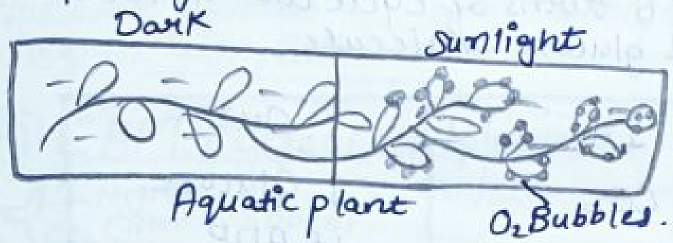
PHOTOSYNTHESIS IN HIGHER PLANTS..

① Important Scientists.

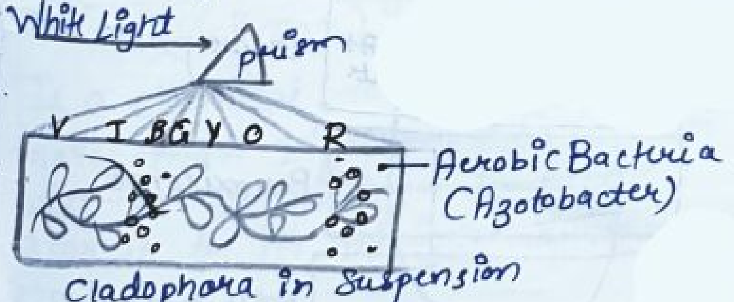
→ **Joseph Priestly (1770)**
→ Revealed essential role of air in growth of plants.
→ performed bell jar experiment and observed → Plant restore to air, what breathing animals and burning candle remove.

→ **Jan IngenHouse.**
→ Observed that sunlight is essential for photosynthesis.



→ **Julius Von Sachs (1854)**
→ Glucose is produced during photosynthesis in green parts of plants.
→ Stored as starch.
→ Green Substance (chlorophyll) located in special bodies (chloroplast).

→ **TW Engelmann (1843-1909)**
→ Best for photosynthesis → Blue and Red Light



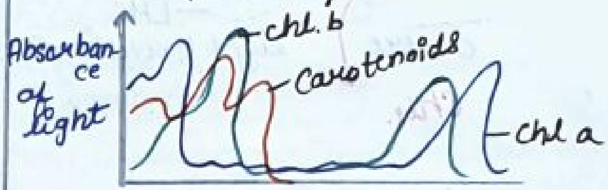
→ Described 1st action spectrum of photosynthesis.

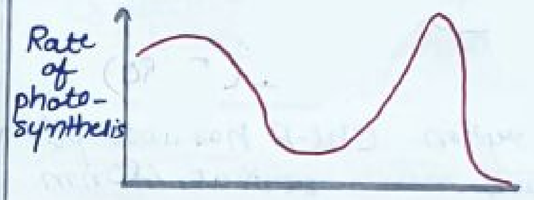
→ **Cornelius Von Niel (1897-1985)**
→ Hydrogen from suitable oxidable compound reduces CO_2 → Glucose.
→ In green plants, hydrogen donor is H_2O, which is oxidised to O_2.
→ In purple and green sulphur bacteria, H_2S is hydrogen donor, releasing sulphur as by product.

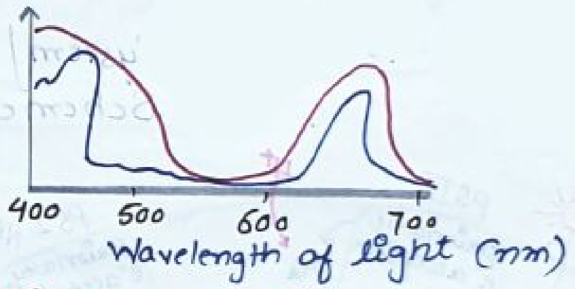
② Types of Pigments → Chromatogram

Chl A → Blue Green
Chl B → Yellow Green
Xanthophylls → Yellow
Carotenoids → Yellow to Yellow Orange

→ absorption Spectrum.





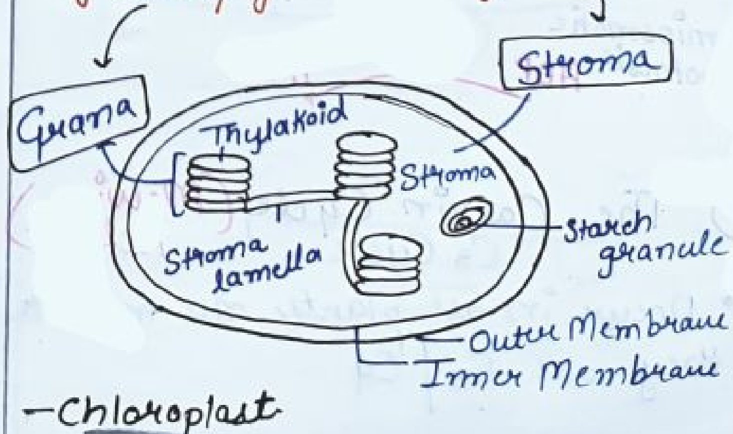


→ Chl A → Blue and Red.
→ Max. photosynthesis → Blue and Red light.
→ Chl A → Major photosynthetic pigment

③ Photosynthesis

Light Reaction.
Formation of ATP and NADPH due to capturing of sunlight by Chlorophyll

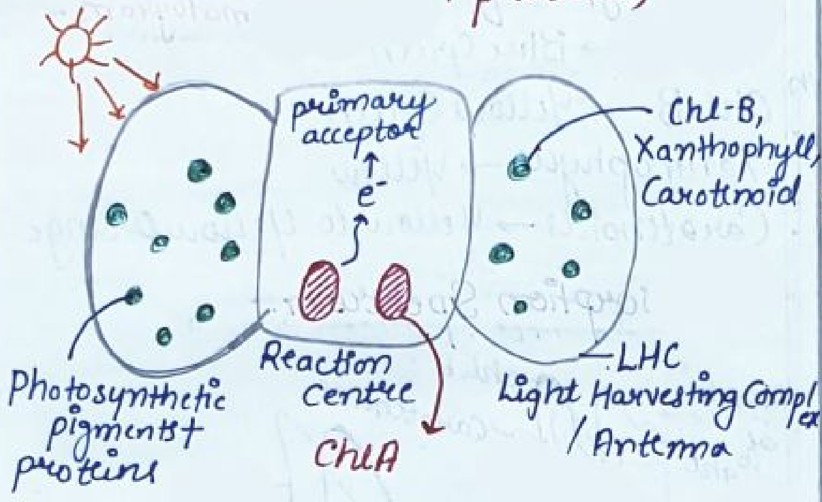
Dark Reaction.
Formation of glucose from CO_2 using ATP and NADPH from light Reaction.



–Chloroplast

④ Light Reaction

→ Photosystem (photosynthetic pigments + protins)

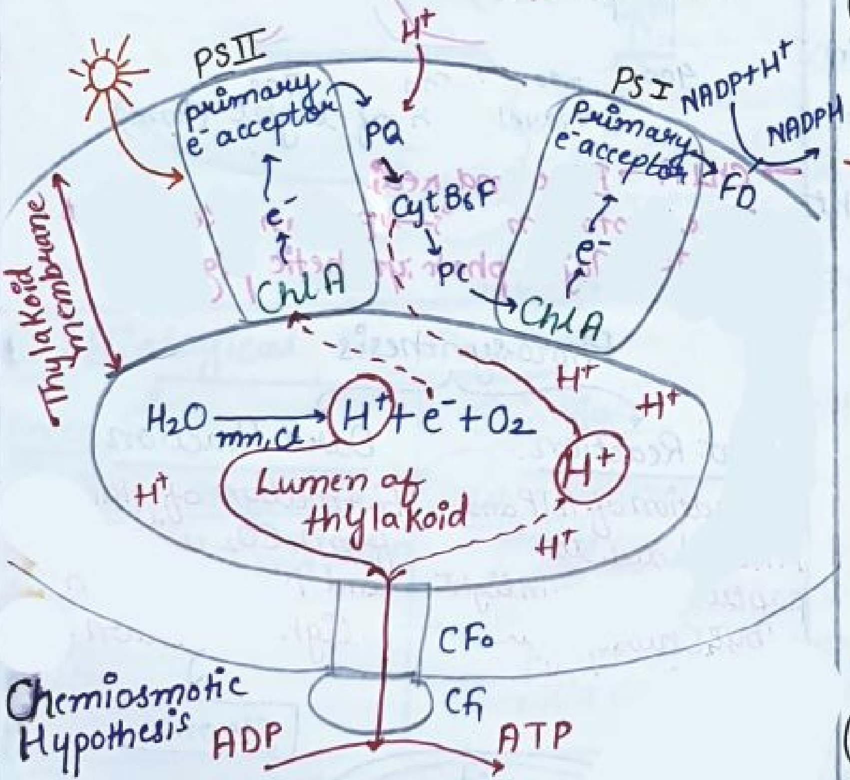


→ photosystems

PS I (P700)
Chl-A has absorption peak at 700nm

PS II (P680)
Chl-A has absorption peak at 680nm

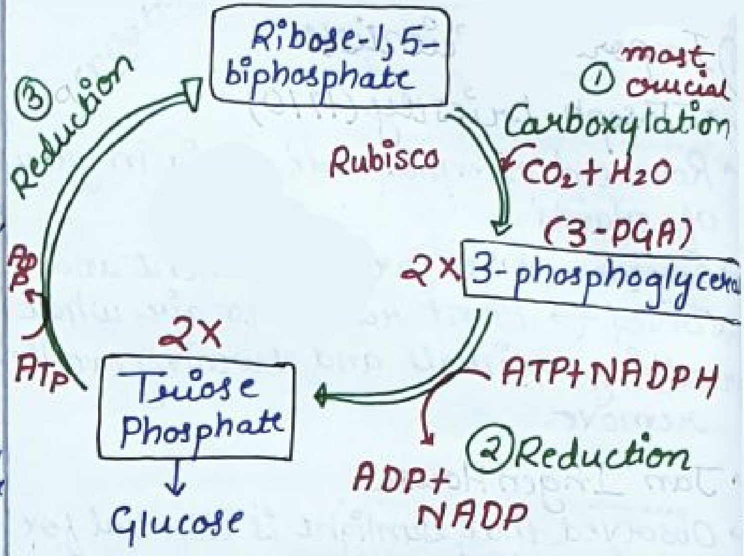
⑤ Electron Transport System / Z Scheme



⑥ The Calvin Cycle / C3 Cycle (Melwin Kelvin)

→ Occur in all plants, no matter they are C3 / C4

primary acceptor of CO_2



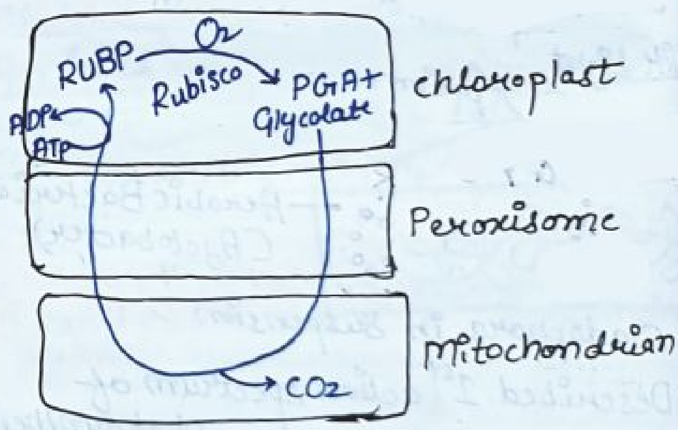
→ 6 turns of cycle will generate 1 glucose molecule

In	Out
6 CO_2	1 Glucose
18 ATP	18 ADP
12 NADPH	12 NADP

⑦ Photorespiration →

High Temp. → Stomata Close → photorespiration

→ Highly wasteful process.



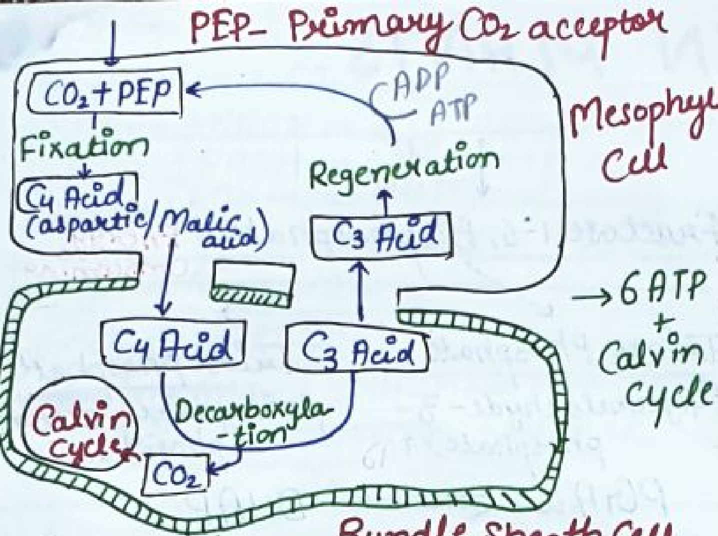
⑧ The C4 Pathway →

→ C4 plants – No photorespiration

→ Hatch and Slack Pathway

→ Plants adapted to dry tropical regions, prevent photorespiration

PEP- Primary CO_2 acceptor

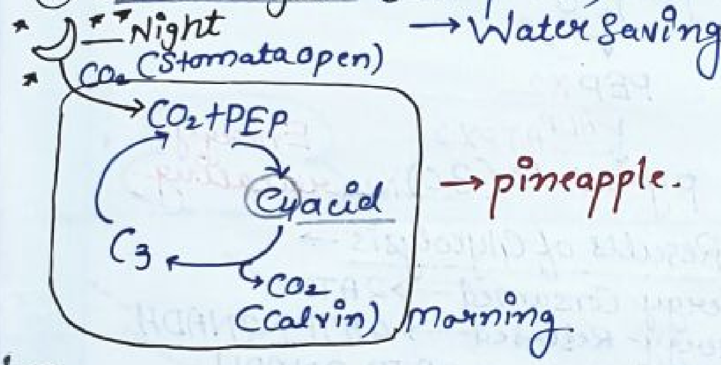


→ Kranz Anatomy →

→ Bundle Sheath Cells arranged around Vascular bundles. 6ATP+ Calvin Cycle

e.g. - Maize, Sorghum *

⑨ CAM Cycle (CAM plants)



⑩ Factors affecting Photosynthesis

① Law of Limiting Factors (1905) (Blackman)

If a chemical process is affected by more than 1 factor, then its rate will be determined by factor nearest to it's minimal Value.

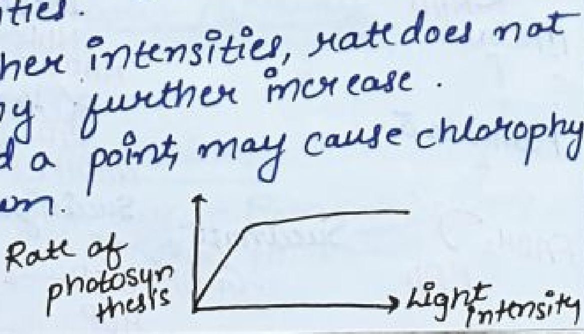
① Light →

→ Saturation at 10% of full Sunlight, so rarely a limiting factor.

→ Linear relation between incident light and CO_2 fixation at low light intensities.

→ At higher intensities, rate does not show any further increase.

→ Beyond a point, may cause chlorophyll breakdown.



② CO_2 Concentration. (major limiting factor)

→ CO_2 level is very low in atmosphere (0.03 to 0.04%)

→ Increase upto 0.05% can cause ↑↑ in CO_2 fixation rates.

→ Saturation of:

C_4 plants → 360 μlL^{-1} *

C_3 plants → 450 μlL^{-1} *

→ ∴ Some C_3 Crops Tomato and Bell-pepper do well in greenhouses.

③ Temperature.

→ C_4 plants → Temp ↑↑, Rate of photosynthesis ↑↑

→ C_3 plants → Optimum temp.
↳ photorespiration

④ Water

→ Water Stress cause stomata to close and makes the leaves wilt.

NEET SLAYER