



# SAFALTA CLASS<sup>TM</sup>

An Initiative by **अमरउजाला**

Study of Plants

Theophrastus

# BOTANY



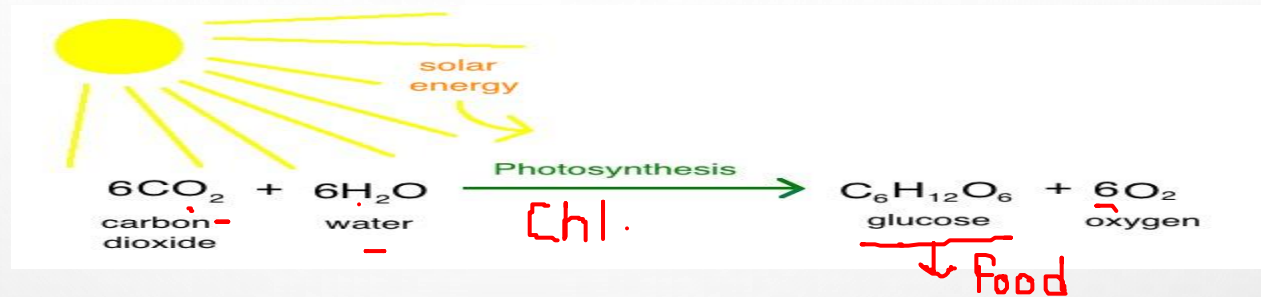
# 1. PHOTOSYNTHESIS: प्रकाश संश्लेषण

5000 Å

UV, IR, Visible

W > R > B

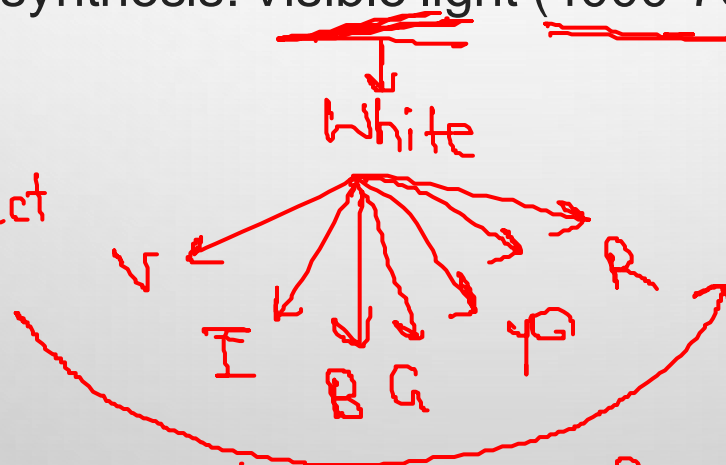
Photosynthesis, the process by which green plants and certain other organisms transform light energy into chemical energy.



Wavelength needed for photosynthesis: Visible light (4000-7000)Angstrom.

Max Rate: Red/ Blue Color

Min Rate: Green Color → reflect



Max rate of P.S.  
White, Red, Blue, green (4000-7000) Å

(400-700)nm

Max Photosynthesis takes place in Leaves because leaf consists of an organelle Chloroplast.

Chloroplast absorbs Sun light.

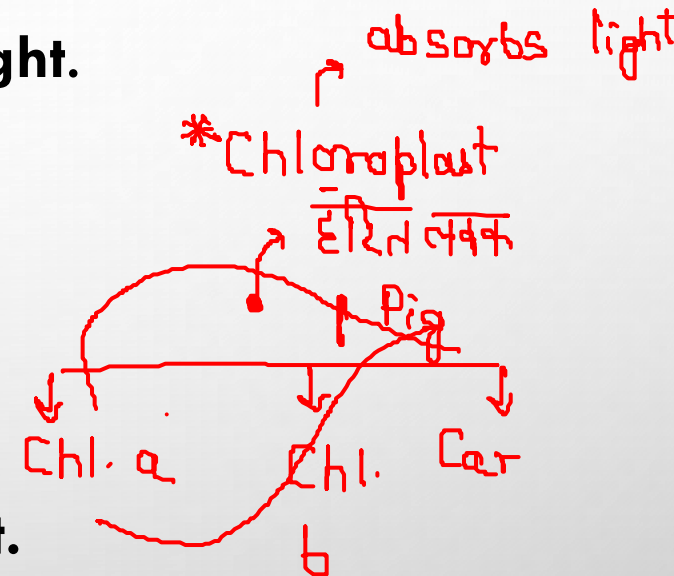
Chloroplast has 3 pigment which absorb light and these pigments are:

1. Chlorophyll A: It absorbs Red, Violet and Blue light.

 → VIBGYOR

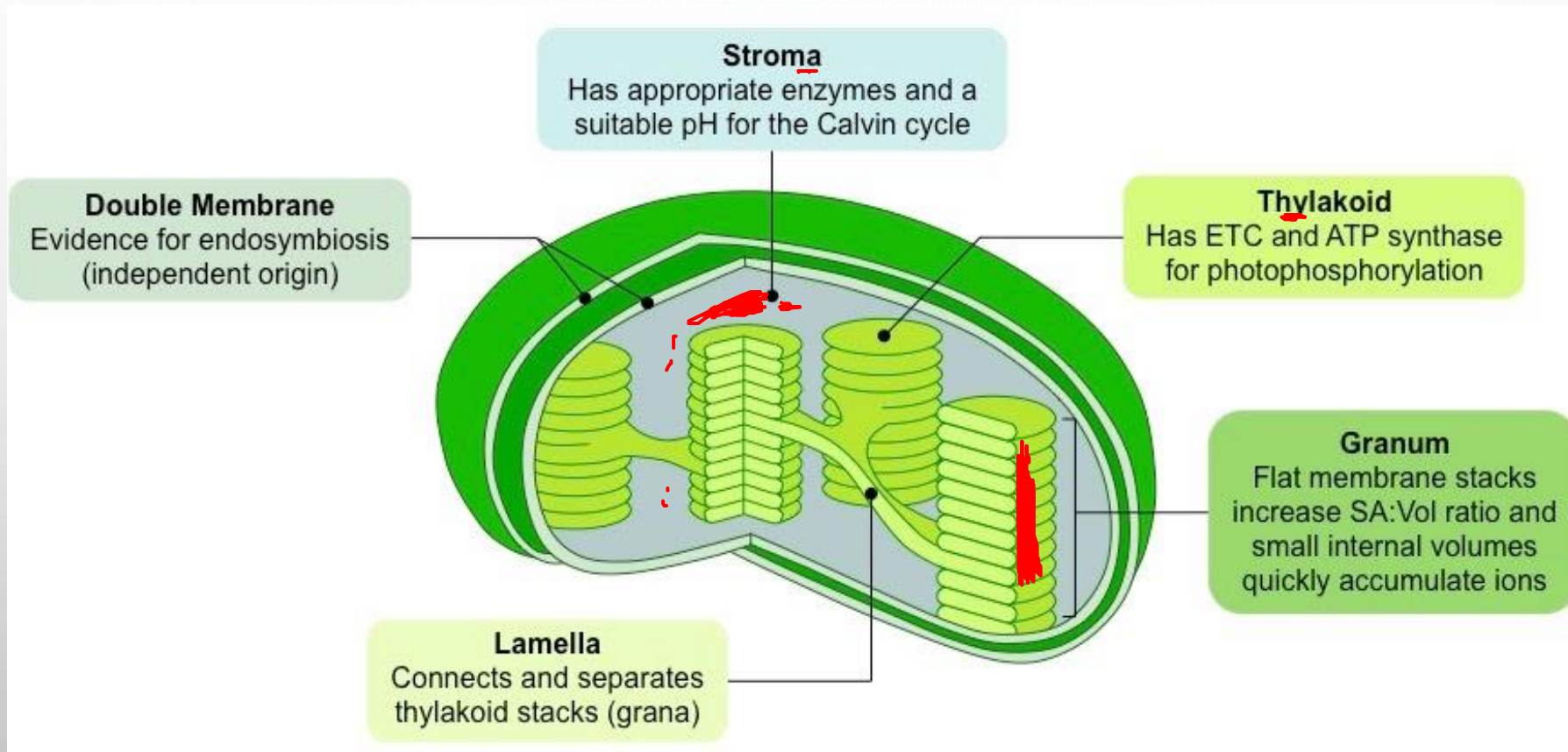
2. Chlorophyll B: It absorbs Blue and Indigo light.

3. Carotenoids: It absorbs Yellow and Orange light.



\*\*\*\*\* Central metal of Chlorophyll: Magnesium \*





## Process of Photosynthesis



**Light Reaction or Hill Reaction :** Discovered by Hill. Takes place in the presence of light in thylakoids

### Steps in Light Reaction

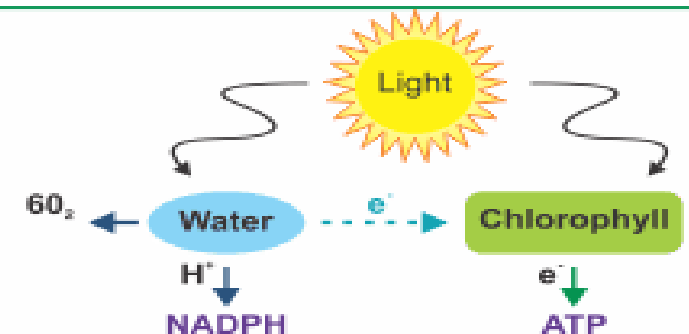
- ❖ **Absorption of Light Energy by Chlorophyll :** Chlorophyll on exposure to light gets activated by absorbing photons
- ❖ **Photolysis of Water :** Absorbed energy is used in splitting of water into hydrogen and oxygen, releasing electrons



- ❖ **Reduction of NADP :** Hydrogen ions released (photolysis) taken up by NADP (Nicotinamide adenine dinucleotide phosphate) is reduced to NADPH<sub>2</sub>



- ❖ **Photophosphorylation :** Formation of ATP (adenosine triphosphate) from ADP(adenosine diphosphate) and inorganic phosphate in the presence of sunlight.



## 2. PIGMENTS OF PLANTS:

Onion - Sulphur

| PIGMENTS लक्षण           | COLORS                              | EXAMPLES                                      |
|--------------------------|-------------------------------------|---|
| FLAVANOIDS               | YELLOW, LIGHT GREEN                 | LEMON, NUTS, PULSES, CABBAGE, grapes          |
| CHLOROPHYLL              | DARK GREEN                          | GREEN LEAFY VEGETABLES, Lady Finger, Capsicum |
| CAROTENOIDS (Eye)        | ORANGISH YELLOW                     | * CARROT, MANGO, PAPAYA                       |
| ANTHOCYANIN              | PINK+ PURPLE+BLUE                   | ONION, BRINJAL*                               |
| LYCOPENE *               | BRIGHT RED                          | TOMATO, BLACK GRAPES, WATER MELON,            |
| BETALENE<br>Xanthocyanin | PURPLE+ VIOLET<br>White / OFF White | JAMUN, BEET ROOT*<br>Radish.                  |

### 3. EDIBLE PARTS OF PLANTS:

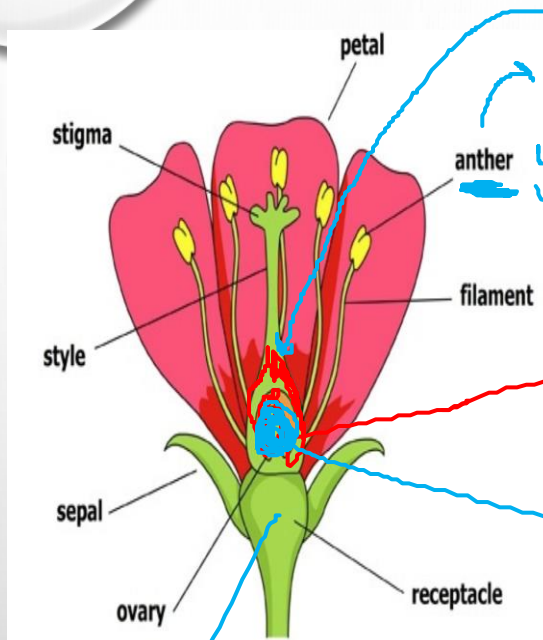
| PARTS OF PLANTS | EXAMPLES   |
|-----------------|--|
| <u>ROOT</u>     | BEET <u>ROOT</u> , <u>TURNIP</u> , <u>CARROT</u> , <u>RADISH</u> , <u>SWEET POTATO</u>                         |
| STEM            | <u>ONION</u> , <u>POTATO</u> , <u>GARLIC</u> , <u>GINGER</u> , <u>SUGAR CANE</u> , <u>TURMERIC</u>             |
| LEAVES          | <u>GREEN LEAFY VEG</u> , <u>CABBAGE</u> पत्ता गोभी   |
| <u>SEED</u>     | <u>PULSE</u> , <u>WHOLE GRAINS</u> , <u>BEANS</u> , <u>PEA</u> , <u>OIL SEED</u> , <u>NUTS</u> , <u>ALMOND</u> |
| FLOWERS         | <u>CAULIFLOWER</u> , <u>BROCCOLI</u> , <u>CLOVES</u> , <u>SAPHRON</u><br>लौंग मेथन                             |



## 4. DIFFERENCE BETWEEN TRUE FRUITS AND FALSE FRUITS:

|  | False Fruit   | True Fruit  |
|--|---|---|
| <b>DEFINITION</b>                          | False fruits arise from floral parts <u>other than the ovary</u> .                | True fruits arise as a result of fertilization where the fertilized <u>ovary</u> wall becomes the fleshy fruit. |
| <b>FERTILIZATION PROCESS</b>               | Not involved  | Involved  |
| <b>PARTS INVOLVED IN FORMING THE FRUIT</b> | Floral parts such as thalamus, peduncle and perianth, parts other than the ovary. | Fertilized ovary  |
| <b>EXAMPLES</b>                            | <u>(Thalamus)</u><br>Apple, pears, jackfruit, pineapple, strawberry.              | Mango, kiwi fruit, watermelon, cherry.  |

## Reproductive part - Flower



Pollengrain पराग कण

पुंस्त्री - Male sexual organ

Ovary - Female Sexual organ → Egg cell

Ovule अणुस

thalamus

Hermaprodite, द्विलिंगी

## 5. DIFFERENCE BETWEEN XYLEM AND PHLOEM:

हृदयिका Capillary Vascular tissue शिरसीय ऊतक

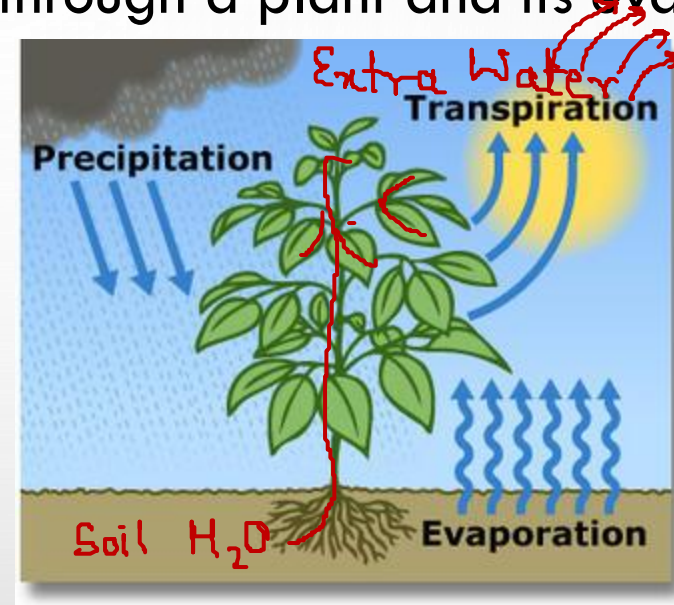
| Xylem - Upward   | Phloem - Bidirection  |
|--|---|
| 1) It transports <u>water and minerals</u> from roots to the apical parts of the plant.  | 1) It transports <u>food material</u> from the leaves to growing parts of the plant.                        |
| 2) Xylem consists of tracheids, vessels, xylem <u>fibres</u> and xylem <u>parenchyma</u> .<br><i>(leaves, stem)</i><br><i>Dead</i> | 2) Phloem consists of sieve tubes, sieve cells, companion cells, phloem fibres and phloem parenchyma.       |
| 3) Only <u>xylem parenchyma</u> is living.   | 3) <i>Dead: Phloem Fibre</i><br>Sieve tubes, sieve cells, companion cells and phloem parenchyma are living. |



| <b>Xylem</b>   | <b>Phloem</b>  |
|--|--|
| 4) Tracheids, vessels, xylem fibres are dead tissues.  | 4) Phloem fibres are dead tissues.   |
| 5) Xylem gives <u>mechanical</u> strength to the plant.  | 5) Phloem does not give <u>mechanical</u> strength to the plant.   |
| 6) Conduction of water by xylem is unidirectional i.e., from roots to apical parts of the plant. | 6) Food material conduction is bidirectional i.e., from leaves to storage organs or growing parts or from storage organs to growing parts of plants. |
| 7) Xylem is star shaped.   | 7) Phloem is not in star shaped.   |
| 8) Xylem occupies the center of the vascular bundle.   | 8) Phloem occurs on outer side of the vascular bundle.   |
| 9) Tubular with hard walled cells.   | 9) Tubular with soft walled cells.   |

## 6. TRANSPIRATION: वाष्पोत्सर्जन

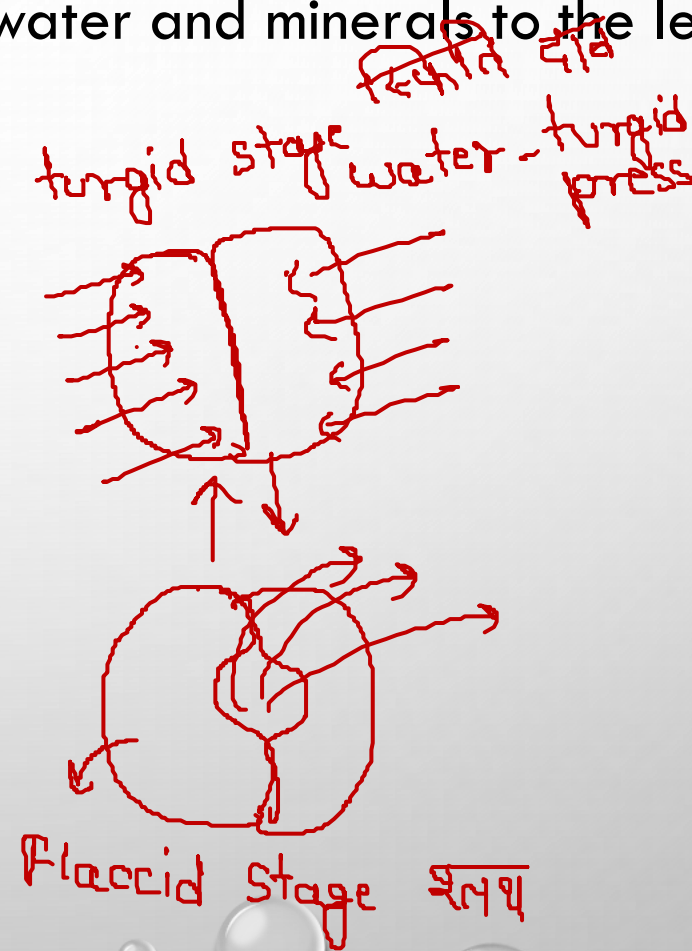
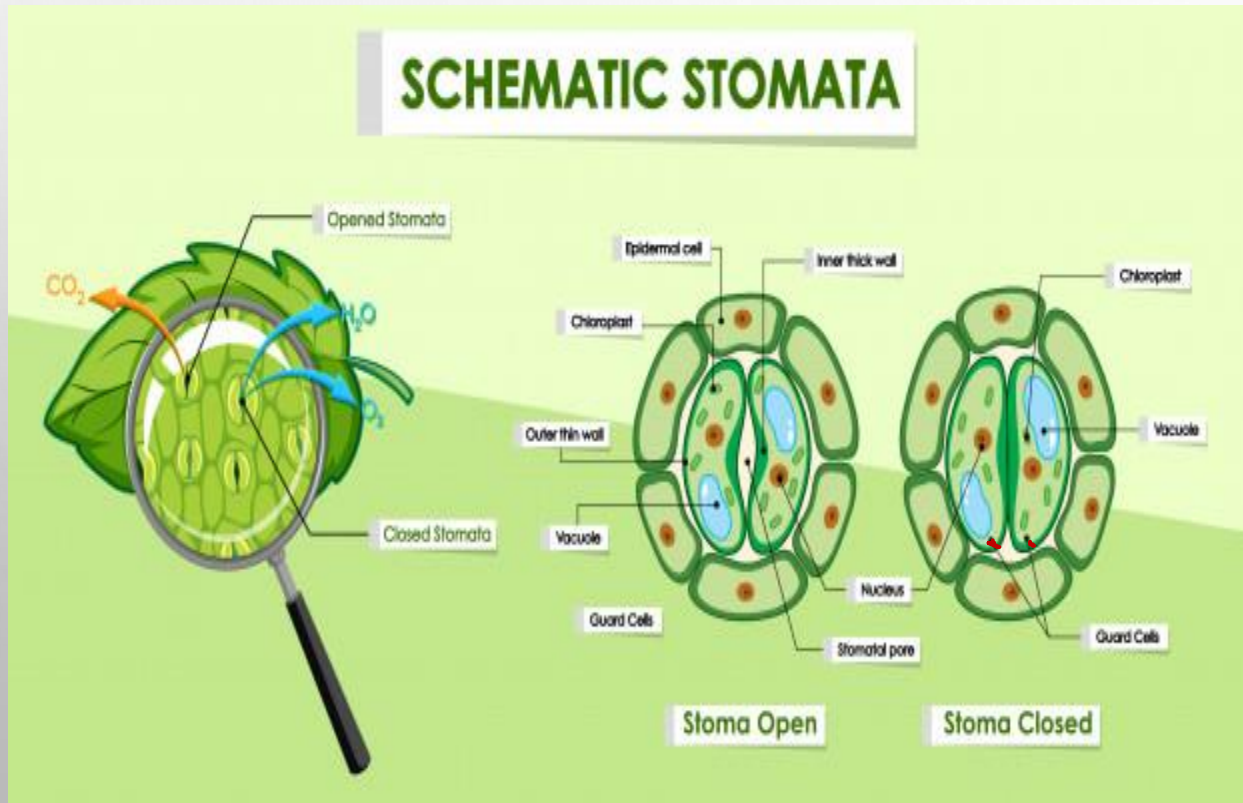
Transpiration is the process of water movement through a plant and its evaporation from aerial parts, such as leaves, stems and flowers.



Transpiration is the evaporation of water from plants. it occurs chiefly at the leaves while their stomata are open for the passage of co<sub>2</sub> and o<sub>2</sub> during photosynthesis.



The water, warmed by the sun, turns into vapor (evaporates), and passes out through thousands of tiny pores (stomata) mostly on the underside of the leaf surface. this is transpiration. it has two main functions: cooling the plant and pumping water and minerals to the leaves for photosynthesis.



Stomatal - Stomata - Leaves - 97.1/.

Cuticular - Cuticles Waxy - 0.3/.

Lenticular - Lenticles - Cracks in Stems  
2.7/.

## Types of transpiration

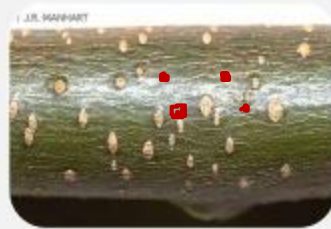
- On the basis of the passages through which plants give out water in the form of vapor transpiration is of three types:



Stomatal  
transpiration



Cuticular  
transpiration



Lenticular  
transpiration

## 7. PLANT HORMONE:

00 dwarf → Phytohormone → Endocrine

← 4 → 8 → 16

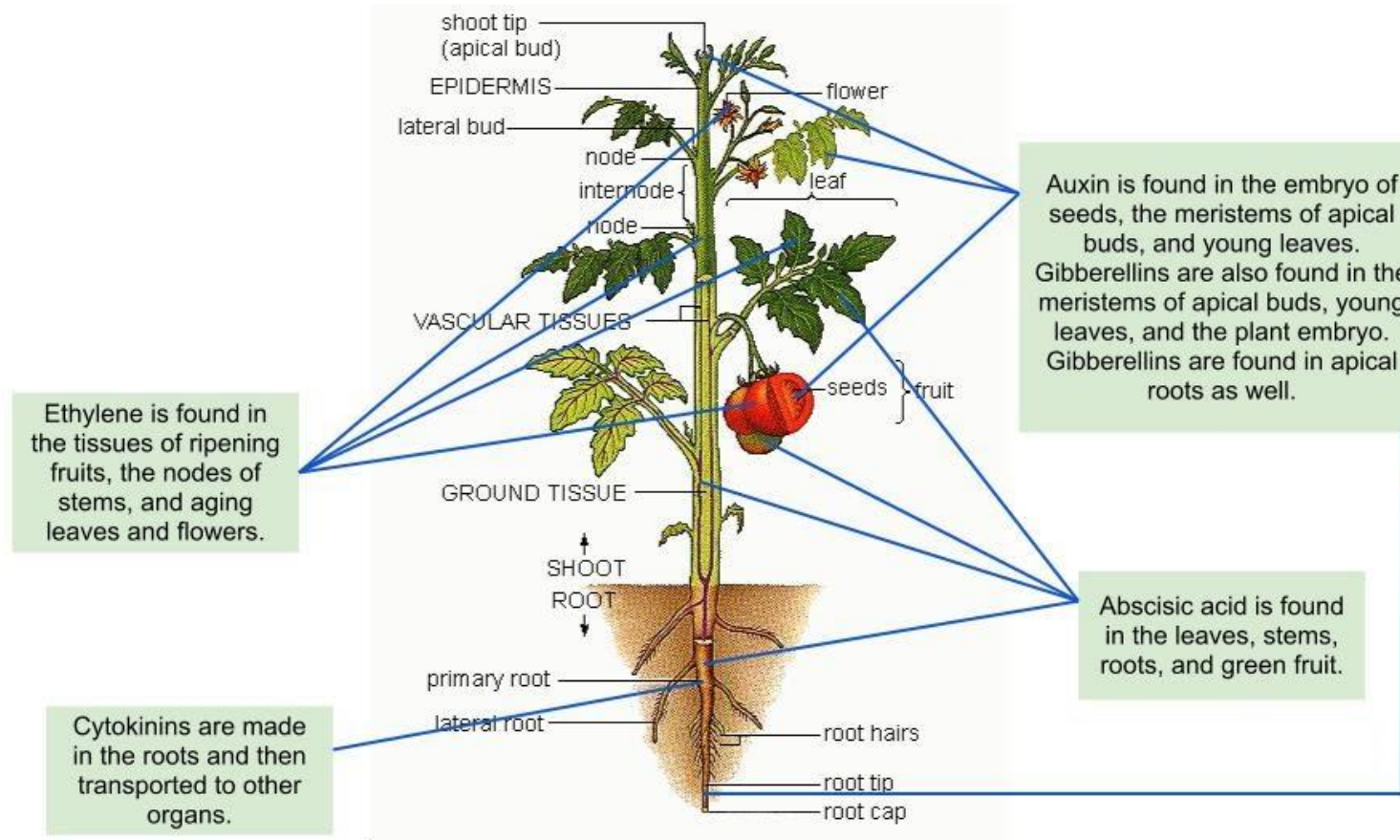
### Plant Growth Hormones

| HORMONE                     | TYPICAL ACTIVITIES   |
|-----------------------------|--|
| Abscissic acid              | Maintains seed dormancy and winter dormancy; closes stomata  |
| Auxins                      | Promote stem elongation, adventitious root initiation, and fruit growth; inhibit axillary bud outgrowth and leaf abscission    |
| <del>Brassinosteroids</del> | <del>Promote stem and pollen tube elongation; promote vascular tissue differentiation</del>                                    |
| Cytokinins                  | Inhibit leaf senescence; promote cell division and axillary bud outgrowth; affect root growth                                  |
| Ethylene (Acetylene)        | Promotes fruit ripening and leaf abscission; inhibits stem elongation and gravitropism   |
| Gibberellins                | Promote seed germination, stem growth, and fruit development; break winter dormancy; mobilize nutrient reserves in grass seeds |

→ late 44171

\*





Original Image source: <http://www.uic.edu/classes/bios/bios100/labs/plantbod.gif>

Auxin

Cytokinin

Gibrelline

Promoter → reaction ↑

Ethylene

Promoter

Inhibitor  $\overline{\text{Inhi}}$

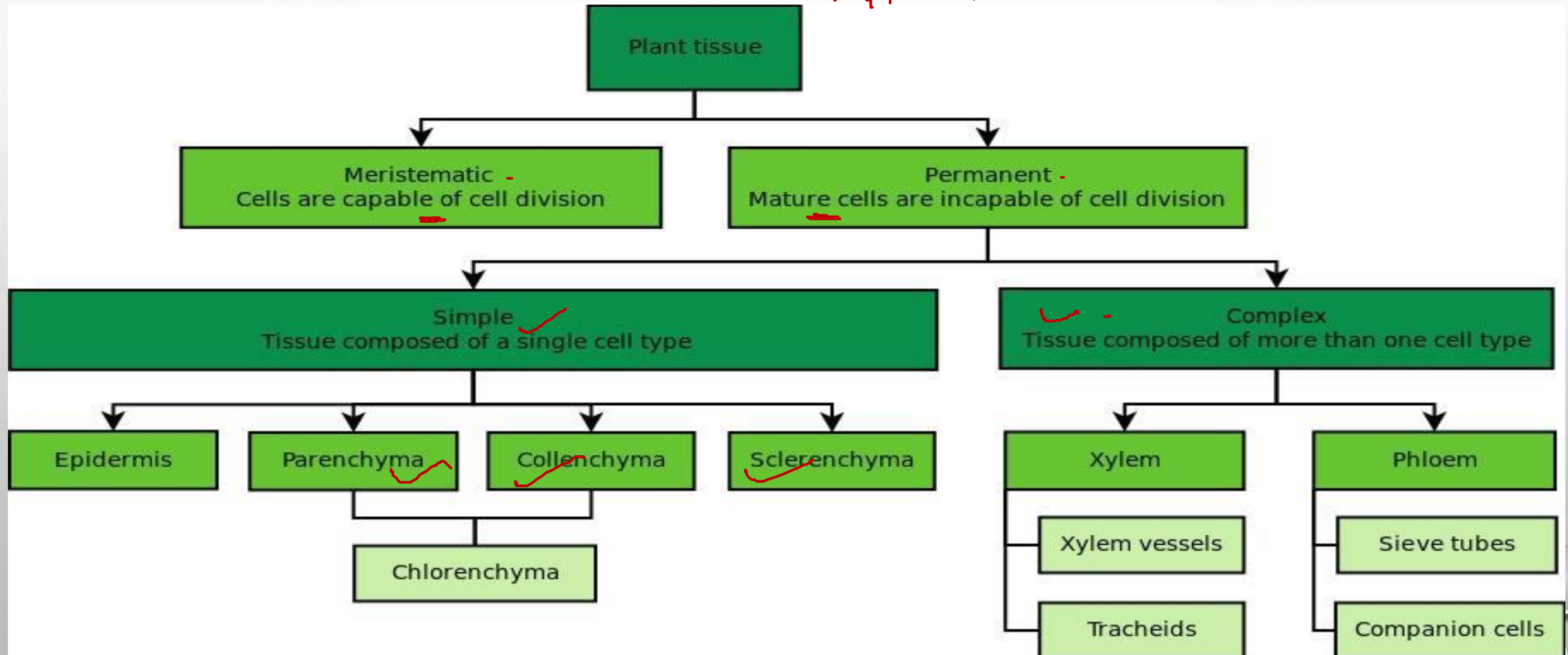
\* gaseous hormone

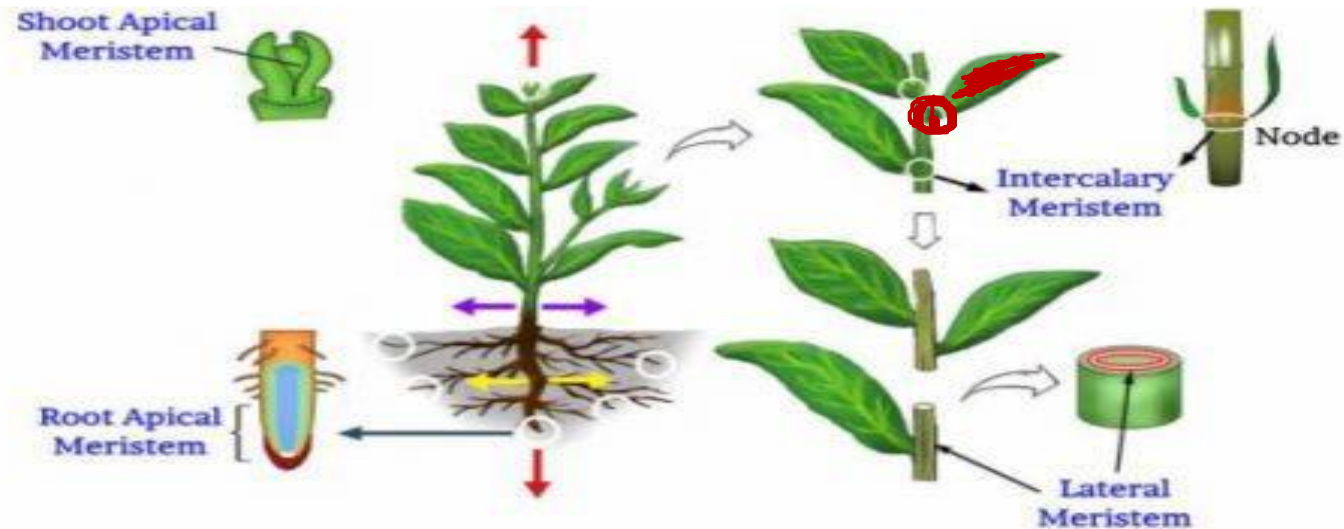
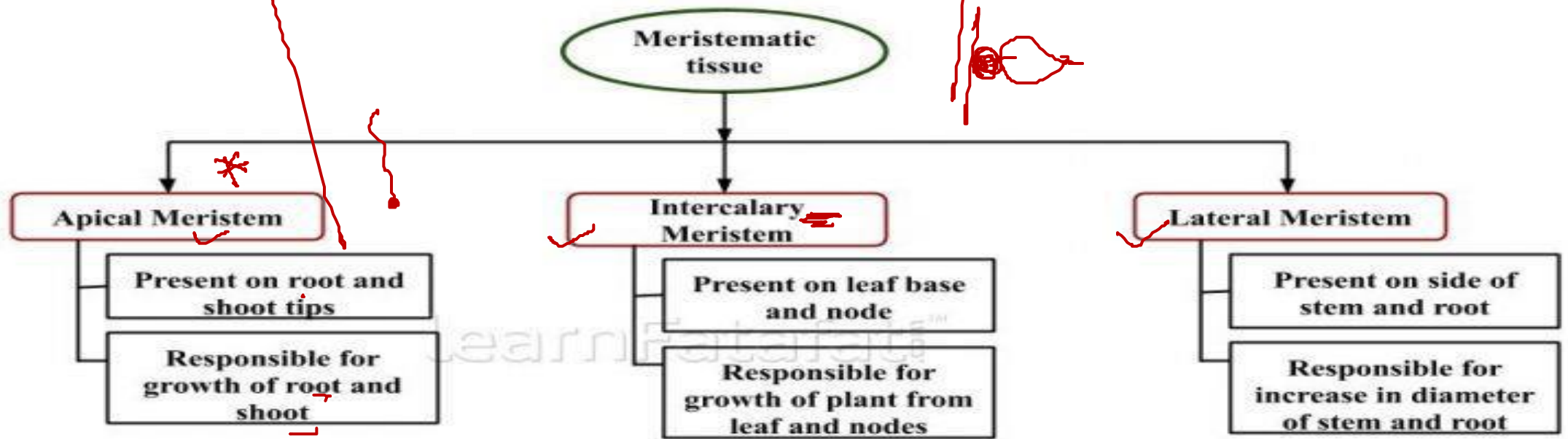
ABA = Inhi  $\overline{\text{Inhi}}$



## 8. PLANT TISSUE:

पादप ऊतक



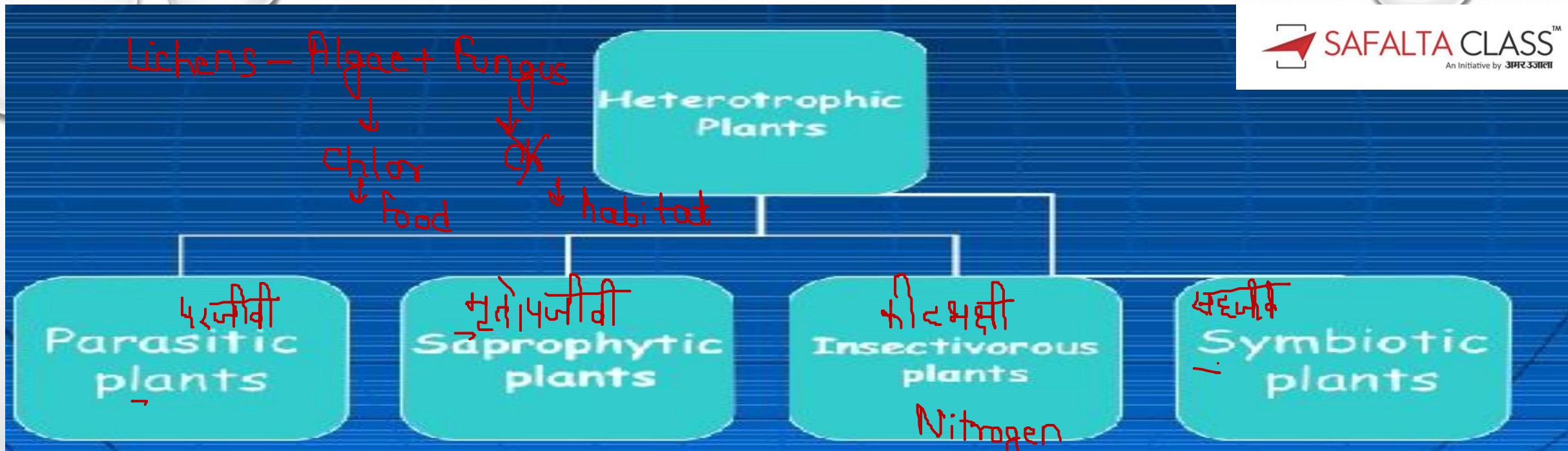



| <b>Parenchyma</b>                                      | <b>Collenchyma</b>                 | <b>Sclerenchyma</b>                      |
|--|------------------------------------|--|
| Cells are thin walled.<br>Only primary wall present    | Thick primary wall at the corners. | Thick walled                             |
| Cells loosely arranged                                 | Cells compactly arranged           | Cells compactly arranged.                |
| Cells are living, nucleus present                      | Cells living, nucleus seen         | Cells dead, devoid of cellular contents. |
| Spherical, polygonal, oval, rectangular or rod shaped. | Shapes are variable.               | Elongated                                |
| Many intercellular spaces.                             | Intercellular spaces absent        | Intercellular spaces absent              |
| Cells vacuolated                                       | Vacuoles absent                    | Vacuoles absent                          |

## 9. MODES OF NUTRITION IN PLANTS:

| <b>AUTOTROPIC NUTRITION</b><br>स्वपोषी   | <b>HETEROTROPIC NUTRITION</b><br>परपोषी   |
|--|---|
| <p>Plants are autotrophs, which means they produce their own food. They use the process of photosynthesis to transform water, sunlight, and carbon dioxide into oxygen, and simple sugars that the plant uses as fuel.</p> <p>Photosynthesis</p> | <p>Some plants cannot produce their own food and must obtain their nutrition from outside sources—these plants are heterotrophic.</p> |
| <p>Eg: Green plants, Blue green algae, Cyanobacteria</p>   | <p>Eg: Fungi</p>  |





|  |   |   |  |
|--|---|---|--|
| <p><b>A parasitic plant is a plant that derives some or all of its nutritional requirement from another living plant</b></p>     | <p><b>saprophyte is a plant that does not have chlorophyll, obtaining its food from dead matter</b></p> | <p><b>Insectivorous plants are plants that derive some of their nutrients from trapping and consuming animals or protozoan.</b></p> | <p><b>Symbiotic plants, or the process of symbiosis, is when two plants live closely together in harmony of one kind or another.</b></p> |
| <p>Eg: Cascuta ✓<br/>Stinking Corpse lily</p>  | <p>Eg: Mushroom ✓<br/>Molds<br/>Mycorrhizal Fungi</p>   | <p>Eg: Pitcher plant, Drossera, *<br/>Lobster pot traps, sundews, butter wort, water wheel plant</p>                                | <p>Eg: Lichens</p>   |