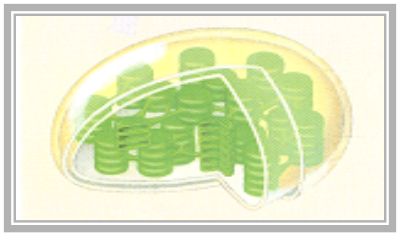
CHLOROPLAST

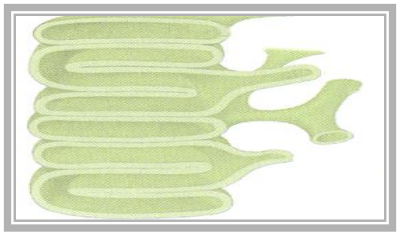


E- ACCEPTOR

E-

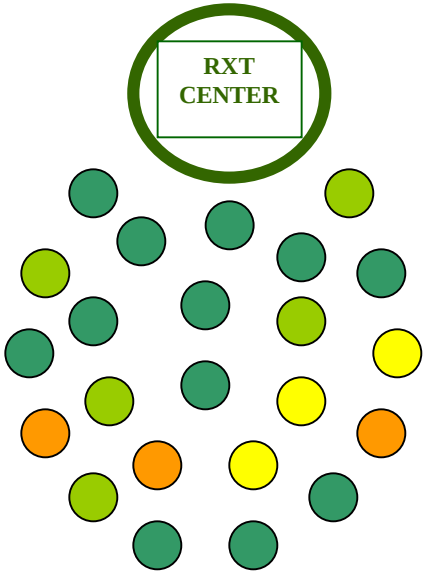
CHEM EGY

THYLAKOID

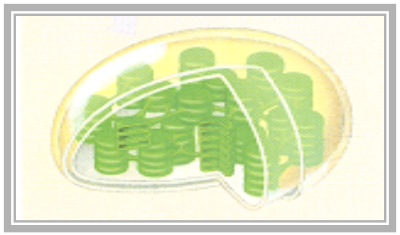


ETC

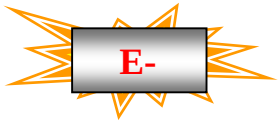
= ENERGY



CHLOROPLAST

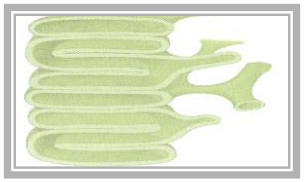


E- ACCEPTOR



CHEM EGY

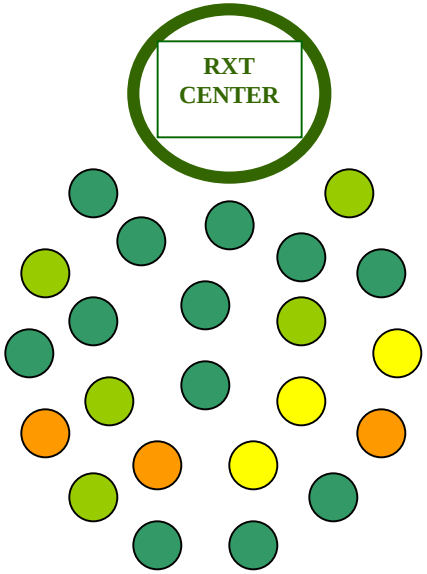
THYLAKOID



E- TRANSPORT CHAIN

E-

= ENERGY



NON-CYCLIC P-P

CYCLIC P-P

R

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

E-

ETC COMPONENTS

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ETC

ATP SYNTHASE

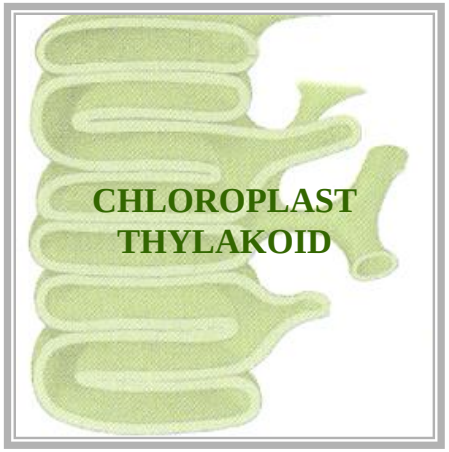
H+ H+ H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

E-

ETC COMPONENTS

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

REDOX RXTS

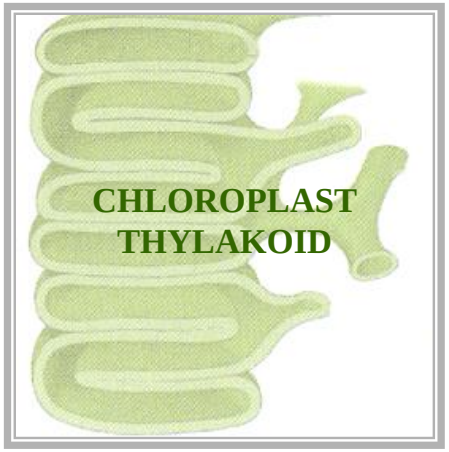
H+ H+ H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



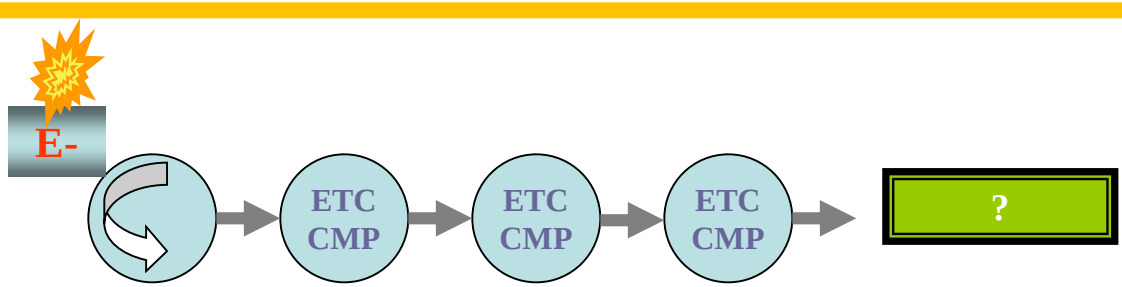
NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE



ATP SYNTHASE

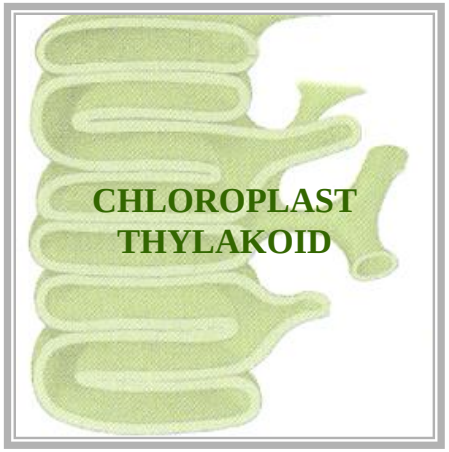
H+ H+ H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+

PS-II / PS-I

E-

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP

ETC CMP

ETC CMP

?

ATP SYNTHASE

H+

H+

H+

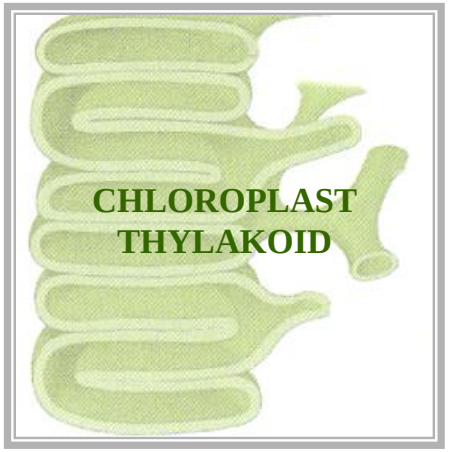
H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

R

CHLOROPLAST THYLAKOID SPACE

H+

PS-II / PS-I

E-

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP

ETC CMP

ETC CMP

ETC CMP

?

ATP SYNTHASE

H+

H+

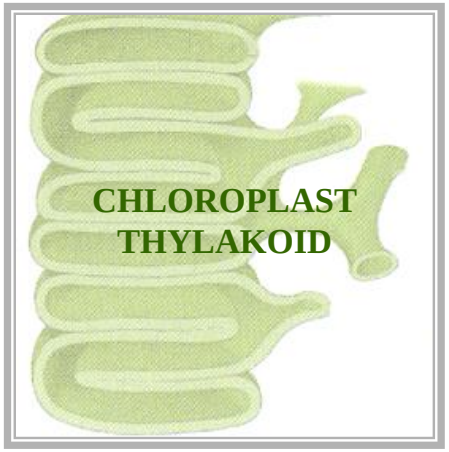
H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+

E-

PS-II / PS-I

E-

CHLOROPLAST THYLAKOID MEMBRANE

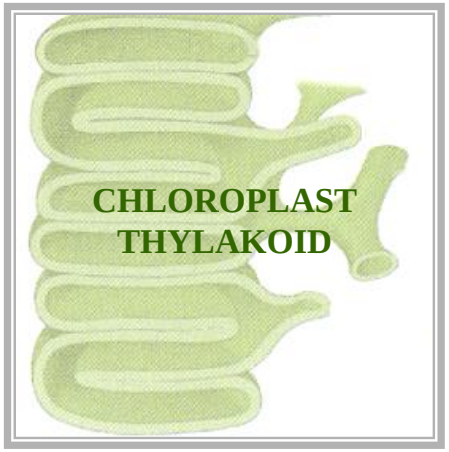
ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

REDOX RXT

H+ H+ H+

CHLOROPLAST STROMA



= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

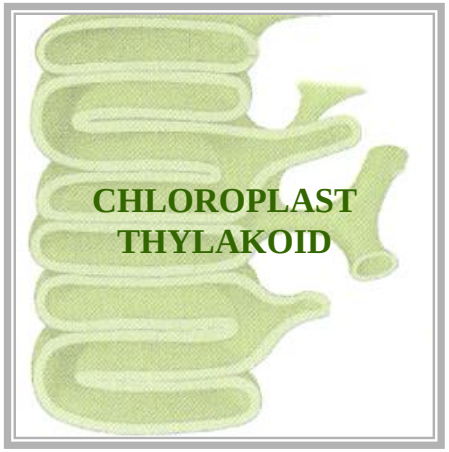
H+ H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP

ETC CMP

ETC CMP

?

ATP SYNTHASE

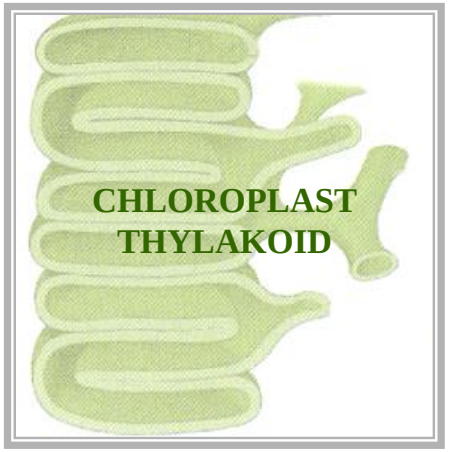
H+ H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+

H+

PS-II / PS-I

E-

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP

ETC CMP

ETC CMP

?

ATP SYNTHASE

H+

H+

H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

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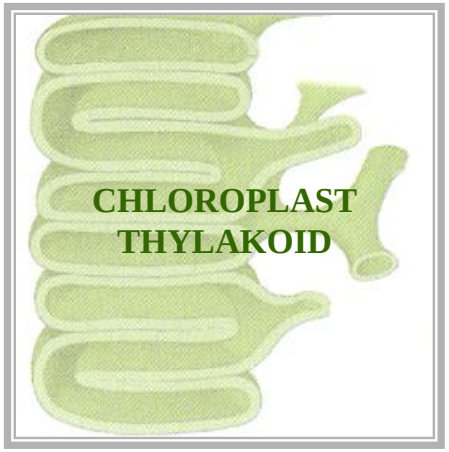


NON-CYCLIC P-P

CYCLIC P-P

R

CHLOROPLAST THYLAKOID SPACE

H+ H+

PS-II / PS-I

E-

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

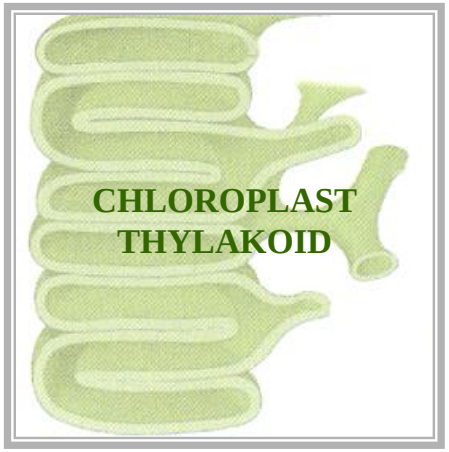
H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+

E-

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

REDOX RXT

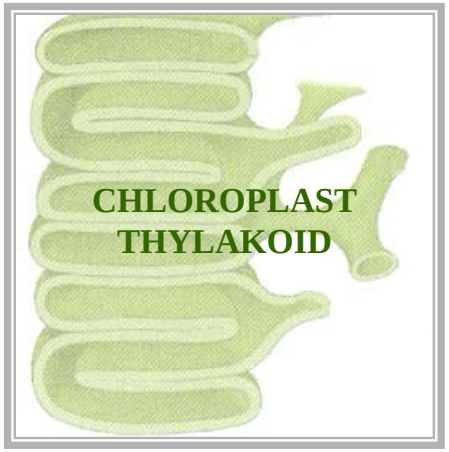
H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

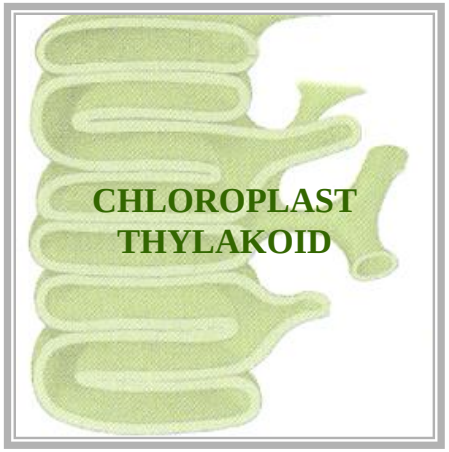
ATP SYNTHASE

H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY = CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

DISSIPATES ENERGY

ATP SYNTHASE

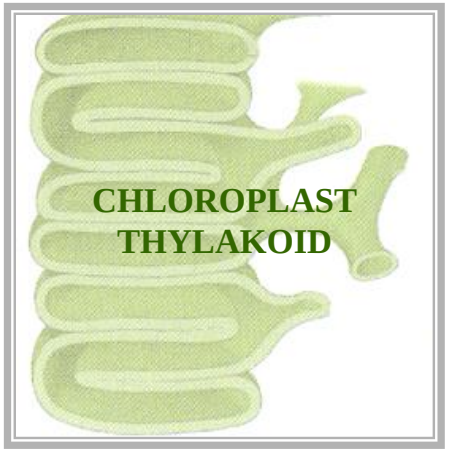
H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+

H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP

ETC CMP

ETC CMP

?

ATP SYNTHASE

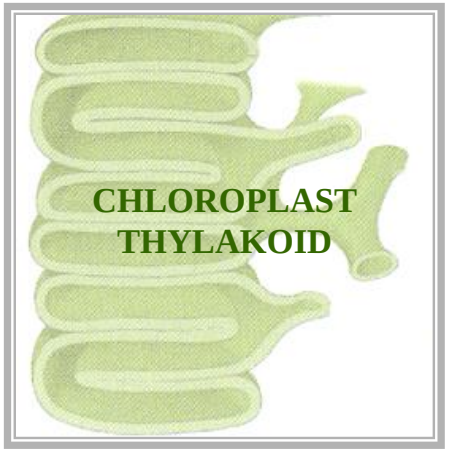
H+ H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+

PS-II / PS-I

E-

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP

ETC CMP

ETC CMP

?

ATP SYNTHASE

H+

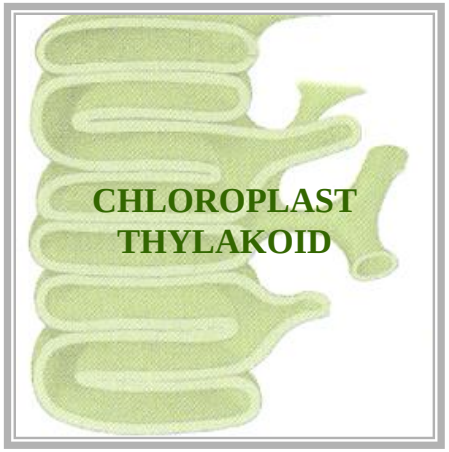
H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+

R

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

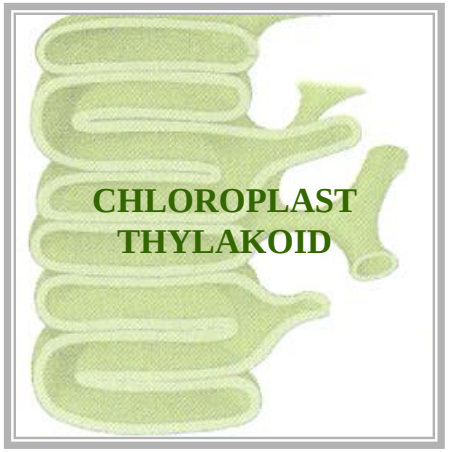
H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+

E-

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

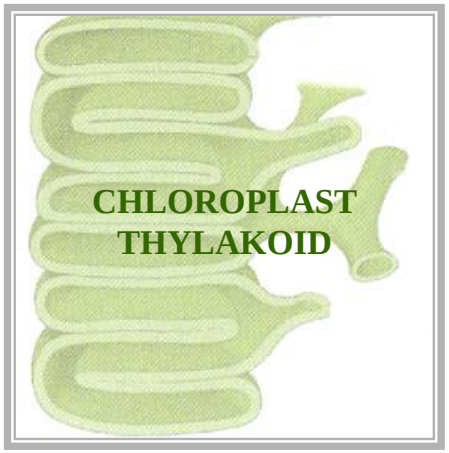
ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

REDOX RXT

H+

CHLOROPLAST STROMA



= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

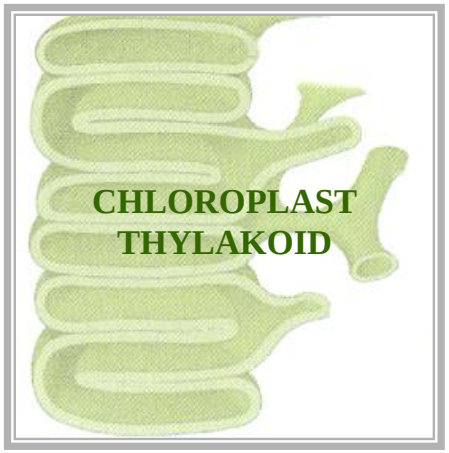
E-

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

ATP SYNTHASE

H+

CHLOROPLAST STROMA



= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+

PS-II / PS-I

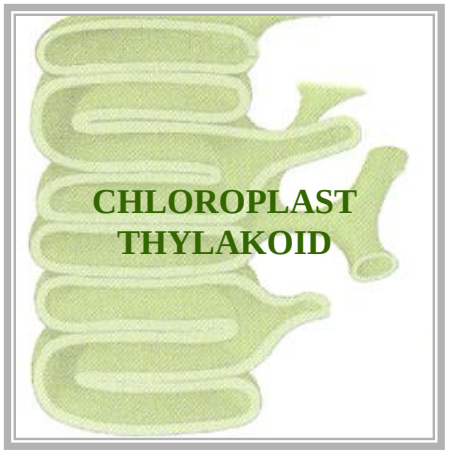
CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → E- → ?

ATP SYNTHASE

H+

CHLOROPLAST STROMA



= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+

H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP

ETC CMP

ETC CMP

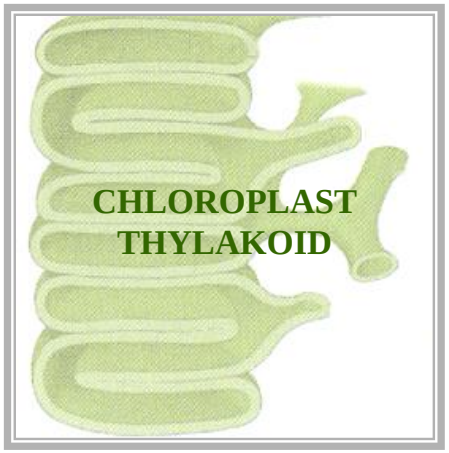
E-

?

ATP SYNTHASE

H+

CHLOROPLAST STROMA



= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+ H+

R

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

E-

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

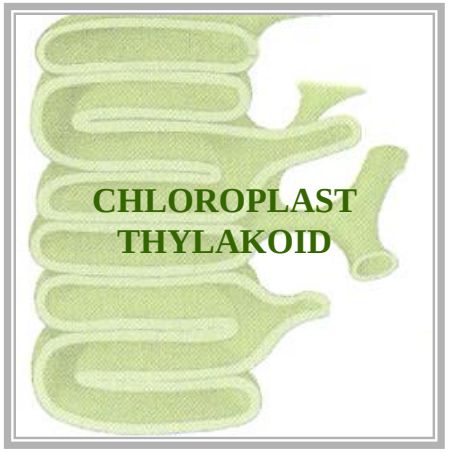
ATP SYNTHASE

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+ H+

E-

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → ?

E-

ATP SYNTHASE

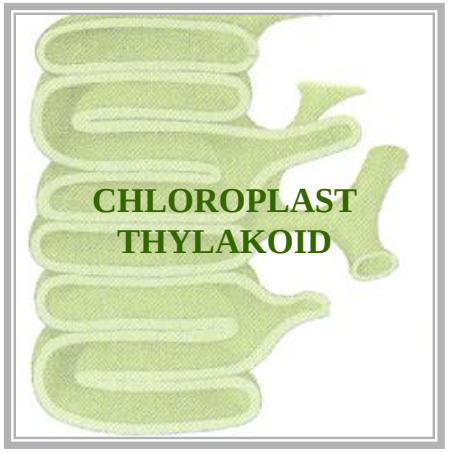
REDOX RXT

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+ H+

?

N

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → E- → ?

ETC

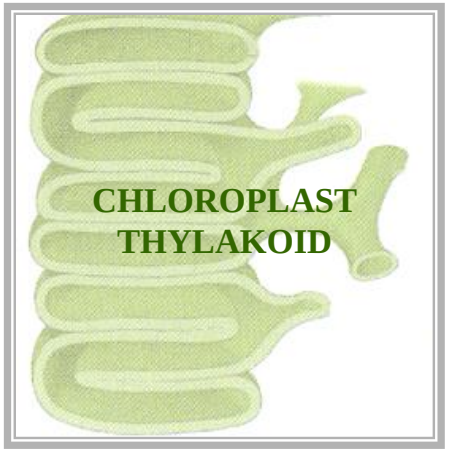
ATP SYNTHASE

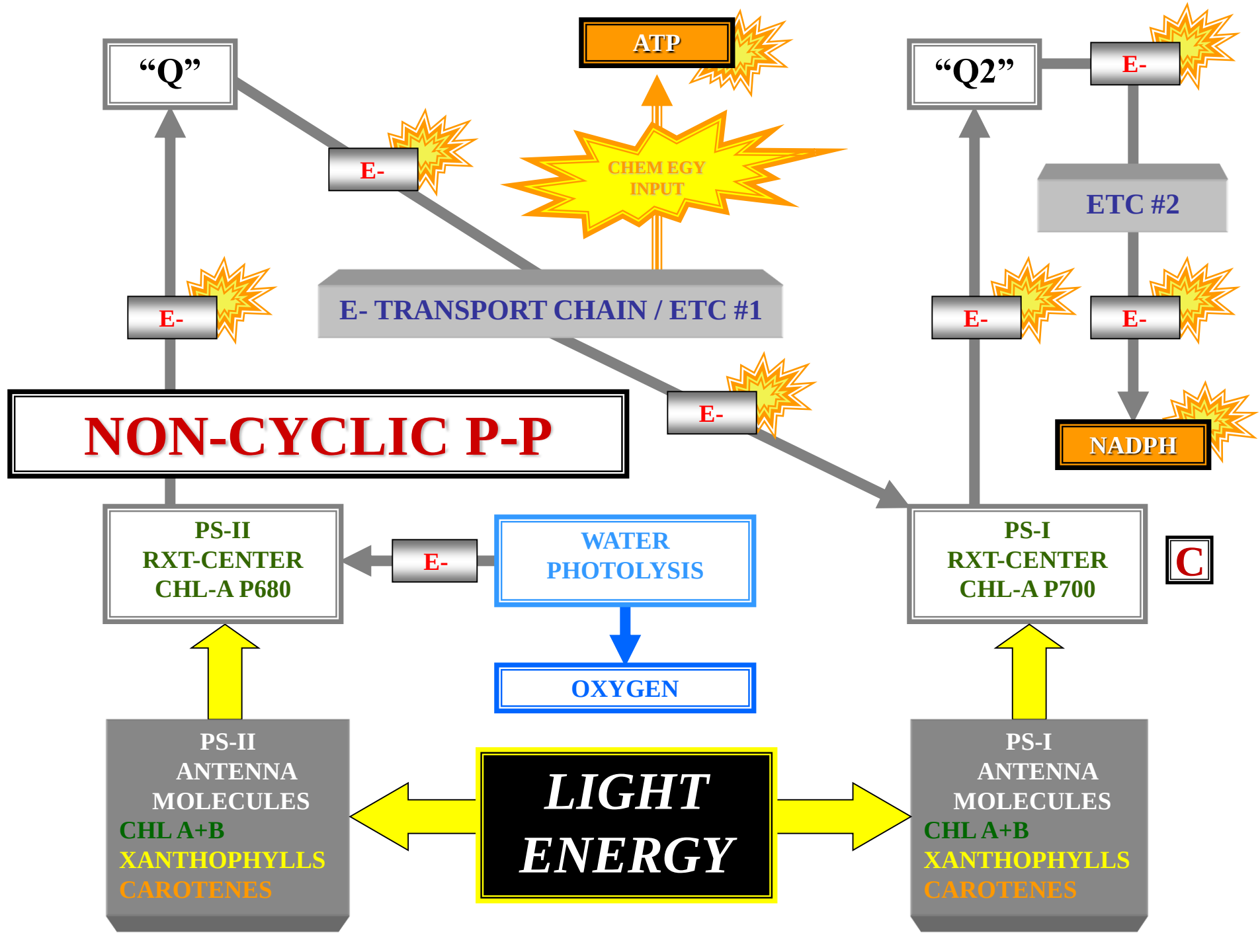
CHLOROPLAST STROMA

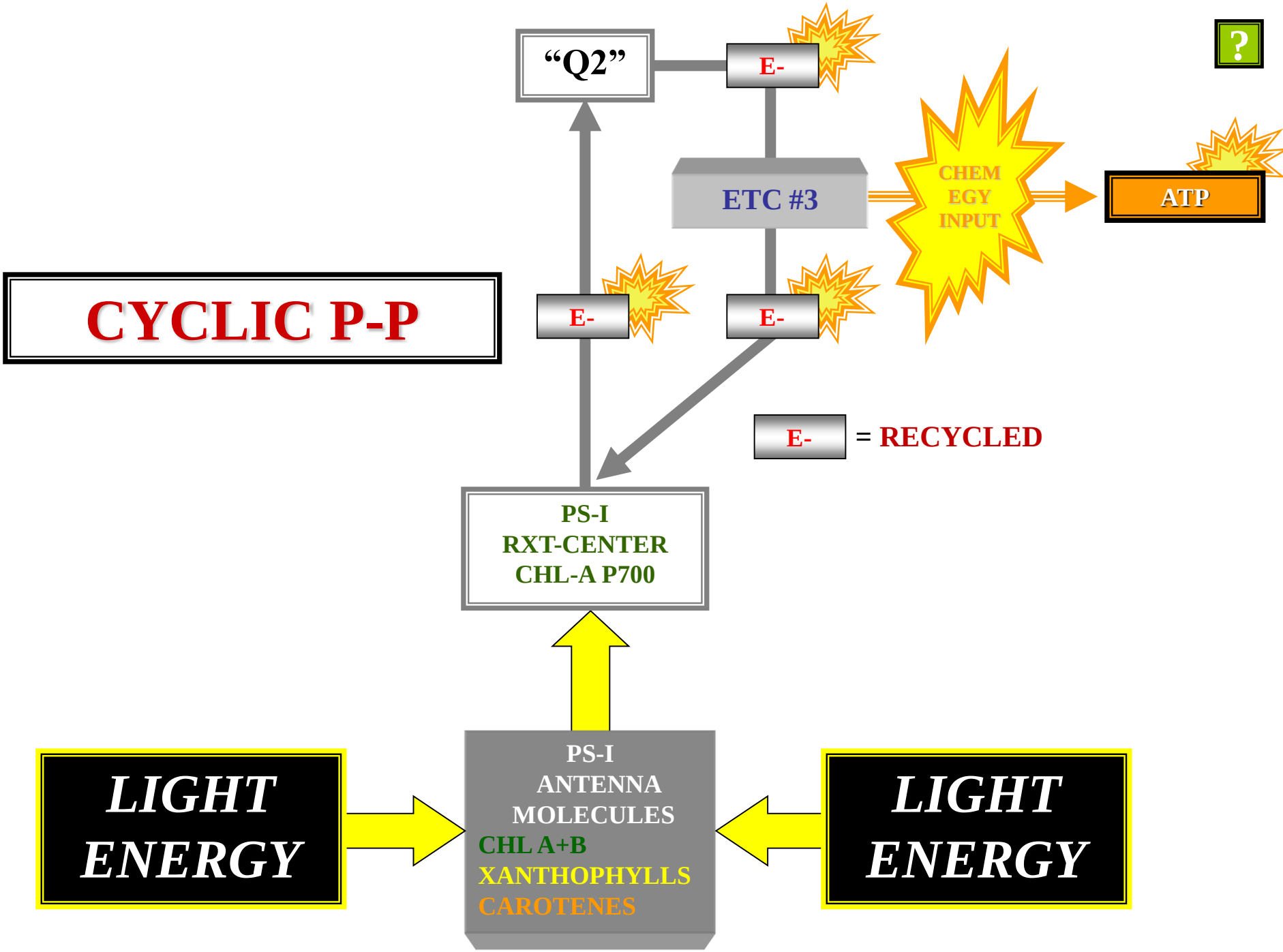
= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY




"Q"
ATP
"Q2"
E-
CHEM EGY INPUT
ETC #2
E- TRANSPORT CHAIN / ETC #1
NON-CYCLIC P-P
NADPH
PS-II RXT-CENTER CHL-A P680
WATER PHOTOLYSIS
PS-I RXT-CENTER CHL-A P700
C
OXYGEN
PS-II ANTENNA MOLECULES
CHL A+B
XANTHOPHYLLS
CAROTENES
LIGHT ENERGY
PS-I ANTENNA MOLECULES
CHL A+B
XANTHOPHYLLS
CAROTENES


?
"Q2"
E-
ETC #3
CHEM EGY INPUT
ATP
CYCLIC P-P
E-
E-
E- = RECYCLED
PS-I
RXT-CENTER
CHL-A P700
PS-I
ANTENNA
MOLECULES
CHL A+B
XANTHOPHYLLS
CAROTENES
LIGHT ENERGY
LIGHT ENERGY

I

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+ H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → E- → ?

ETC

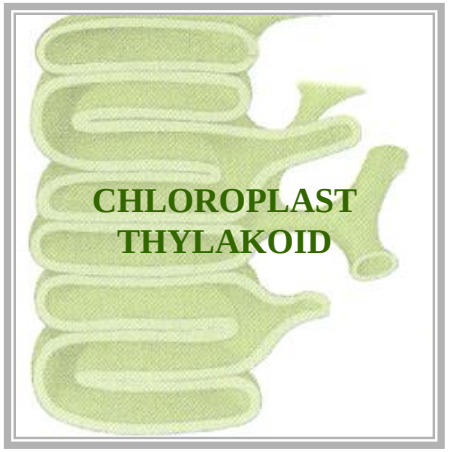
ATP SYNTHASE

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



$

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+ H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → E- → PS-I

ETC

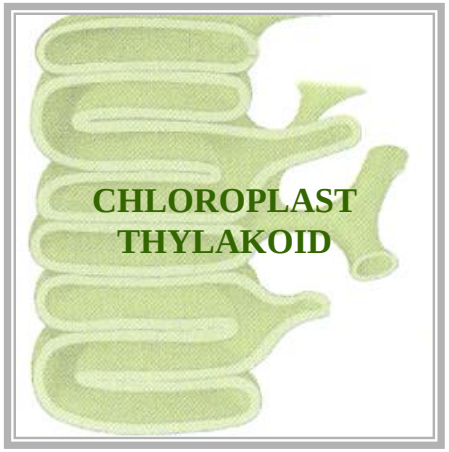
ATP SYNTHASE

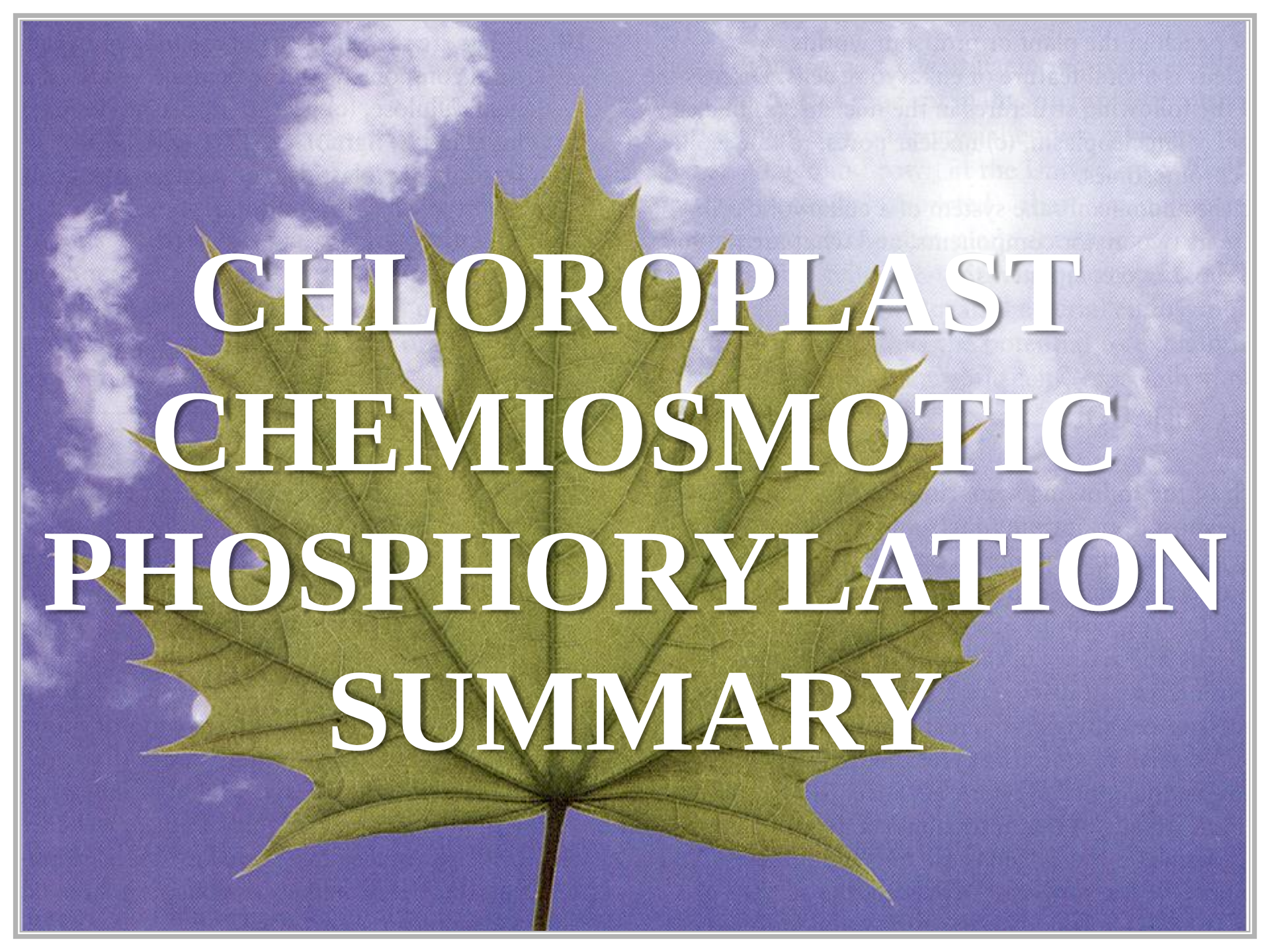
CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY




CHLOROPLAST
CHEMIOSMOTIC
PHOSPHORYLATION
SUMMARY

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

E-

THYLAKOID SPACE

THYLAKOID MEMBRANE

PS

ATP SYNTHASE

PHOTO-SYSTEM

STROMA

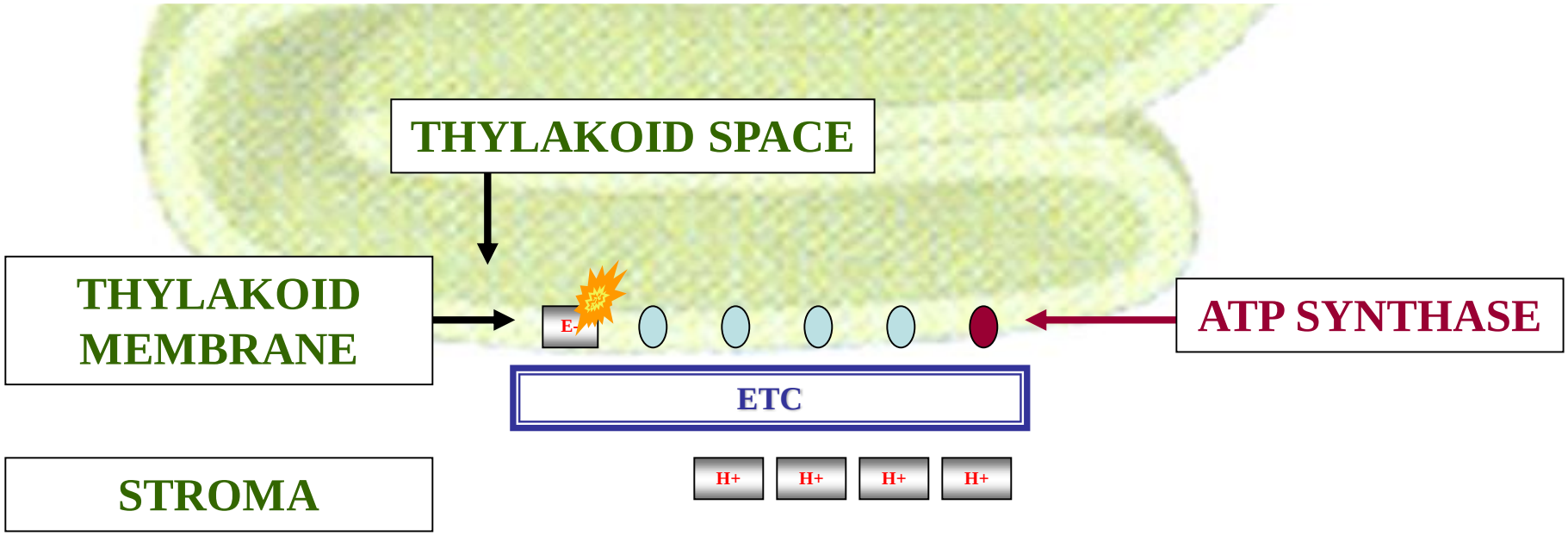
H+ H+ H+ H+

= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

R

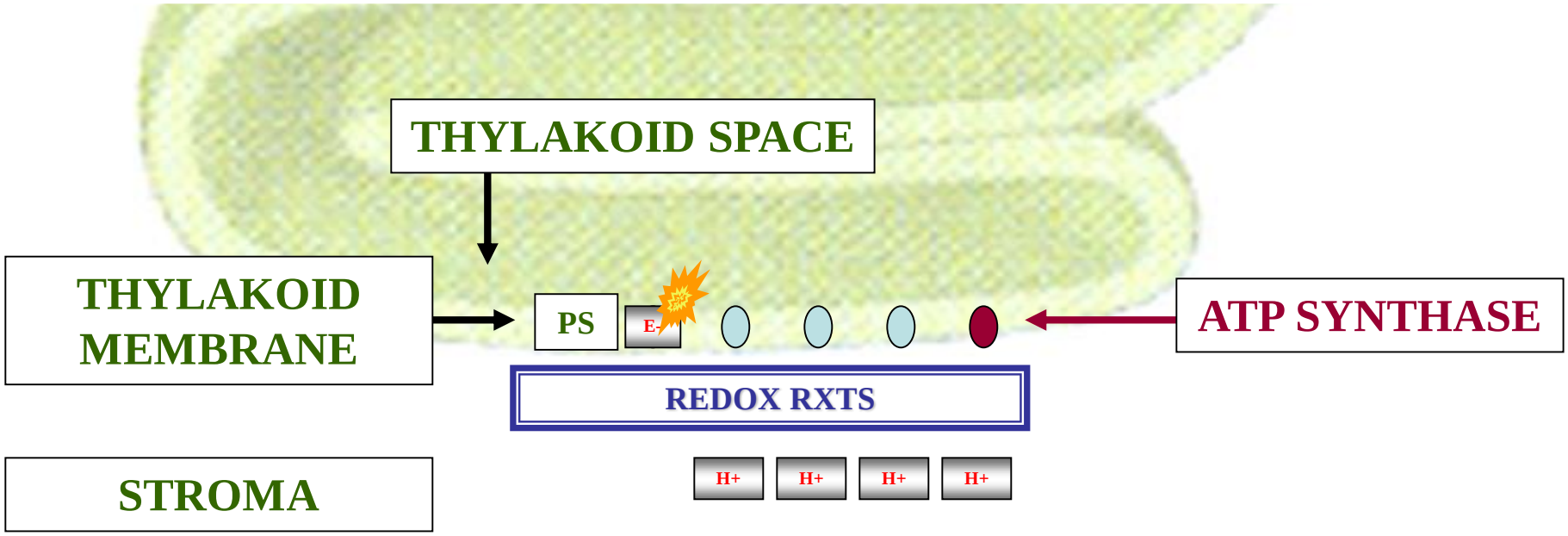


= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

E-

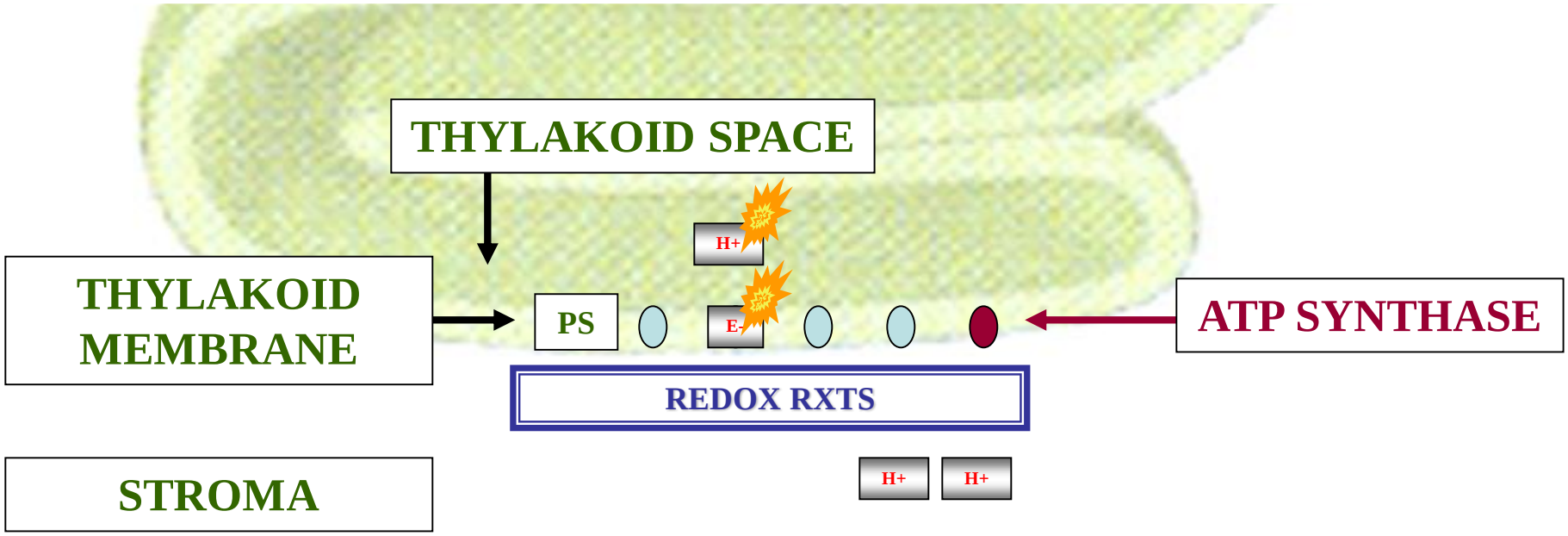


= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

E-

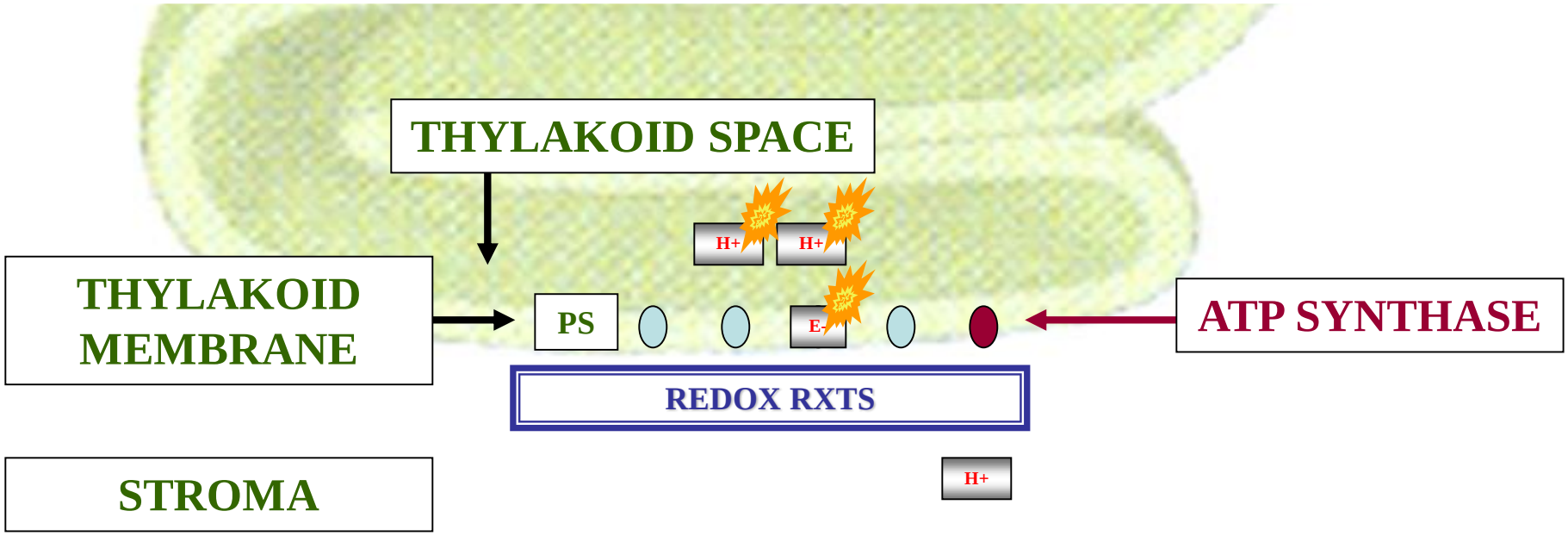


= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

E-

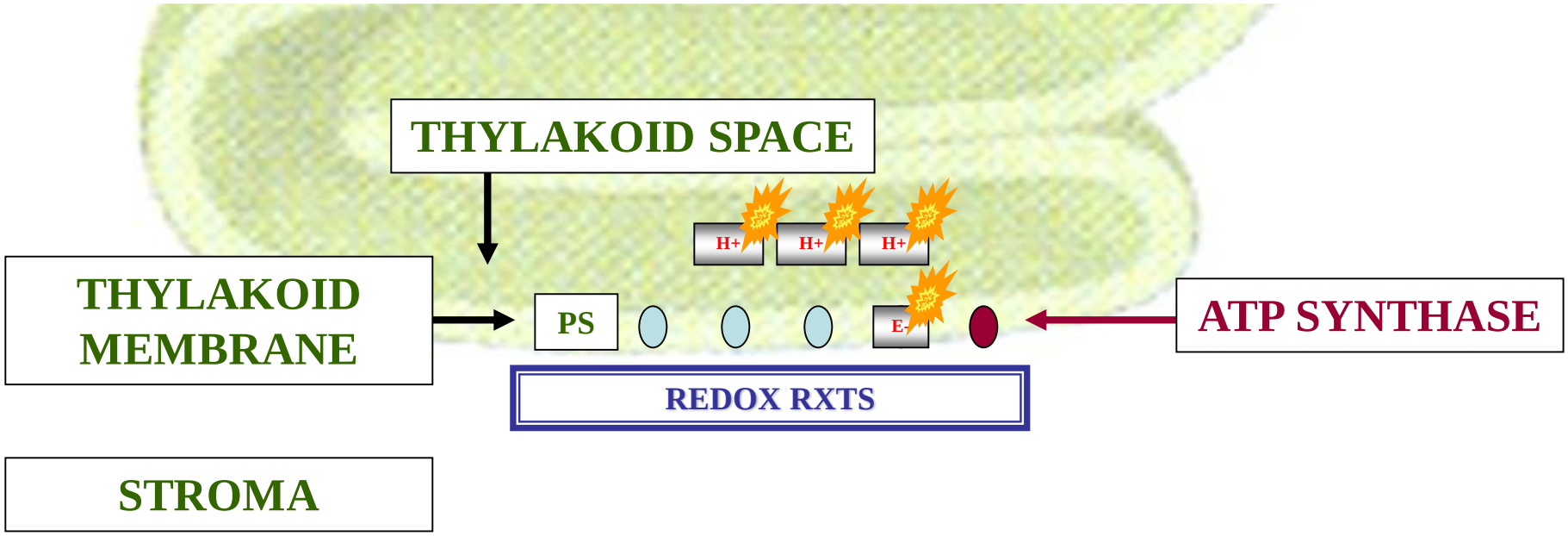


= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

E-



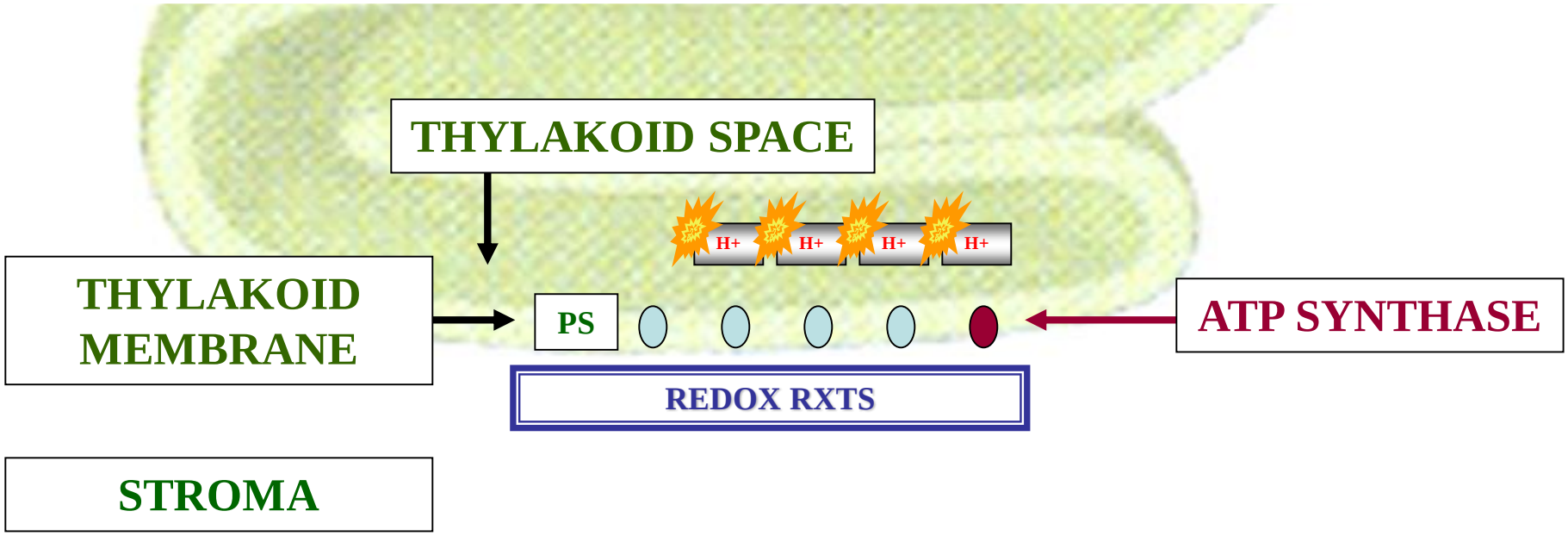
= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

^

H+



= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

A

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST THYLAKOID SPACE

H+ H+ H+ H+

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

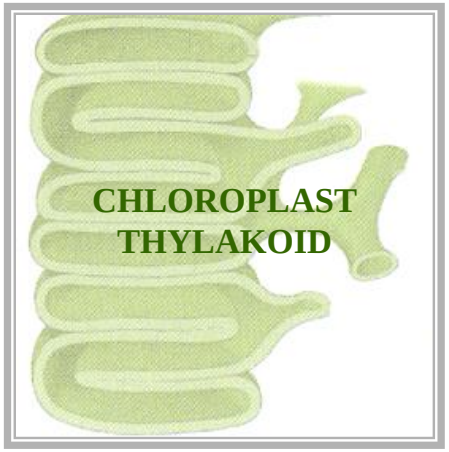
ATP SYNTHASE

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

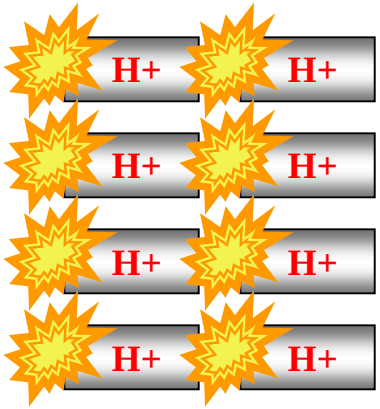
= HEAT ENERGY

= CHEMICAL ENERGY



P

H+ ACCUMULATE BEHIND ATP-SYNTHASE



CHLOROPLAST THYLAKOID SPACE

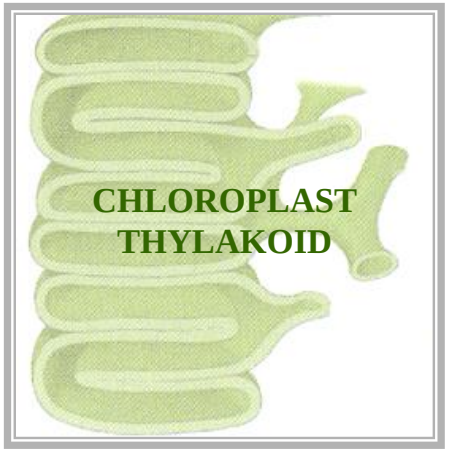
PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

CHLOROPLAST STROMA

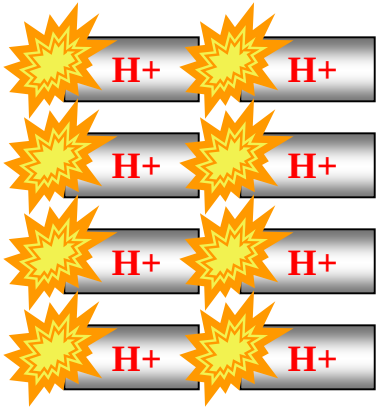


= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

H+ ACCUMULATE BEHIND ATP-SYNTHASE



CHLOROPLAST THYLAKOID SPACE

POTENTIAL CHEM EGY

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

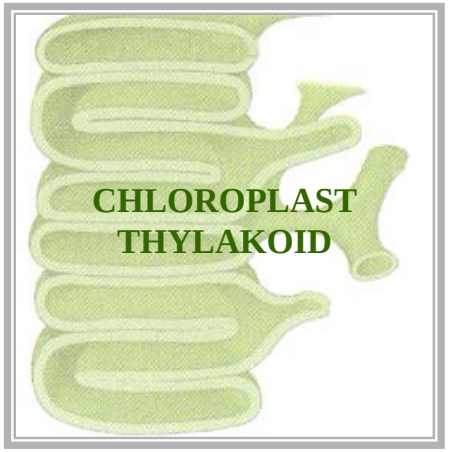
ATP SYNTHASE

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

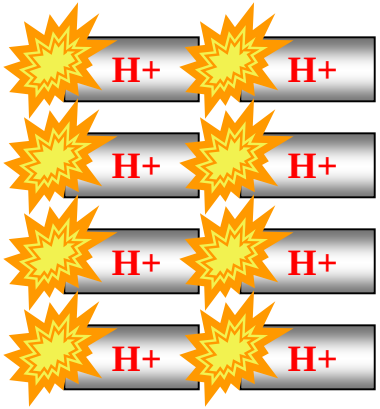
= HEAT ENERGY

= CHEMICAL ENERGY



ANALOGY
WATER & DAM

CHLOROPLAST THYLAKOID SPACE



POTENTIAL CHEM EGY

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

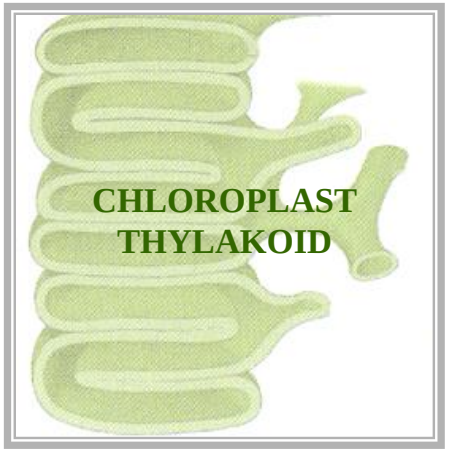
ATP SYNTHASE

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

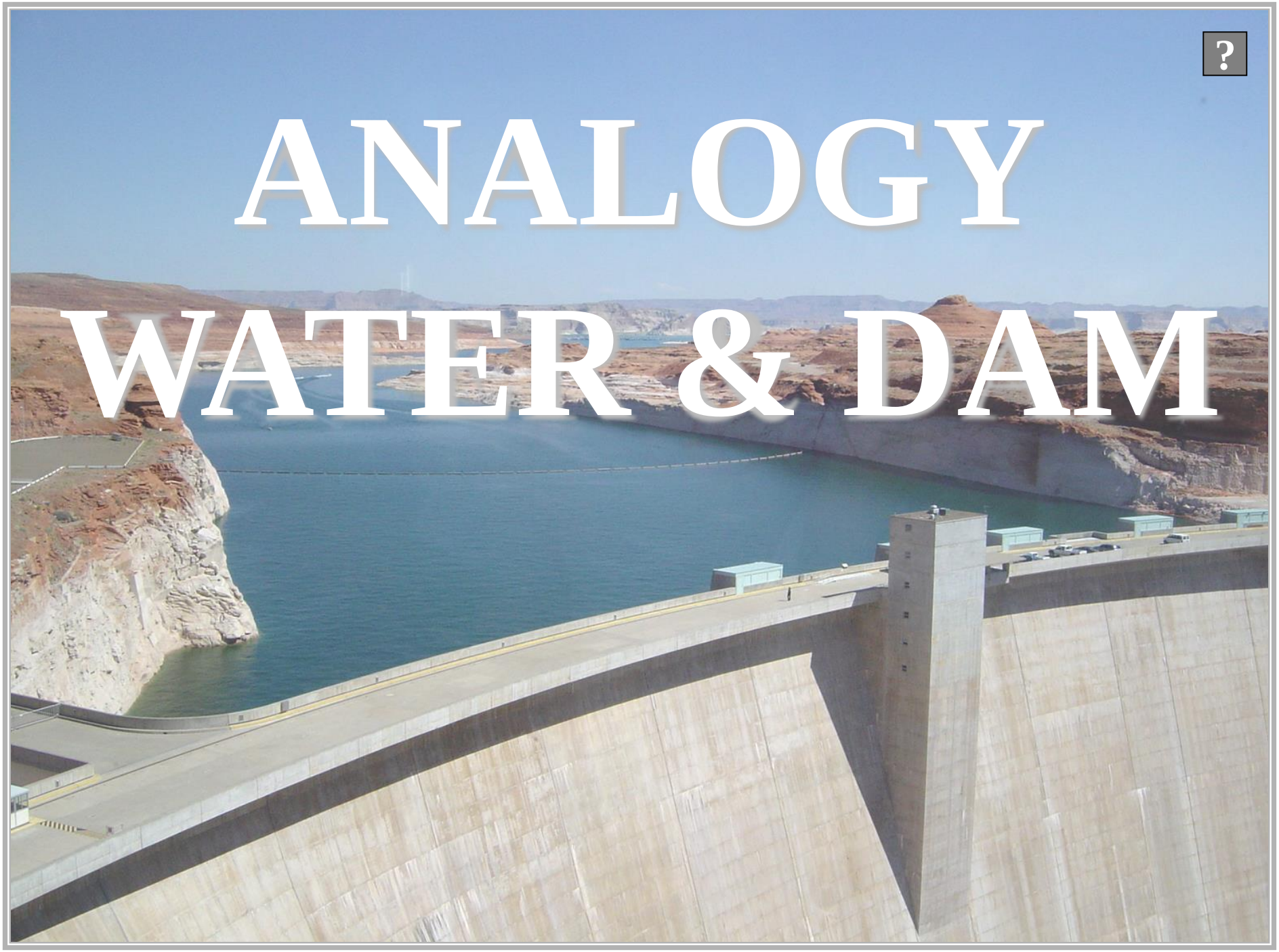
= CHEMICAL ENERGY



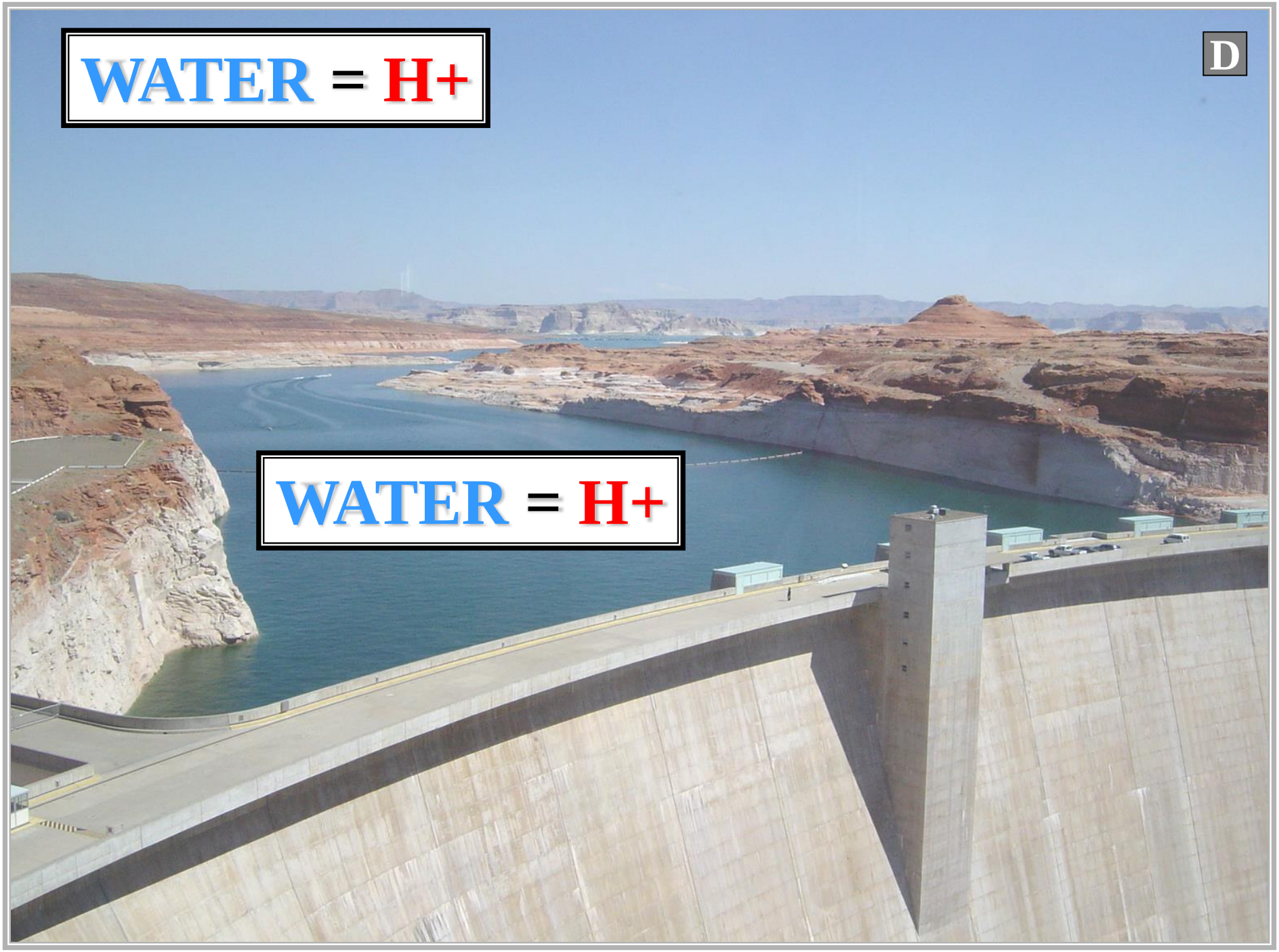
?

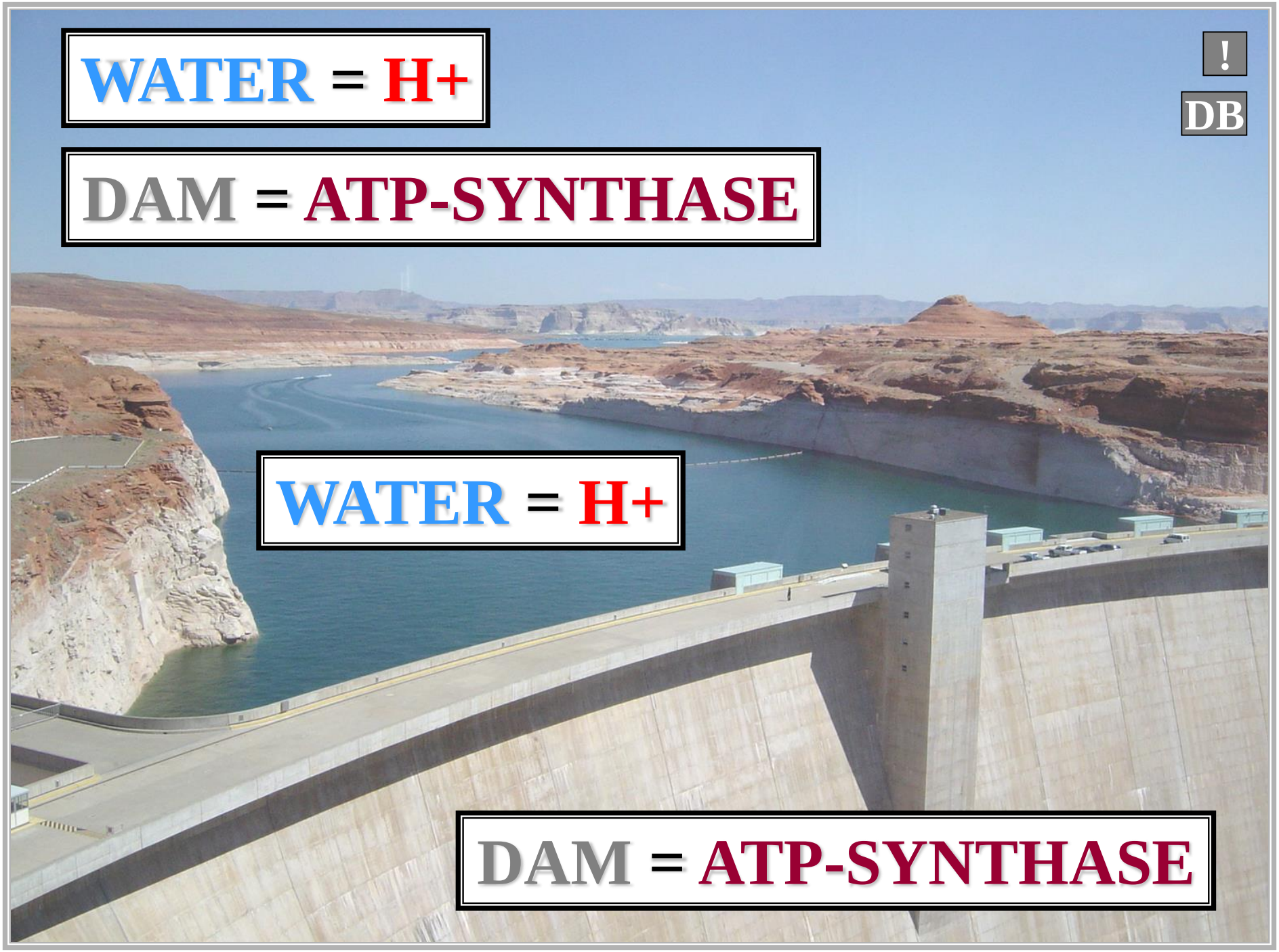
ANALOGY

WATER & DAM




WATER = ?
H


WATER = H+
D
WATER = H+


WATER = H+
!
DB
DAM = ATP-SYNTHASE
WATER = H+
DAM = ATP-SYNTHASE

CHLOROPLAST THYLAKOID SPACE

CRITICAL MASS H+ PASS VIA ATP SYNTHASE TO STROMA

H+ H+ H+ H+ H+ H+ H+ H+

POTENTIAL CHEM EGY

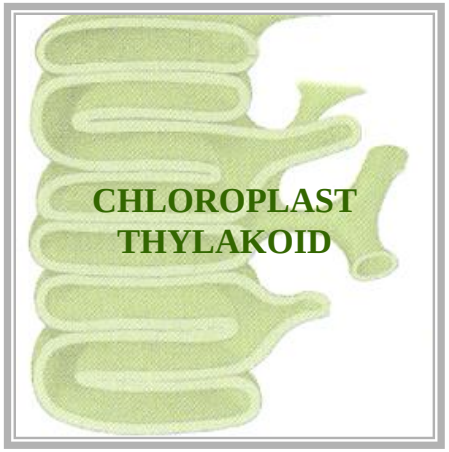
PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

CHLOROPLAST STROMA



= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

CRITICAL MASS
H+ PASS VIA ATP SYNTHASE TO STROMA

CHLOROPLAST THYLAKOID SPACE

POTENTIAL CHEM EGY

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

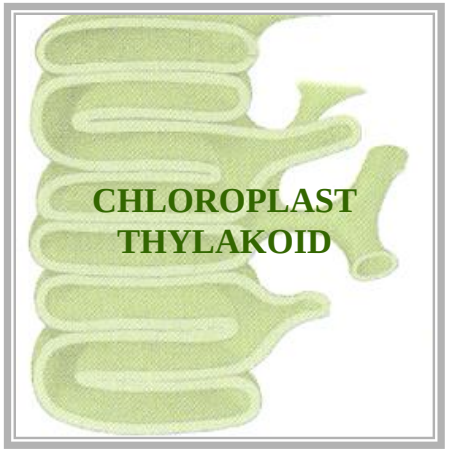
H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



CRITICAL MASS
H+ PASS VIA ATP SYNTHASE TO STROMA

CHLOROPLAST THYLAKOID SPACE

POTENTIAL CHEM EGY

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

POTENTIAL CHEMICAL ENERGY

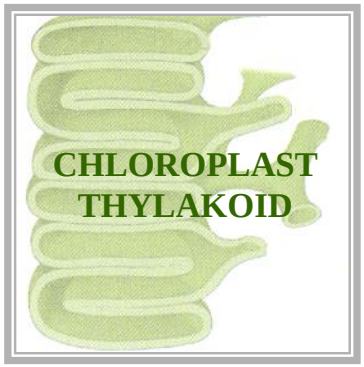
H+ H+ H+ H+ ← H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY



EX

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

POTENTIAL CHEMICAL EGY RELEASED

POTENTIAL CHEM EGY RELEASED

H+ H+ H+ H+ ← H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

A

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

POTENTIAL CHEMICAL EGY RELEASED

EXERGONIC RXT

H+ H+ H+ H+ ← H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

?

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

P + ADP

EXERGONIC RXT

H+ H+ H+ H+ ← H+

CHLOROPLAST STROMA

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

A

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

P + ADP

EXERGONIC RXT

H+ H+ H+ H+

CHLOROPLAST STROMA

INPUT CHEMICAL ENERGY

?

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

EN

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

P + ADP

EXERGONIC RXT

H+ H+ H+ H+

CHLOROPLAST STROMA

INPUT CHEMICAL ENERGY

ATP

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

C

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

P + ADP

EXERGONIC RXT

H+ H+ H+ H+

CHLOROPLAST STROMA

ENDERGONIC RXT

INPUT CHEMICAL ENERGY

ATP

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

P

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

P + ADP

EXERGONIC RXT

H+ H+ H+ H+

COUPLED

INPUT CHEMICAL ENERGY

ENDERGONIC RXT

CHLOROPLAST STROMA

ATP

= ELECTRON TRANSPORT CHAIN COMPONENT

= HEAT ENERGY

= CHEMICAL ENERGY

$

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

ETC CMP → ETC CMP → ETC CMP → ETC CMP → PS-I

ATP SYNTHASE

P + ADP

EXERGONIC RXT

H+ H+ H+ H+

COUPLED

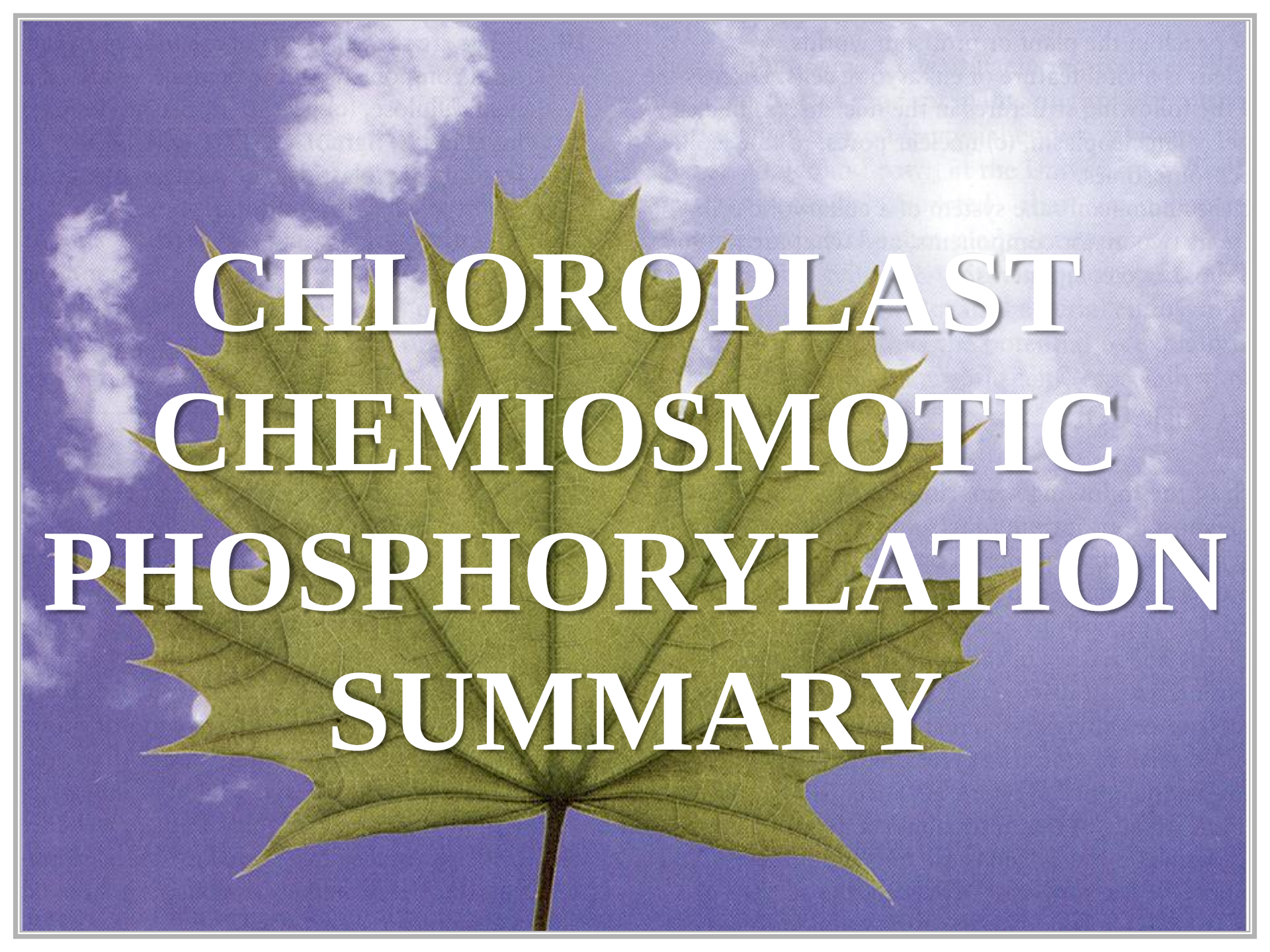
INPUT CHEMICAL ENERGY

CHLOROPLAST STROMA

ENDERGONIC RXT

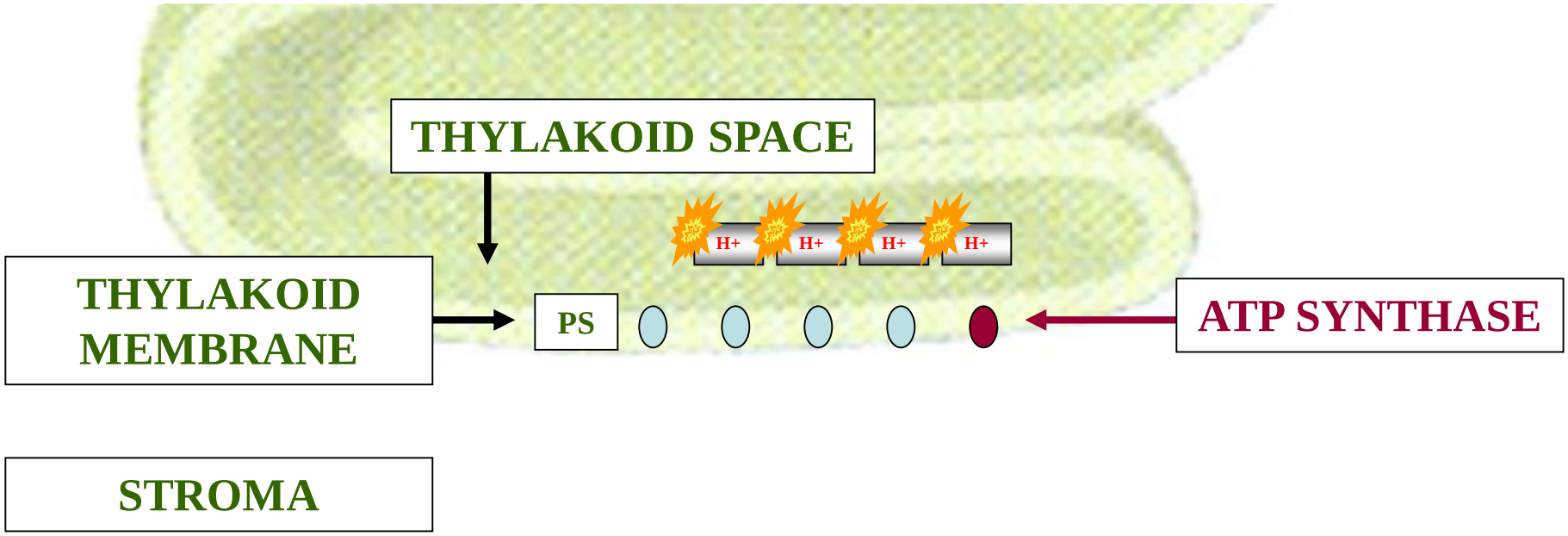
ATP

PHOSPHORYLATION


CHLOROPLAST
CHEMIOSMOTIC
PHOSPHORYLATION
SUMMARY

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

H+

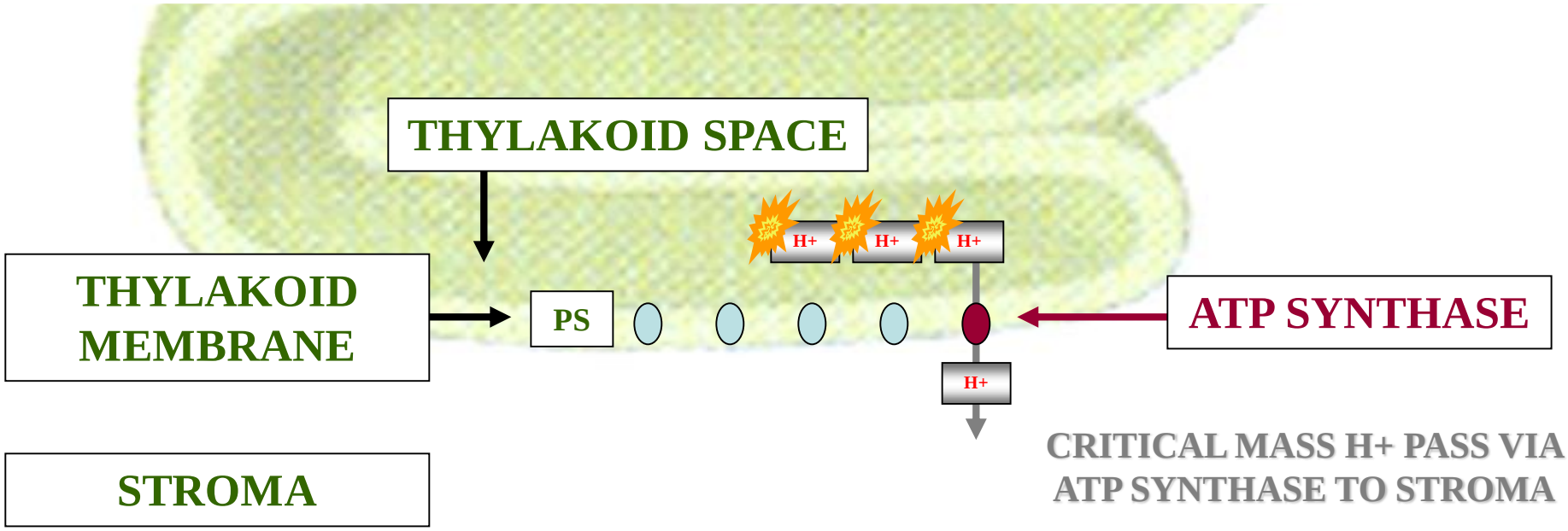


= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

H+



= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

R

THYLAKOID SPACE

POTENTIAL CHEMICAL ENERGY

THYLAKOID MEMBRANE

PS

ATP SYNTHASE

STROMA

H+ H+ H+ H+

CRITICAL MASS H+ PASS VIA ATP SYNTHASE TO STROMA

= POTENTIAL CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

A

P

THYLAKOID SPACE

THYLAKOID MEMBRANE

PS

ATP SYNTHASE

STROMA

H+ H+ H+ H+

POTENTIAL CHEMICAL ENERGY RELEASED

= CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

A

N

THYLAKOID SPACE

THYLAKOID MEMBRANE

PS

ATP SYNTHASE

STROMA

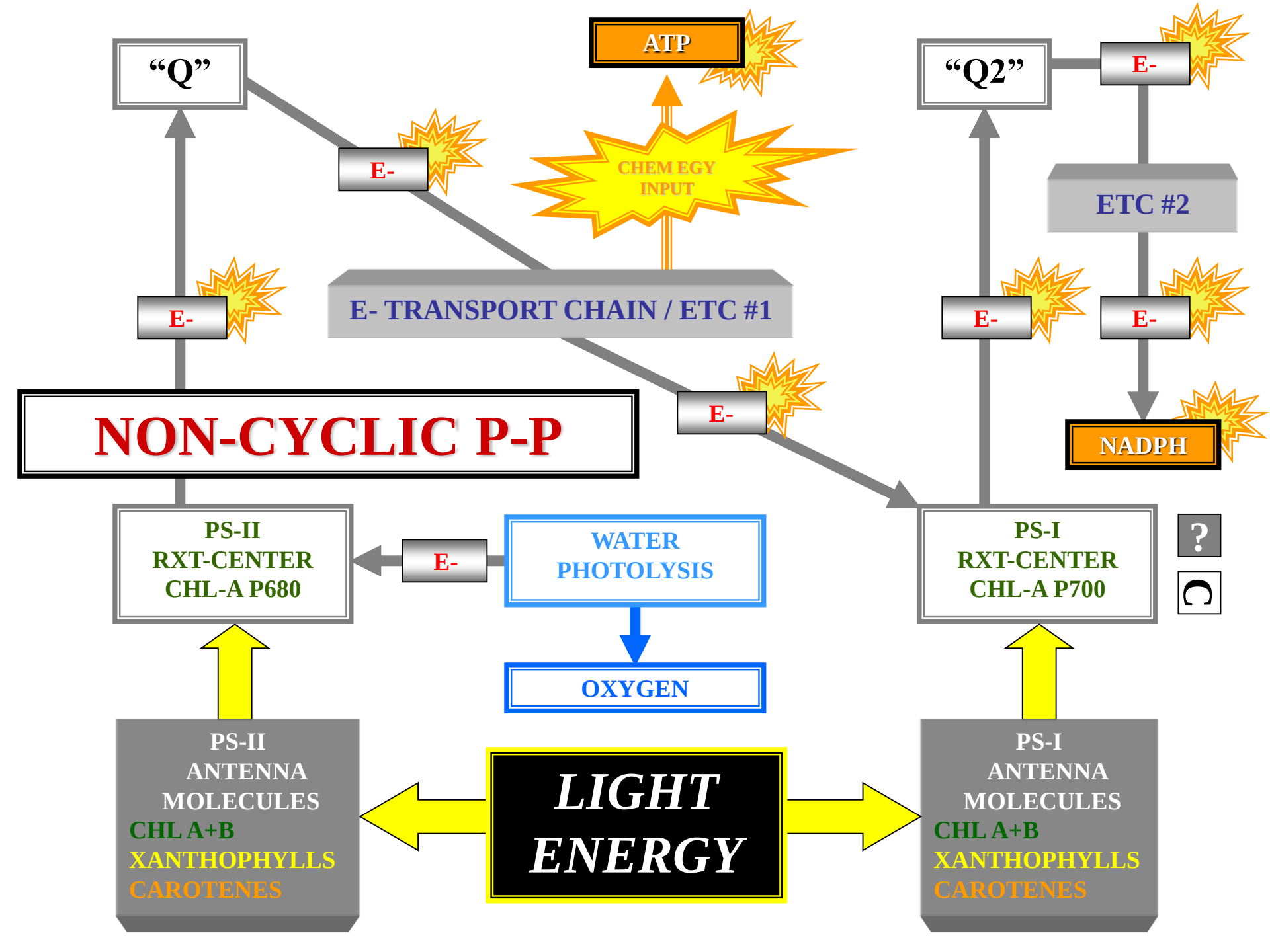
H+ H+ H+ H+

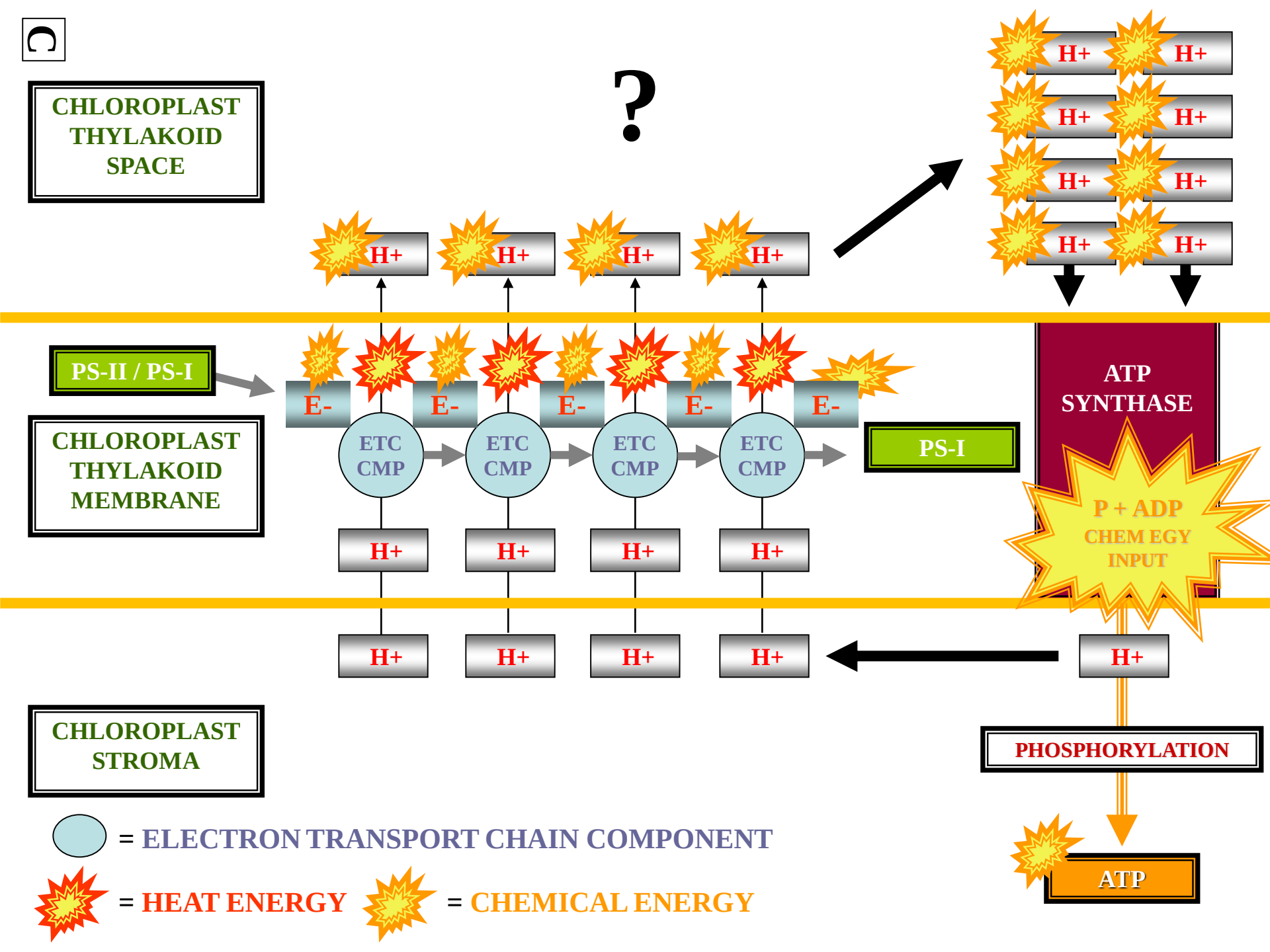
ATP

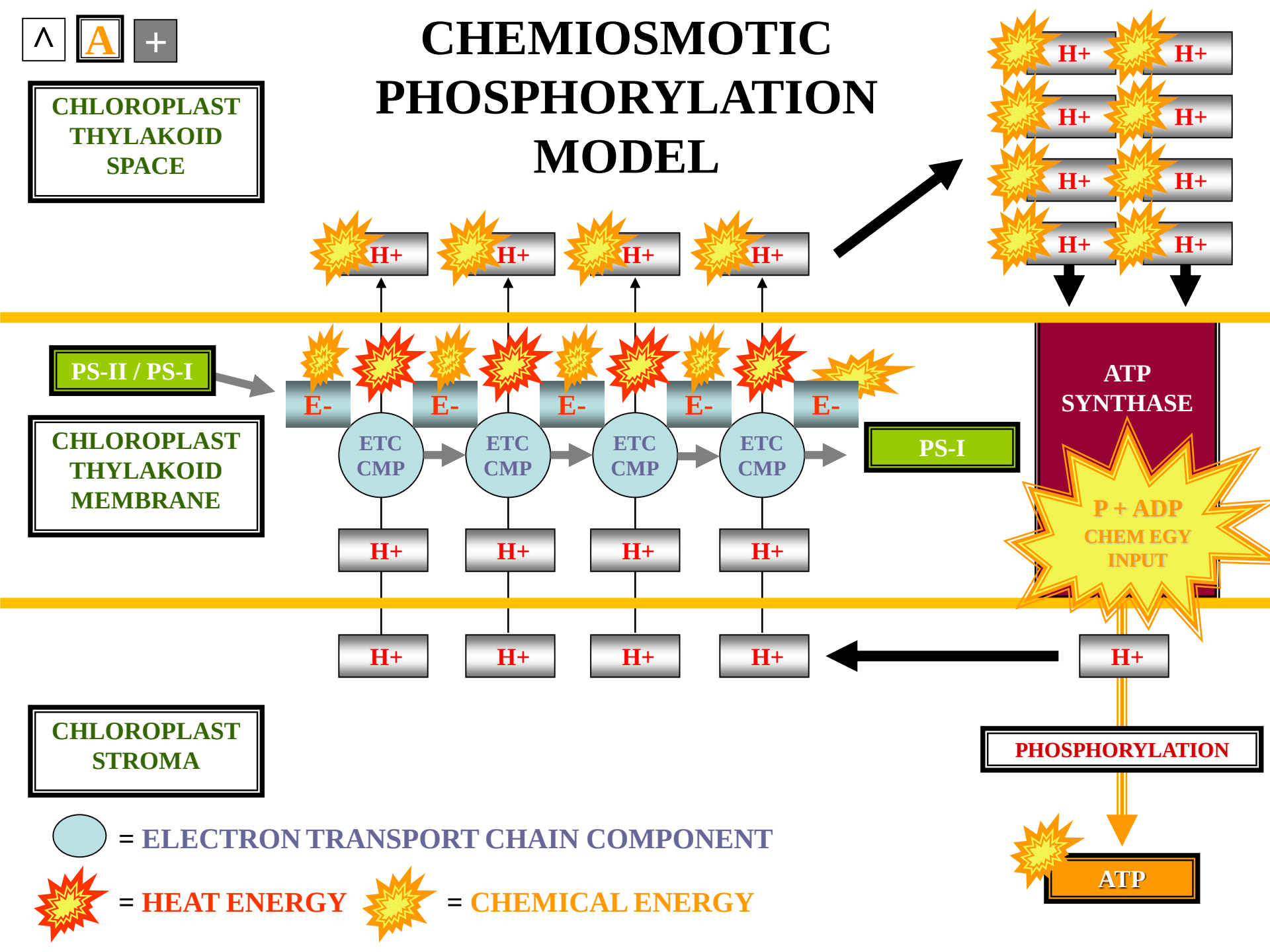
PHOSPHORYLATION

= CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT


"Q"
ATP
"Q2"
E-
CHEM EGY INPUT
ETC #2
E- TRANSPORT CHAIN / ETC #1
NON-CYCLIC P-P
NADPH
PS-II RXT-CENTER CHL-A P680
WATER PHOTOLYSIS
PS-I RXT-CENTER CHL-A P700
?
OXYGEN
PS-II ANTENNA MOLECULES
CHL A+B
XANTHOPHYLLS
CAROTENES
LIGHT ENERGY
PS-I ANTENNA MOLECULES
CHL A+B
XANTHOPHYLLS
CAROTENES


CHLOROPLAST THYLAKOID SPACE
?
H+
H+
H+
H+
H+
H+
H+
H+
H+
H+
PS-II / PS-I
E-
E-
E-
E-
E-
ETC CMP
ETC CMP
ETC CMP
ETC CMP
PS-I
ATP SYNTHASE
P + ADP
CHEM EGY INPUT
CHLOROPLAST THYLAKOID MEMBRANE
H+
H+
H+
H+
H+
H+
H+
H+
H+
CHLOROPLAST STROMA
PHOSPHORYLATION
ATP
= ELECTRON TRANSPORT CHAIN COMPONENT
= HEAT ENERGY
= CHEMICAL ENERGY


CHEMIOSMOTIC PHOSPHORYLATION MODEL
CHLOROPLAST THYLAKOID SPACE
CHLOROPLAST THYLAKOID MEMBRANE
CHLOROPLAST STROMA
PS-II / PS-I
PS-I
H+
E-
ETC CMP
ATP SYNTHASE
P + ADP
CHEM EGY INPUT
PHOSPHORYLATION
ATP
= ELECTRON TRANSPORT CHAIN COMPONENT
= HEAT ENERGY
= CHEMICAL ENERGY

CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

A

C

THYLAKOID SPACE

THYLAKOID MEMBRANE

PS

ATP SYNTHASE

STROMA

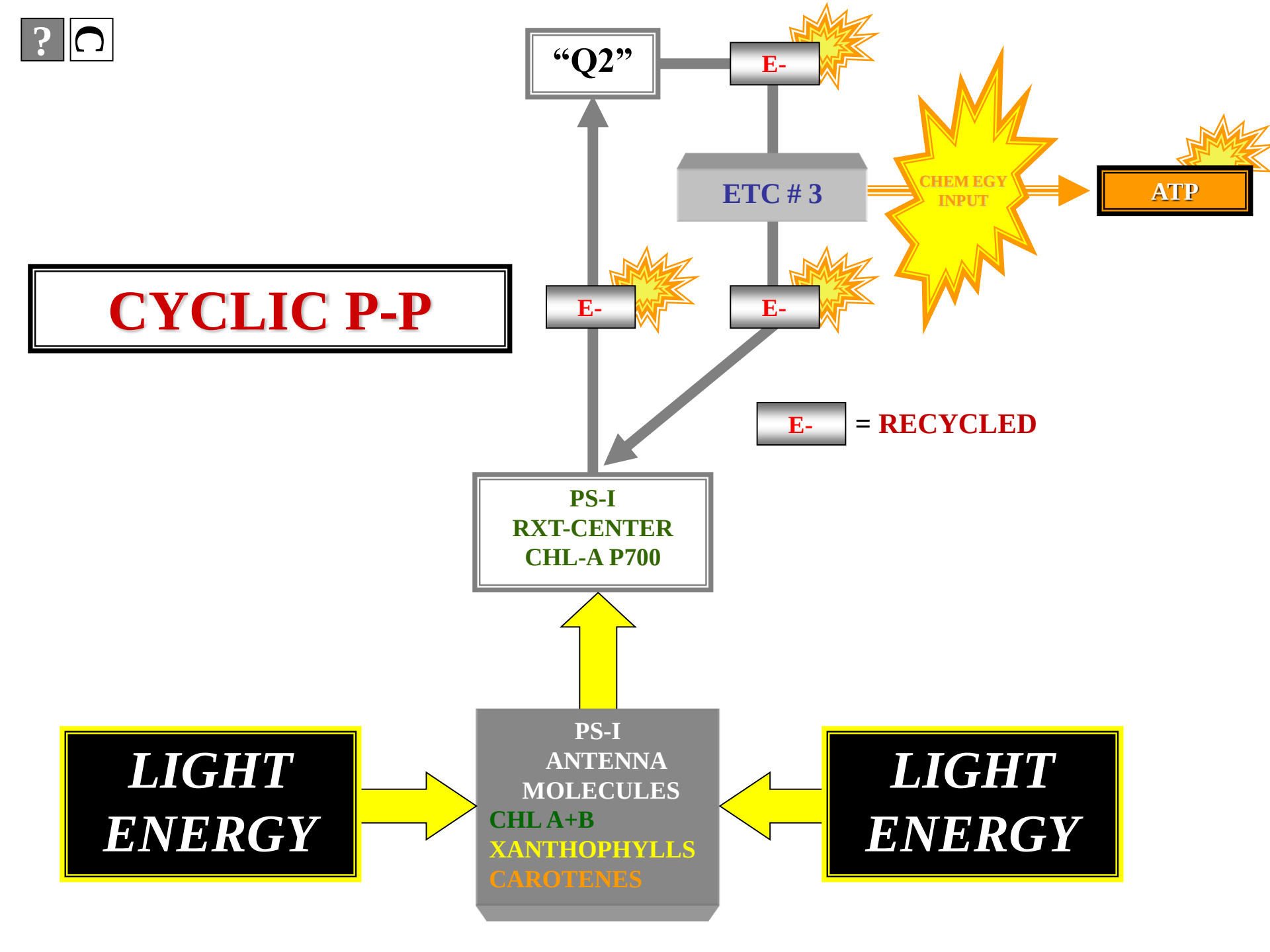
H+ H+ H+ H+

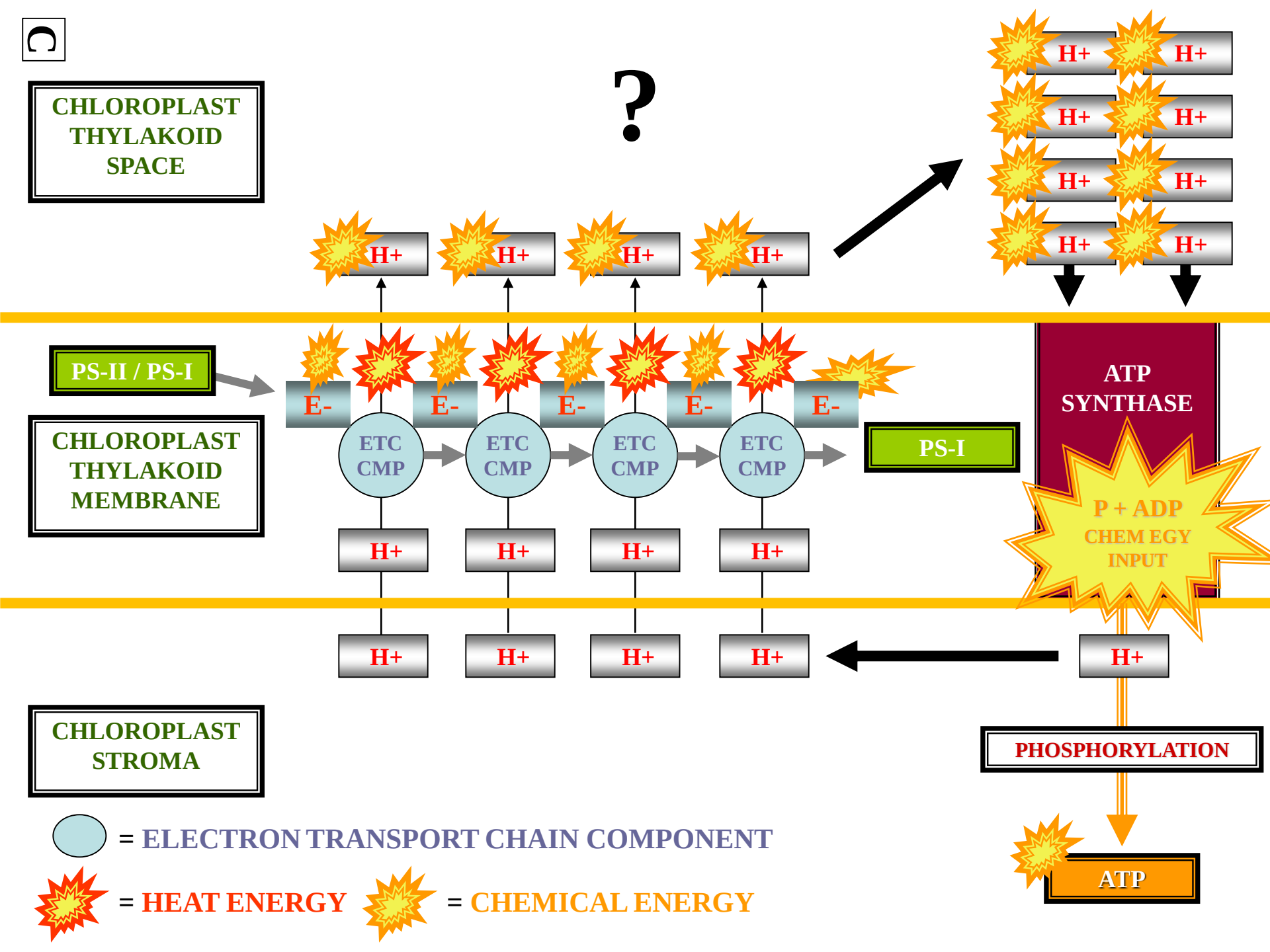
ATP

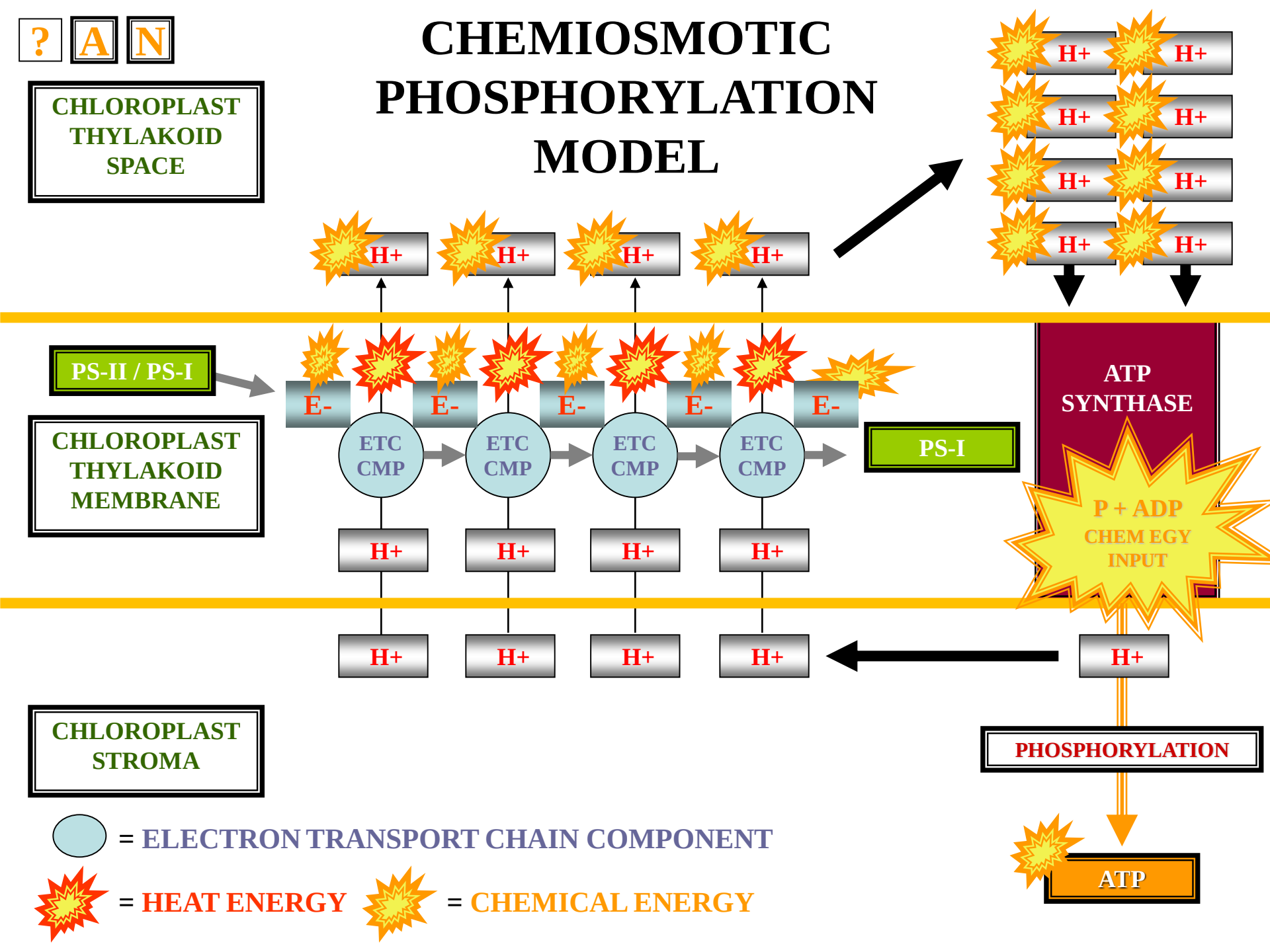
PHOSPHORYLATION

= CHEMICAL ENERGY

= ELECTRON TRANSPORT CHAIN COMPONENT


"Q2"
E-
ETC # 3
CHEM EGY INPUT
ATP
CYCLIC P-P
E-
E-
E- = RECYCLED
PS-I
RXT-CENTER
CHL-A P700
PS-I
ANTENNA
MOLECULES
CHL A+B
XANTHOPHYLLS
CAROTENES
LIGHT ENERGY
LIGHT ENERGY


CHLOROPLAST THYLAKOID SPACE
?
H+
H+
H+
H+
H+
H+
H+
H+
H+
H+
PS-II / PS-I
E-
E-
E-
E-
E-
ETC CMP
ETC CMP
ETC CMP
ETC CMP
PS-I
ATP SYNTHASE
P + ADP
CHEM EGY INPUT
CHLOROPLAST THYLAKOID MEMBRANE
H+
H+
H+
H+
H+
H+
H+
H+
H+
CHLOROPLAST STROMA
PHOSPHORYLATION
ATP
= ELECTRON TRANSPORT CHAIN COMPONENT
= HEAT ENERGY
= CHEMICAL ENERGY


? A N
CHEMIOSMOTIC PHOSPHORYLATION MODEL
CHLOROPLAST THYLAKOID SPACE
CHLOROPLAST THYLAKOID MEMBRANE
CHLOROPLAST STROMA
PS-II / PS-I
PS-I
H+
E-
ETC CMP
ATP SYNTHASE
P + ADP
CHEM EGY INPUT
PHOSPHORYLATION
ATP
= ELECTRON TRANSPORT CHAIN COMPONENT
= HEAT ENERGY
= CHEMICAL ENERGY

PHOTOSYNTHESIS

A

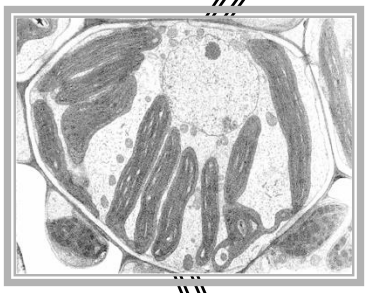
N

WATER

LIGHT EGY

E-

PHOTOLYSIS



LT RXT

THYLAKOID GRANUM

?

DK RXT

STROMA

CHLOROPLAST

ATMOSPHERE

OXYGEN

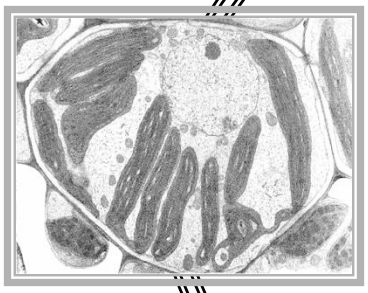
PHOTOSYNTHESIS

WATER

LIGHT EGY

E-

PHOTOLYSIS



LT RXT

THYLAKOID GRANUM

ATP

DK RXT

STROMA

NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST

ATMOSPHERE

OXYGEN

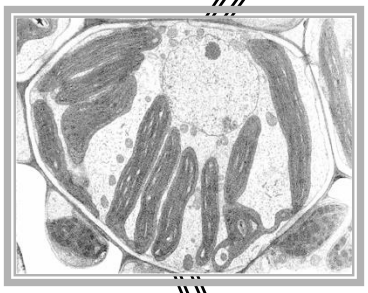
PHOTOSYNTHESIS

WATER

LIGHT EGY

E-

PHOTOLYSIS



LT RXT

THYLAKOID GRANUM

ATP NADPH

DK RXT

STROMA

NON-CYCLIC P-P

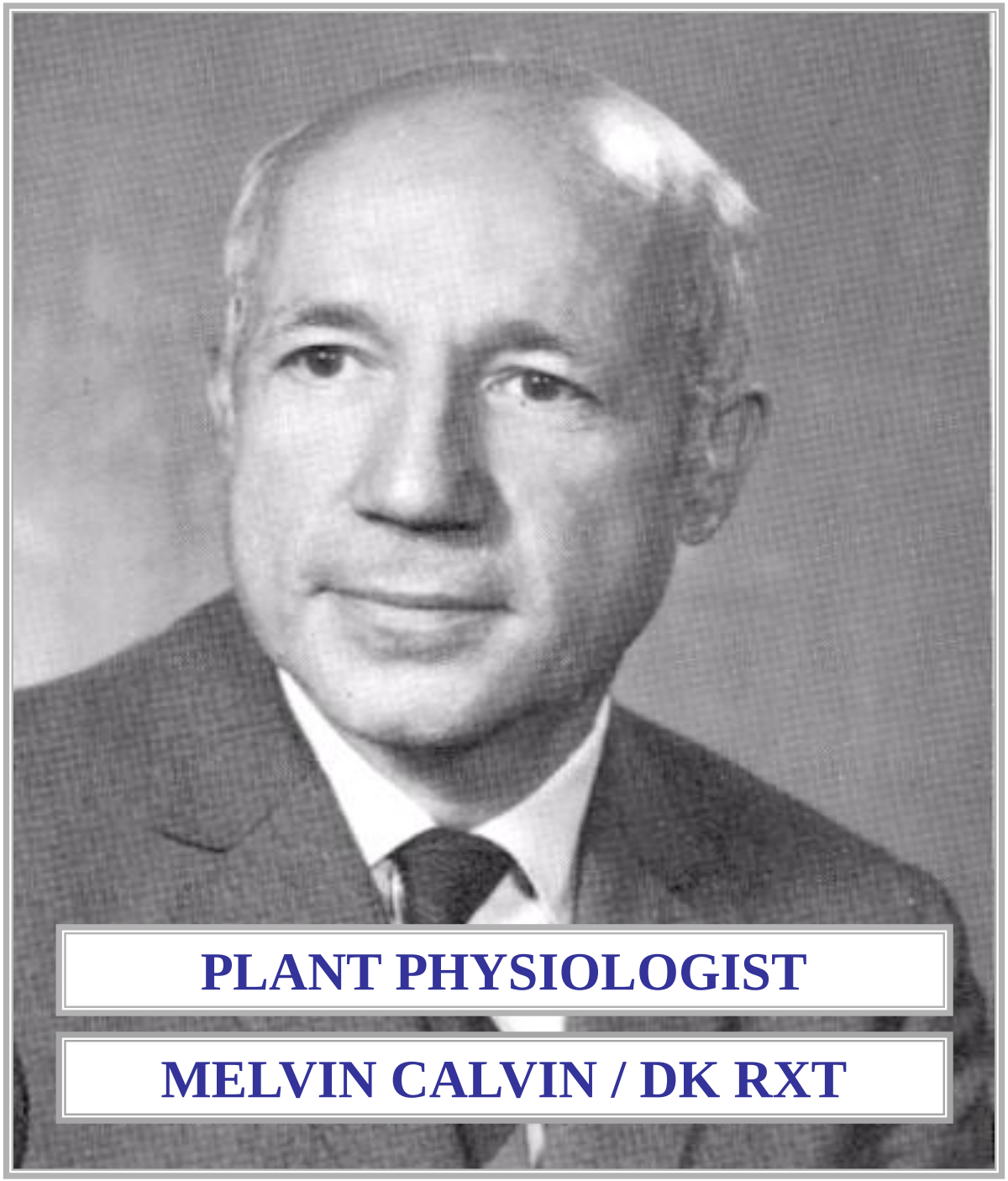
CYCLIC P-P

CHLOROPLAST

ATMOSPHERE

OXYGEN

DARK REACTION SPECIFICS



PLANT PHYSIOLOGIST

MELVIN CALVIN / DK RXT

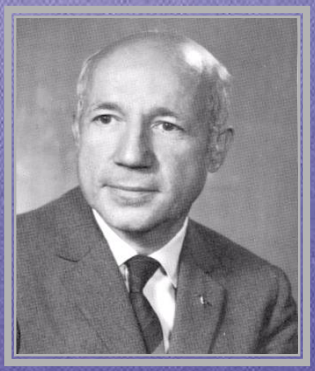
DR

+

PHOTOSYNTHESIS

L

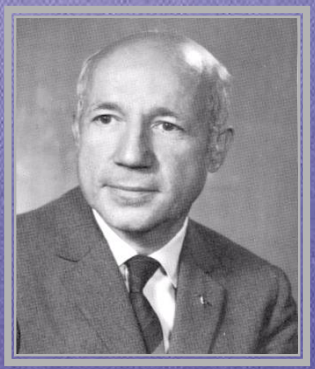
DARK REACTION



PHOTOSYNTHESIS

S

DARK RXT
LIGHT
INDEPENDENT
REACTION

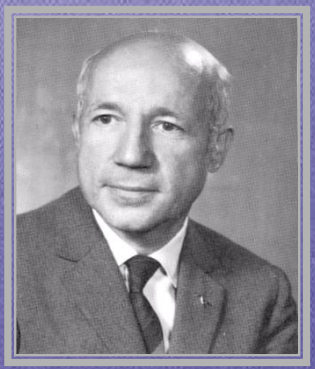


PHOTOSYNTHESIS

¿

G

DARK RXT SYNTHESIS REACTION



PHOTOSYNTHESIS

EZ

WATER

CO2

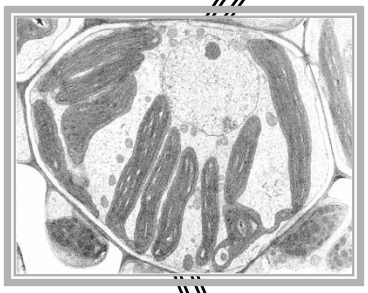
LIGHT EGY

PHOTO

ATMOSPHERE

E-

PHOTOLYSIS



LT RXT

THYLAKOID
GRANUM

ATP
NADPH

DK RXT

STROMA

SYNTHESIS

CHEM EGY
INPUT

CHLOROPLAST

ATMOSPHERE

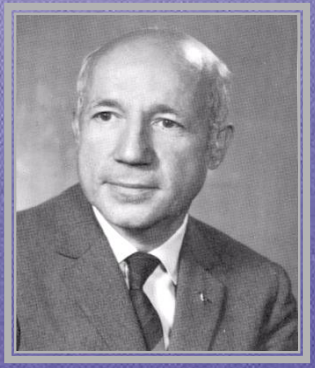
OXYGEN

GLUCOSE

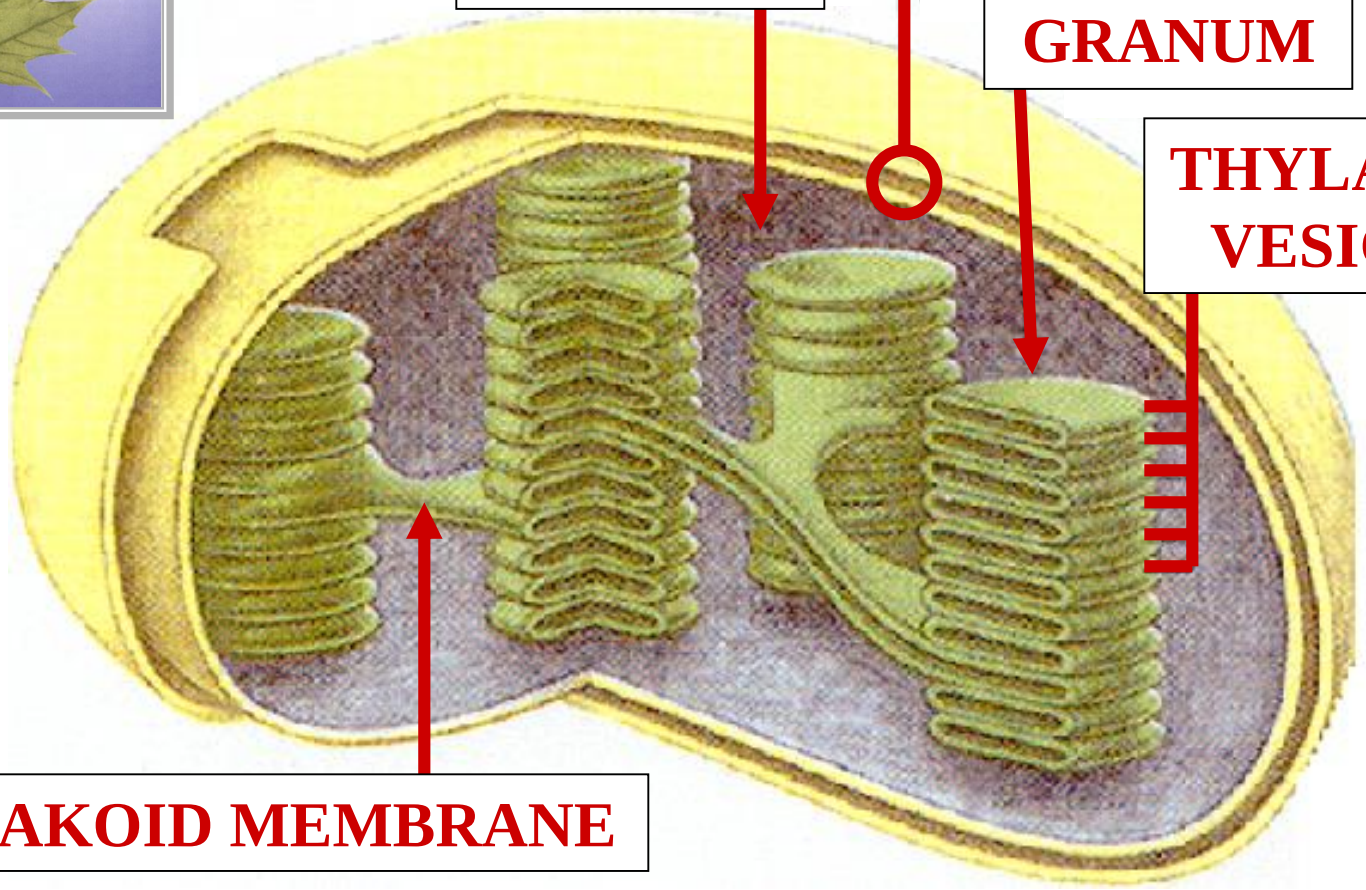
PHOTOSYNTHESIS

¿

DARK RXT CONSISTS ENZYMATIC REACTIONS

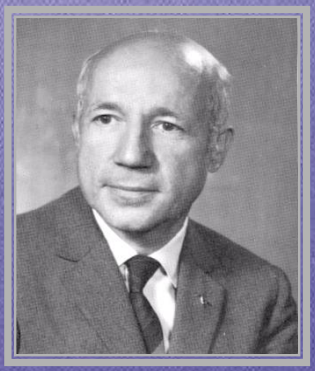


CHLOROPLAST ULTRASTRUCTURE



PHOTOSYNTHESIS

DARK RXT OCCURS W/IN STROMA



DARK REACTION TYPES

PHOTOSYNTHESIS
DARK REACTIONS

CALVIN CYCLE

PHOTOSYNTHESIS
DARK REACTIONS

PHOTOSYNTHESIS
DARK REACTIONS

CALVIN CYCLE
HATCH & SLACK CYCLE

PHOTOSYNTHESIS
DARK REACTIONS

PHOTOSYNTHESIS
DARK REACTIONS

CALVIN CYCLE
HATCH & SLACK CYCLE
CRASSULACEAN ACID METABOLISM

PHOTOSYNTHESIS
DARK REACTIONS

DARK REACTION

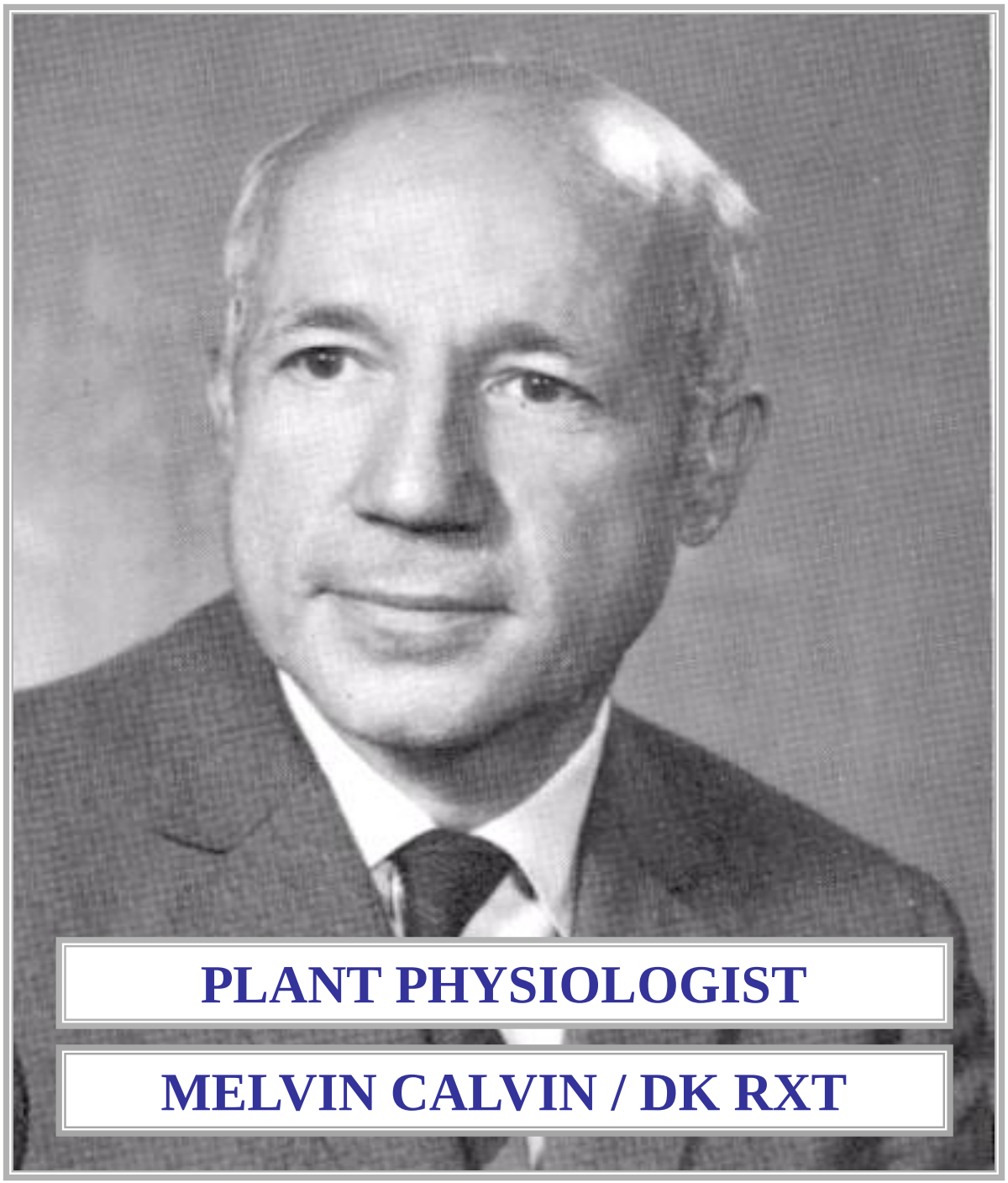
CALVIN CYCLE

CALVIN CYCLE

SYNONYMOUS

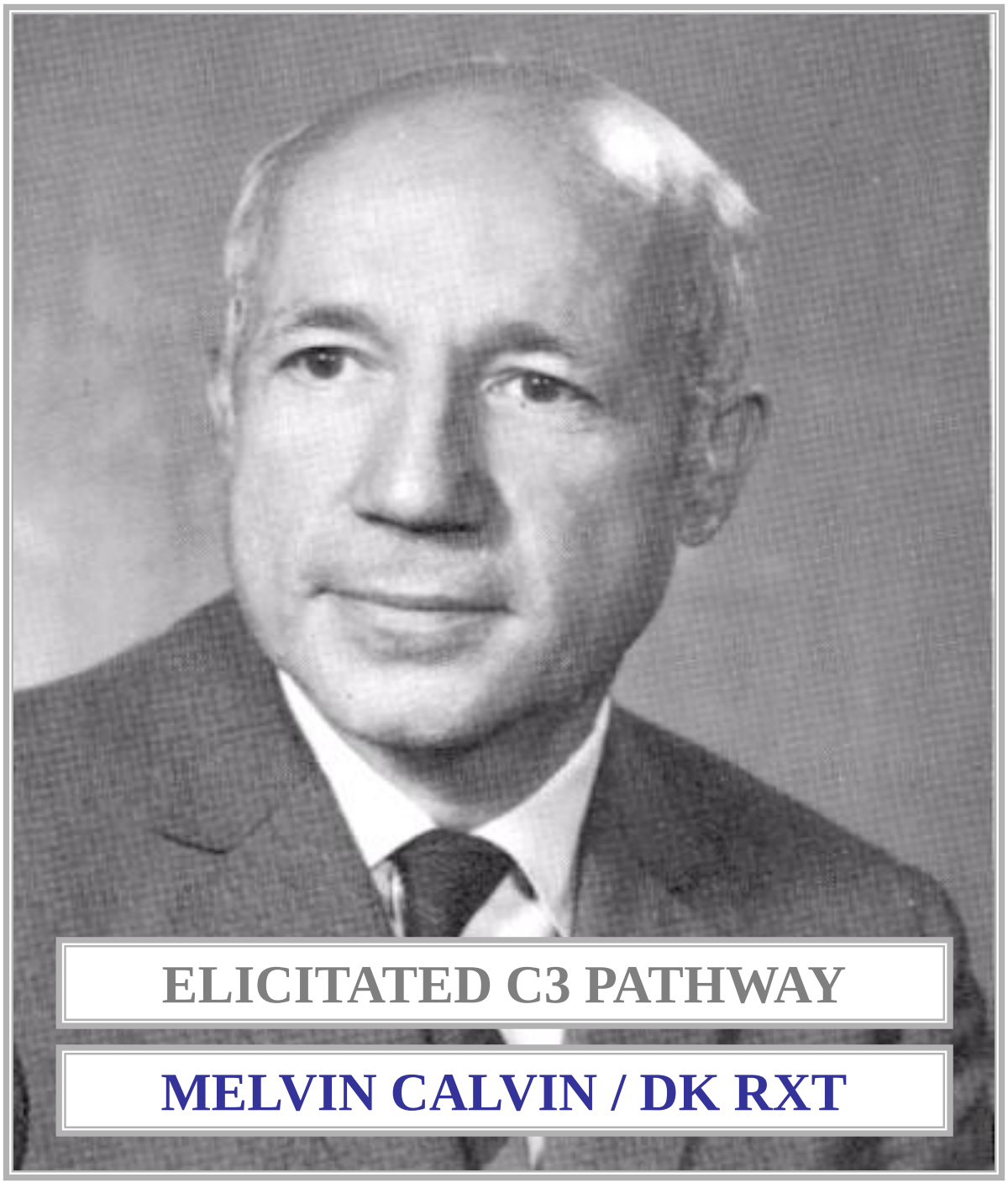
C3 PATHWAY

EL

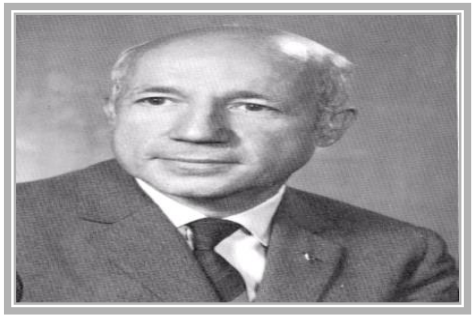


PLANT PHYSIOLOGIST

MELVIN CALVIN / DK RXT



CC



CO_2 + RIBULOSE BISPHOSPHATE / (RUBP)

FEEDSBACK

RIBULOSE BISPHOSPHATE CARBOXYLASE (RUBP-CARBOXYLASE)

UNSTABLE 6C COMPOUND

PHOSPHOGLYCERATE / (PGA)

ATP

BISPHOSPHOGLYCERATE / (BIPGA)

NADPH

PHOSPHOGLYCERALDEHYDE / (PGAL)

CHEM EGY INPUT

GLUCOSE ENTERS METABOLISM

ALL RXTS REQUIRE A SPECIFIC ENZYME

PHOSPHOGLYCERATE / (PGA)

ATP

BISPHOSPHOGLYCERATE / (BIPGA)

NADPH

PHOSPHOGLYCERALDEHYDE / (PGAL)

COMPLEX SERIES CHEMICAL RXTS (CSCR)

ATP

RIBULOSE BISPHOSPHATE / (RUBP)

C3 PATHWAY

CALVIN CYCLE

C3 PATHWAY ACRONYMS

C3 ACRONYMS

RUBP = RIBULOSE BISPHOSPHATE

C3 ACRONYMS

C3 ACRONYMS

RUBP = RIBULOSE BISPHOSPHATE
PGA = PHOSPHOGLYCERATE

C3 ACRONYMS

C3 ACRONYMS

RUBP = RIBULOSE BISPHOSPHATE
PGA = PHOSPHOGLYCERATE
BIPGA = BISPHOSPHOGLYCERATE

C3 ACRONYMS

C3 ACRONYMS

RUBP = RIBULOSE BISPHOSPHATE
PGA = PHOSPHOGLYCERATE
BIPGA = BISPHOSPHOGLYCERATE
PGAL = PHOSPHOGLYCERALDEHYDE

C3 ACRONYMS

C3 ACRONYMS

RUBP = RIBULOSE BISPHOSPHATE
PGA = PHOSPHOGLYCERATE
BIPGA = BISPHOSPHOGLYCERATE
PGAL = PHOSPHOGLYCERALDEHYDE
CSCR = COMPLEX SERIES CHEM-RXTS

C3 ACRONYMS

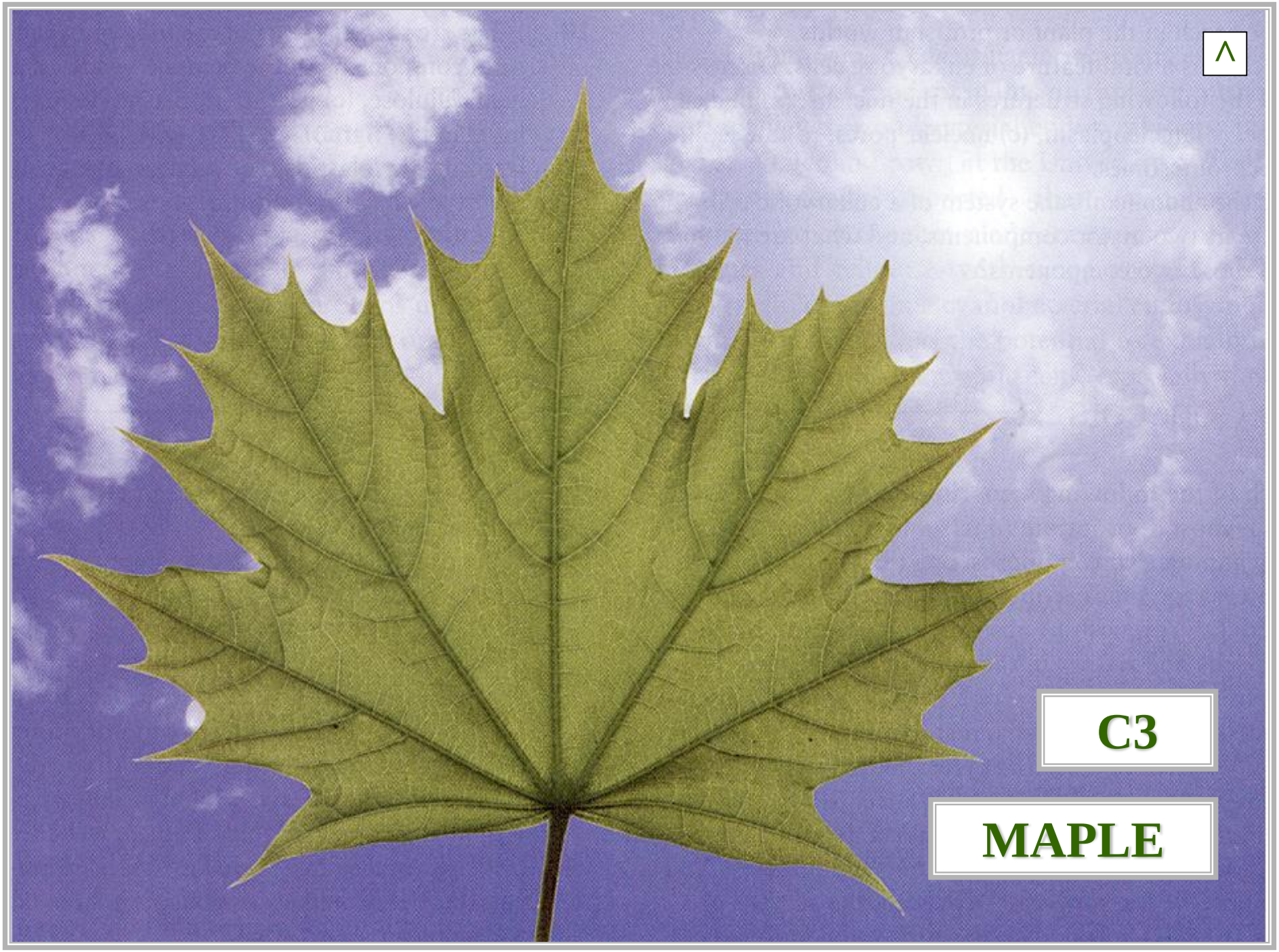
C3 ACRONYMS

RUBP = RIBULOSE BISPHOSPHATE
PGA = PHOSPHOGLYCERATE
BIPGA = BISPHOSPHOGLYCERATE
PGAL = PHOSPHOGLYCERALDEHYDE
CSCR = COMPLEX SERIES CHEM-RXTS
BOX = LOCATION

C3 ACRONYMS

C3 PATHWAY SPECIFICS

C3
PATHWAY
MAPLE PLANT


^
C3
MAPLE