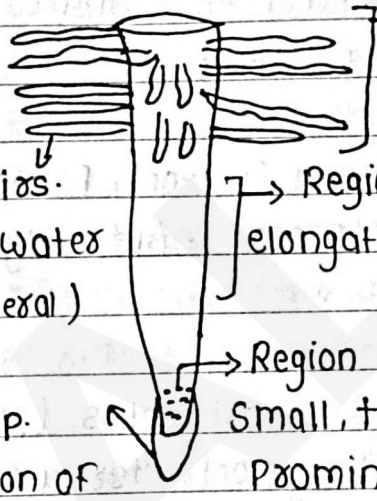
* Morphology of Flowering Plants *

* Root

1) Tap Root → Root arises from Radicle (Ex- mustard)
2) Fibrous Roots - Primary root is short live and Replaced by large number of roots (Ex - Wheat)
3) Adventitous Roots - Roots arises from parts of the Plant other than Radicle (Ex Grass, monstera, banyan tree)

* Regions of Root:



→ Region of maturation - cells differentiate and mature (xylem, phloem, endodermis)

Root hairs: (Absorb water and mineral)

→ Region of Elongation: → cells undergo elongation. Responsible for growth & length of root

→ Region of Meristematic activity (Dividing cells) Small, thin walled, dense cytoplasm, Prominant nucleus.

Root cap: (Protection of Root Tip)

* Modifications of Root:

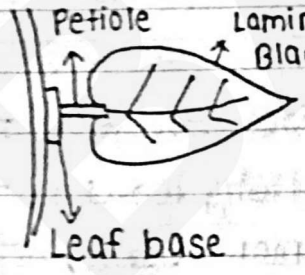
	1) Food storage:	2) Support:	3) Respiration:
→	Tap roots of carrot and Turnip.	→ Prop roots of Banyan tree.	→ Pneumatophores (Rhizophora)
→	Adventitious roots of sweet potato	→ Stilt roots of Maize & Sugarcane.	→ Swampy area.

* Stem

Stem Modification.

Underground stem	Sub-aerial Stem	Aerial Stem
* Tuber → Potato	* Runner → Grass, Strawberry	* Tendrils. → Cucumber, Pumpkin, Watermelon, Grapevines
* CORM → Zamikand	* Stolon. → Mint, Jasmine	
* Rhizome. → Ginger - Turmeric	* Sucker. → Banana, Pineapple, Chrysanthemum	* Thorns. → Citrus, Bogainvillea.
* Bulbil. - Onion - Garlic	* Offset. → Pistia, Eichhornia	* Phylloclade. → Opuntia (Flat) Euphorbia (cylindrical)

* LEAF.



* Leaf Base - attached to Stem
* Petiole - Hold the blade.
* Lamina - Green part of leaf with veins and veinlets
* Pulvinus is a swollen leaf base seen in leguminous plants.

* Venation → Arrangement of veins and veinlets

Types.

Reticulate	Parallel
 Seen in Dicots	 Seen in monocots

* Type of leaves

- Simple
- Compound
  - pinnate (neem)
  - palmate (silk & cotton)

* Phyllotaxy - Arrangement of leaves on stem or branch

Types

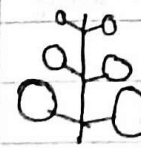
- Alternate — Ex - Chinarose, mustard, Sunflower
- Opposite — Ex - Guava, Calotropis
- Whorled — Ex - Alstonia

* Leaf Modification

- * Climbing → Tendrils — Ex - Peas
- * Defence → Spines — Ex - Cactus
- * Food storage → Fleshy leaves (onion & Garlic)
- * Insectivorous → pitcher plant → venus fly trap

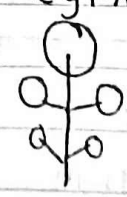
* Inflorescence - Arrangement of flowers on floral axis

Racemose (Acropetal order)



→ Indeterminate growth
→ Young flowers at apex
→ Ex - Cassia, Gulmohar

Cymose (Basipetal order



→ Determinate growth
→ Young flowers at base
→ Ex. Jasmine

* The Flower:

→ Reproductive unit in the angiosperms.

→ Has 4 whorls arranged successively on the swollen end of the stalk or Pedicel, called as Thalamus or receptacle

→ Bisexual Flower- Has both stamens & carpels.

→ Unisexual Flower- Having only stamen or carpel.

* BRACT- Reduced leaf at the base of Pedicel

→ Flower with Bracts → Bracteate Flower

→ Flower without Bracts → Ebracteate Flower

* Flower Symmetry *

1) Actinomorphic. (Radial Symmetry)	2) Zygomorphic. (Bilateral Symmetry)	3) Asymmetric.
→ Any plane divide into two equal radial halves	→ One plane divide into two similar halves	→ Flower cannot divide into two similar halves by any plane.
Ex- Mustard, Datura, Chilli	Ex- Pea, Bean, Cassia, Gulmohar	Ex - Canna.

→ A Flower may be Trimerous, Tetramerous, or Pentamerous when the floral appendages are in multiple of 3, 4 or 5.

* Hypogynous *	* Perigynous *	* Epigynous *
→ Gynoecium occupies highest position (Superior ovary)	→ Gynoecium & other parts are almost at the same level (Half inferior ovary)	→ Other parts are above than ovary. → Margin of thalamus enclosing the ovary completely & gets fused [Inferior Ovary]
→ Ex- Mustard, Brinjal, China rose.	Ex- Plum, Peach, Rose.	→ Ex- Guava, cucumber. Ray Florets of sunflower

* Parts of a Flower.

Flower.
- 4 whorls
  - Accesory (2)
    - Calyx (made of sepals)
    - Corolla (made of Petals)
  - Reproductive (2)
    - Androecium (Made of Stamens)
    - Gynoecium (made of carpels)

Calyx. → made of → Sepals
- United → Gamosepalous
- Free → Poly sepalous

- outermost whorl
- Green, leaf like
- Function (protection)

Corolla. → made of → Petals
- United - Gamopetalous
- Free - Polypetalous.

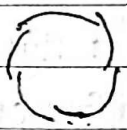
- Brightly coloured

* Aestivation → Arrangement of Sepals or Petals.

→ Types.

1) Valvate - when sepals / Petals just touch one another without overlapping. ex- Calotropis

2) Twisted - overlaps with one another
Ex - China rose, lady's Finger, cotton



3) Imbricate - overlapping without direction
Ex - Cassia, Gulmohar

4) Vexillary or - papilionaceous

→ 5 petals
Ex- Pea, Bean.

* Androecium.

Androecium → (made of) Stamens → (made of) Anther + Filament

STAMEN → (if unites with) → Petals – Epipetalous (ex- Brinjal)
Perianth – Epiphyllous (ex- lily)

→ Staminode - Steril Stamen.

→ STAMEN
- United
  - Monoadelphous [one bundle] ex-china rose
  - Diadelphous [Two bundle] ex- pea
  - Polyadelphous [more than 2 bundles] ex- citrus
- Free - Polyandrous.

→ variation in length of filaments within a flower as in, salvia & Mustard

* Gynoecium. → Made up of CARPELS.

CARPEL

Stigma	Style	Ovary.
- Receptive surface for pollen grain.	Connects the ovary to the stigma	Enlarged basal part bears ovules on Placenta (1/more)

If more than 1 carpels
- Free - Apocarpous (Ex- Lotus, Rose)
- Fused - Syncarpous (Ex- Mustard, Tomato)

* Placentation · [Arrangement of ovules within ovary]

Types of Placentation →

1) MARGINAL – Placenta form a ridge along a ventral suture of the ovary and ovules are born on ridge forming two rows Ex - Peas.

2) Axile - when placenta is axial and the ovules are attached to it in multicolour ovary Ex - China rose, Tomato, Lemon.

3) Parietal - ovules develops on the inner wall of the ovary or on peripheral part - ovary is one chambered but it become two chambered due to the formation of False septum · Ex - Argemone Mustard.

4) Free central - when the ovules are born on central axis and septa are absent ex - Dianthus, Primrose

5) Basal - Placenta develops at the base of ovary and a single ovule is attached to it Ex - Sunflower, Marigold

* FRUIT (Develops after Fertilization)

→ If Fruit is formed without Fertilization of ovary called as Parthenocarpic fruit

Fruit consist of { Wall or Pericarp, SEED. } may be { DRY OR Fleshy } differentiated into { Epicarp, Mesocarp, Endocarp }

→ In Mango and coconut, the Fruit is known as drupe. They develop from monocarpellary Superior ovaries and are one seeded

→ In mango pericarp is well differentiated into an outer thin epicarp, middle fleshy edible mesocarp and an inner stony hard endocarp · In coconut which is also a drupe, the mesocarp is Fibrous.

* The SEED:
→ Develops after Fertilisation of ovules
→ Seed contains Seed coat and Embryo
→ Embryo is made up of Radicle, Plumule, an embryonal axis, cotyledon

* Dicot Seed: → 2 cotyledon present
→ outermost covering of a seed is Seed-coat
→ Seed coat has 2 layers [outer- Testa & inner- Tegmen]
→ Hilum is a scar on the seed coat through which the developing Seeds were attached to fruit
→ Above the hilum is a small pore called Micropyle.
→ Embryo → Embryonal axis + 2 cotyledon.

* Monocot Seed: → one cotyledon
→ In the Seeds of cereals such as maize the seed coat is membranous and generally Fused with Fruit wall.
→ Endosperm is bulky and stores Food
→ Outer covering of endosperm separates the embryo by a proteinous layer called, Aleurone layer
→ Embryo is small and situated in a groove at one end of endosperm
→ Embryo consist of shield shaped cotyledon called Scutellum and Short axis with Plumule and Radicle
→ Plumule enclosed ~~with~~ in coleoptile & Radicle in coleorhiza

* Floral Formula:

K - Calyx	P - Perianth	⊕ - Actinomorphic
C - Corolla	♂ - Male	% - Zygomorphic
A - Androecium	♀ - Female	$\underline{G}$ - Superior
G - Gynoecium.	⚥ - Bisexual	$\overline{G}$ - Inferior

1) Fabaceae - % ♀♂ K(5) $C_{1+2+(2)}$ $A_{(9)+1}$ $\underline{G}_1$

2) Solanaceae - ⊕ ♀♂ K(5) $\overbrace{C(5)}$ A_5 $\underline{G}_{(2)}$

3) Liliaceae - Br ⊕ ♀♂ $\overbrace{P(3+3)}$ $A_{(3+3}$ $G_{(3)}$

4) Brassicaceae - ⊕ ♀♂ K_{2+2} C_4 A_{2+4} $\underline{G}_{(2)}$

	Fabaceae	Solanaceae	Liliaceae
Inflorescence	Racemose	Cymose	Cymose
Fruit	Legume	Bony or capsule	Capsule
Seed	Non-endospermic	Endospermic	Endospermic

* Examples.

1) Fabaceae - * Pulses - (Gram, Arhar, Sem, moong, Soyabean)
* Edible oil - (Soyabean Groundnut) * Medicine - (Muliathi).
* Dye - (Indigofera) * Fibres (Sunhemp) * Fodder - (Sesbiana, Trifolium) * Ornamentals - ( )upin Sweet pea)

2) Solanaceae -
* Food - (Tomato, Brinjal, potato) * spice (chilli)
* Medicine (Belladonna, Ashwagandha).
* Fumigatory (Tobacco) * Ornamentals (Petunia)

3) Liliaceae.
* Ornamentals (Tulip, Gloriosa), * Medicine (Aloe)
* Vegetable (Asparagus), * ~~Eat~~ Cholchicine (colchicum autumnale