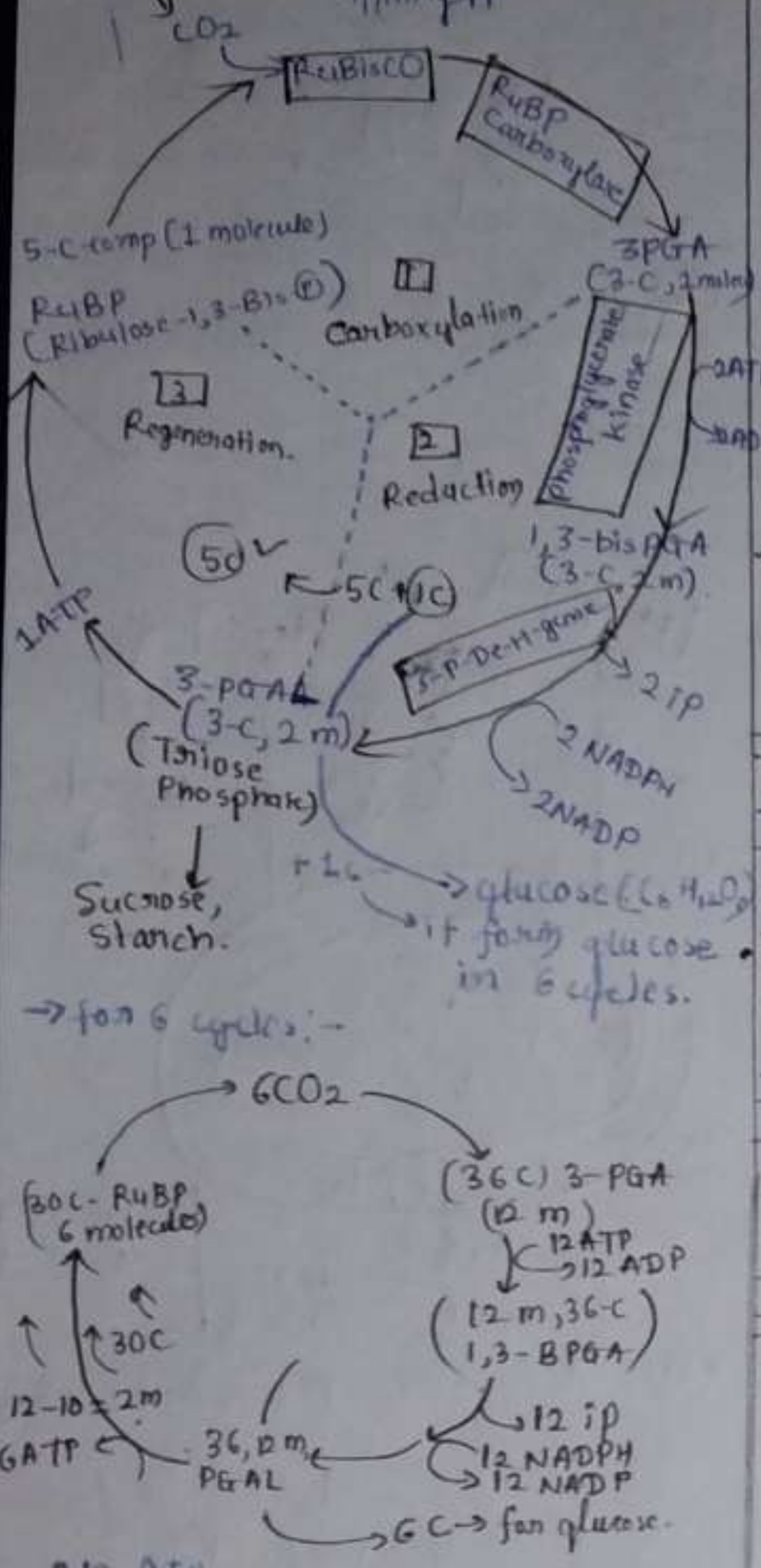
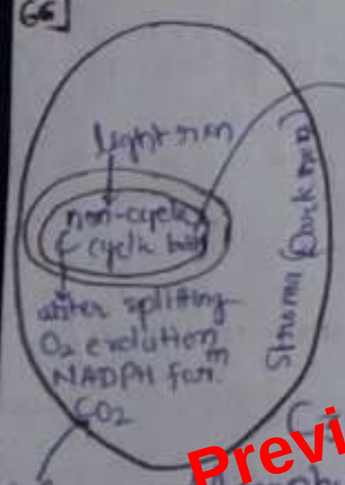
* 3 Phases
→ Carboxylation (CO_2 addition)
→ Reduction
→ Regeneration
* enzyme used RuBisCO ← Oxygenase ↓ Carboxylase affinity ↑↑



• 12 ATP
6 ATP
18 ATP & 12 NADPH ✓

66] 

Ribulose Bis-(B) Carboxylase Oxygenase activity here (conc ↑↑↑)
O_2 + RuBisCO → result into Photorespiration (Wasteful process).
↳ we've to avoid this done by C_4 plants

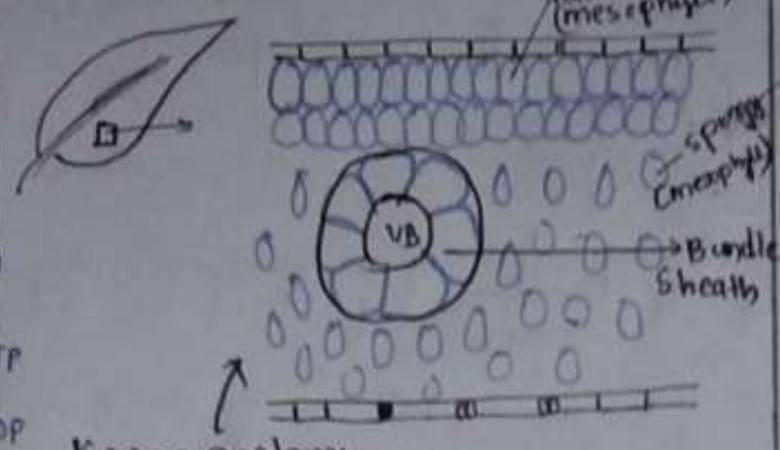
67] Melvin Calvin → use of radioactive ^{14}C in algal photosynthesis → discovery → 1st CO_2 fixation pdt was 3-C organic acid.
→ also ~~calculated~~ contributed work out complete biosynthetic pathway, hence called Calvin cycle.

68] Calvin Pathway occurs in all photosynthetic plants (C_3 or C_4 or any ✓)

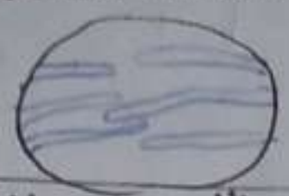
69] Carboxylation (most crucial step).
→ fixation of CO_2 into stable organic intermediate
→ Carboxylation of RuBP → CO_2 utilised.
→ rxn catalysed by RuBP carboxylase

60] Series of rxn → form of glucose.
Reduction ↗ 2 molecules of
→ step: utilisation of 1 ATP for phosphorylation & 2 NADPH for reduction per CO_2 molecule fixed

10] C_4 Plants/pthway/Hatch-Slack Pathway
→ they change their leaf anatomy
modify
update

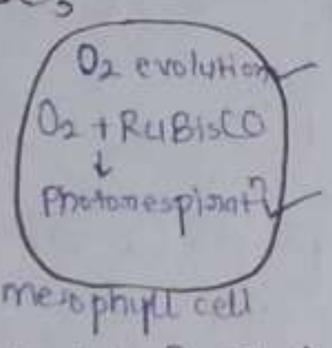


* Bundle sheath cells:-



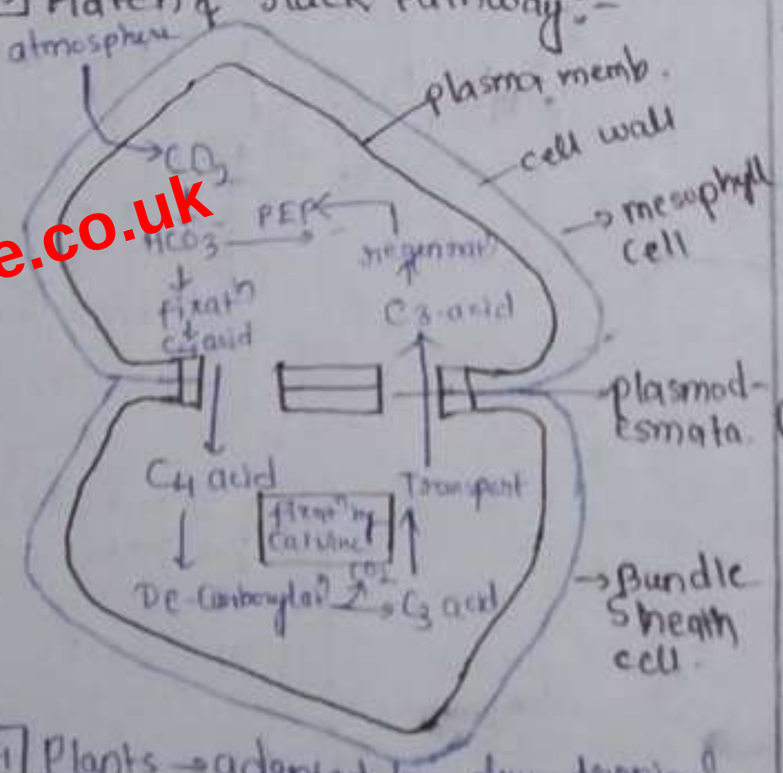
11] Mesophyll cells	Bundle sheath cells (BSC)
→ small (size), less (no)	→ large & more
→ RuBisco ✗	→ RuBisCO ✓
→ granal + stromal thyl	→ agranal + stromal thyl
→ water splitting ✓	✗
O_2 evolution ✓	✗
NADPH form ✓	✗
ATP form ✓	✓
→ photolysis of H_2O ✓	→ no photolysis.
→ PS I → granal, stromal ✓	✓
→ PS II → grana	✗
→ Non cyclic & cyclic photophosphorylation	→ only cyclic
→ no calvin cycle	→ calvin cycle ✓ coz RuBisCO ✓

12] C_3



C_4 mesophyll cell
Cyclic & non cyclic
→ H_2O splitting ✓
→ O_2 evoln ✓
but RuBisCO ✗
no photophosphorylation

13] Hatch & Slack Pathway:-



74] Plants → adapted by dry tropical regions → C_4 pathway
→ OAA → 1st fixation product / intermediate -diate pdt of C_4
↳ use C_3 pathway / Calvin cycle as main biosynthetic pathway.

75] C_4 → tolerate higher temp, show response to high light intensities, have greater productivity of biomass

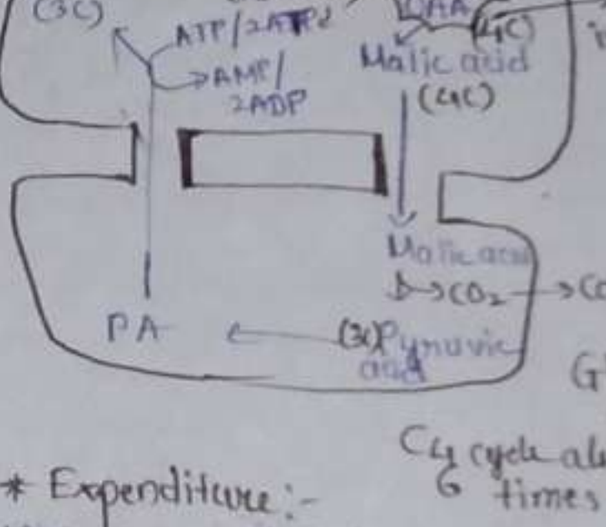
76] Kranz → wreadth & its reflection of arrangement of cells

77] BSC → large no of chloroplast, thick wall impervious to gaseous exchg, no ICS.

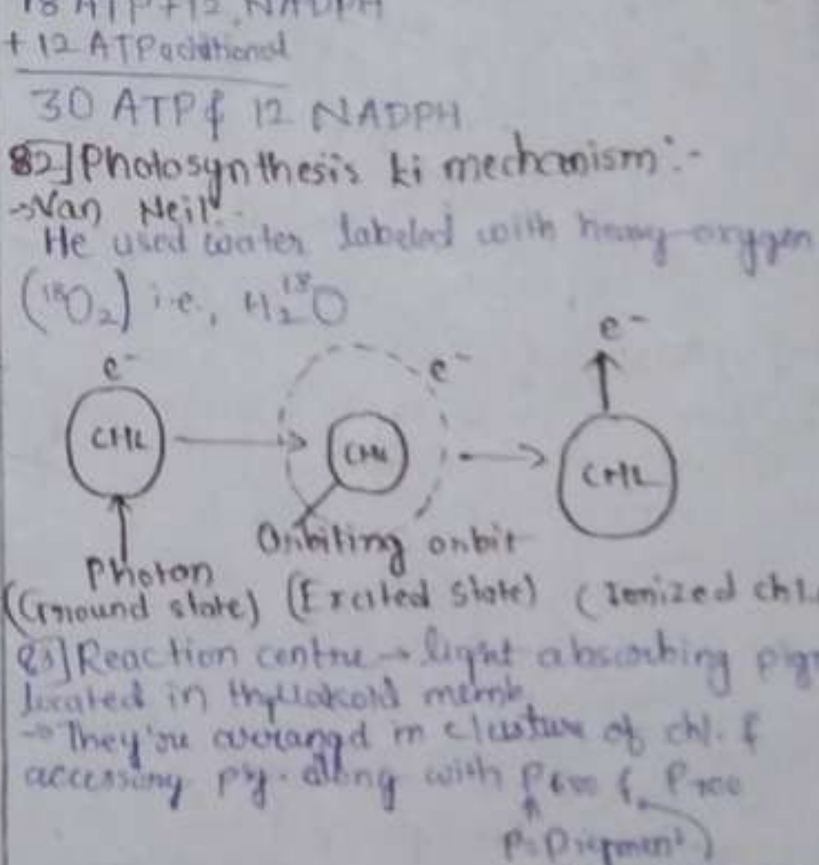
78] Ex C_4 pathway → 1° acceptor CO_2 → 3 C comp (PEP) → enzyme → PEPcase (PEP carboxylase)
* C_4 acid is OAA.
→ 4 carbon comp → malic acid or aspartic acid

79] BSC → rich in RuBisCO but lack PEPcase.

80]



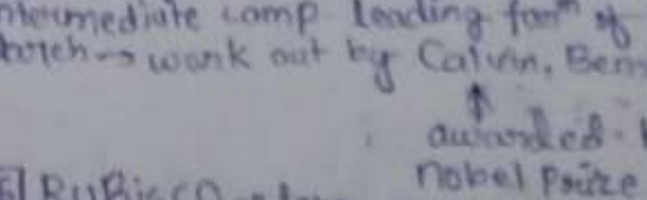
81]



C_4 cycle also occurs in 6 times.

* Expenditure:-
18 ATP + 12 NADPH
+ 12 ATP additional
30 ATP & 12 NADPH

82] Photosynthesis ki mechanism:-
→ Van Neil:
He used water labeled with heavy oxygen ($^{18}O_2$) i.e., $H_2^{18}O$



83] Reaction centre → light absorbing pigment located in thylakoid membr.
→ They're arranged in clusters of chl & accessory pig. along with Prot & Prot (P: Pigment) may form reaction centre & Photosynthetic

84] PS II → photolysis of water & release of oxygen
↳ when PS II oxidised absorb light → e's released & chl molecule oxidised.

85] Path of Carbon fixation in dark rxn was intermediate comp leading form of sugar & starch → work out by Calvin, Benson.
↑ awarded by Nobel Prize in 1961

86] RuBisCO → large protein molecule & comprises 16%. chloroplast protein.