

# CHLOROPLAST

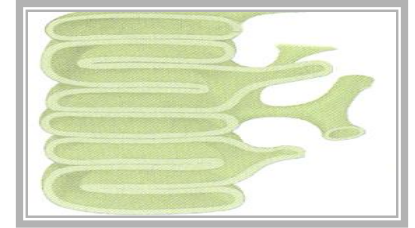


E- ACCEPTOR



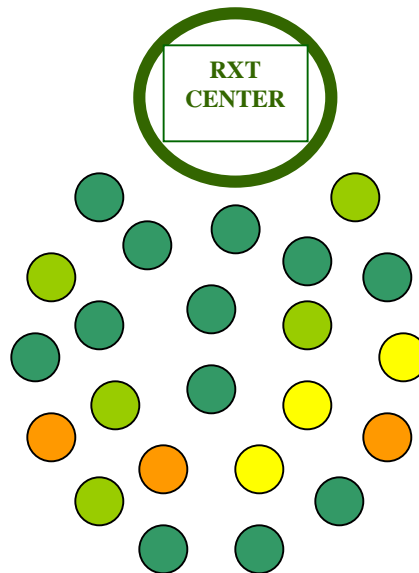
CHEM EGY

# THYLAKOID



ETC

 = ENERGY



# CHLOROPLAST

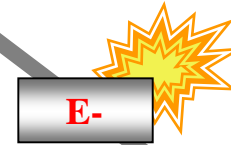
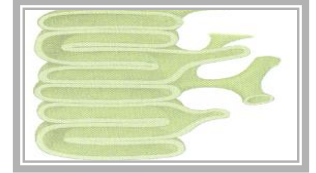


E- ACCEPTOR



CHEM EGY

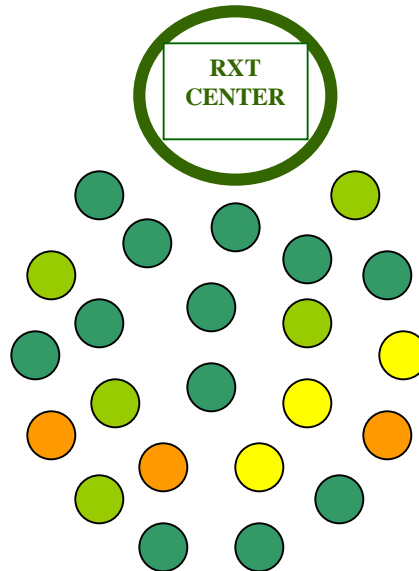
# THYLAKOID



E- TRANSPORT CHAIN

E-

 = ENERGY



# NON-CYCLIC P-P

# CYCLIC P-P

R

CHLOROPLAST  
THYLAKOID  
SPACE

PS-II / PS-I

ETC COMPONENTS

E-

CHLOROPLAST  
THYLAKOID  
MEMBRANE

ETC  
CMP

ETC  
CMP

ETC  
CMP

ETC  
CMP

?

ATP  
SYNTHASE

ETC

H+

H+

H+

H+

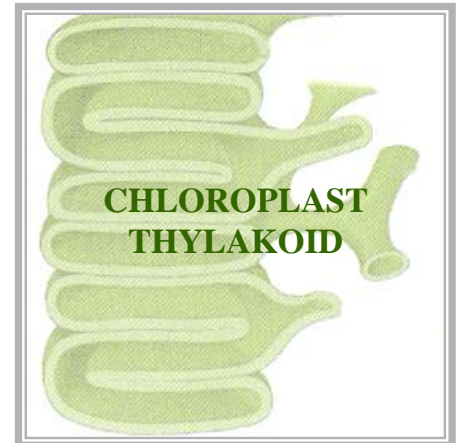
CHLOROPLAST  
STROMA

CHLOROPLAST  
THYLAKOID

● = ELECTRON TRANSPORT CHAIN COMPONENT

☀ = HEAT ENERGY

☀ = CHEMICAL ENERGY



# NON-CYCLIC P-P

# CYCLIC P-P

CHLOROPLAST  
THYLAKOID  
SPACE

CHLOROPLAST  
THYLAKOID  
MEMBRANE

PS-II / PS-I

E-

ETC COMPONENTS

ETC  
CMP

ETC  
CMP

ETC  
CMP

ETC  
CMP

?

ATP  
SYNTHASE

REDOX RXTS

H+

H+

H+

H+

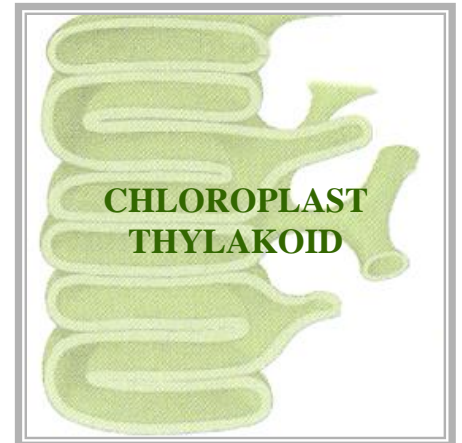
CHLOROPLAST  
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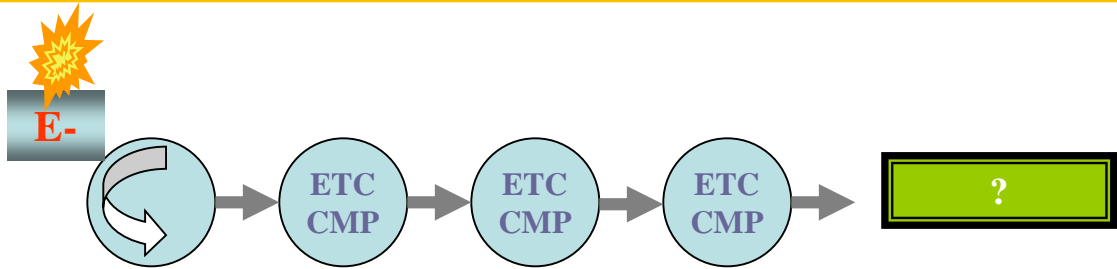
CHLOROPLAST  
THYLAKOID  
SPACE

NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I  
CHLOROPLAST  
THYLAKOID  
MEMBRANE



ATP  
SYNTHASE

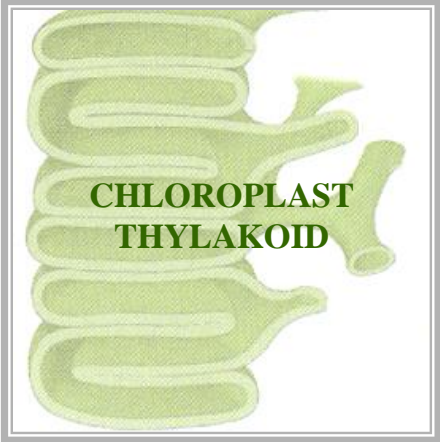
H+

H+

H+

H+

CHLOROPLAST  
STROMA



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# NON-CYCLIC P-P

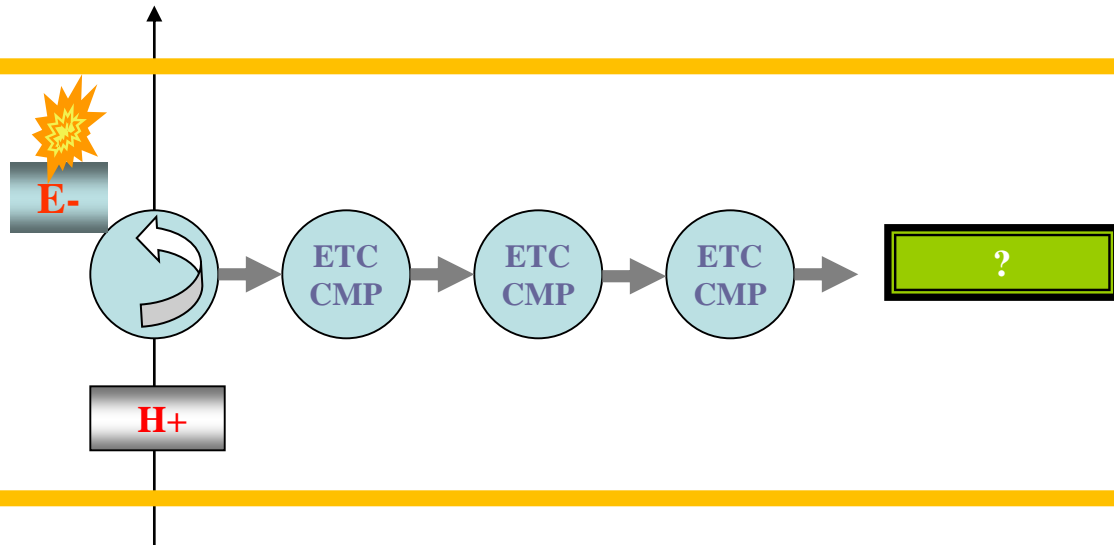
# CYCLIC P-P

CHLOROPLAST  
THYLAKOID  
SPACE

PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE

ATP  
SYNTHASE



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H+

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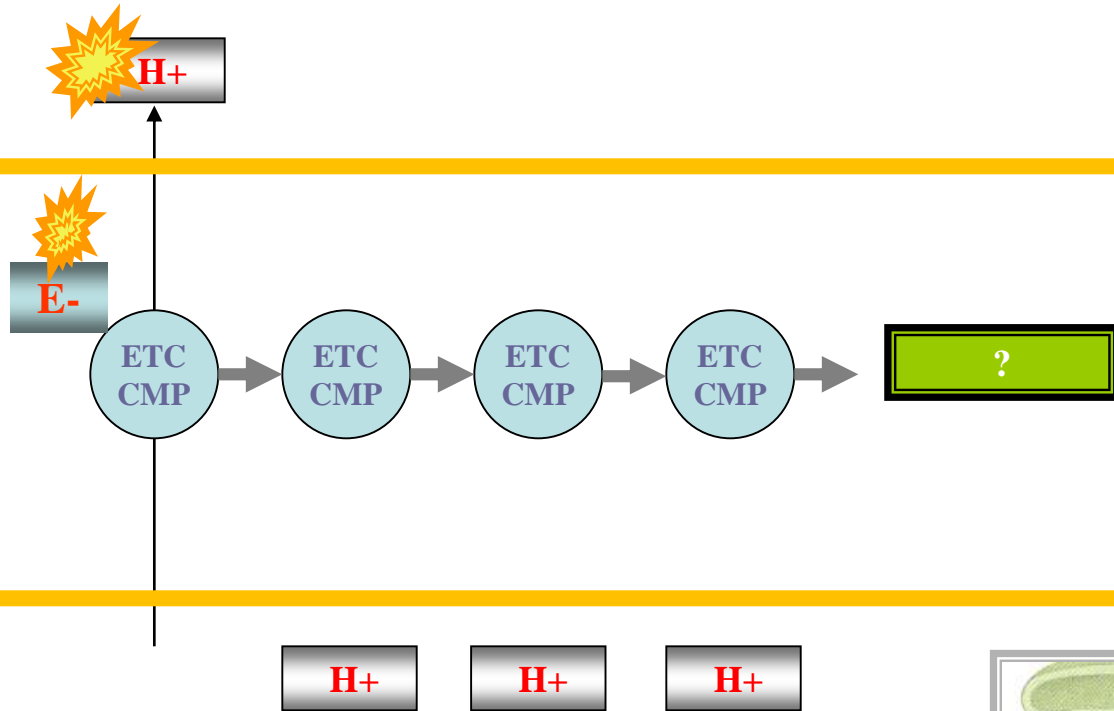
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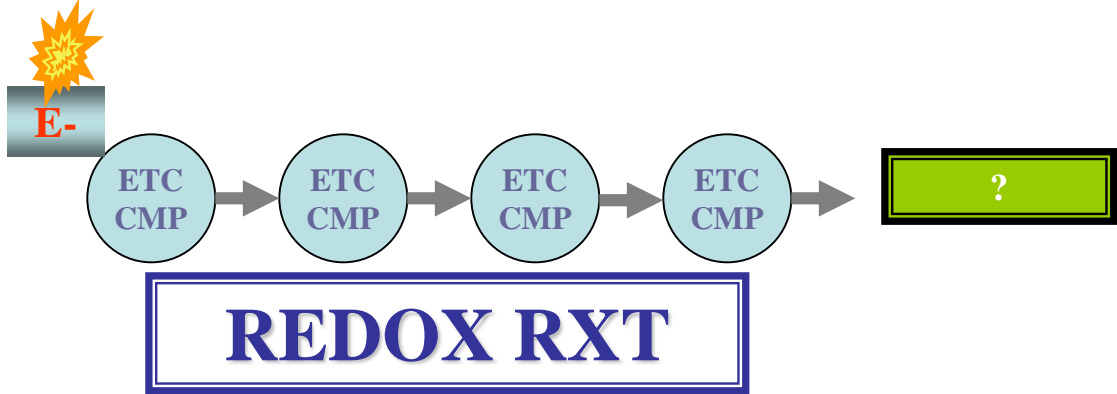
**NON-CYCLIC P-P**

**CYCLIC P-P**



PS-II / PS-I

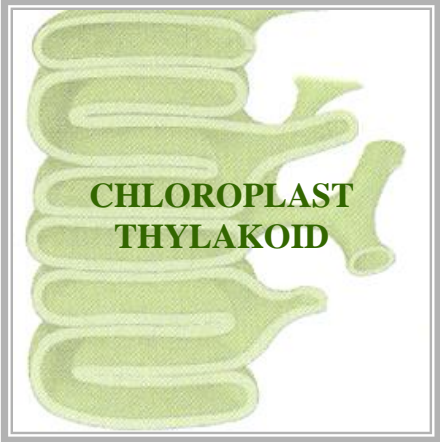
CHLOROPLAST  
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SYNTHASE



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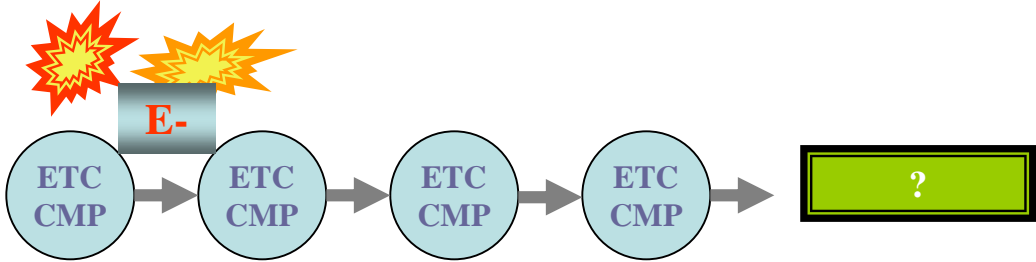
NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I

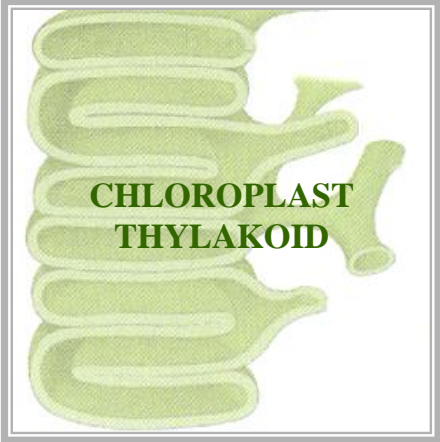
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SYNTHASE



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SPACE

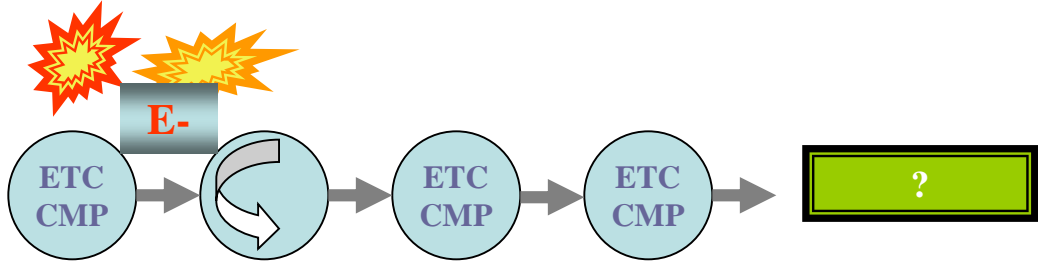
NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I

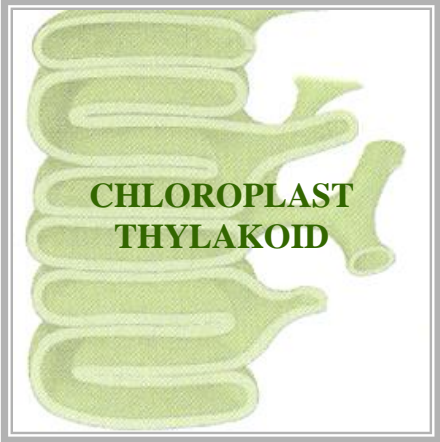
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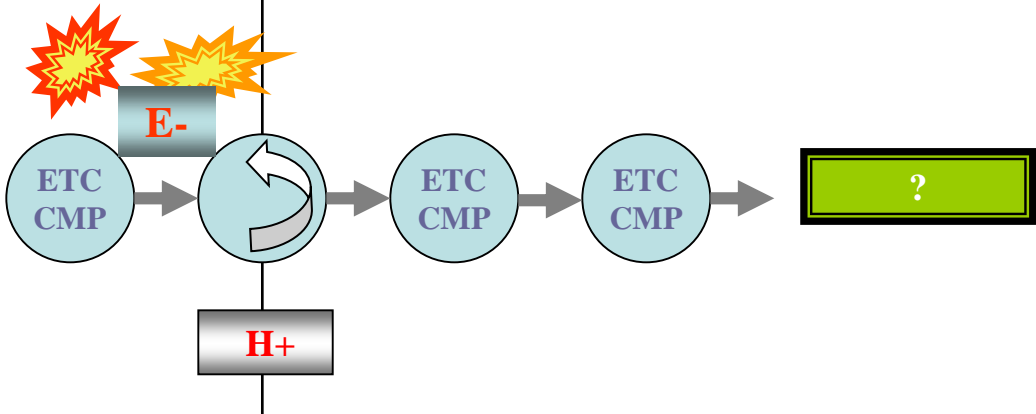
CHLOROPLAST  
THYLAKOID  
SPACE

H+

H+

PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE

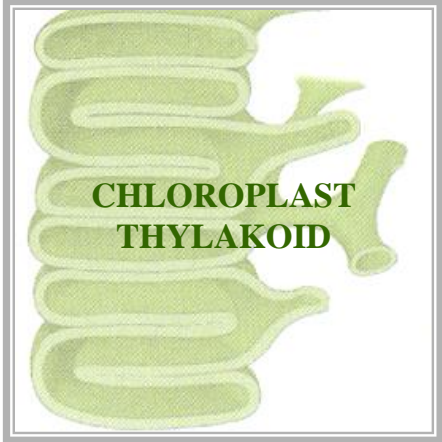


ATP  
SYNTHASE

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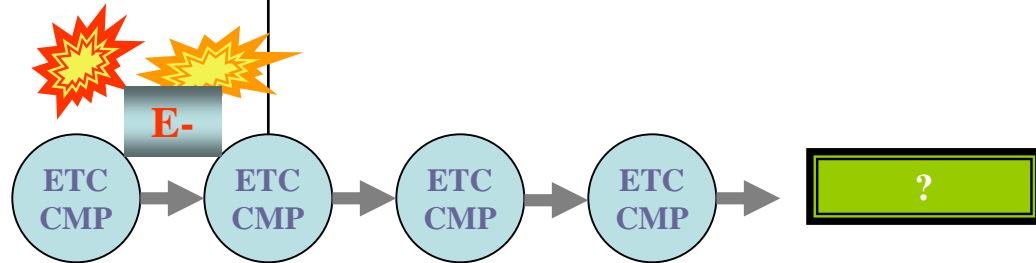
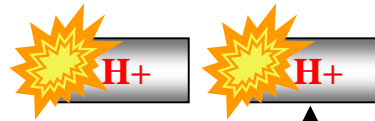
PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE

ATP  
SYNTHASE

CHLOROPLAST  
STROMA

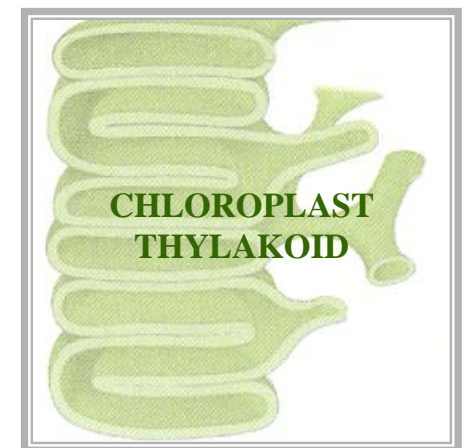
CHLOROPLAST  
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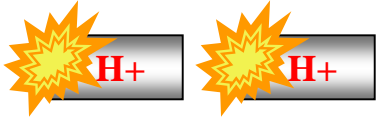




CHLOROPLAST  
THYLAKOID  
SPACE

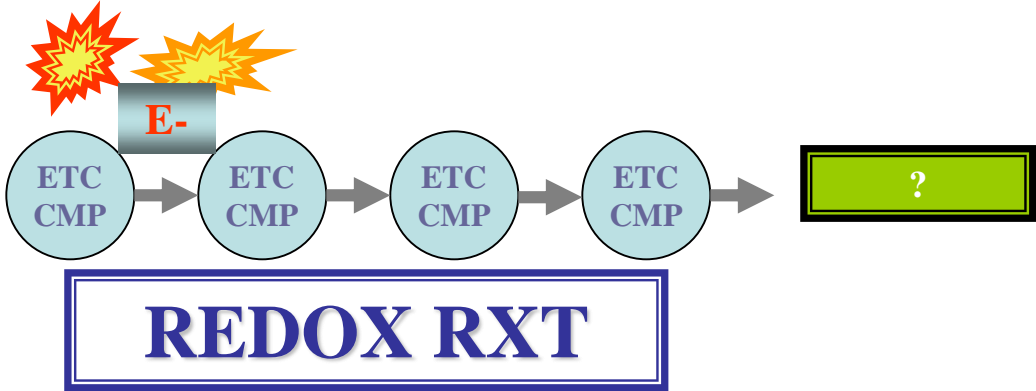
NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I

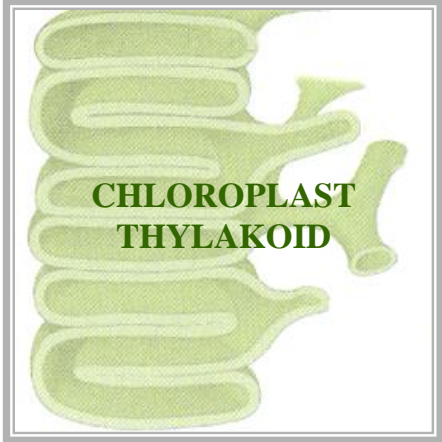
CHLOROPLAST  
THYLAKOID  
MEMBRANE



ATP  
SYNTHASE



CHLOROPLAST  
STROMA



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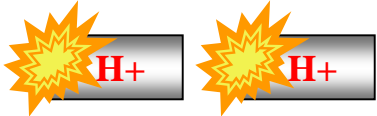
★ = HEAT ENERGY

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CHLOROPLAST  
THYLAKOID  
SPACE

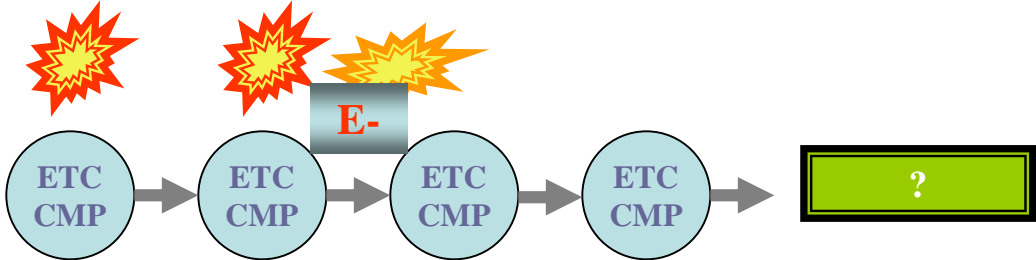
NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I

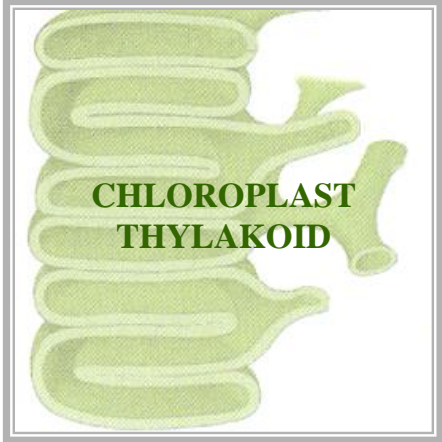
CHLOROPLAST  
THYLAKOID  
MEMBRANE



ATP  
SYNTHASE



CHLOROPLAST  
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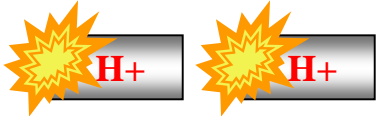
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CHLOROPLAST  
THYLAKOID  
SPACE

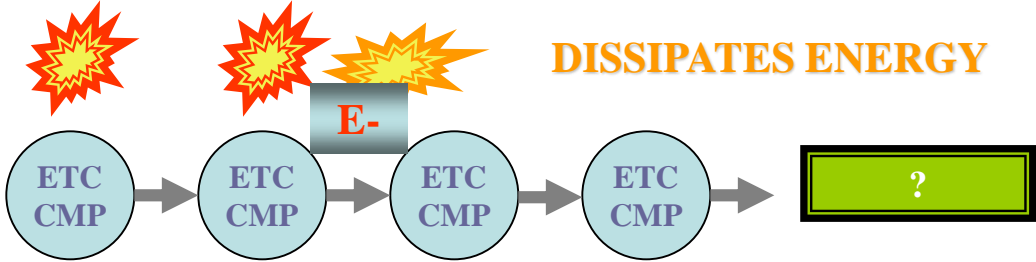
NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I

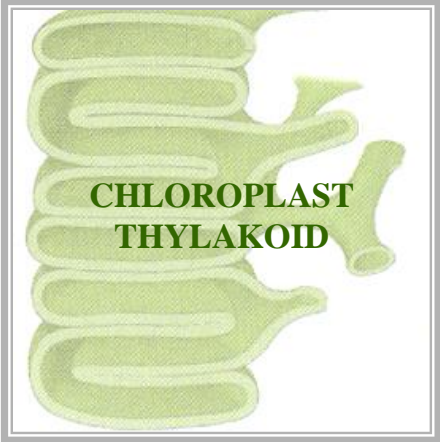
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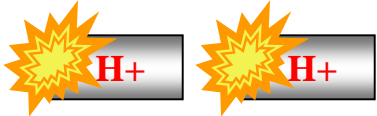
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CHLOROPLAST  
THYLAKOID  
SPACE

**NON-CYCLIC P-P**

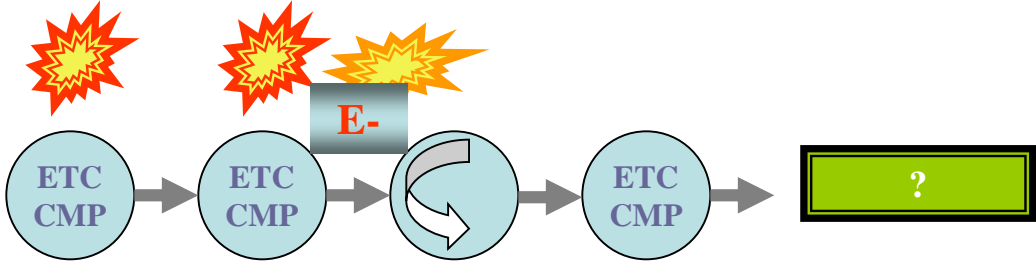
**CYCLIC P-P**



H+

PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE

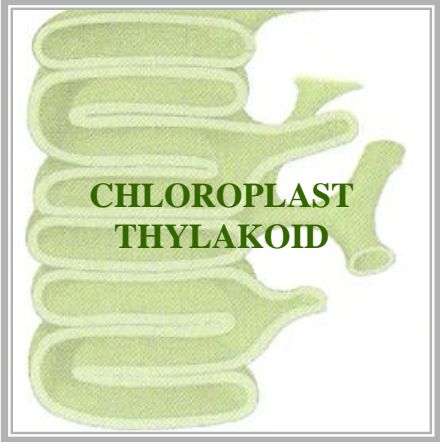


ATP  
SYNTHASE

H+

H+

CHLOROPLAST  
STROMA



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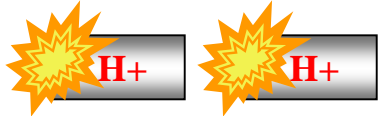
★ = HEAT ENERGY

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CHLOROPLAST  
THYLAKOID  
SPACE

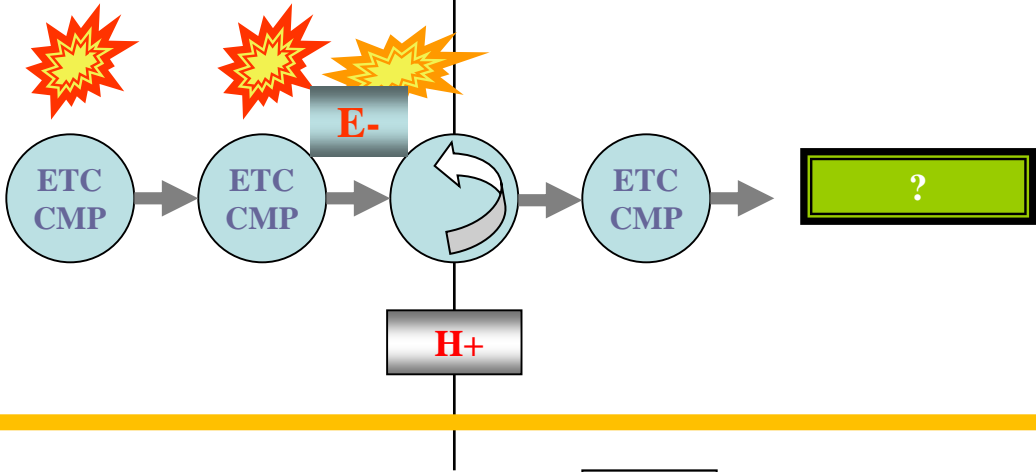
**NON-CYCLIC P-P**

**CYCLIC P-P**



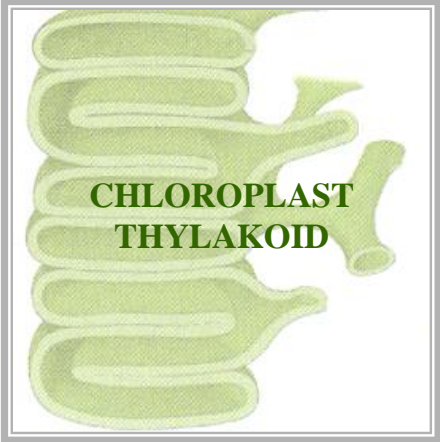
PS-II / PS-I

CHLOROPLAST  
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ATP  
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CHLOROPLAST  
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# NON-CYCLIC P-P

# CYCLIC P-P

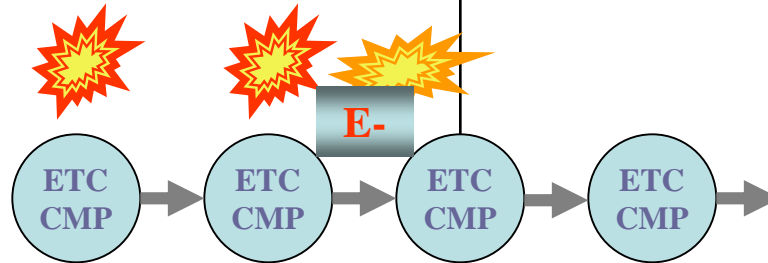
CHLOROPLAST  
THYLAKOID  
SPACE



R

PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE



ATP  
SYNTHASE

CHLOROPLAST  
STROMA

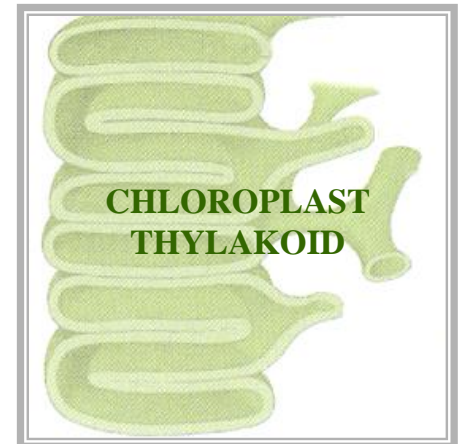


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CHLOROPLAST  
THYLAKOID  
SPACE

NON-CYCLIC P-P

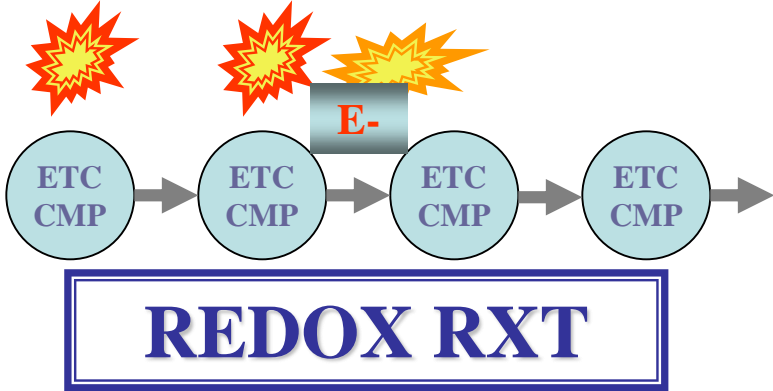
CYCLIC P-P



E-

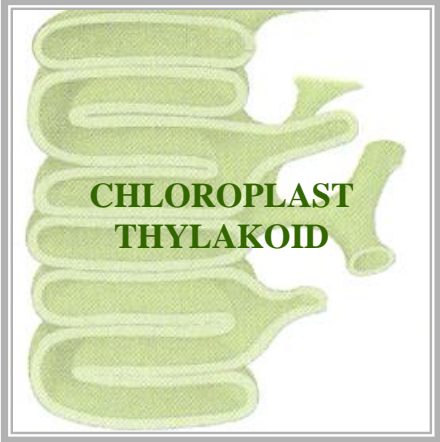
PS-II / PS-I

CHLOROPLAST  
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CHLOROPLAST  
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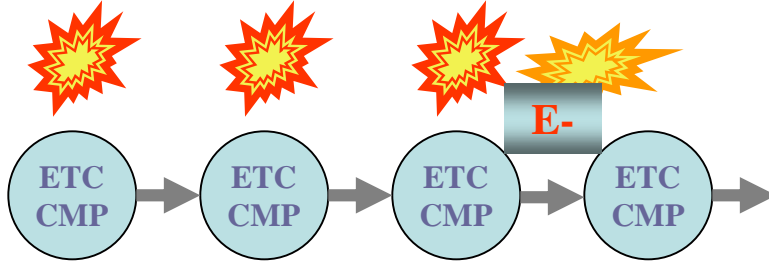
NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I

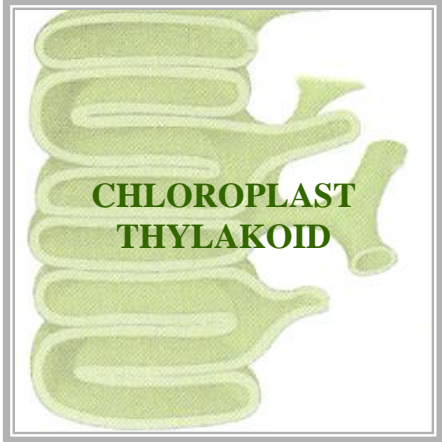
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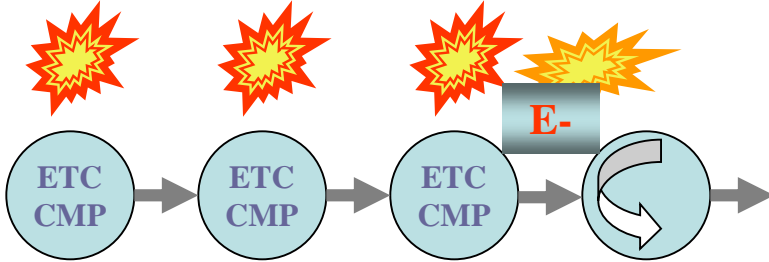
NON-CYCLIC P-P

CYCLIC P-P



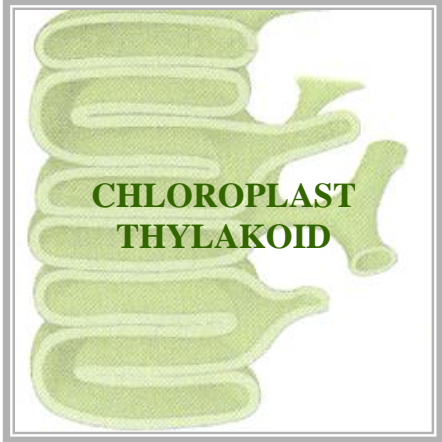
PS-II / PS-I

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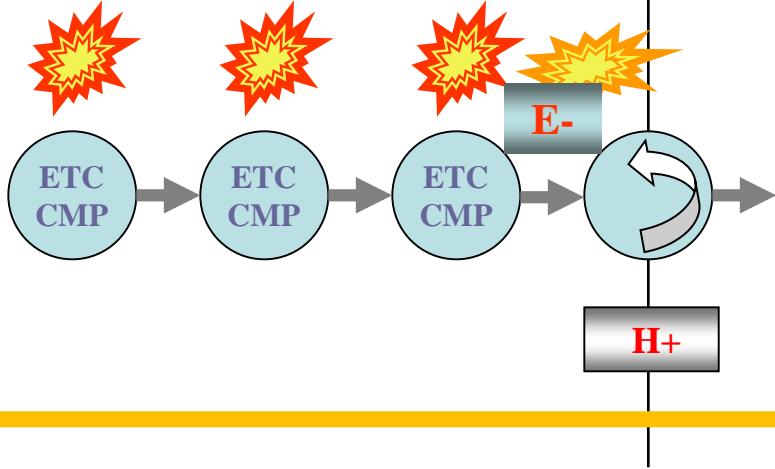
**CYCLIC P-P**



$H^+$

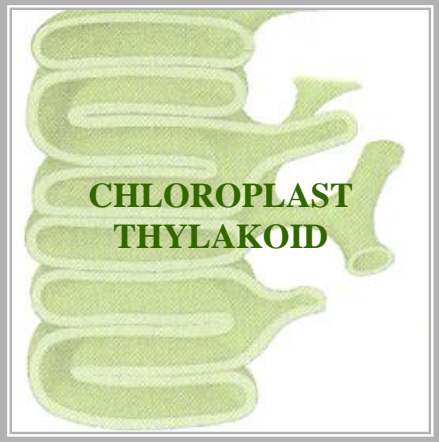
PS-II / PS-I

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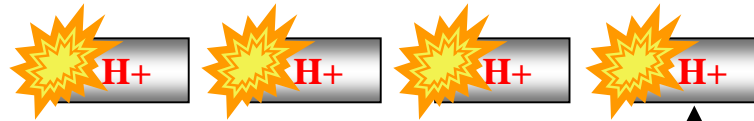
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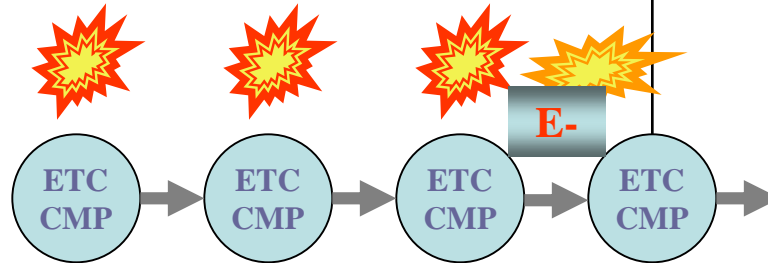
CHLOROPLAST  
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R

PS-II / PS-I

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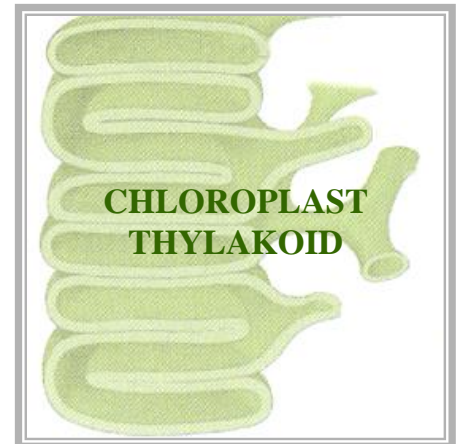
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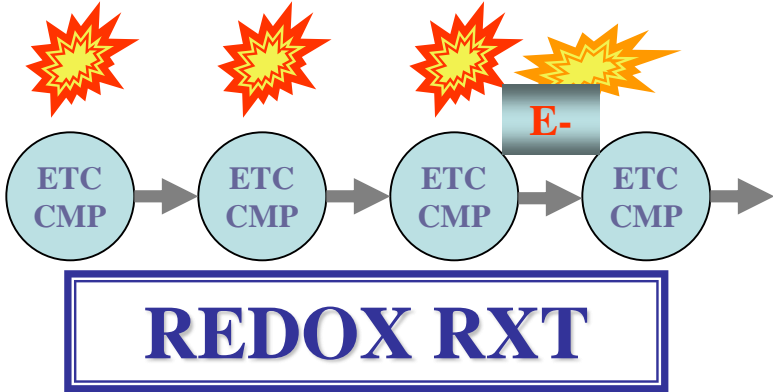
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CYCLIC P-P



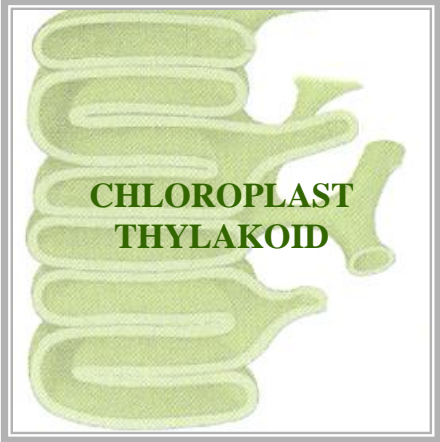
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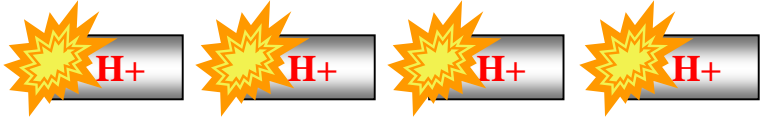
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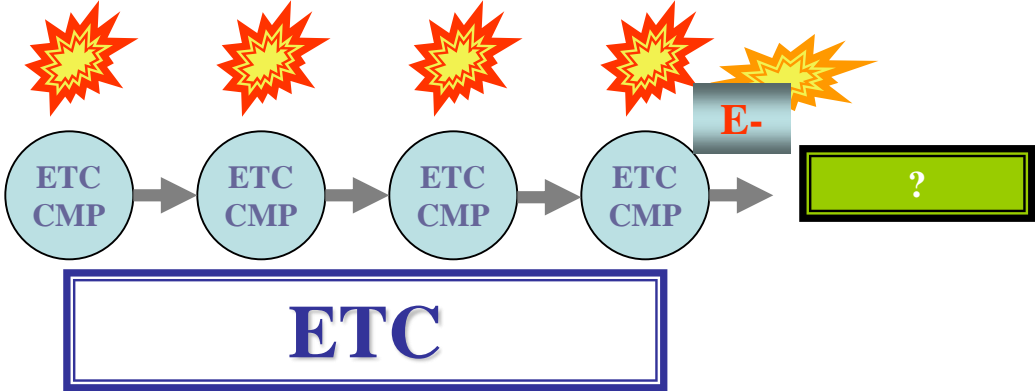
CYCLIC P-P



?  
Z

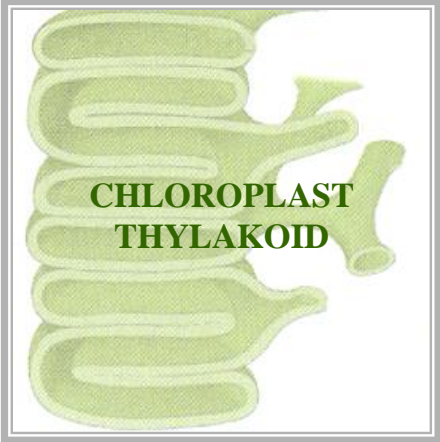
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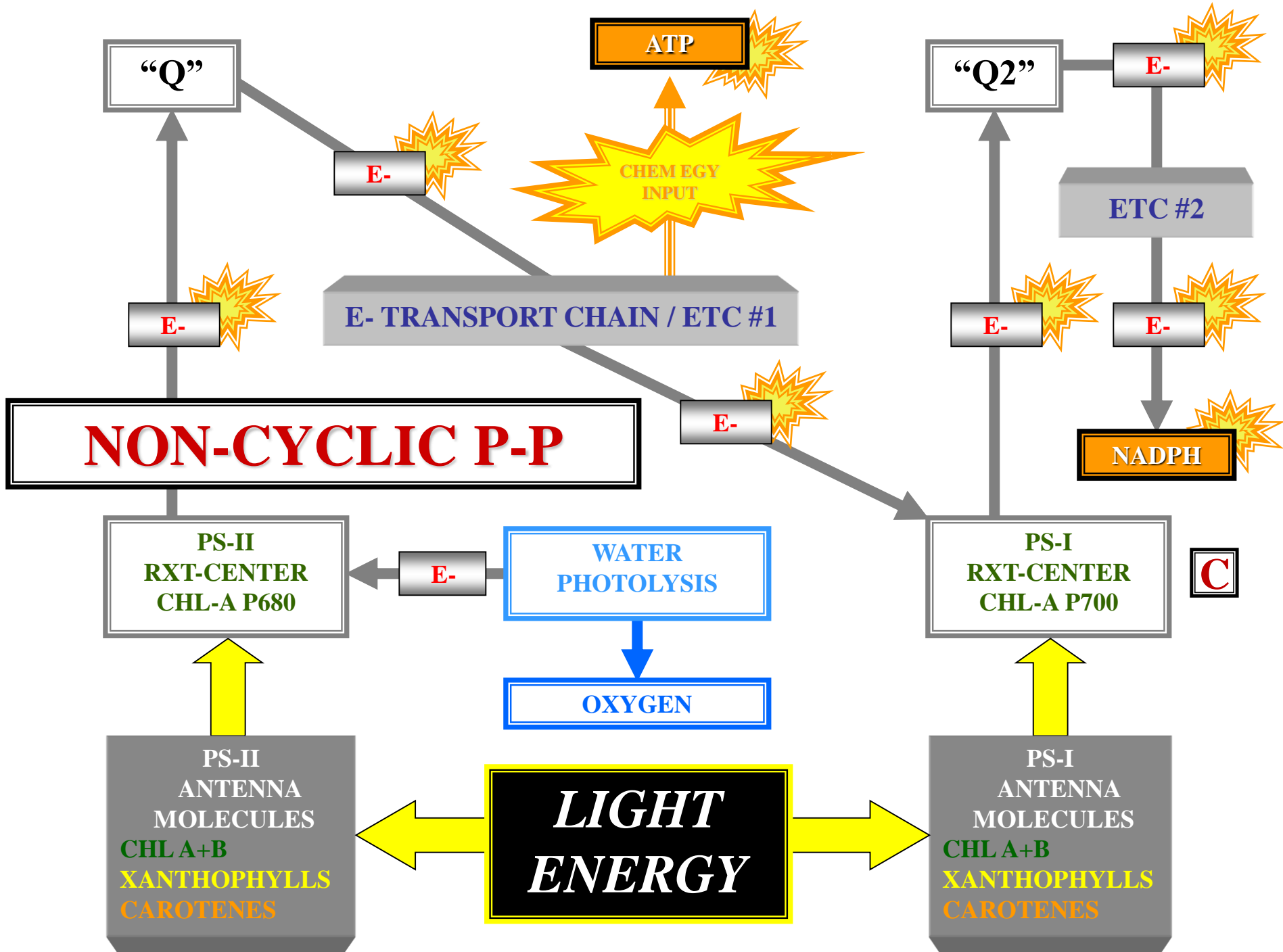
CHLOROPLAST  
STROMA

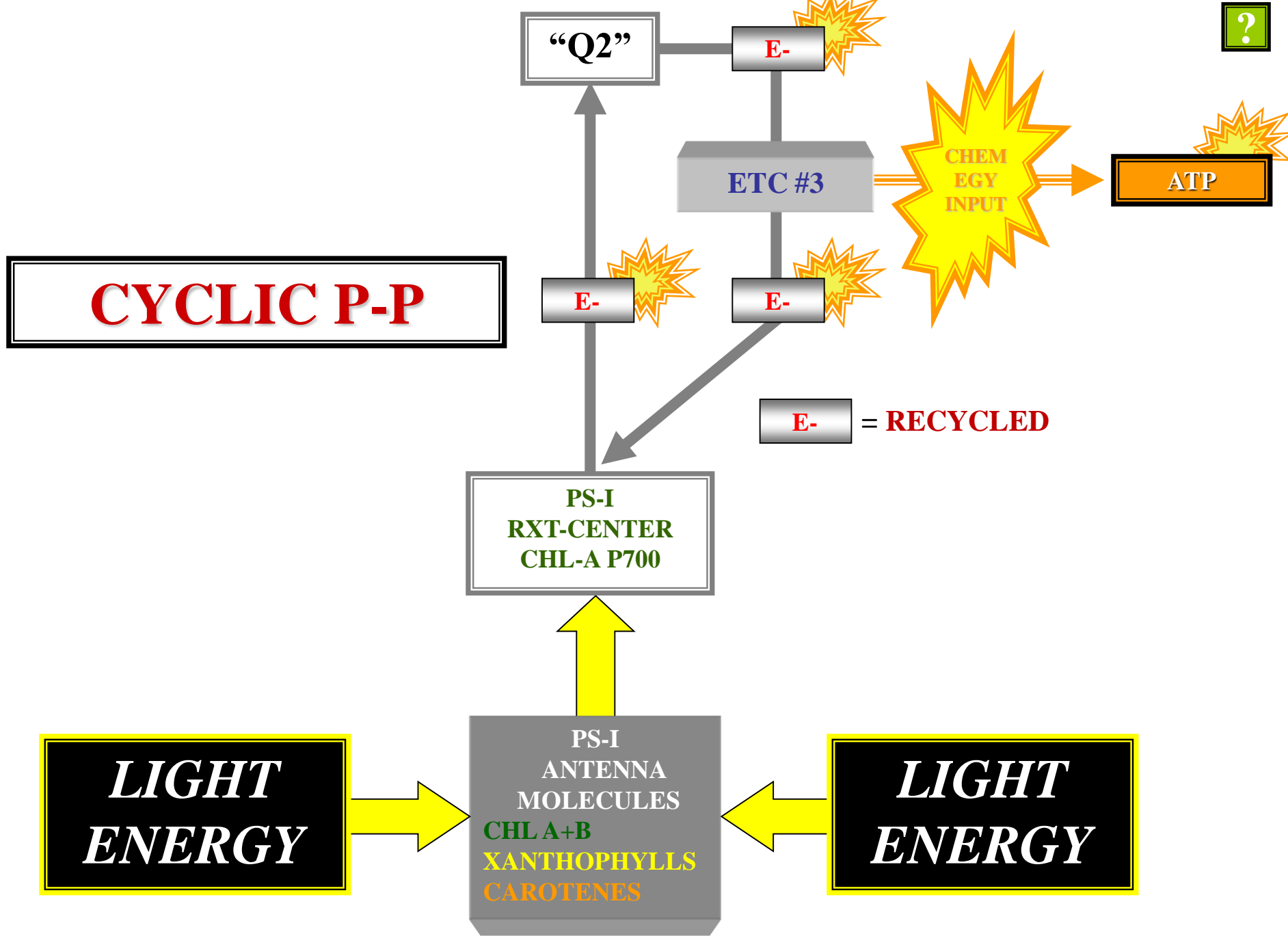


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★ = HEAT ENERGY

★ = CHEMICAL ENERGY



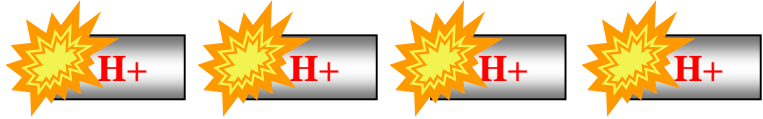


# I

CHLOROPLAST  
THYLAKOID  
SPACE

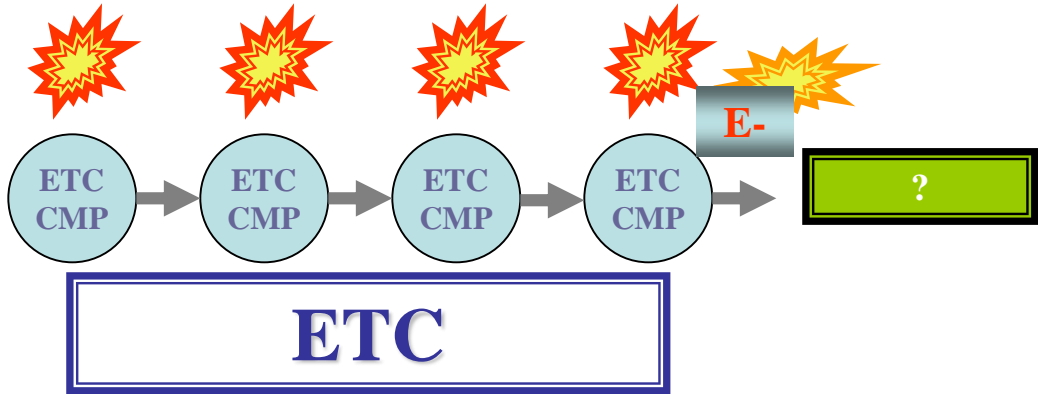
NON-CYCLIC P-P

CYCLIC P-P



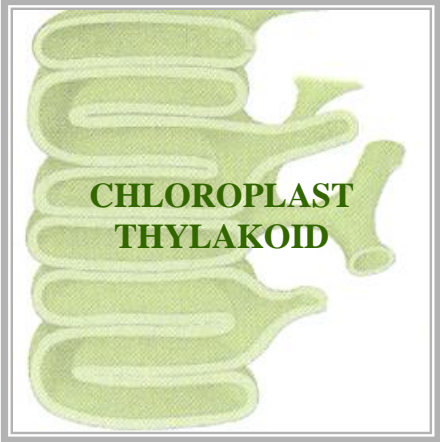
PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE



ATP  
SYNTHASE

CHLOROPLAST  
STROMA



● = ELECTRON TRANSPORT CHAIN COMPONENT

★ = HEAT ENERGY

★ = CHEMICAL ENERGY

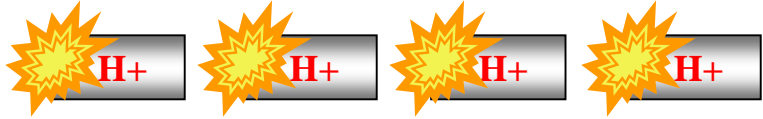




CHLOROPLAST  
THYLAKOID  
SPACE

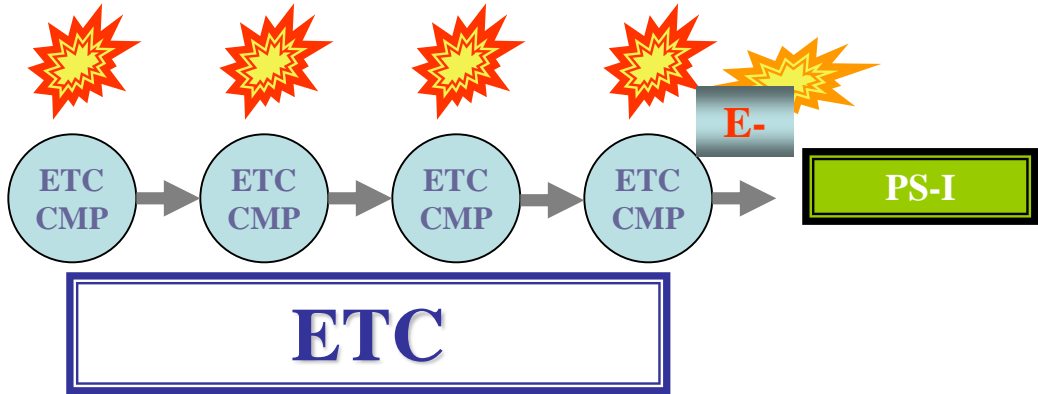
NON-CYCLIC P-P

CYCLIC P-P



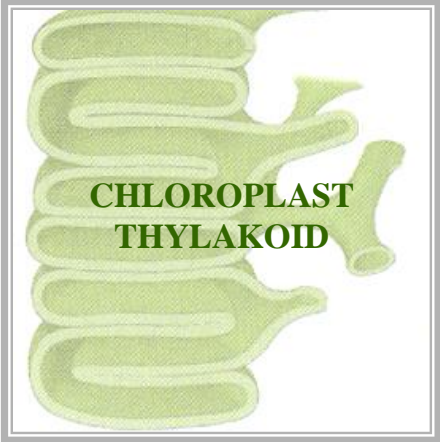
PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE



ATP  
SYNTHASE

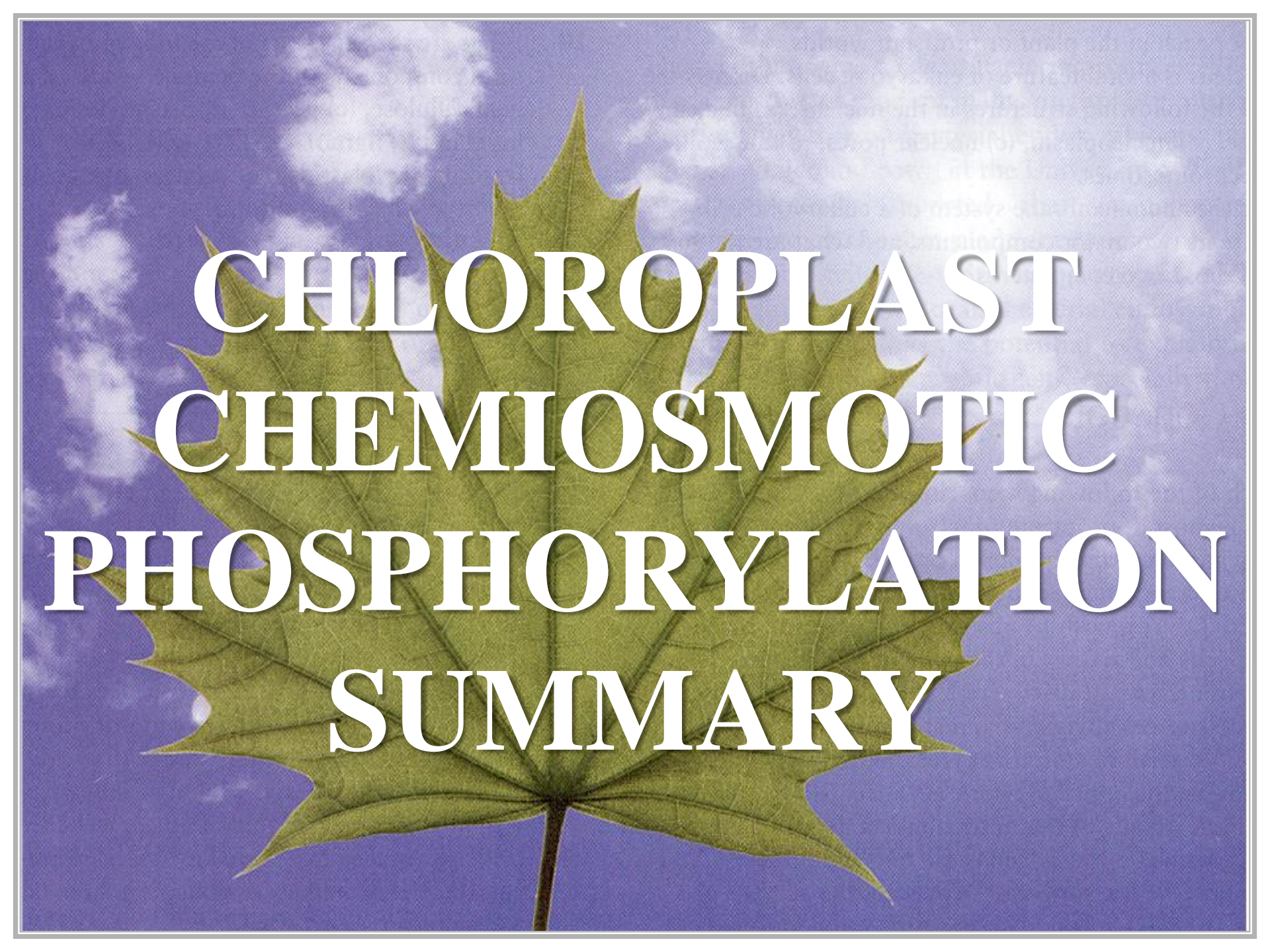
CHLOROPLAST  
STROMA



● = ELECTRON TRANSPORT CHAIN COMPONENT

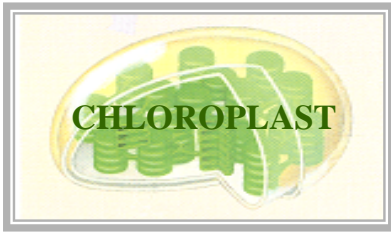
★ = HEAT ENERGY

★ = CHEMICAL ENERGY

A large, vibrant green maple leaf is the central focus, set against a bright blue sky with scattered white clouds. The leaf's veins are clearly visible, and its stem extends downwards. The overall scene is bright and natural, suggesting a healthy plant.

# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION SUMMARY



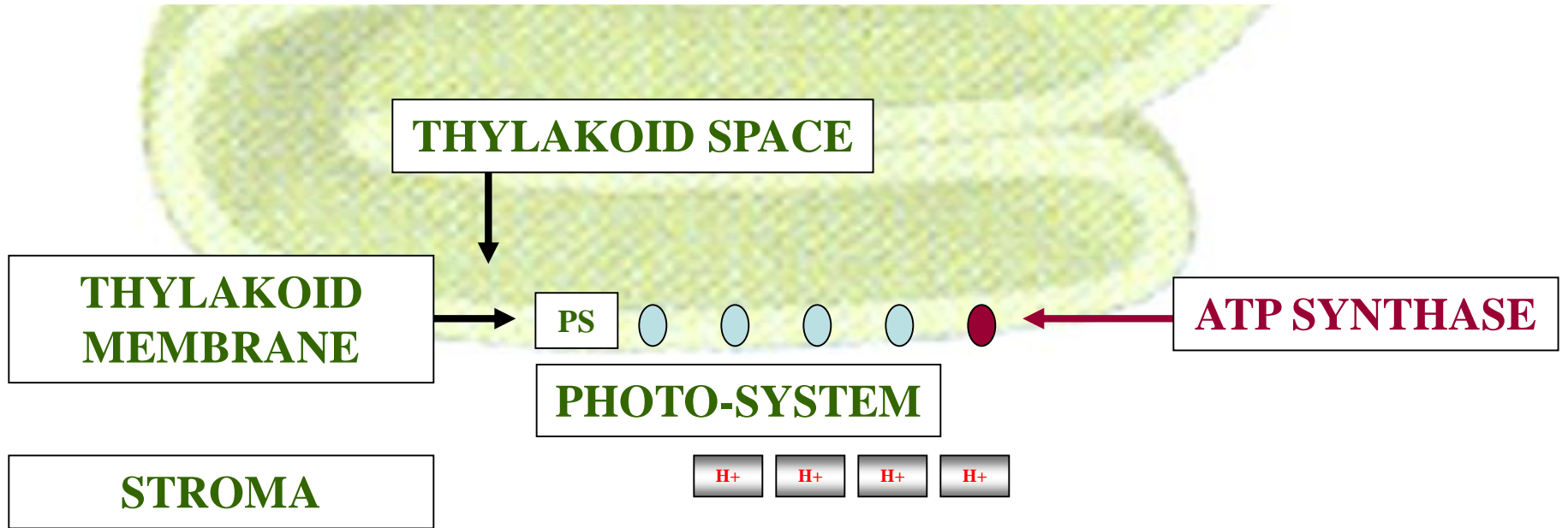


# CHLOROPLAST CHEMIOSMOTIC



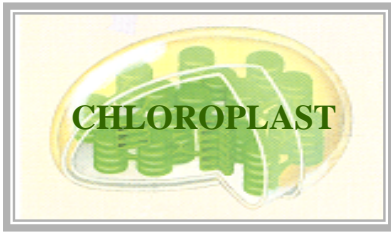
# PHOSPHORYLATION

E-



 = POTENTIAL CHEMICAL ENERGY

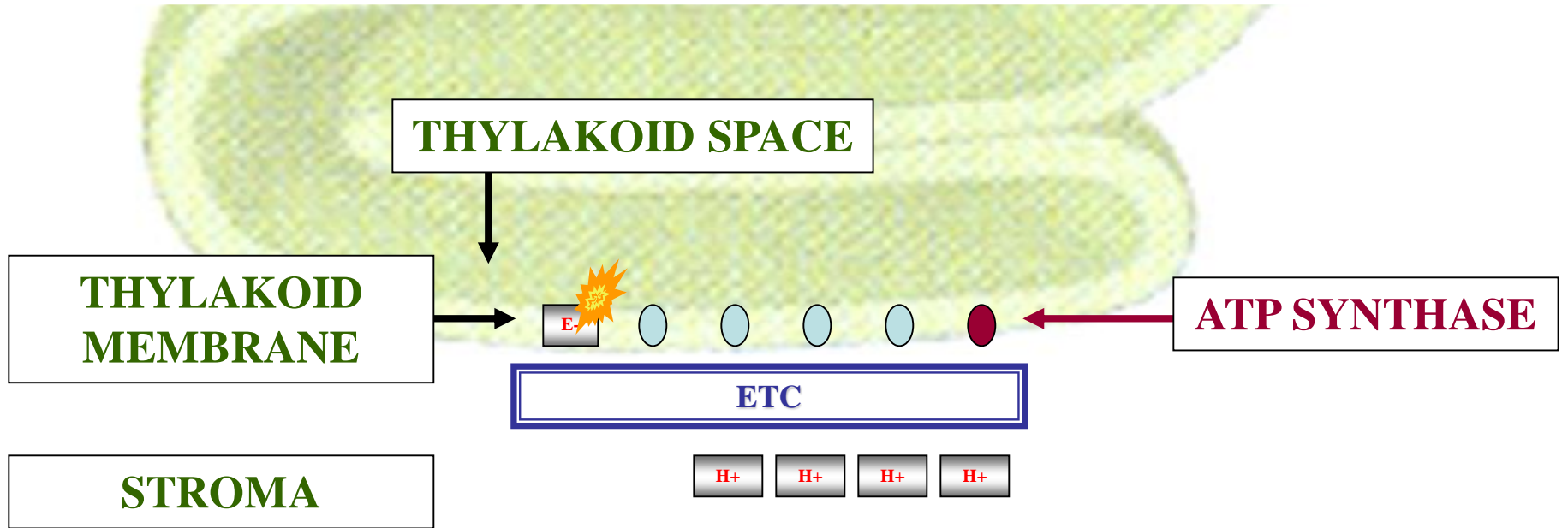
 = ELECTRON TRANSPORT CHAIN COMPONENT



# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

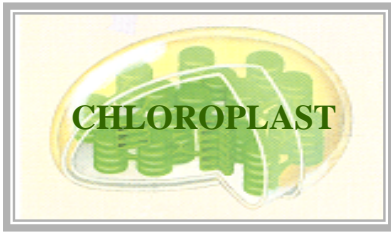


R



 = POTENTIAL CHEMICAL ENERGY

 = ELECTRON TRANSPORT CHAIN COMPONENT

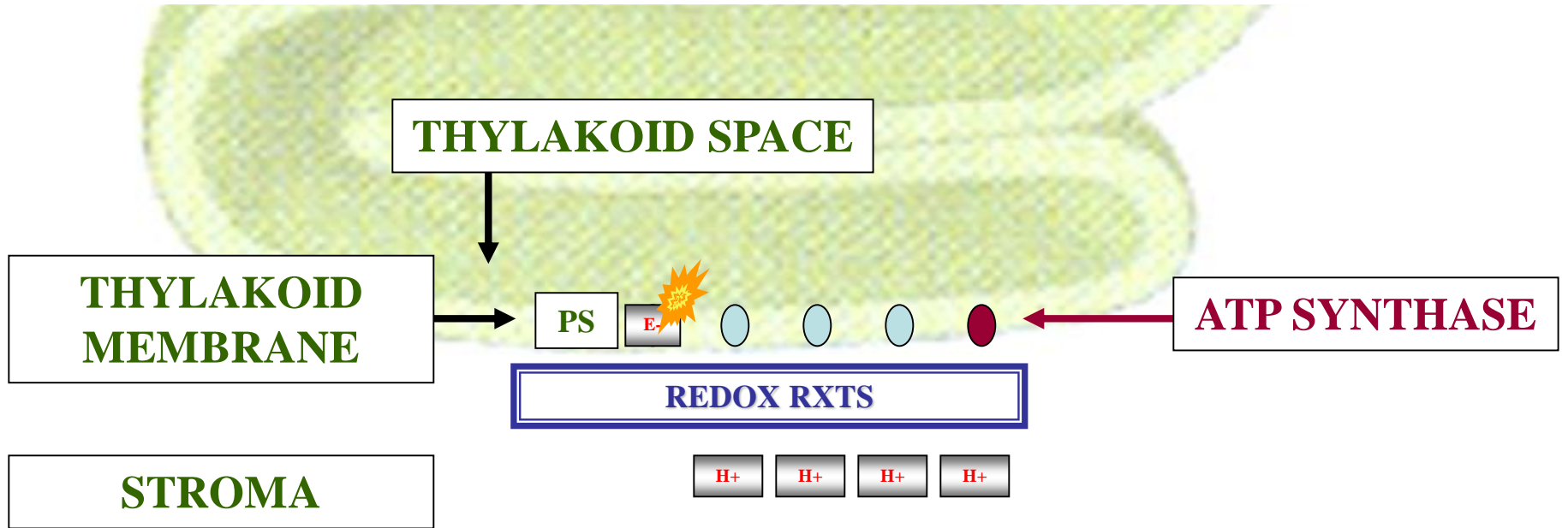


# CHLOROPLAST CHEMIOSMOTIC



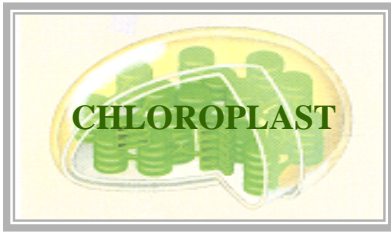
# PHOSPHORYLATION

E-



 = POTENTIAL CHEMICAL ENERGY

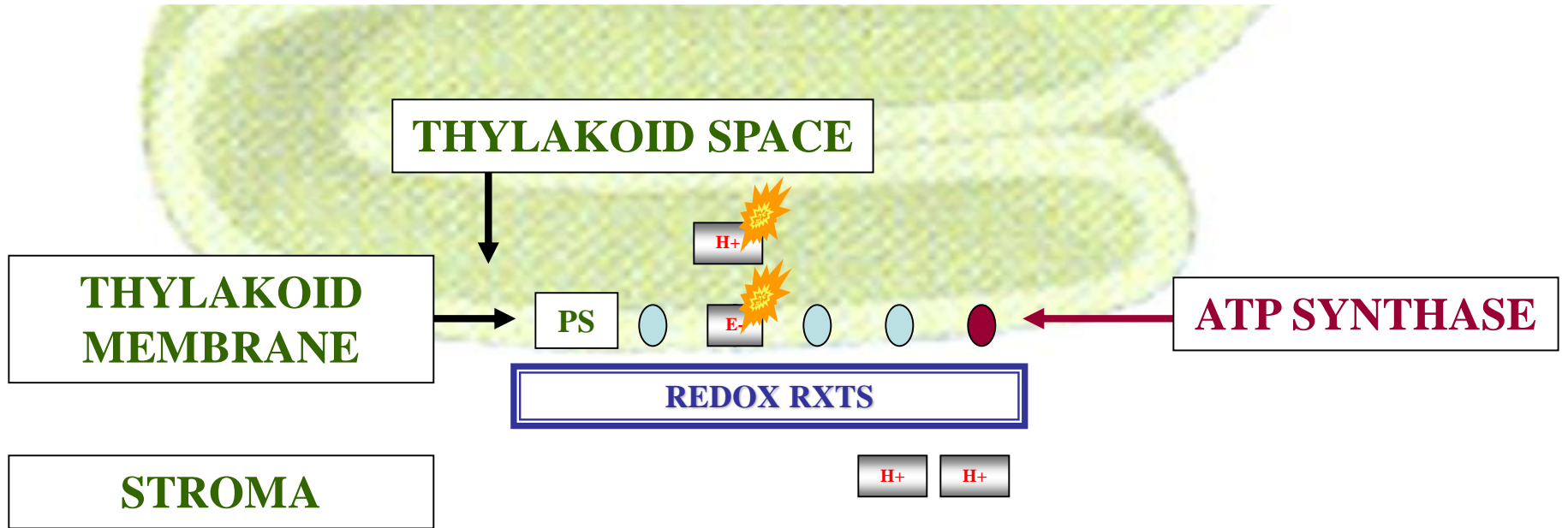
 = ELECTRON TRANSPORT CHAIN COMPONENT



# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

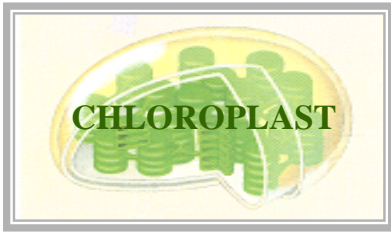


E-



 = POTENTIAL CHEMICAL ENERGY

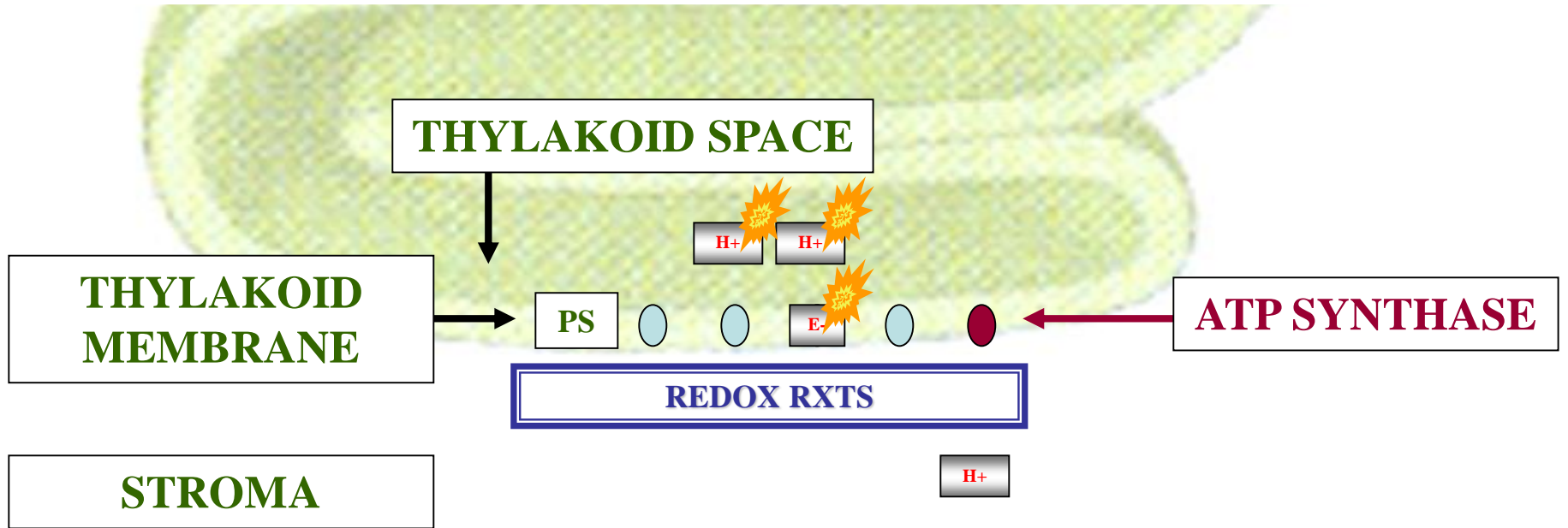
 = ELECTRON TRANSPORT CHAIN COMPONENT



# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION



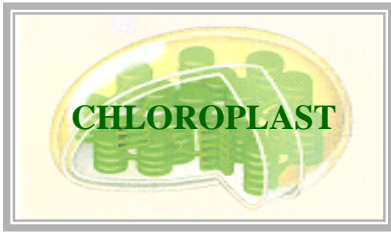
E-



 = POTENTIAL CHEMICAL ENERGY

 = ELECTRON TRANSPORT CHAIN COMPONENT



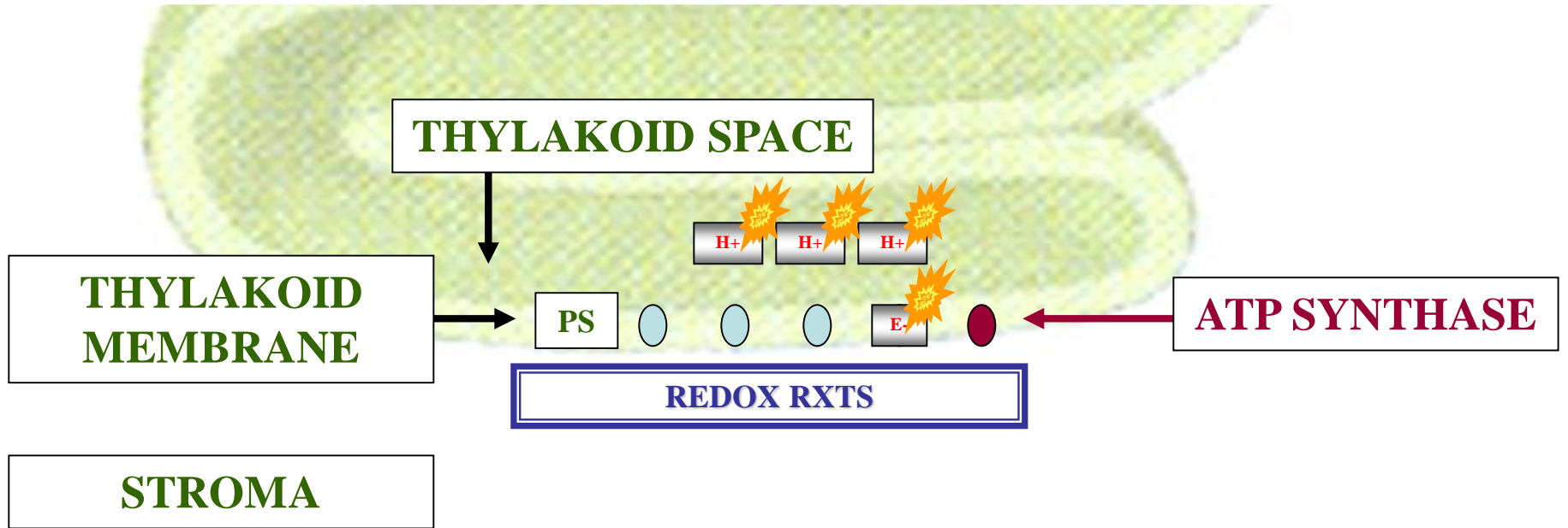


# CHLOROPLAST CHEMIOSMOTIC



# PHOSPHORYLATION

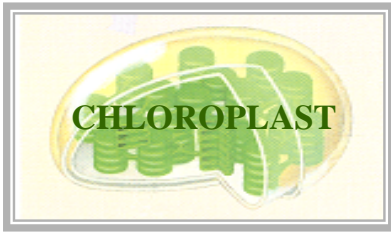
E-



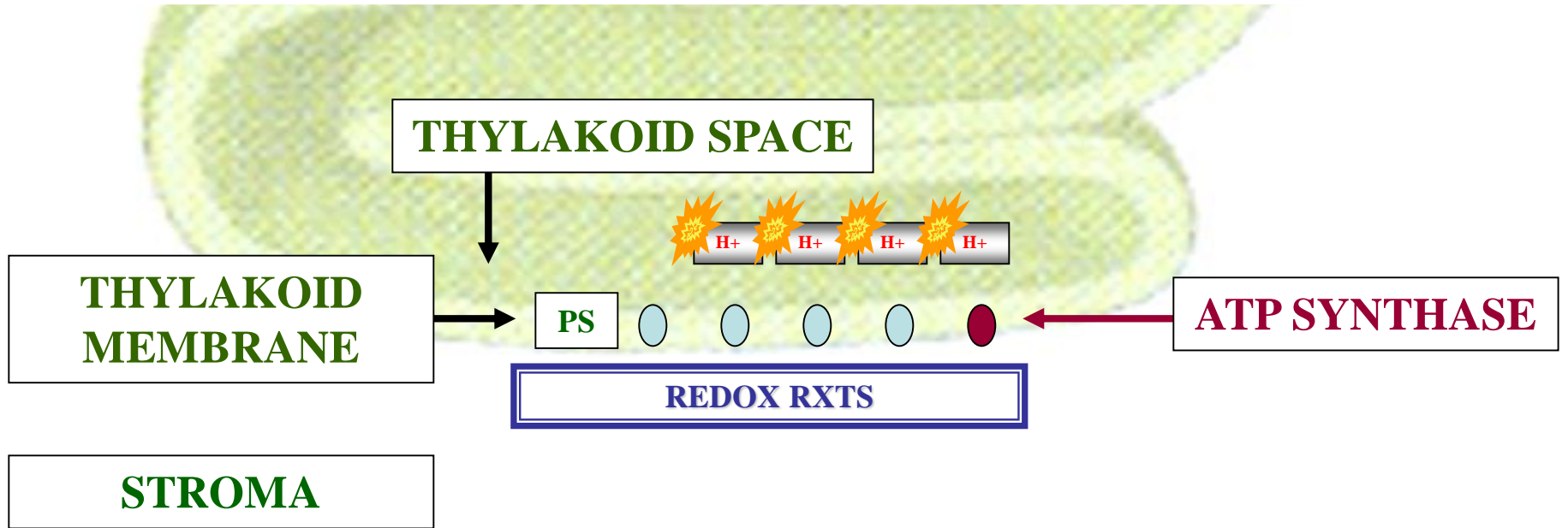
 = POTENTIAL CHEMICAL ENERGY

 = ELECTRON TRANSPORT CHAIN COMPONENT





# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION



 = POTENTIAL CHEMICAL ENERGY

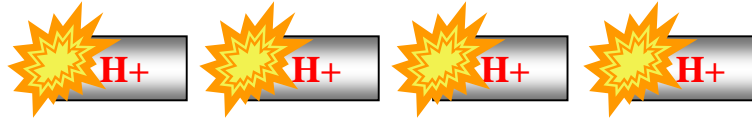
 = ELECTRON TRANSPORT CHAIN COMPONENT

A

CHLOROPLAST  
THYLAKOID  
SPACE

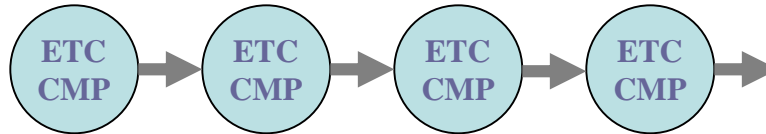
NON-CYCLIC P-P

CYCLIC P-P



PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE



ATP  
SYNTHASE

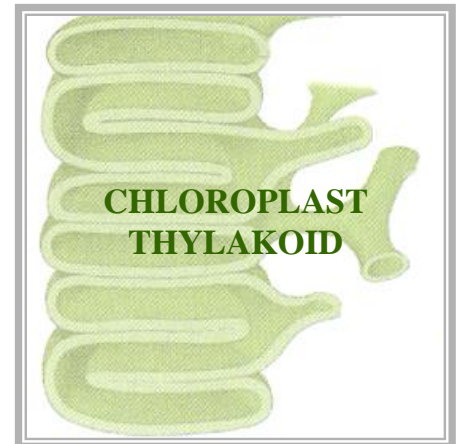
CHLOROPLAST  
STROMA

CHLOROPLAST  
THYLAKOID

● = ELECTRON TRANSPORT CHAIN COMPONENT

★ = HEAT ENERGY

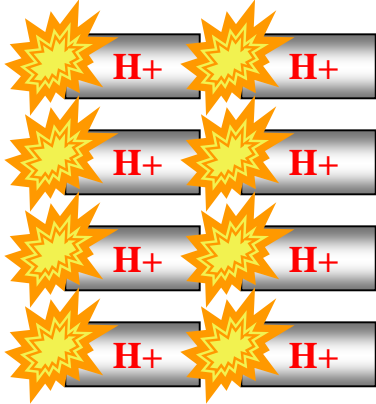
★ = CHEMICAL ENERGY



**P**

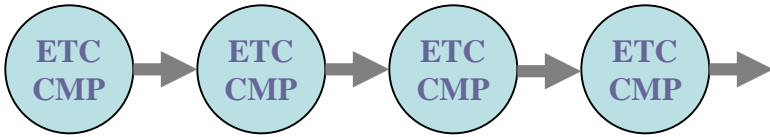
# H+ ACCUMULATE BEHIND ATP-SYNTASE

**CHLOROPLAST  
THYLAKOID  
SPACE**



**PS-II / PS-I**

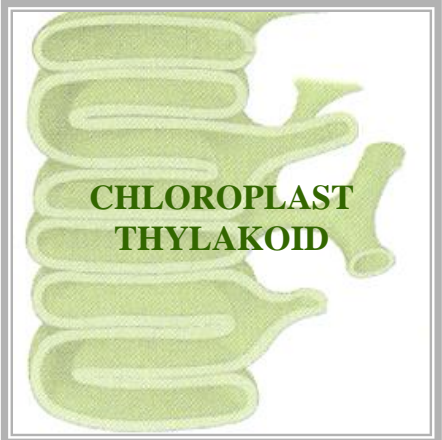
**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**PS-I**

**ATP  
SYNTASE**

**CHLOROPLAST  
STROMA**



● = ELECTRON TRANSPORT CHAIN COMPONENT

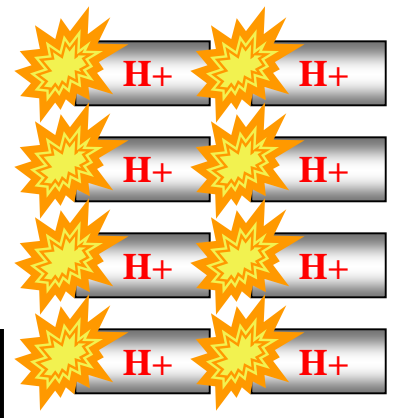
★ = HEAT ENERGY

★ = CHEMICAL ENERGY



# H<sup>+</sup> ACCUMULATE BEHIND ATP-SYNTHASE

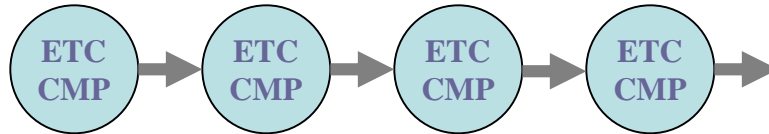
CHLOROPLAST  
THYLAKOID  
SPACE



POTENTIAL CHEM EGY

PS-II / PS-I

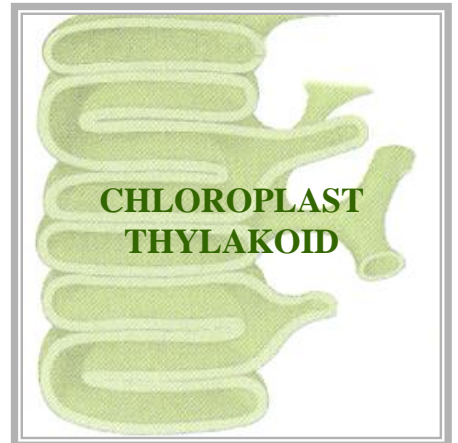
CHLOROPLAST  
THYLAKOID  
MEMBRANE



PS-I

ATP  
SYNTHASE

CHLOROPLAST  
STROMA



 = ELECTRON TRANSPORT CHAIN COMPONENT

 = HEAT ENERGY

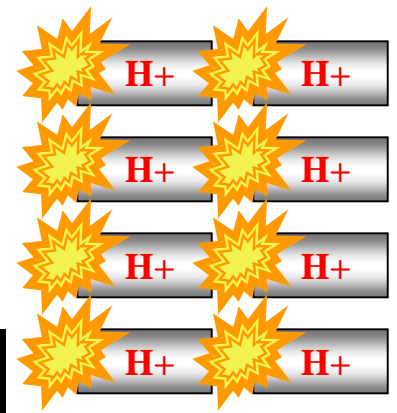
 = CHEMICAL ENERGY



# ANALOGY WATER & DAM

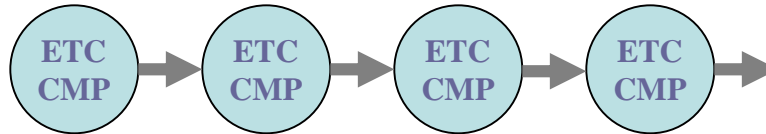
CHLOROPLAST  
THYLAKOID  
SPACE

POTENTIAL CHEM EGY



PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE



PS-I

ATP  
SYNTHASE

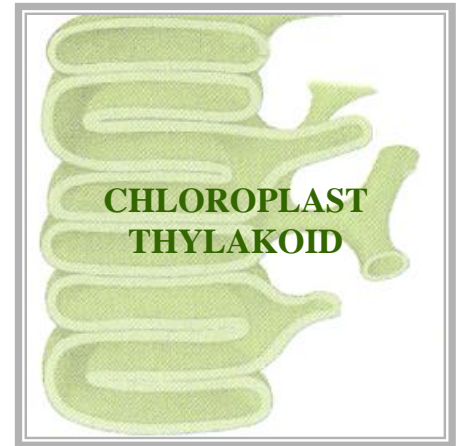
CHLOROPLAST  
STROMA

CHLOROPLAST  
THYLAKOID

 = ELECTRON TRANSPORT CHAIN COMPONENT

 = HEAT ENERGY

 = CHEMICAL ENERGY

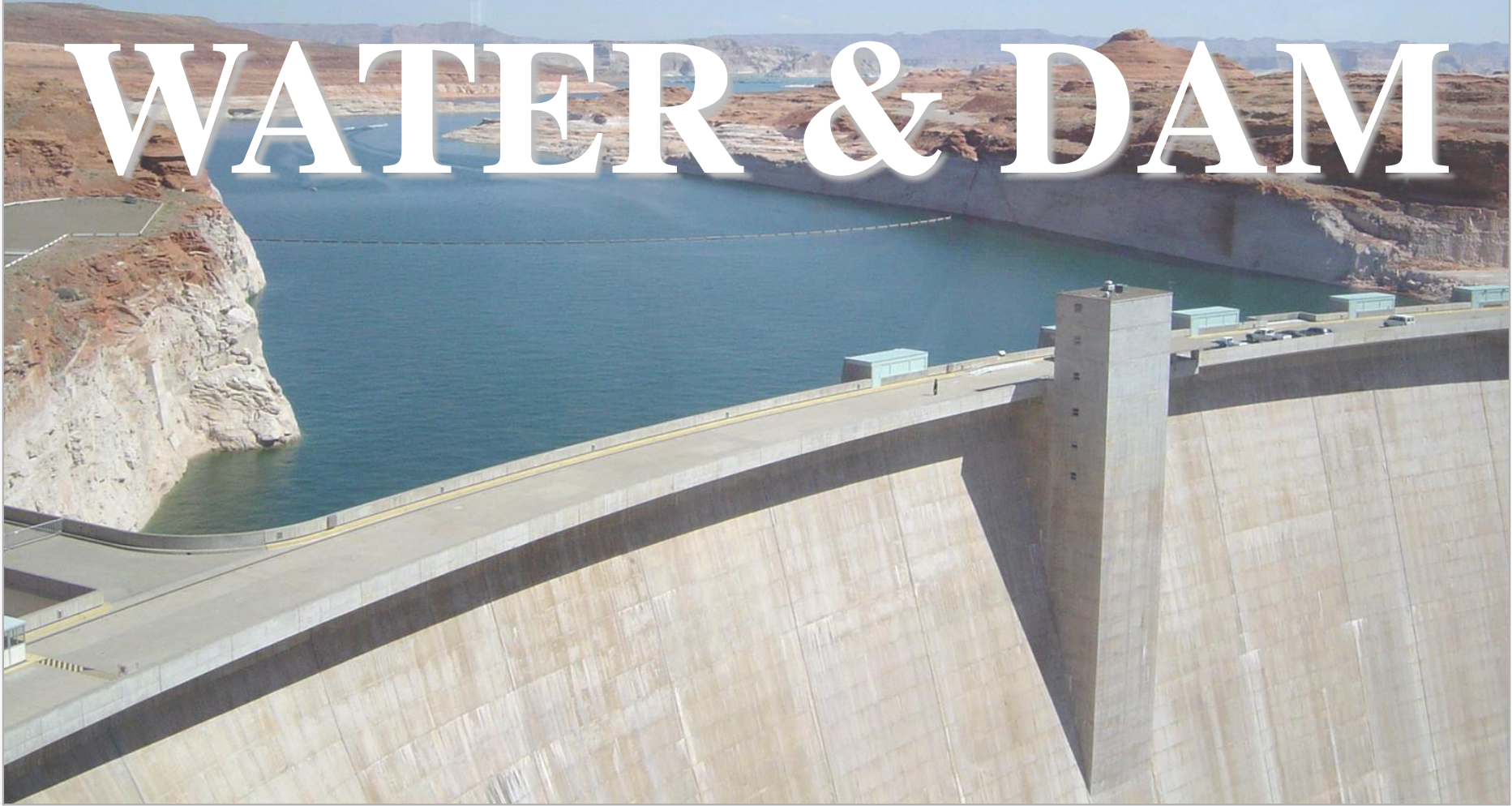






# ANALOGY

# WATER & DAM





**WATER = ?**

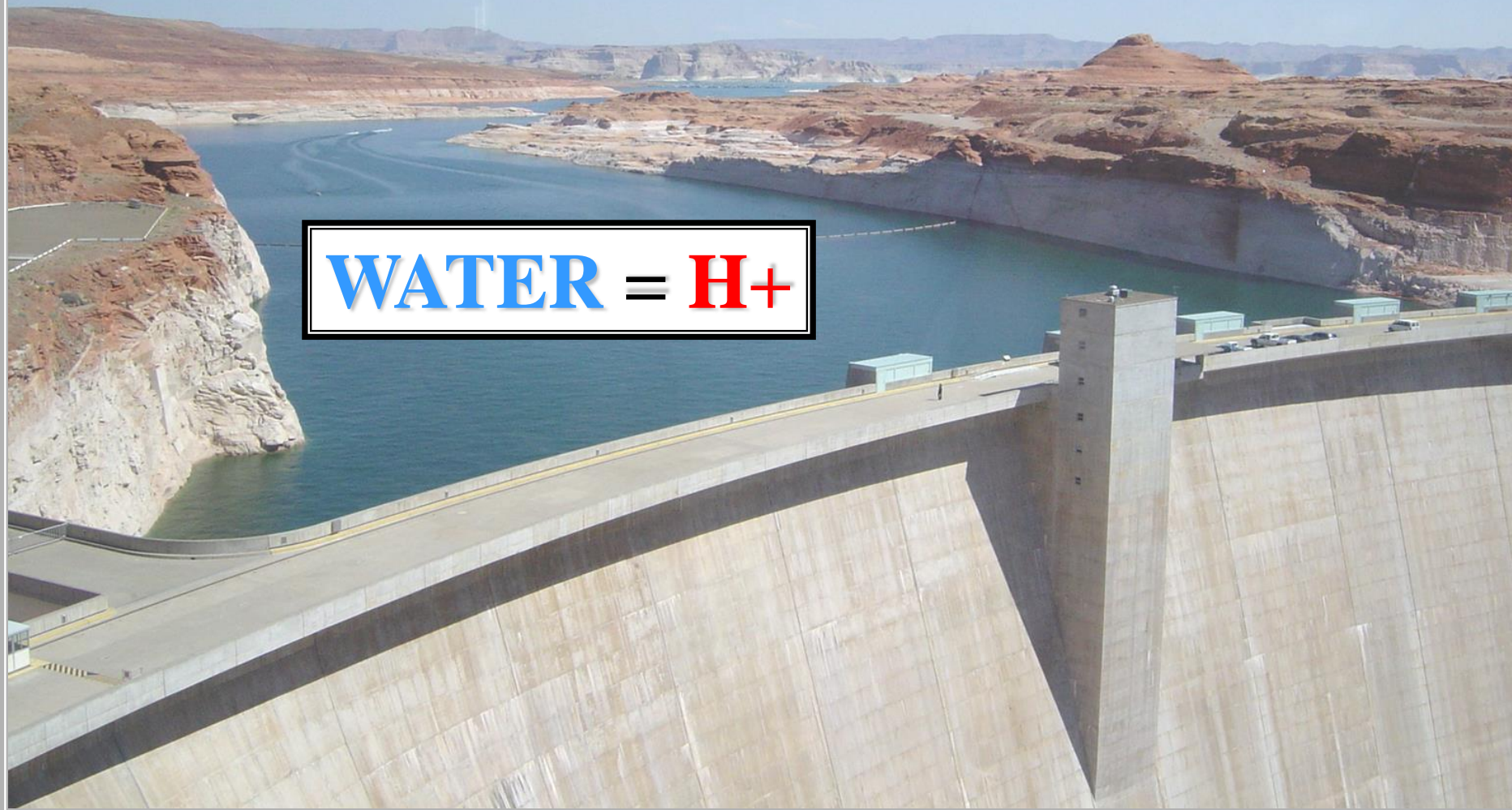
**H**





**WATER = H<sup>+</sup>**

**WATER = H<sup>+</sup>**





**WATER = H<sup>+</sup>**

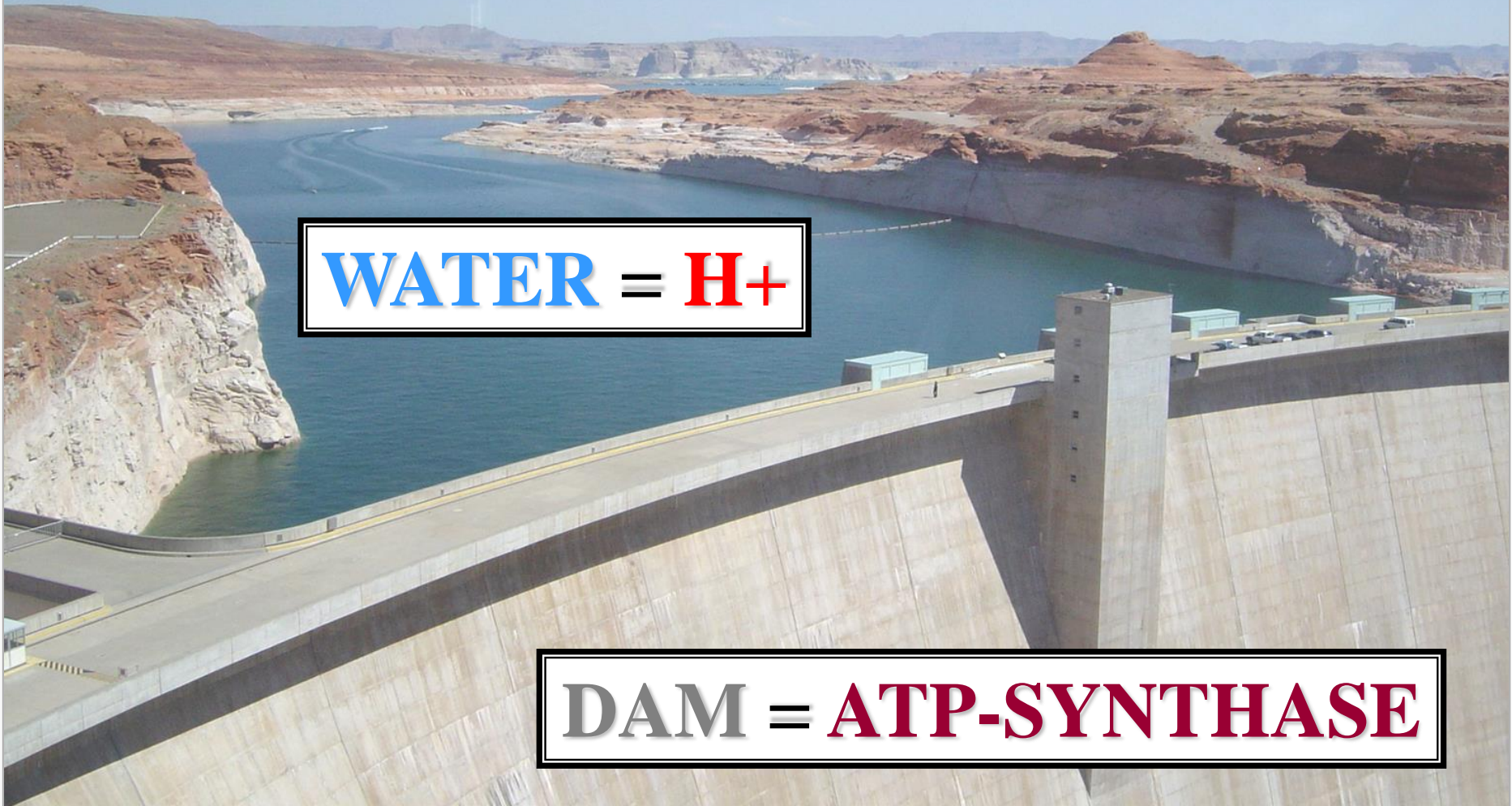
!

DB

**DAM = ATP-SYNTHASE**

**WATER = H<sup>+</sup>**

**DAM = ATP-SYNTHASE**

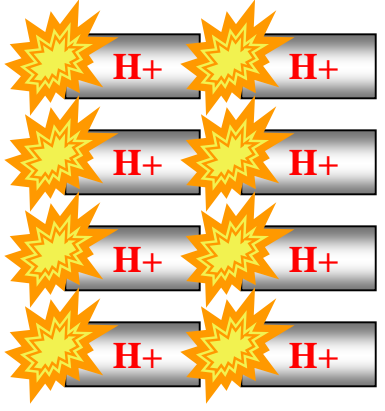




CHLOROPLAST  
THYLAKOID  
SPACE

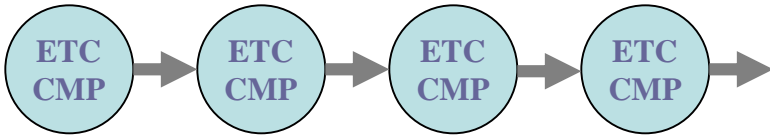
# CRITICAL MASS H+ PASS VIA ATP SYNTHASE TO STROMA

POTENTIAL CHEM EGY



PS-II / PS-I

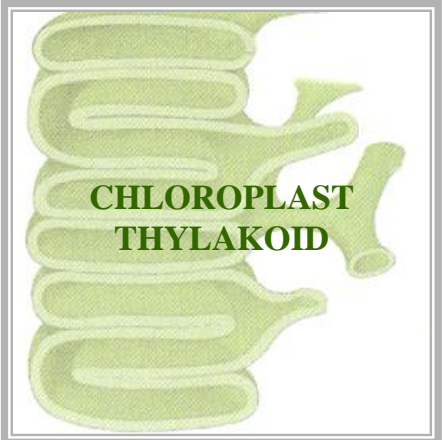
CHLOROPLAST  
THYLAKOID  
MEMBRANE



PS-I

ATP  
SYNTHASE

CHLOROPLAST  
STROMA



 = ELECTRON TRANSPORT CHAIN COMPONENT

 = HEAT ENERGY

 = CHEMICAL ENERGY



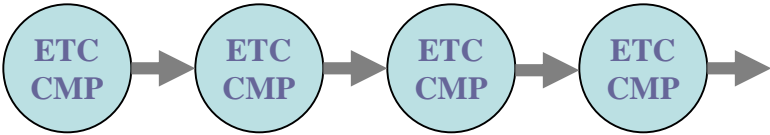
**CHLOROPLAST  
THYLAKOID  
SPACE**

# CRITICAL MASS H<sup>+</sup> PASS VIA ATP SYNTHASE TO STROMA

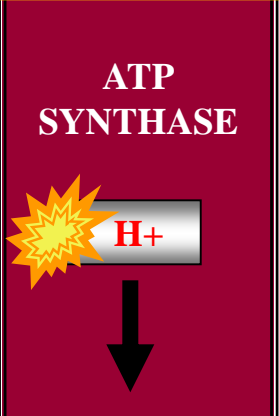
**POTENTIAL CHEM EGY**

**PS-II / PS-I**

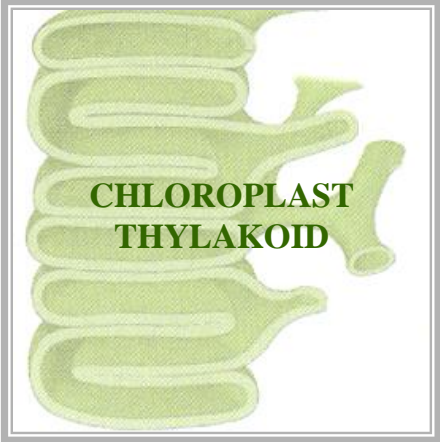
**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**PS-I**



**CHLOROPLAST  
STROMA**



 = ELECTRON TRANSPORT CHAIN COMPONENT

 = HEAT ENERGY

 = CHEMICAL ENERGY



# CRITICAL MASS

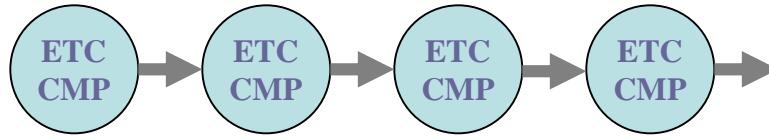
## H<sup>+</sup> PASS VIA ATP SYNTHASE TO STROMA

CHLOROPLAST THYLAKOID SPACE

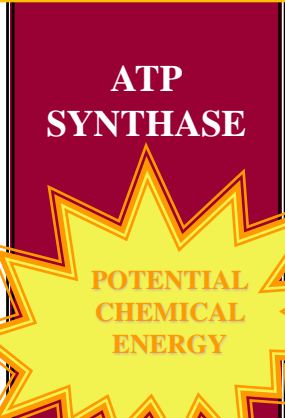
POTENTIAL CHEM EGY

PS-II / PS-I

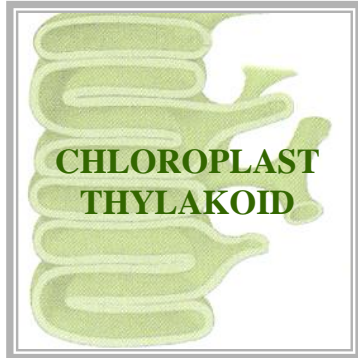
CHLOROPLAST THYLAKOID MEMBRANE



PS-I



CHLOROPLAST STROMA



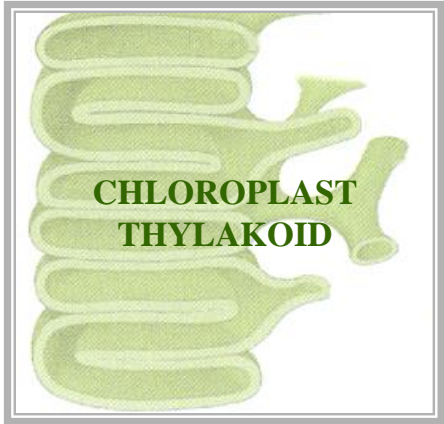
 = ELECTRON TRANSPORT CHAIN COMPONENT

 = HEAT ENERGY

 = CHEMICAL ENERGY

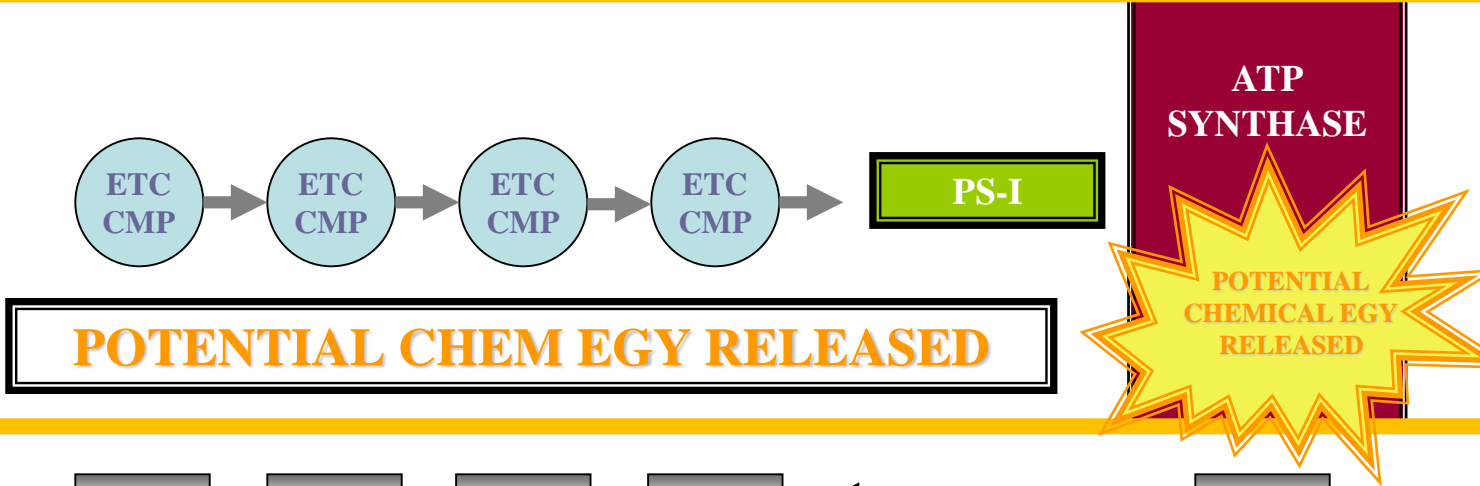
**EX**

**CHLOROPLAST  
THYLAKOID  
SPACE**



**PS-II / PS-I**

**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**CHLOROPLAST  
STROMA**

 = **ELECTRON TRANSPORT CHAIN COMPONENT**

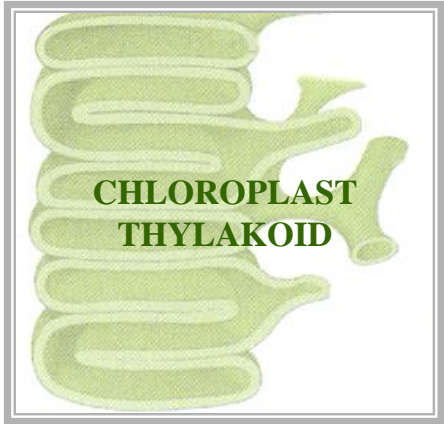
 = **HEAT ENERGY**

 = **CHEMICAL ENERGY**



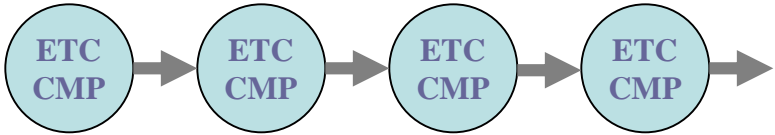
**A**

**CHLOROPLAST  
THYLAKOID  
SPACE**



**PS-II / PS-I**

**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**PS-I**

**EXERGONIC RXT**

**ATP  
SYNTHASE**

**POTENTIAL  
CHEMICAL EGY  
RELEASED**



**CHLOROPLAST  
STROMA**

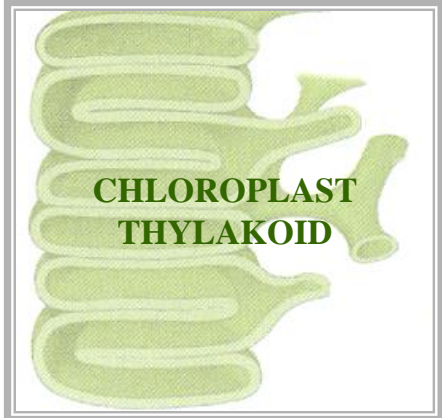
 = **ELECTRON TRANSPORT CHAIN COMPONENT**

 = **HEAT ENERGY**

 = **CHEMICAL ENERGY**



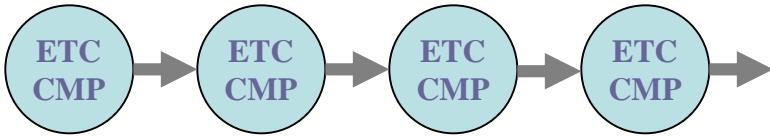
**CHLOROPLAST  
THYLAKOID  
SPACE**



**CHLOROPLAST  
THYLAKOID**

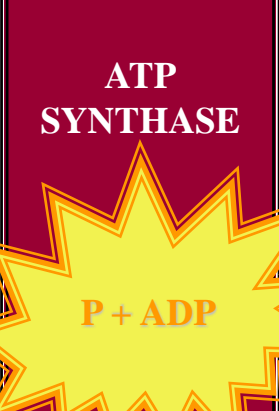
**PS-II / PS-I**

**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**PS-I**

**EXERGONIC RXT**



**ATP  
SYNTHASE**

**P + ADP**



**CHLOROPLAST  
STROMA**

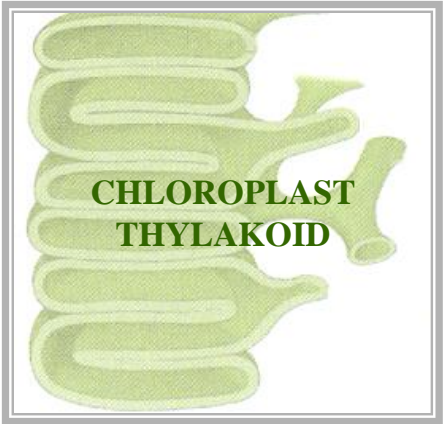
 = **ELECTRON TRANSPORT CHAIN COMPONENT**

 = **HEAT ENERGY**

 = **CHEMICAL ENERGY**

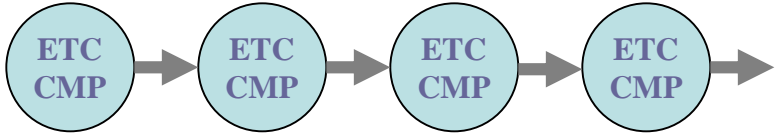
**A**

**CHLOROPLAST  
THYLAKOID  
SPACE**



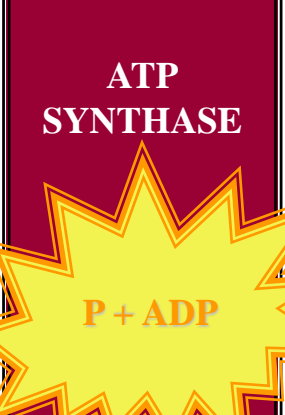
**PS-II / PS-I**

**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**PS-I**

**EXERGONIC RXT**



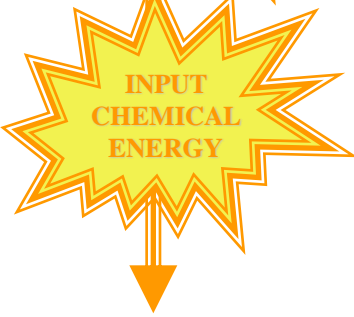
**H+**

**H+**

**H+**

**H+**

**CHLOROPLAST  
STROMA**



**?**

● = **ELECTRON TRANSPORT CHAIN COMPONENT**

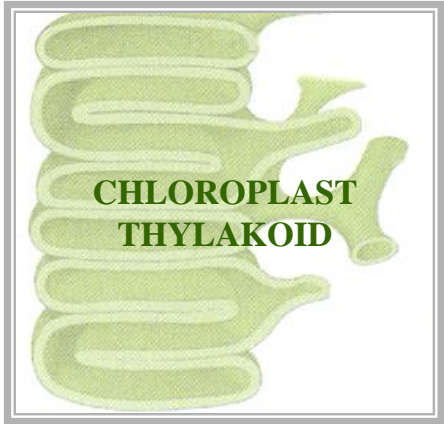
★ = **HEAT ENERGY**

★ = **CHEMICAL ENERGY**



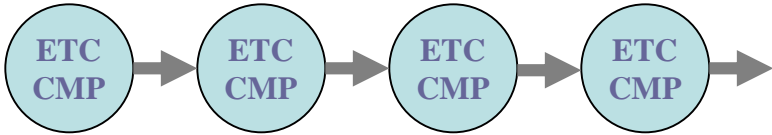
**EN**

**CHLOROPLAST  
THYLAKOID  
SPACE**



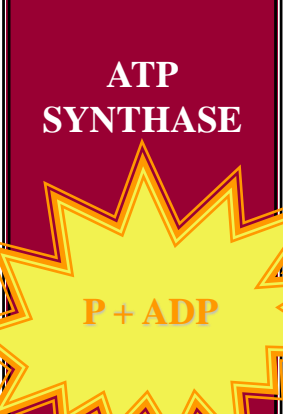
**PS-II / PS-I**

**CHLOROPLAST  
THYLAKOID  
MEMBRANE**

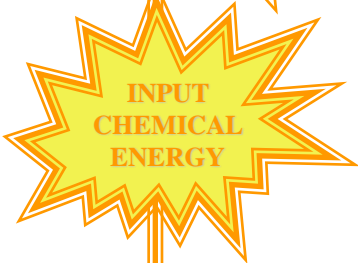


**PS-I**

**EXERGONIC RXT**



**CHLOROPLAST  
STROMA**



**ATP**

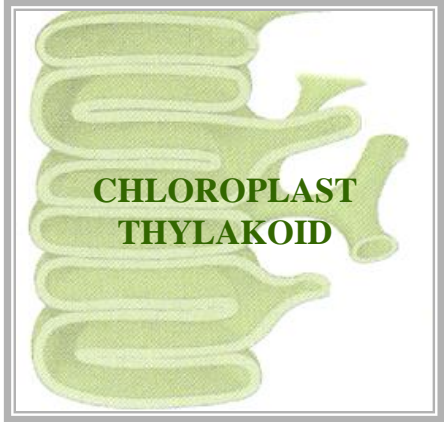
 = **ELECTRON TRANSPORT CHAIN COMPONENT**

 = **HEAT ENERGY**

 = **CHEMICAL ENERGY**

C

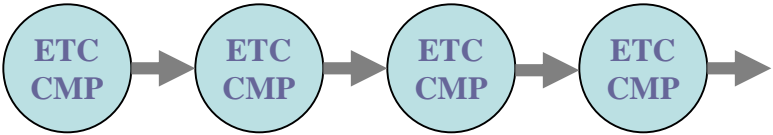
CHLOROPLAST  
THYLAKOID  
SPACE



CHLOROPLAST  
THYLAKOID

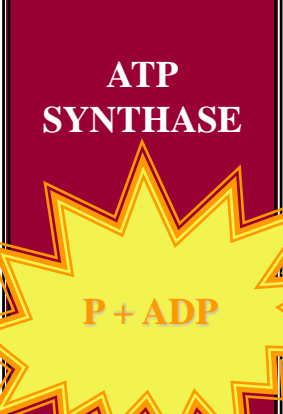
PS-II / PS-I

CHLOROPLAST  
THYLAKOID  
MEMBRANE



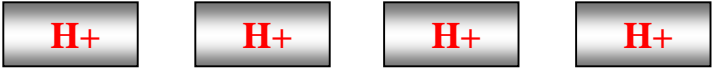
PS-I

EXERGONIC RXT



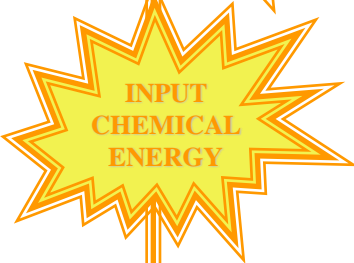
ATP  
SYNTHASE

P + ADP



CHLOROPLAST  
STROMA

ENDERGONIC RXT



INPUT  
CHEMICAL  
ENERGY



ATP

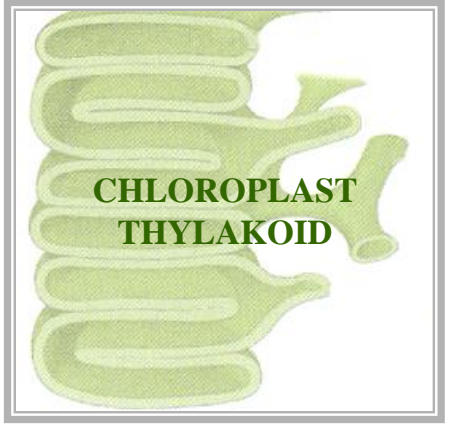
● = ELECTRON TRANSPORT CHAIN COMPONENT

☀ = HEAT ENERGY

☀ = CHEMICAL ENERGY

**P**

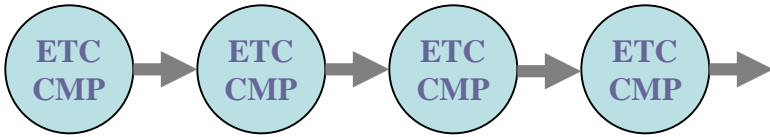
**CHLOROPLAST  
THYLAKOID  
SPACE**



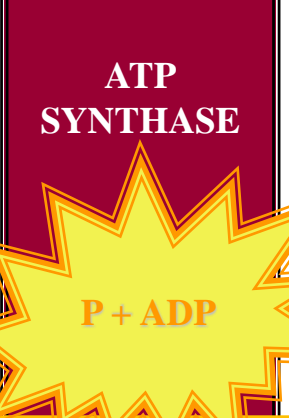
**CHLOROPLAST  
THYLAKOID**

**PS-II / PS-I**

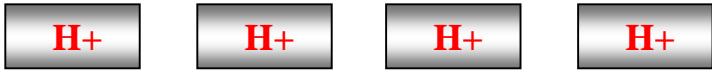
**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**PS-I**



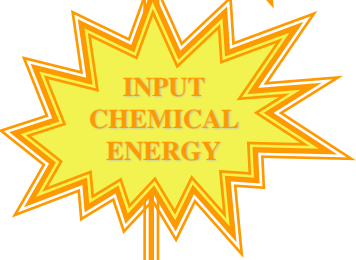
**EXERGONIC RXT**



**COUPLED**

**ENDERGONIC RXT**

**CHLOROPLAST  
STROMA**



**ATP**

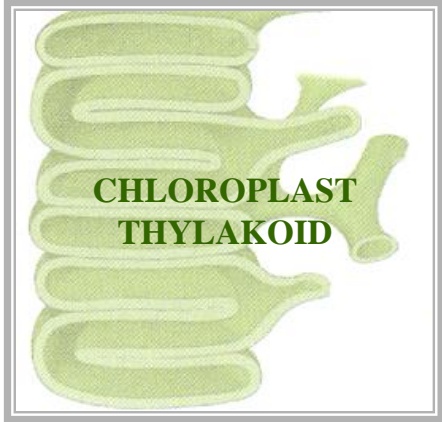
 = **ELECTRON TRANSPORT CHAIN COMPONENT**

 = **HEAT ENERGY**

 = **CHEMICAL ENERGY**



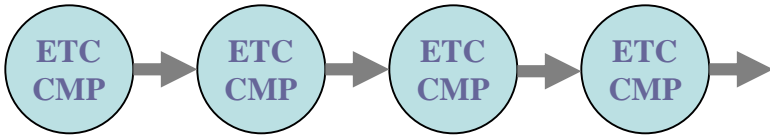
**CHLOROPLAST  
THYLAKOID  
SPACE**



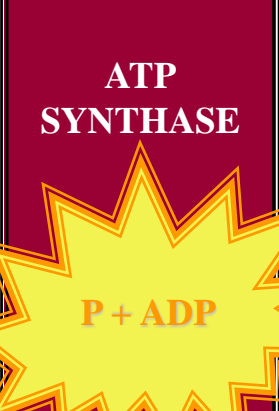
**CHLOROPLAST  
THYLAKOID**

**PS-II / PS-I**

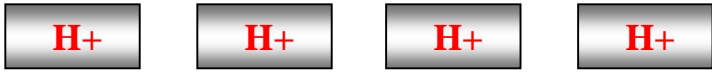
**CHLOROPLAST  
THYLAKOID  
MEMBRANE**



**PS-I**



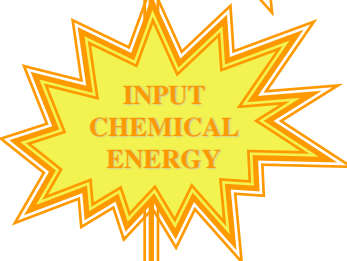
**EXERGONIC RXT**



**COUPLED**

**ENDERGONIC RXT**

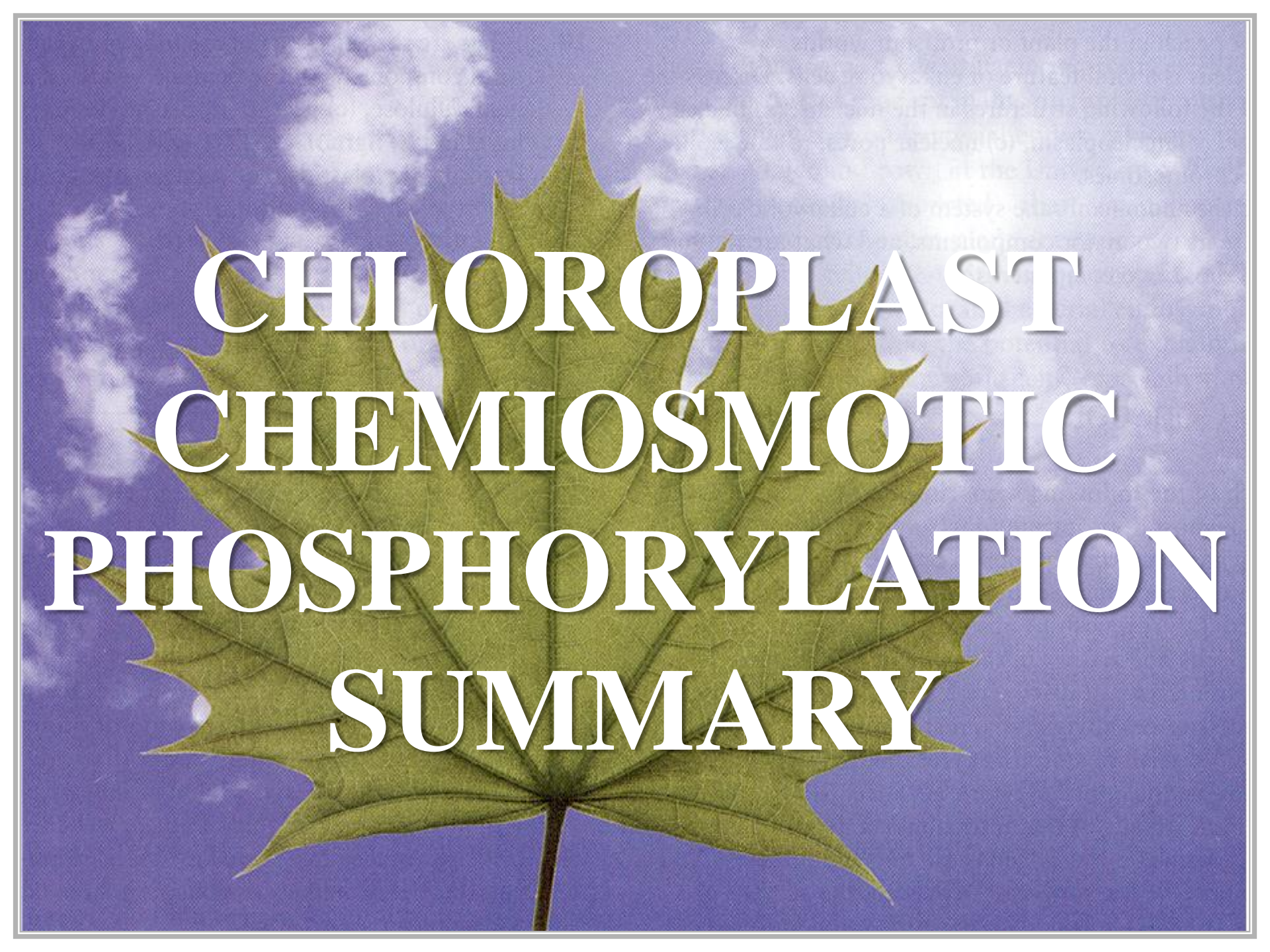
**CHLOROPLAST  
STROMA**



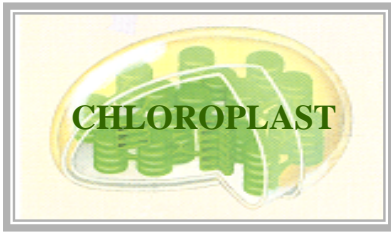
**PHOSPHORYLATION**

**ATP**

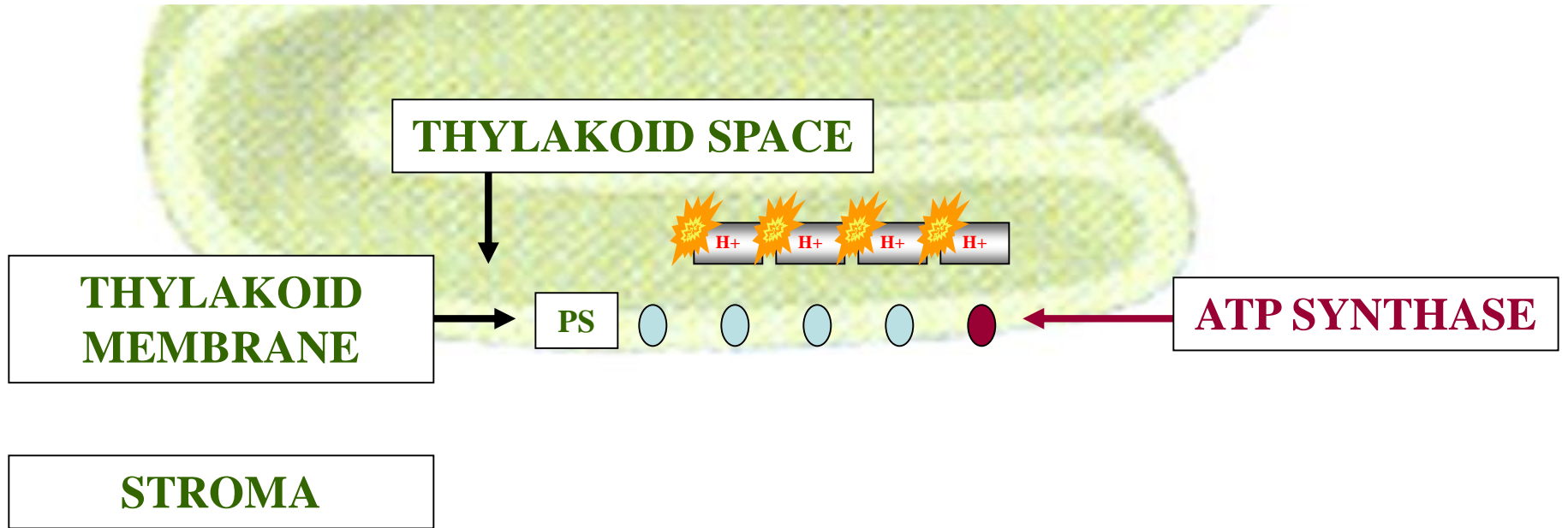
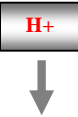


A large, vibrant green maple leaf is the central focus, set against a bright blue sky with scattered white clouds. The leaf's veins are clearly visible, and its stem extends downwards. The overall scene is bright and natural, suggesting a healthy plant in a sunny environment.

# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION SUMMARY



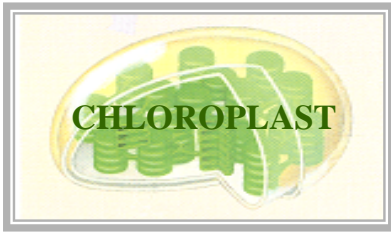
# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION



 = POTENTIAL CHEMICAL ENERGY

 = ELECTRON TRANSPORT CHAIN COMPONENT

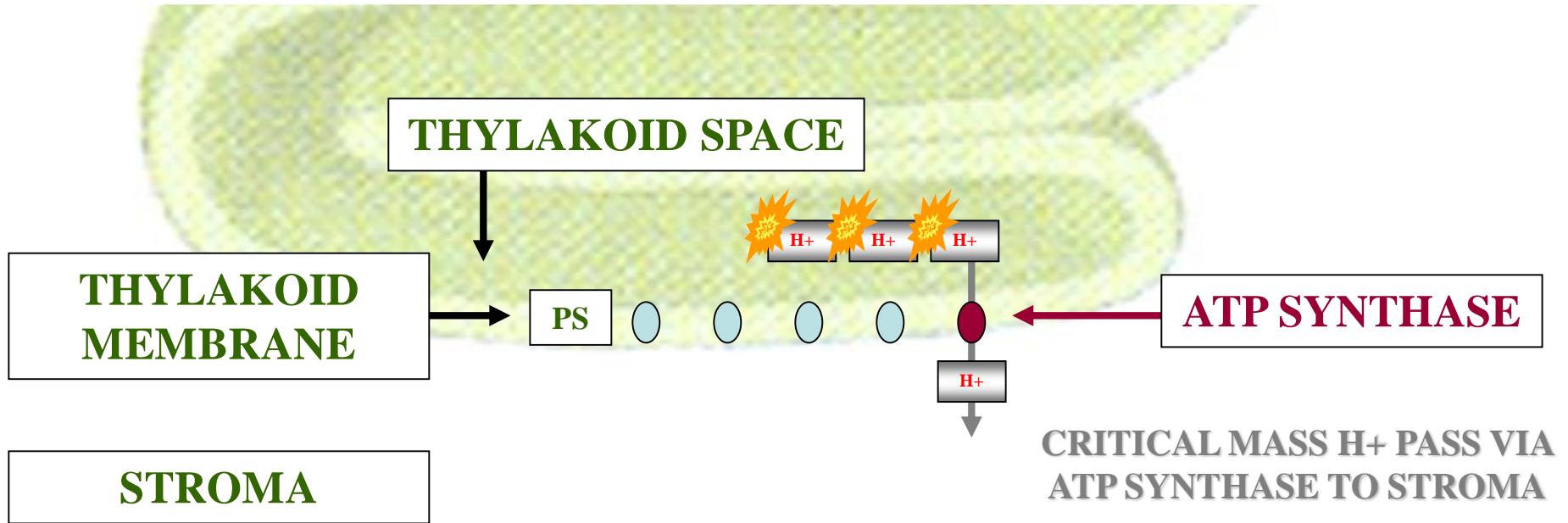




# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION

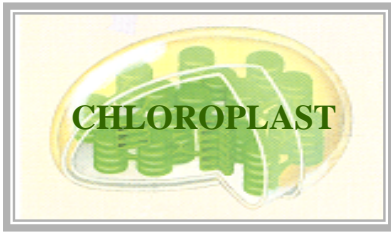


H<sup>+</sup>



 = POTENTIAL CHEMICAL ENERGY

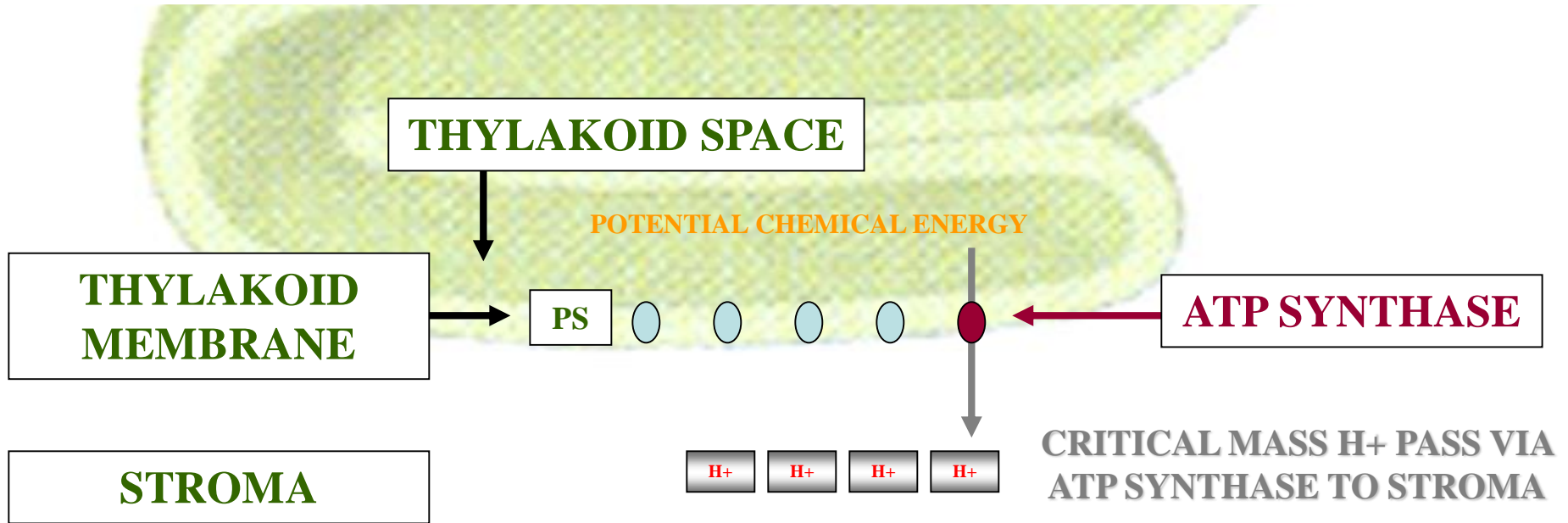
 = ELECTRON TRANSPORT CHAIN COMPONENT



# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION



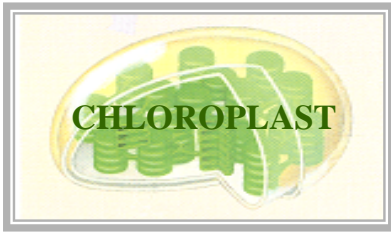
R



 = POTENTIAL CHEMICAL ENERGY

 = ELECTRON TRANSPORT CHAIN COMPONENT



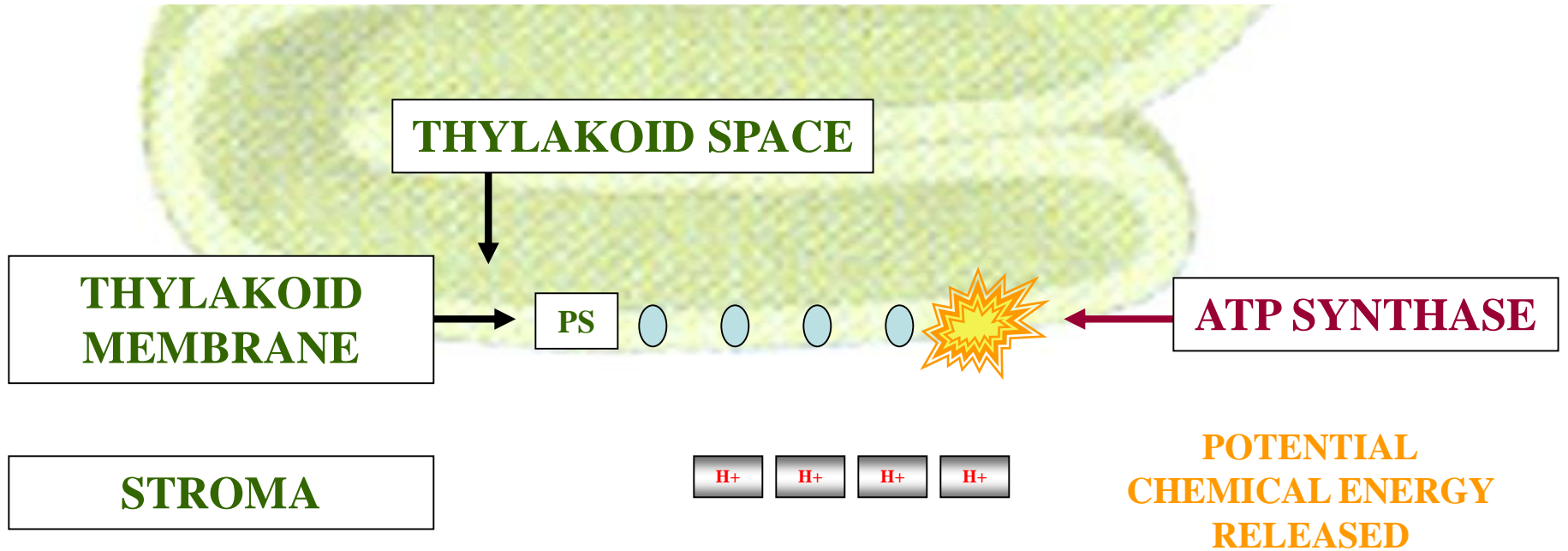


# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION



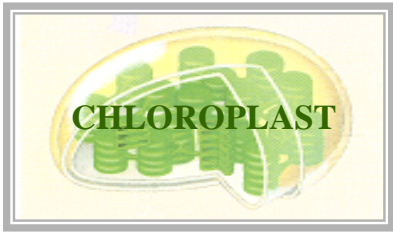
A

P



 = CHEMICAL ENERGY

 = ELECTRON TRANSPORT CHAIN COMPONENT

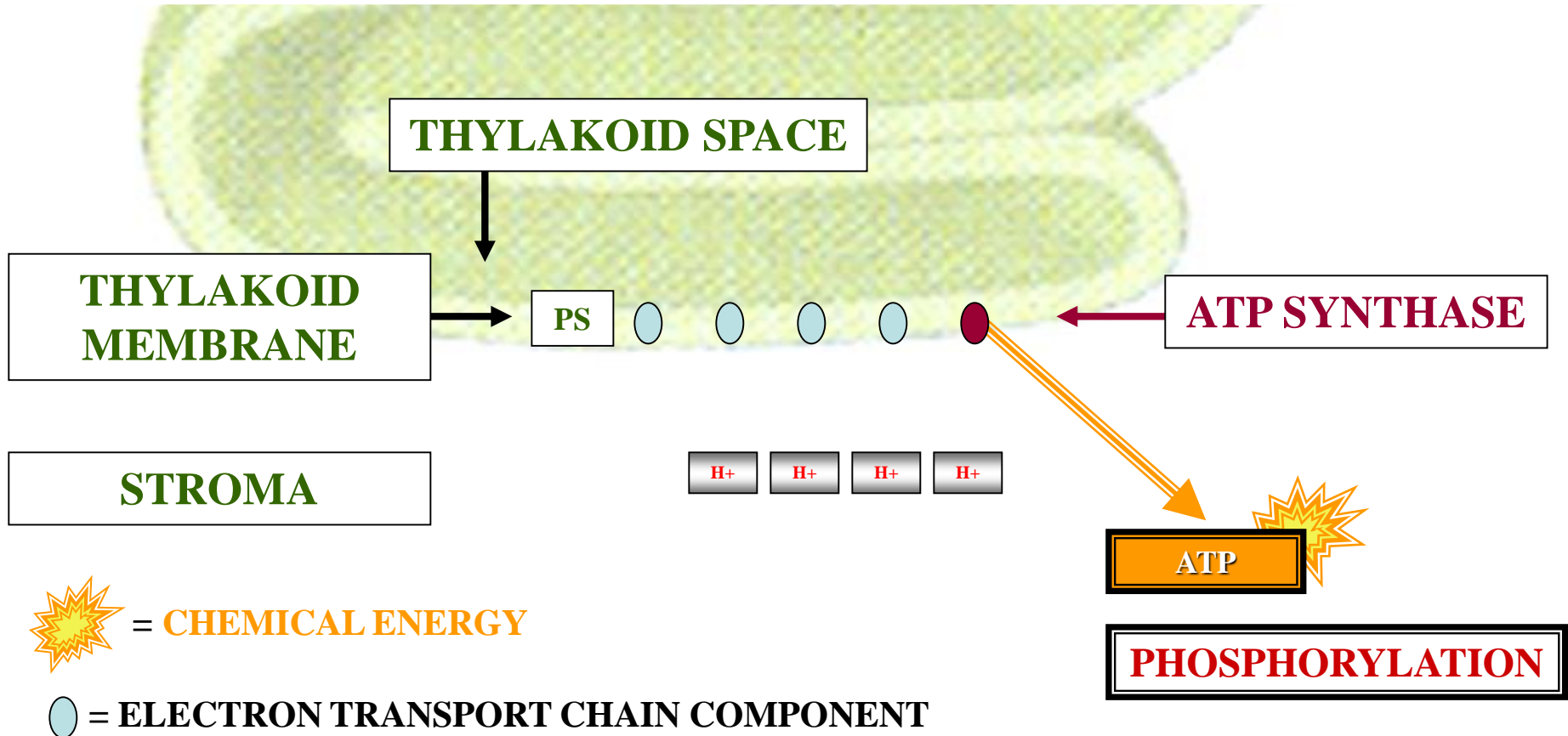


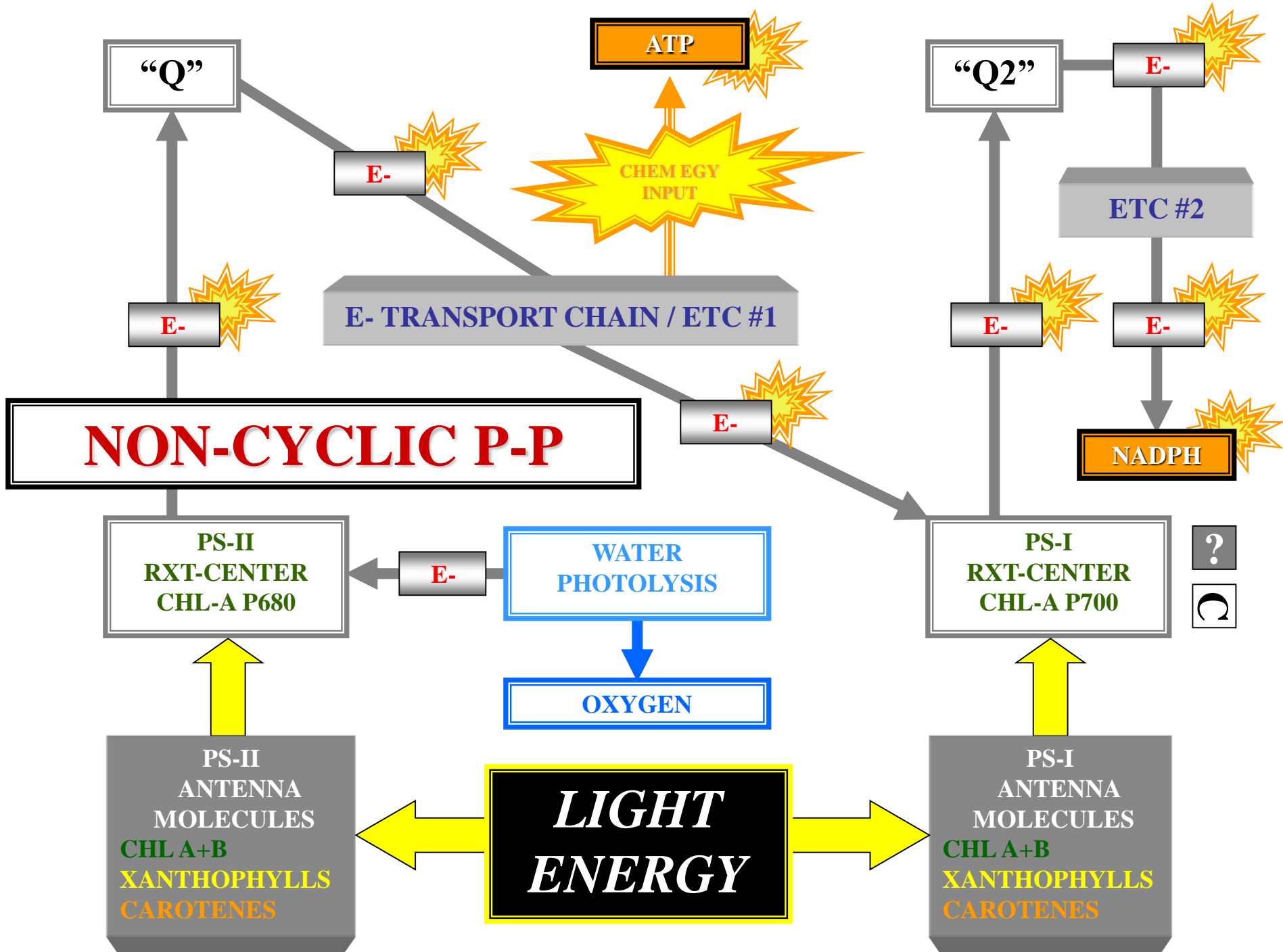
# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION



A

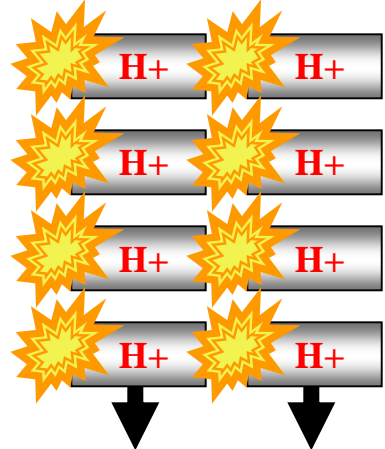
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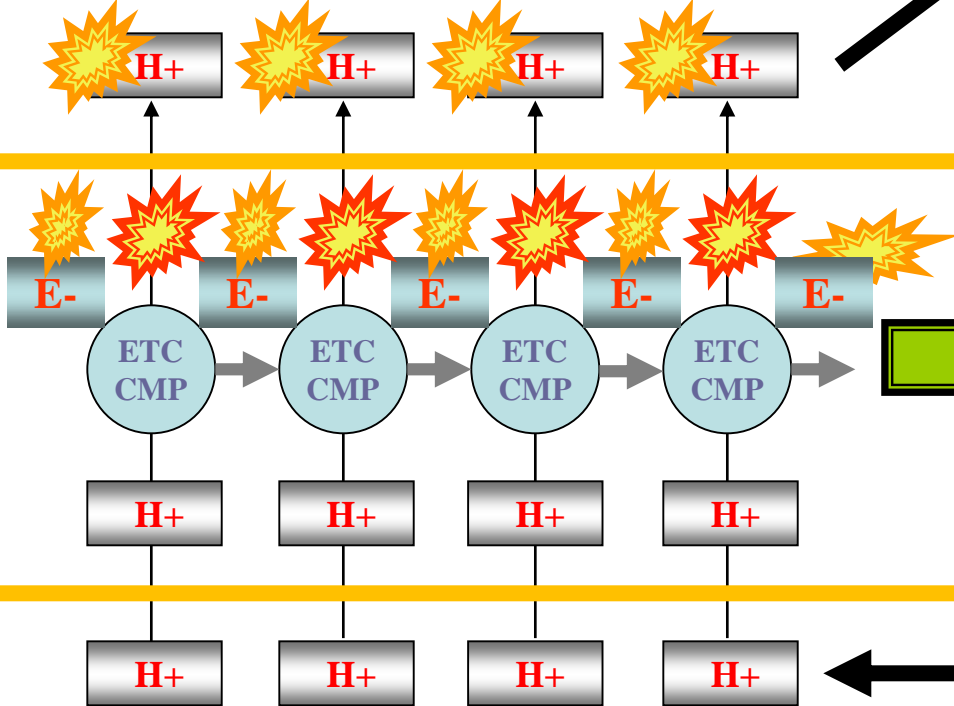




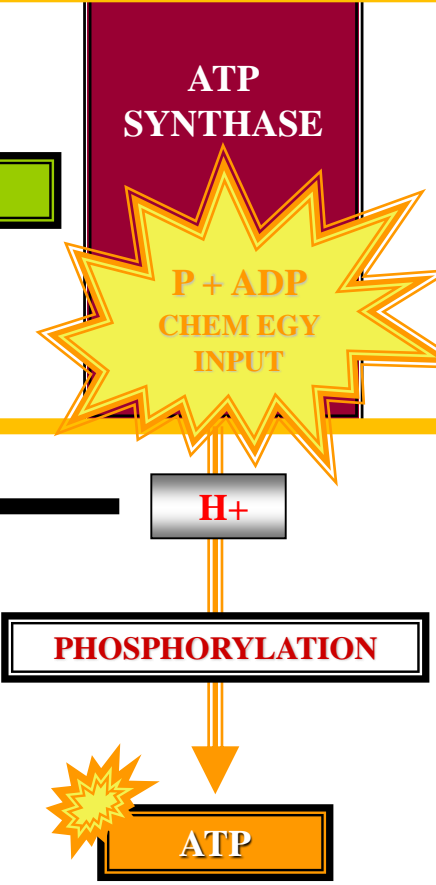
**CHLOROPLAST THYLAKOID SPACE**



**PS-II / PS-I**  
**CHLOROPLAST THYLAKOID MEMBRANE**



**CHLOROPLAST STROMA**



● = ELECTRON TRANSPORT CHAIN COMPONENT  
 ★ = HEAT ENERGY    ★ = CHEMICAL ENERGY

^ A +

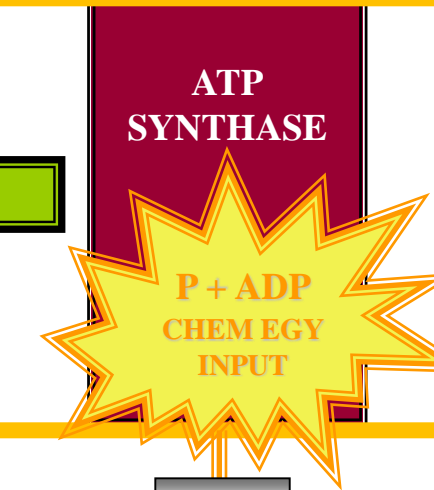
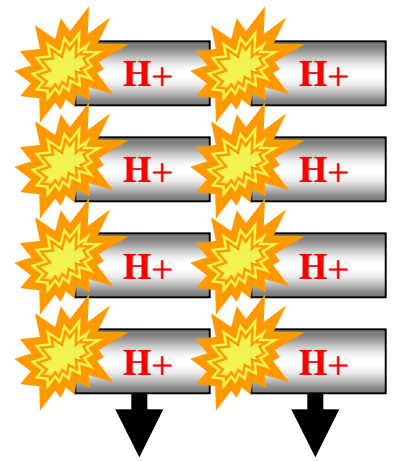
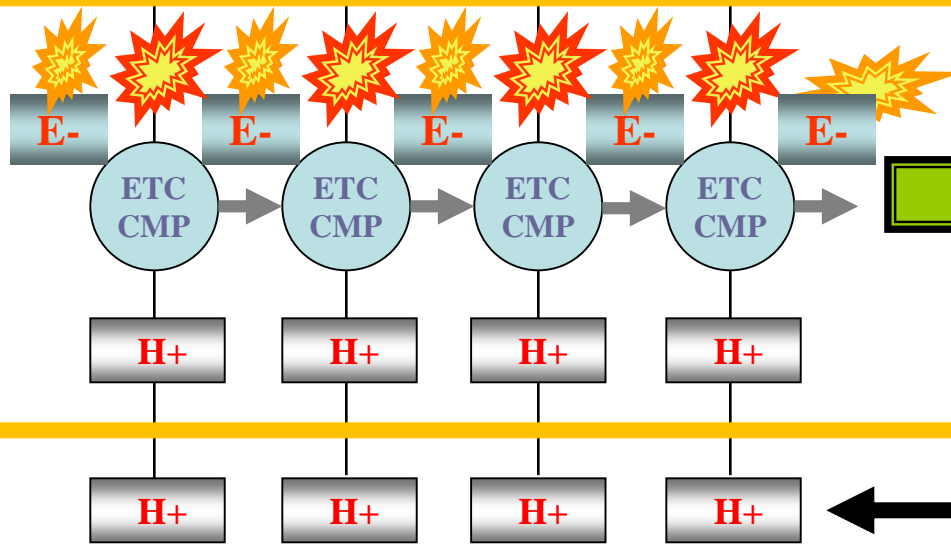
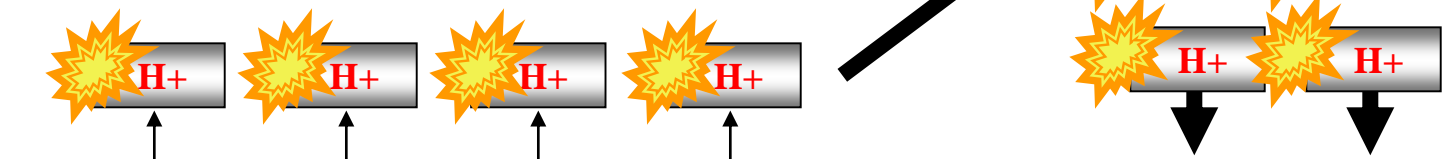
# CHEMIOSMOTIC PHOSPHORYLATION MODEL

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I

CHLOROPLAST THYLAKOID MEMBRANE

CHLOROPLAST STROMA

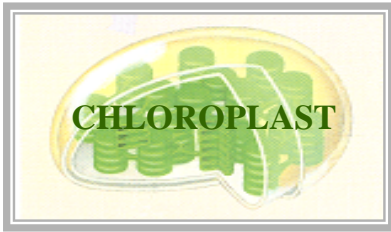


PHOSPHORYLATION



● = ELECTRON TRANSPORT CHAIN COMPONENT

★ = HEAT ENERGY    ★ = CHEMICAL ENERGY

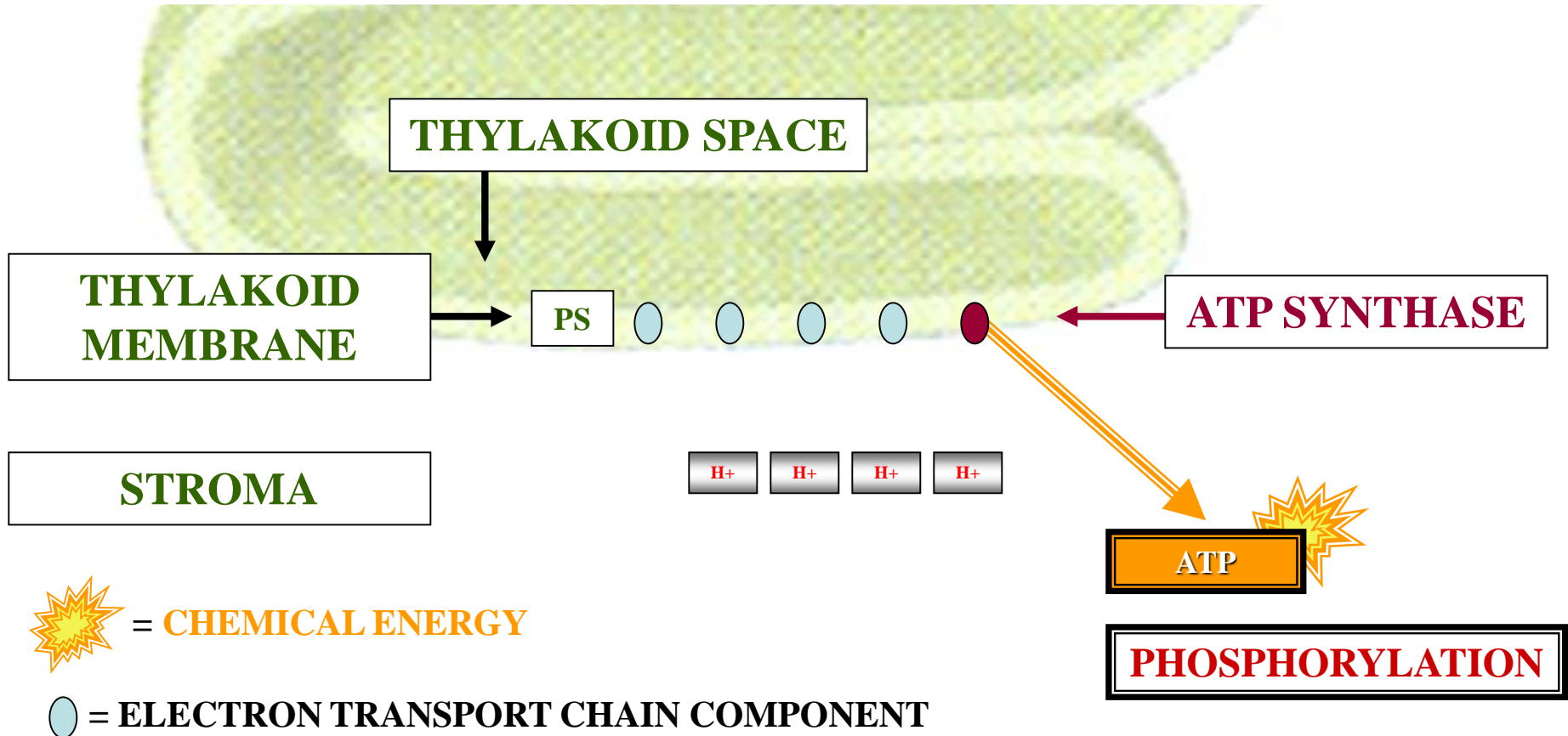


# CHLOROPLAST CHEMIOSMOTIC PHOSPHORYLATION



A

C





# CYCLIC P-P

**LIGHT ENERGY**

PS-I  
ANTENNA  
MOLECULES  
CHL A+B  
XANTHOPHYLLS  
CAROTENES

**LIGHT ENERGY**

PS-I  
RXT-CENTER  
CHL-A P700

“Q2”

ETC # 3

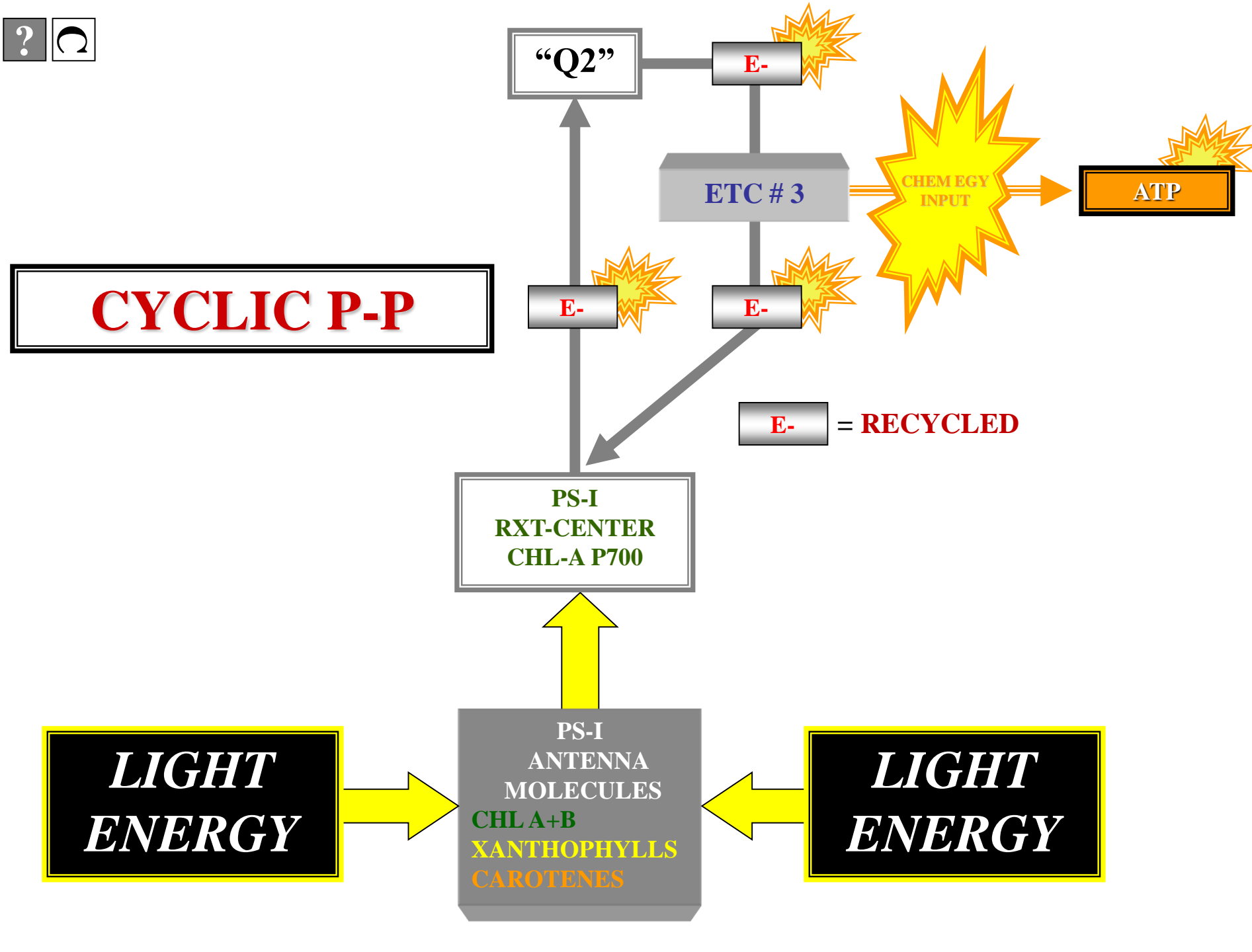
ATP

E-

E-

E- = RECYCLED

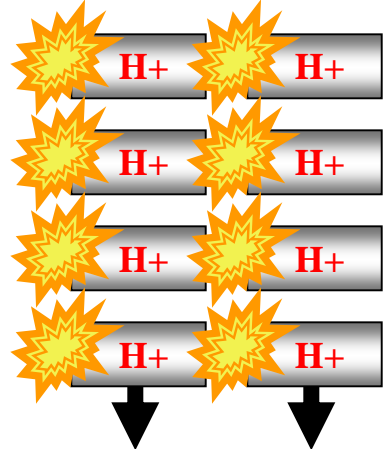
CHEM EGY  
INPUT



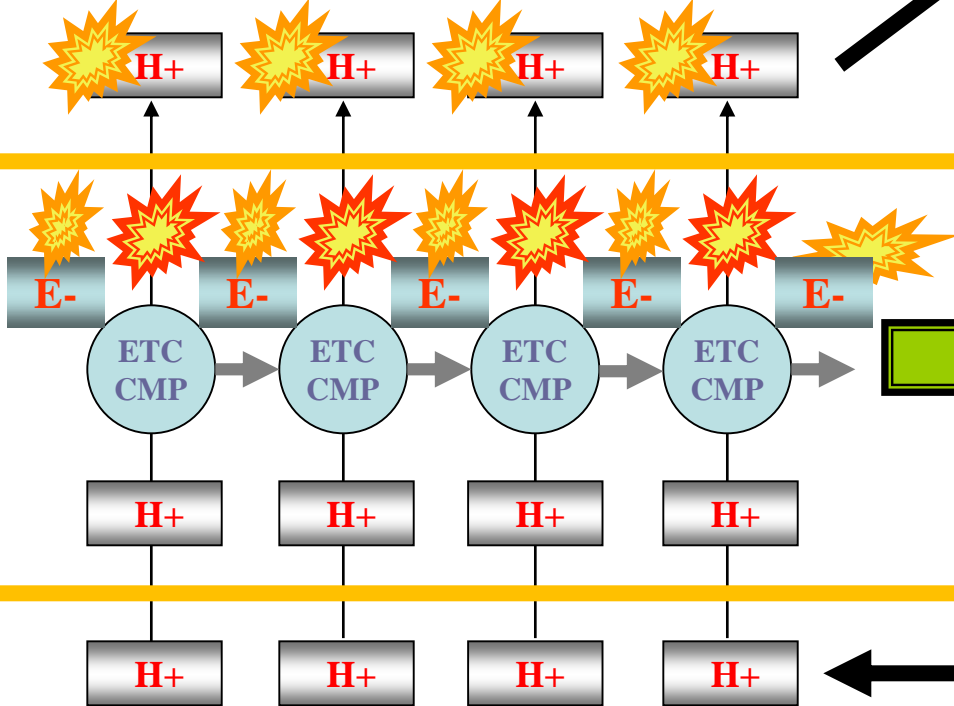




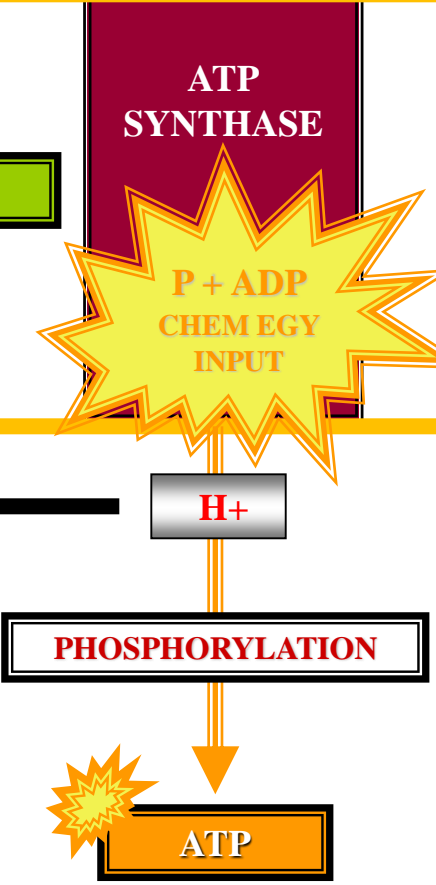
**CHLOROPLAST THYLAKOID SPACE**



**PS-II / PS-I**  
**CHLOROPLAST THYLAKOID MEMBRANE**



**CHLOROPLAST STROMA**



● = ELECTRON TRANSPORT CHAIN COMPONENT  
 ★ = HEAT ENERGY    ★ = CHEMICAL ENERGY

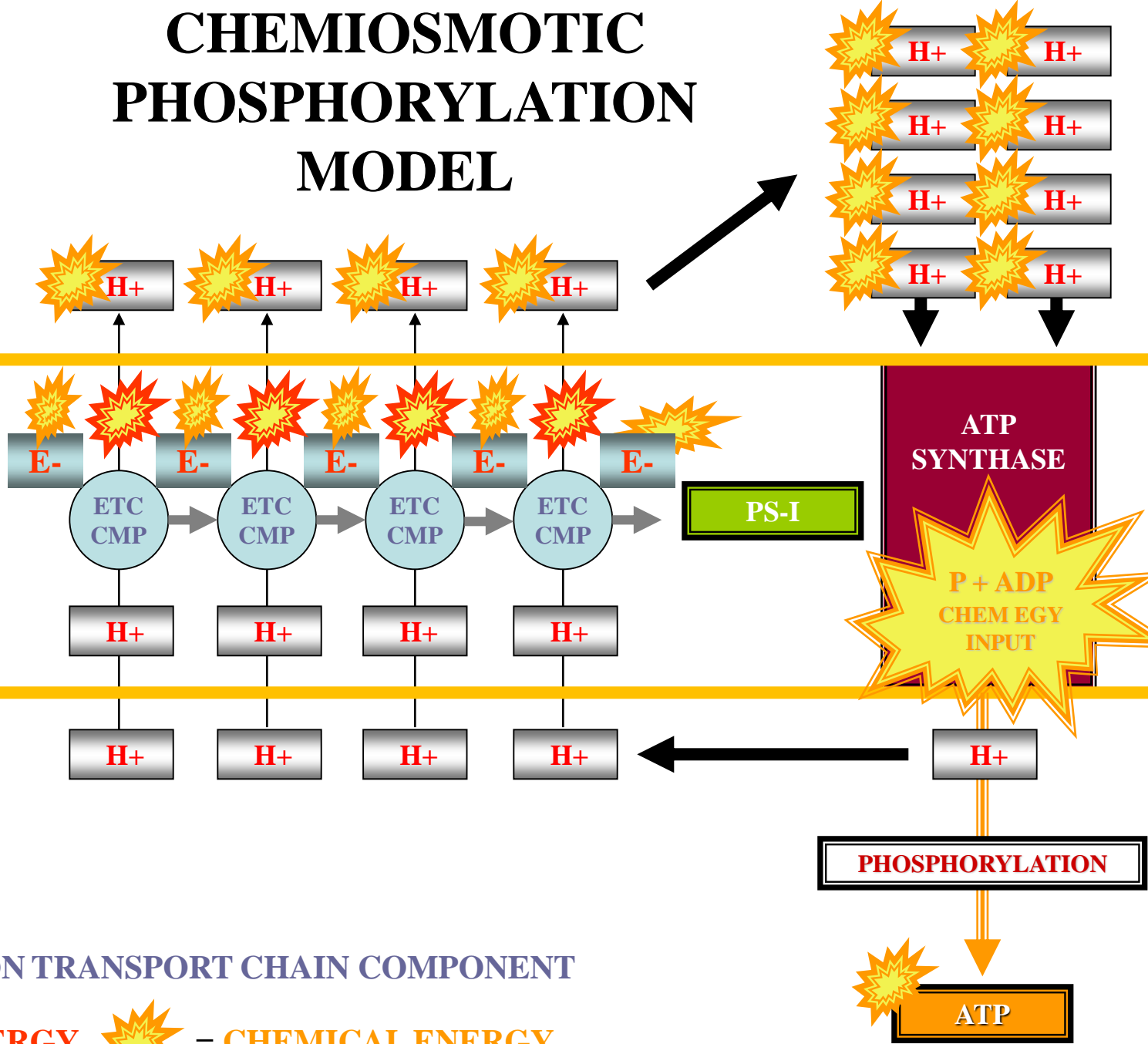
? A N

# CHEMIOSMOTIC PHOSPHORYLATION MODEL

CHLOROPLAST THYLAKOID SPACE

PS-II / PS-I  
CHLOROPLAST THYLAKOID MEMBRANE

CHLOROPLAST STROMA



● = ELECTRON TRANSPORT CHAIN COMPONENT

★ = HEAT ENERGY    ★ = CHEMICAL ENERGY

PHOSPHORYLATION

ATP

# PHOTOSYNTHESIS

A

N



WATER

**LIGHT ENERGY**

E-

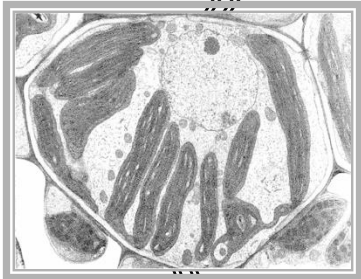
PHOTOLYSIS

LT RXT

THYLAKOID  
GRANUM

DK RXT

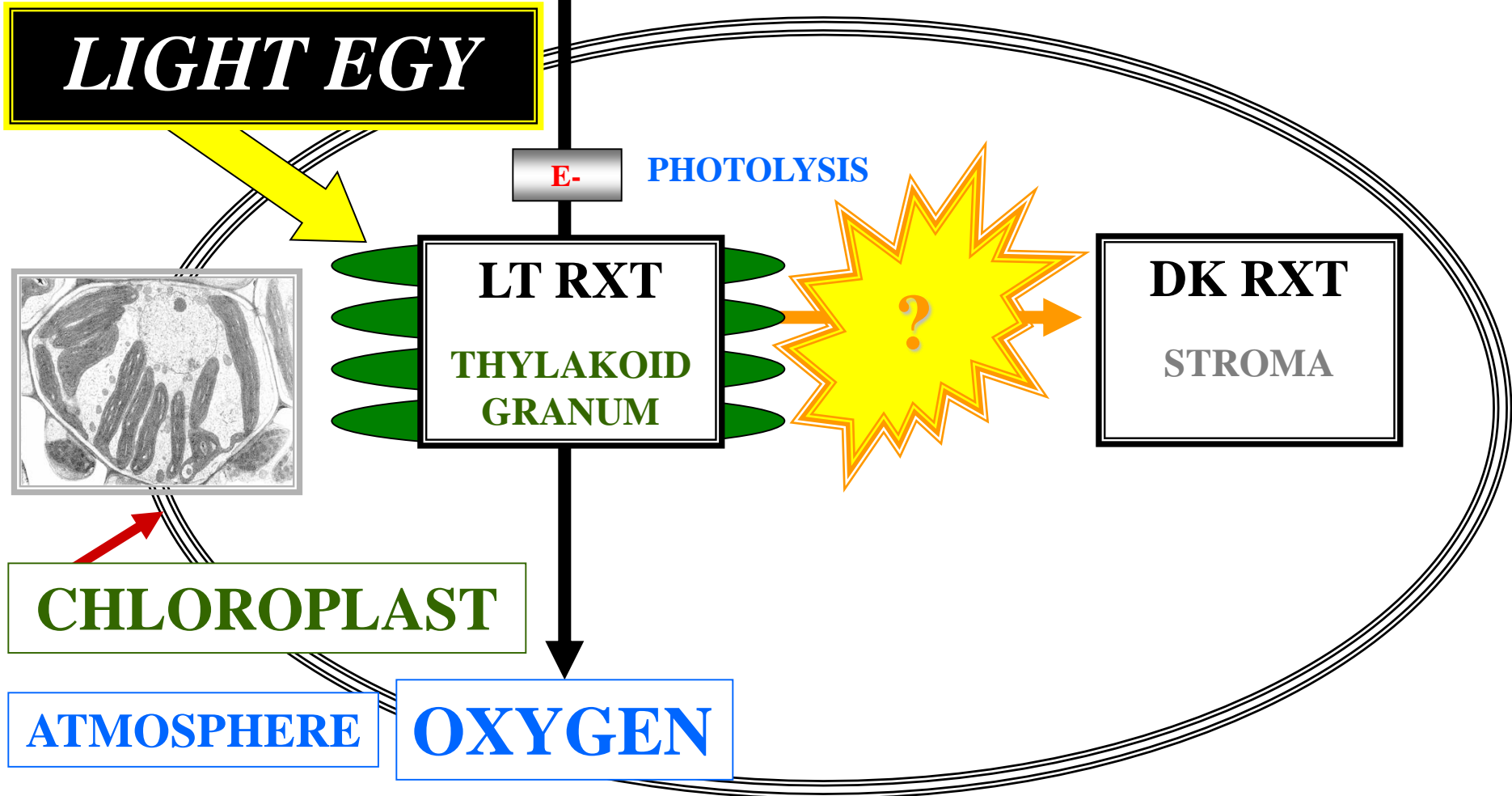
STROMA



CHLOROPLAST

ATMOSPHERE

OXYGEN



# PHOTOSYNTHESIS

N



WATER

**LIGHT ENERGY**

E-

PHOTOLYSIS

LT RXT

THYLAKOID  
GRANUM

DK RXT

STROMA

ATP

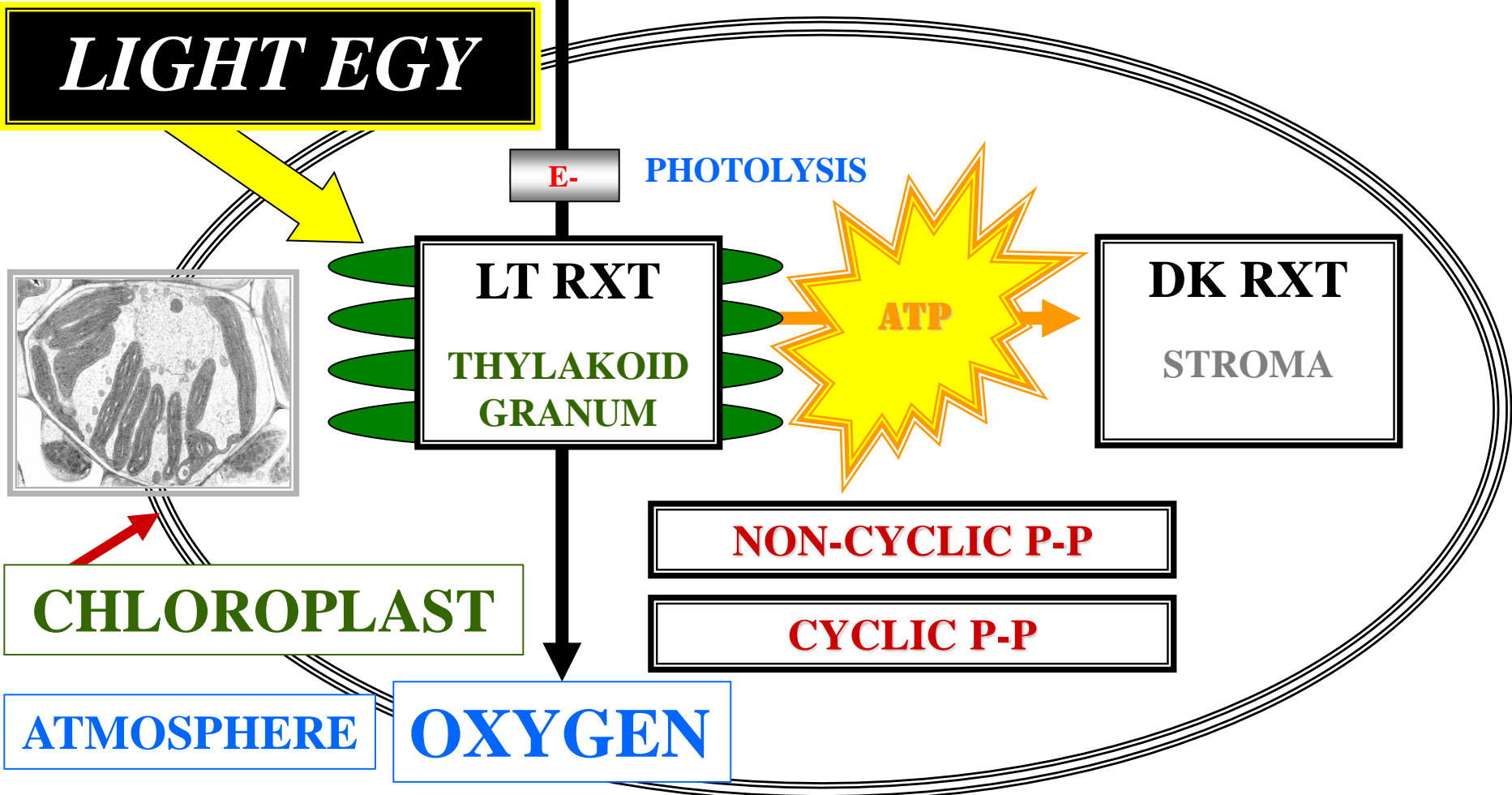
NON-CYCLIC P-P

CYCLIC P-P

CHLOROPLAST

ATMOSPHERE

OXYGEN







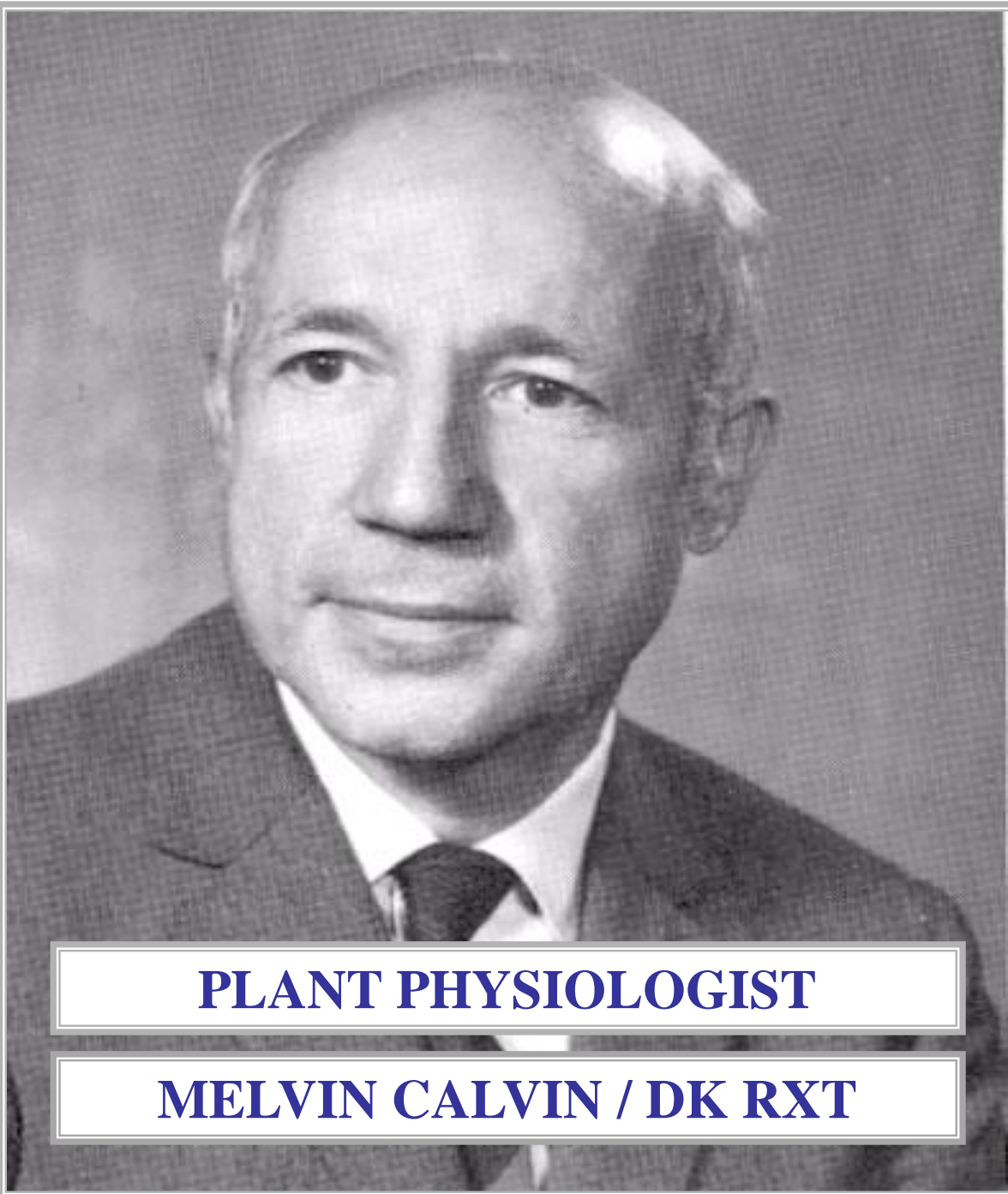
# DARK REACTION SPECIFICS





**DR**

+



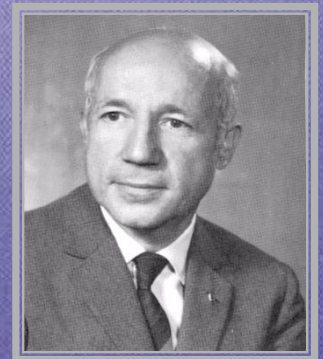
**PLANT PHYSIOLOGIST**

**MELVIN CALVIN / DK RXT**

# PHOTOSYNTHESIS

L

## DARK REACTION

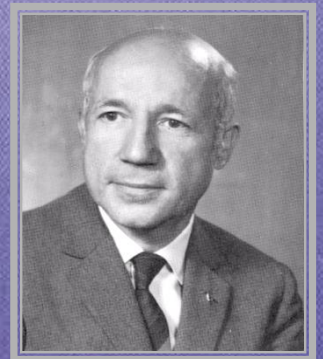




# PHOTOSYNTHESIS

S

**DARK RXT**  
**LIGHT**  
**INDEPENDENT**  
**REACTION**

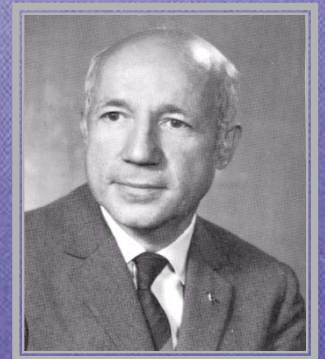




# PHOTOSYNTHESIS



## DARK RXT SYNTHESIS REACTION



# PHOTOSYNTHESIS

EZ



WATER

CO<sub>2</sub>

**LIGHT ENERGY**

**PHOTO**

ATMOSPHERE

E-

PHOTOLYSIS



LT RXT

THYLAKOID  
GRANUM

ATP  
NADPH

DK RXT

STROMA

CHLOROPLAST

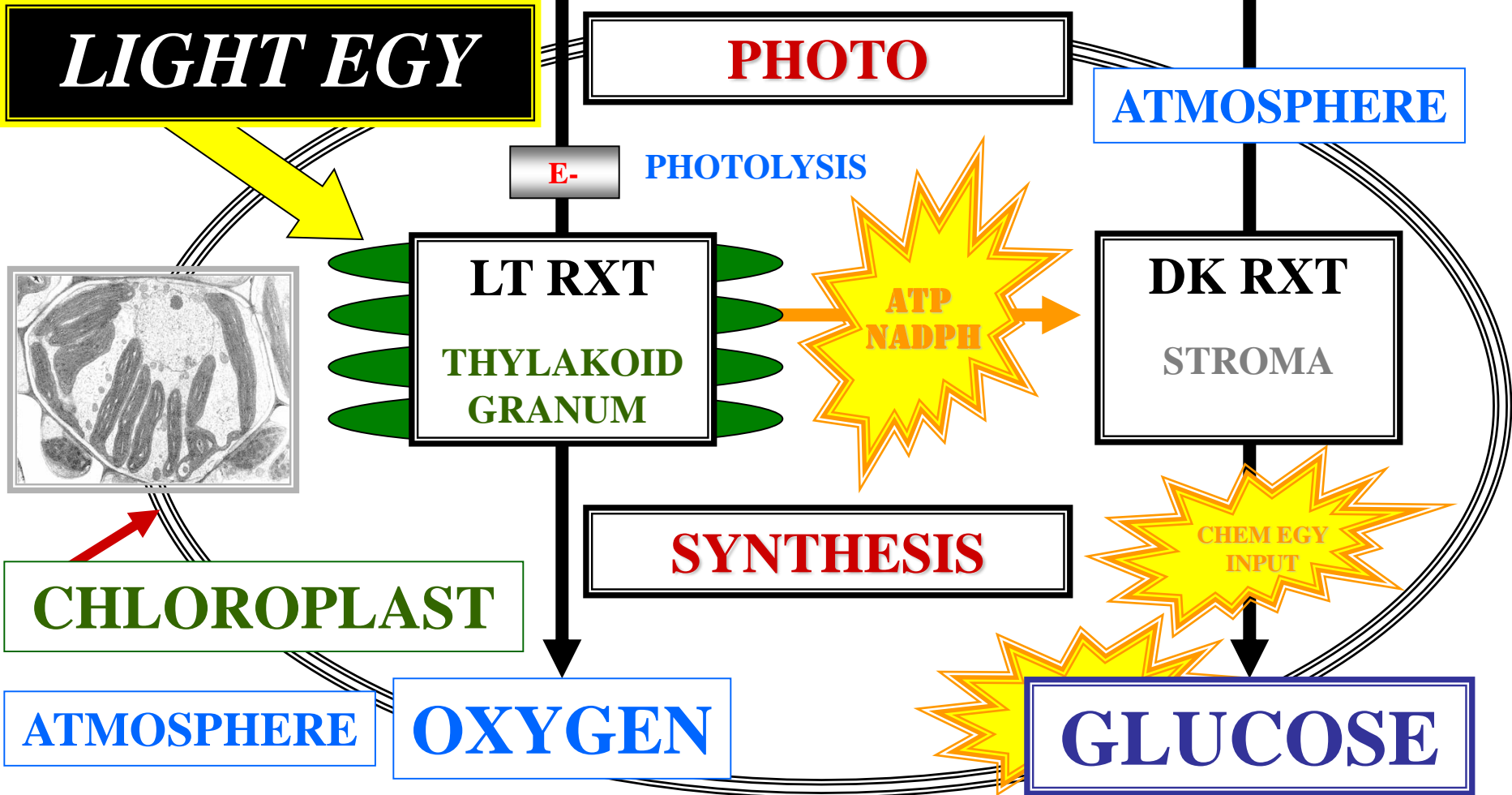
**SYNTHESIS**

CHEMICAL  
INPUT

ATMOSPHERE

OXYGEN

GLUCOSE

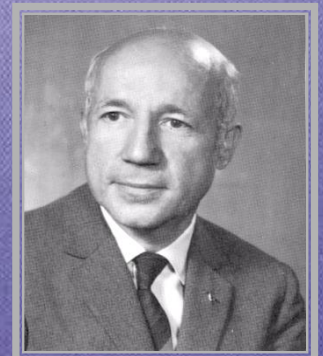




# PHOTOSYNTHESIS



**DARK RXT  
CONSISTS  
ENZYMATIC  
REACTIONS**

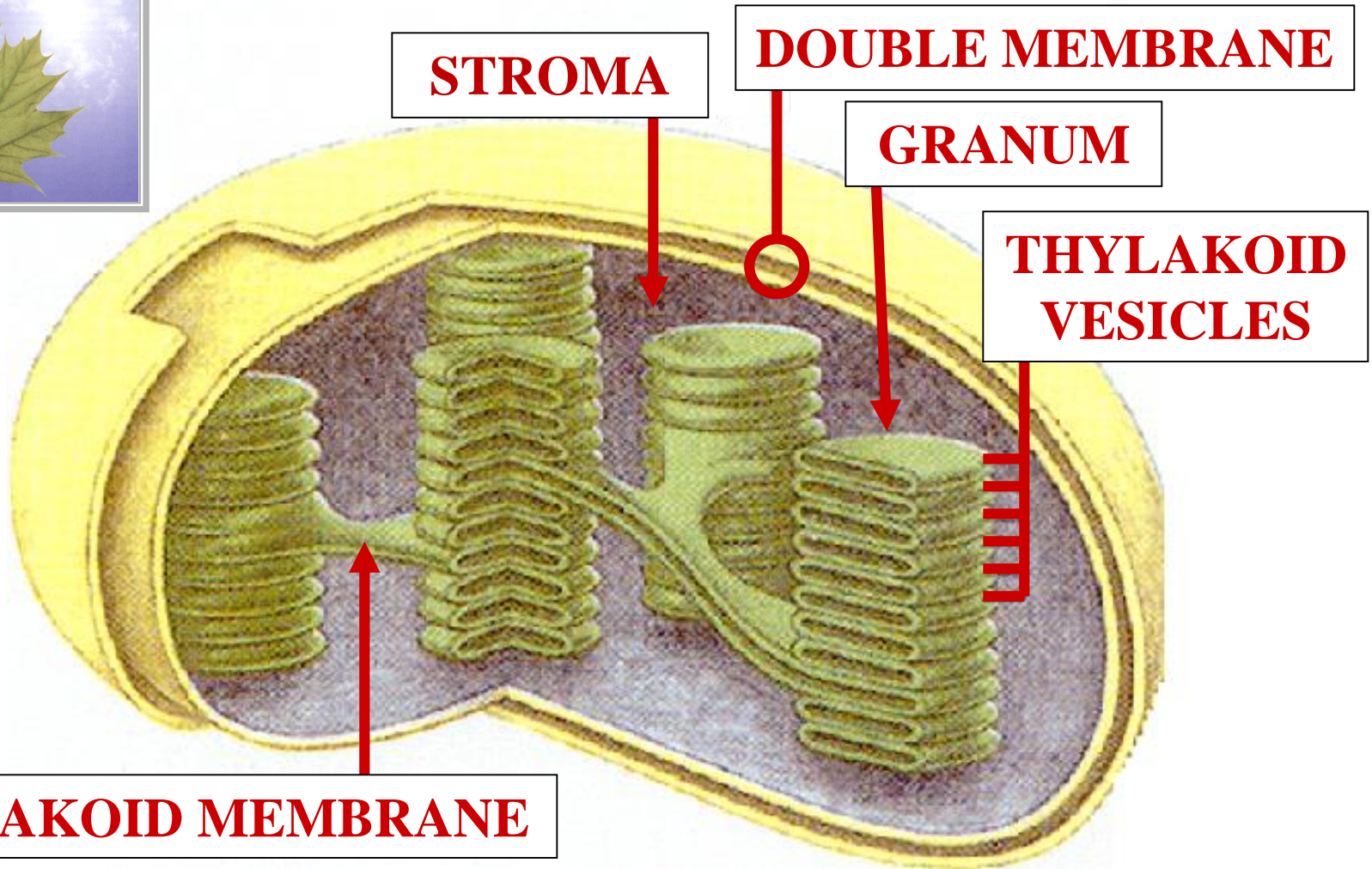




# CHLOROPLAST ULTRASTRUCTURE



S

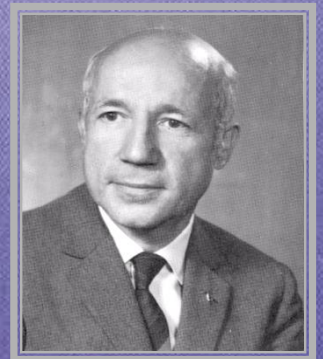




# PHOTOSYNTHESIS



**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**

**---**

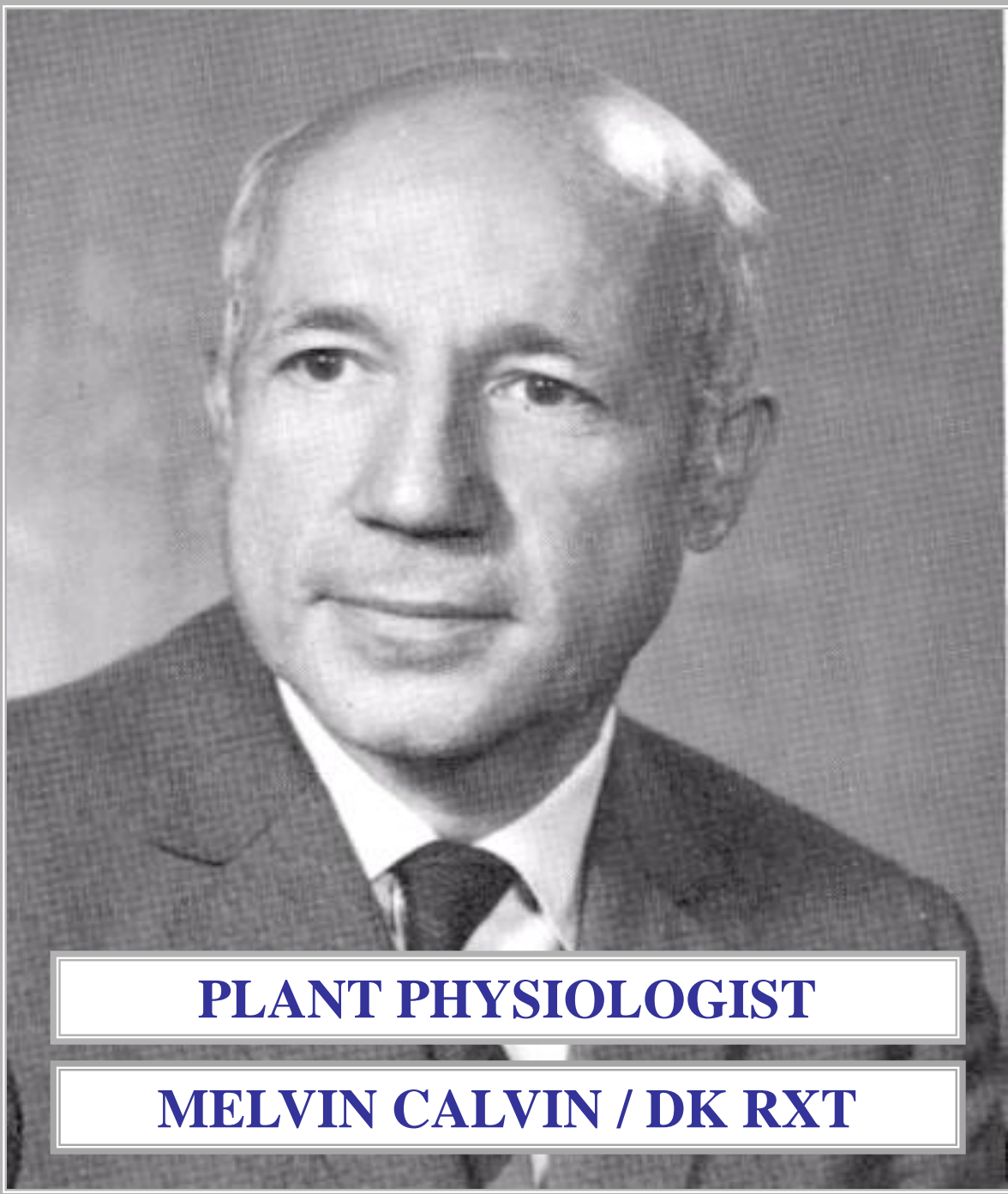
**CALVIN CYCLE**



**CALVIN CYCLE**

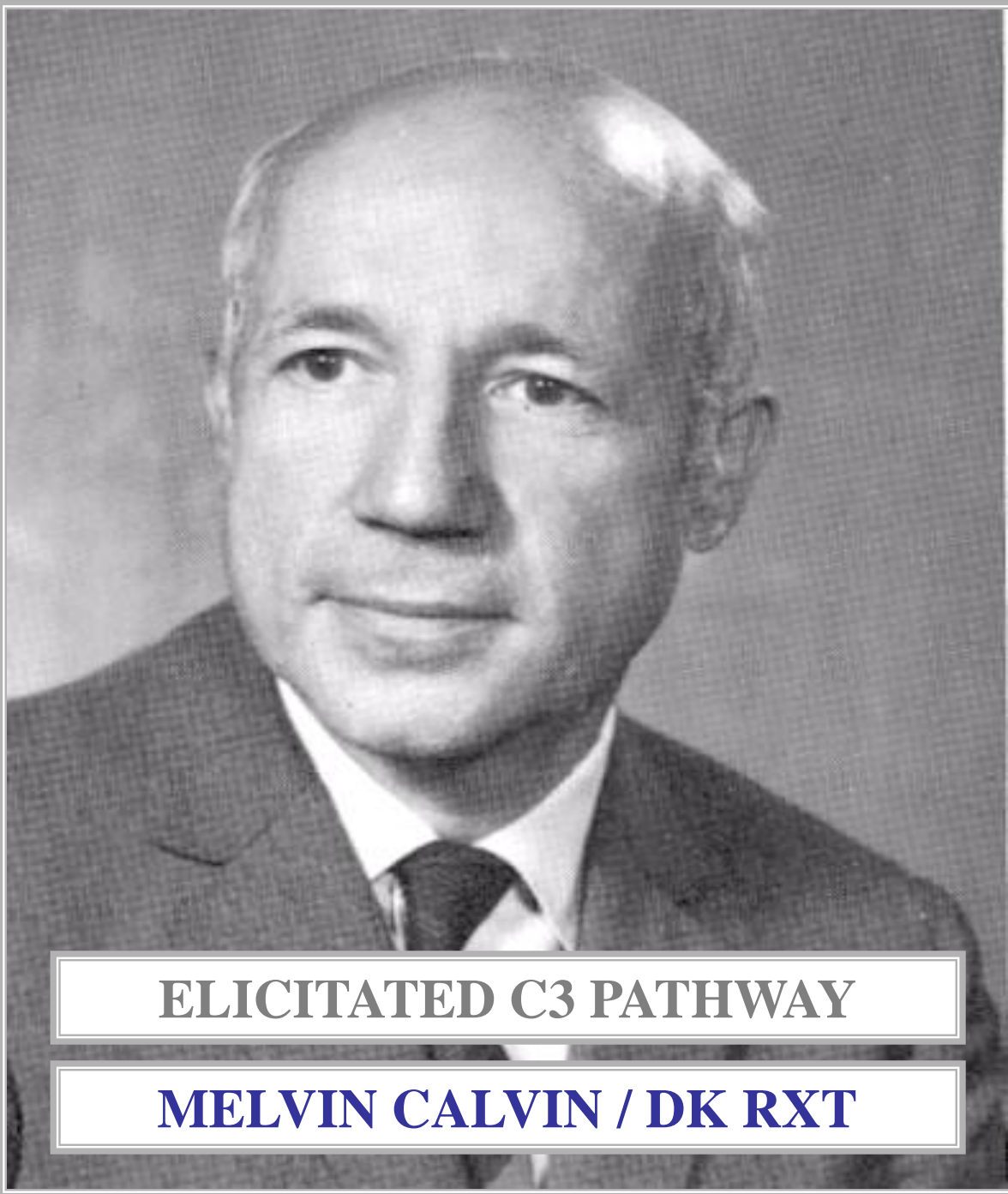
**SYNONYMOUS**

**C3 PATHWAY**



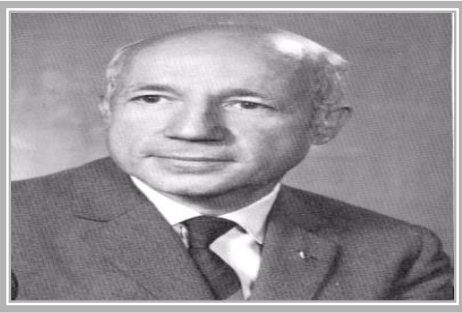
**PLANT PHYSIOLOGIST**

**MELVIN CALVIN / DK RXT**



**ELICITATED C3 PATHWAY**

**MELVIN CALVIN / DK RXT**



CO<sub>2</sub> + **RIBULOSE BIPHOSPHATE / (RUBP)**

**FEEDBACK**

**RIBULOSE BIPHOSPHATE  
CARBOXYLASE  
(RUBP-CARBOXYLASE)**



**PHOSPHOGLYCERATE / (PGA)**

**UNSTABLE 6C COMPOUND**

**PHOSPHOGLYCERATE / (PGA)**

**ATP**

**ATP**

**BIPHOSPHOGLYCERATE / (BIPGA)**

**BIPHOSPHOGLYCERATE / (BIPGA)**

**NADPH**

**NADPH**

**PHOSPHOGLYCERALDEHYDE / (PGAL)**

**PHOSPHOGLYCERALDEHYDE / (PGAL)**

**CHEM EGY  
INPUT**

**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

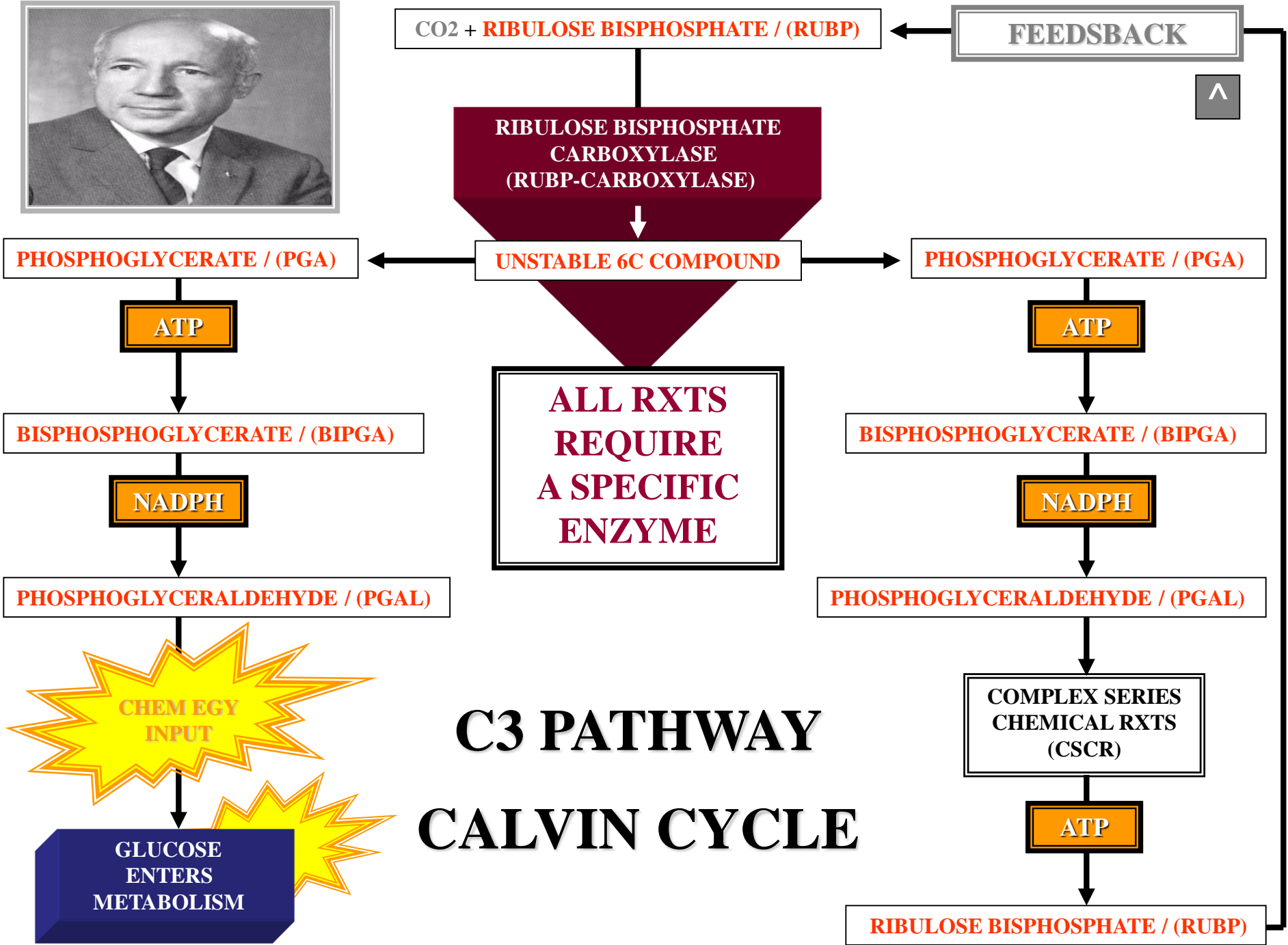
**COMPLEX SERIES  
CHEMICAL RXTS  
(CSCR)**

**GLUCOSE  
ENTERS  
METABOLISM**

**ATP**

# **C3 PATHWAY CALVIN CYCLE**

**RIBULOSE BIPHOSPHATE / (RUBP)**



**C3**  
**PATHWAY**  
**ACRONYMS**



# **C3 ACRONYMS**

**RUBP = RIBULOSE BISPHOSPHATE**

**C3 ACRONYMS**

# **C3 ACRONYMS**

**RUBP = RIBULOSE BISPHOSPHATE**

**PGA = PHOSPHOGLYCERATE**

**C3 ACRONYMS**

# C3 ACRONYMS

**RUBP = RIBULOSE BISPHTOSPHATE**

**PGA = PHOSPHOGLYCERATE**

**BIPGA = BISPHTOSPHOGLYCERATE**

# C3 ACRONYMS

# C3 ACRONYMS

RUBP = RIBULOSE BISPHTOSPHATE

PGA = PHOSPHOGLYCERATE

BIPGA = BISPHTOSPHOGLYCERATE

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**