule   Radicle

↓ Coleoptile   ↓ Coleorhiza

Pericarp
Endosperm

Cotyledon
Coleoptile
Plumule

Radicle
Coleorhiza

MONOCOT SEED