AM

+

ANTENNA MOLECULES

ABSORB LIGHT ENERGY

→

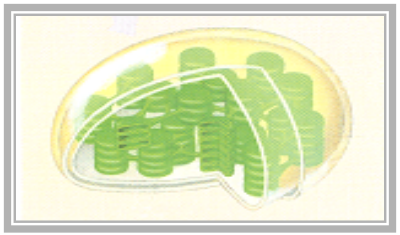
REACTION CENTER

ANTENNA MOLECULES

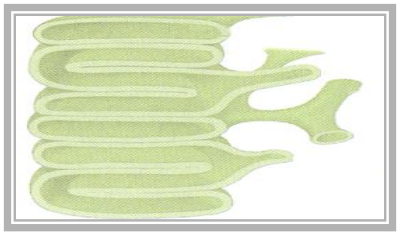
CHLOROPLAST

PS-II

THYLAKOID



ANTENNA MOLECULES



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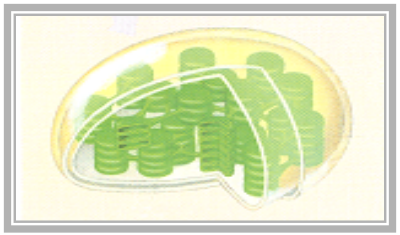
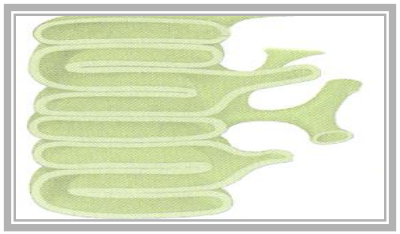
CHLOROPLAST

PS-II

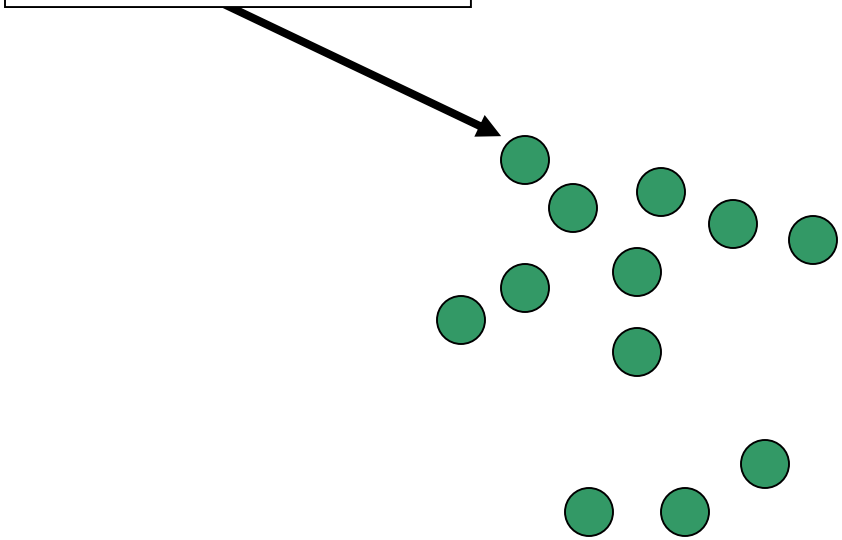
THYLAKOID



ANTENNA MOLECULES



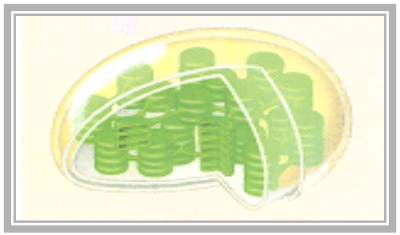
CHLOROPHYLL A



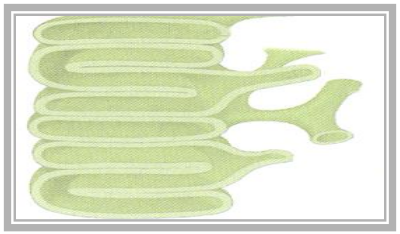
CHLOROPLAST

PS-II

THYLAKOID

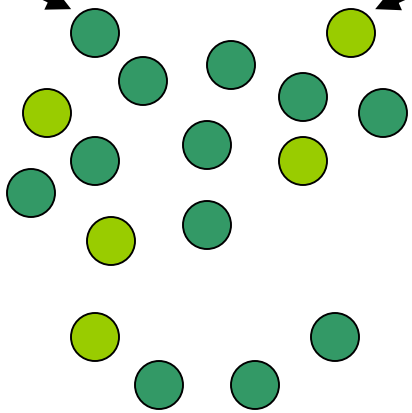


ANTENNA MOLECULES



CHLOROPHYLL A

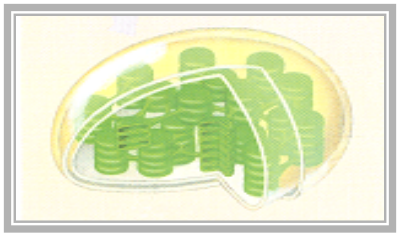
CHLOROPHYLL B



CHLOROPLAST

PS-II

THYLAKOID



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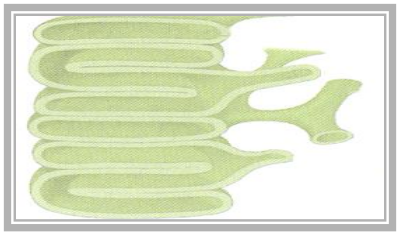
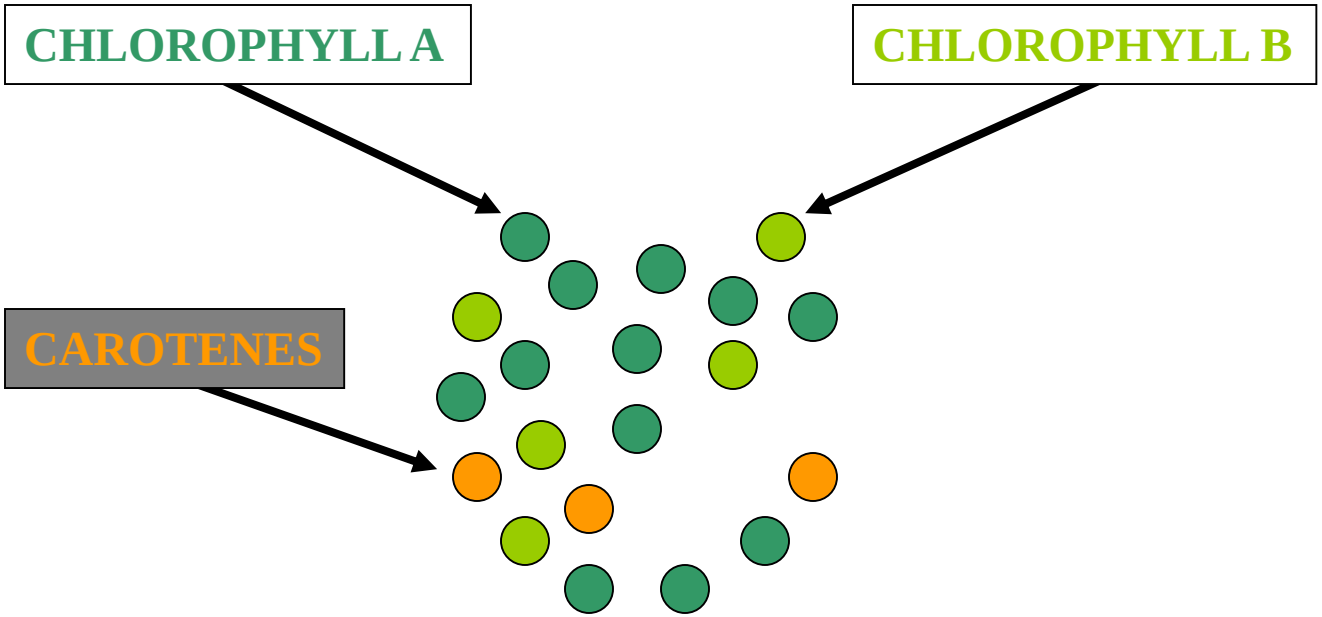
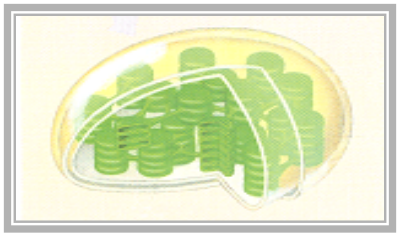




CHLOROPLAST

PS-II

THYLAKOID



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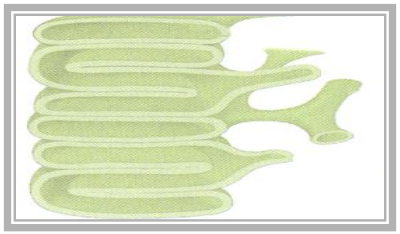
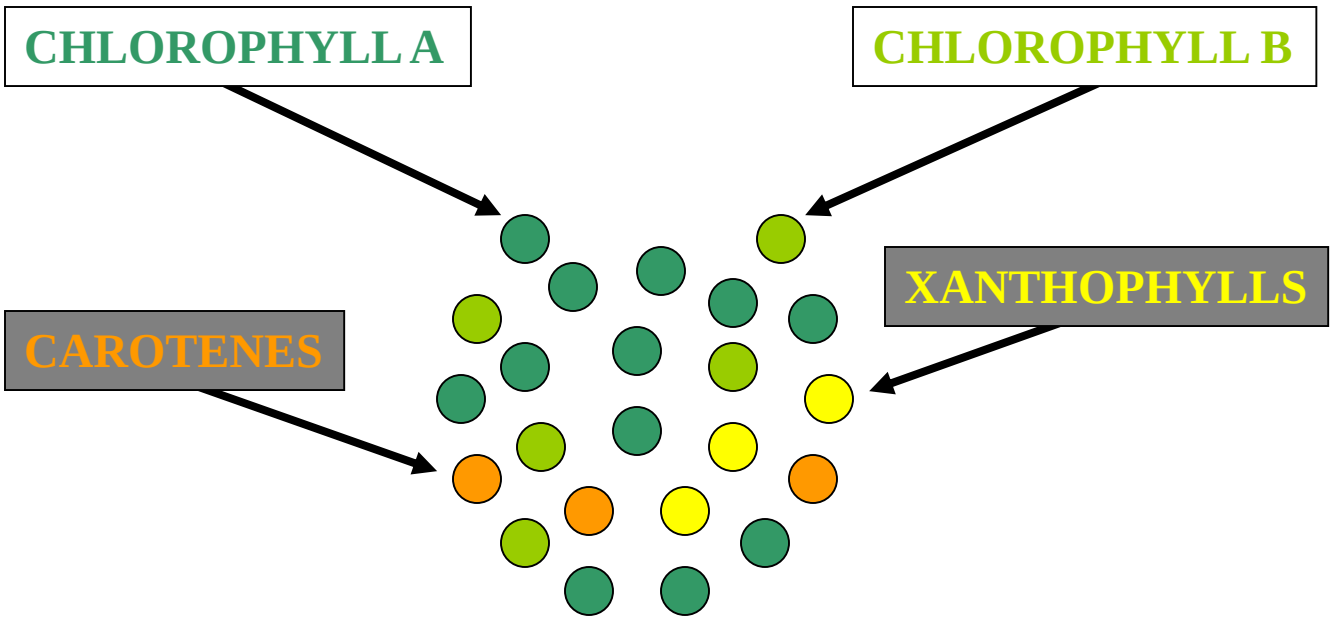
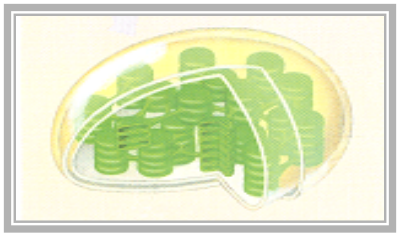




CHLOROPLAST

PS-II

THYLAKOID



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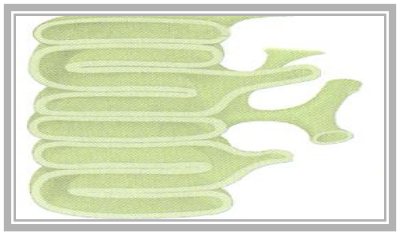
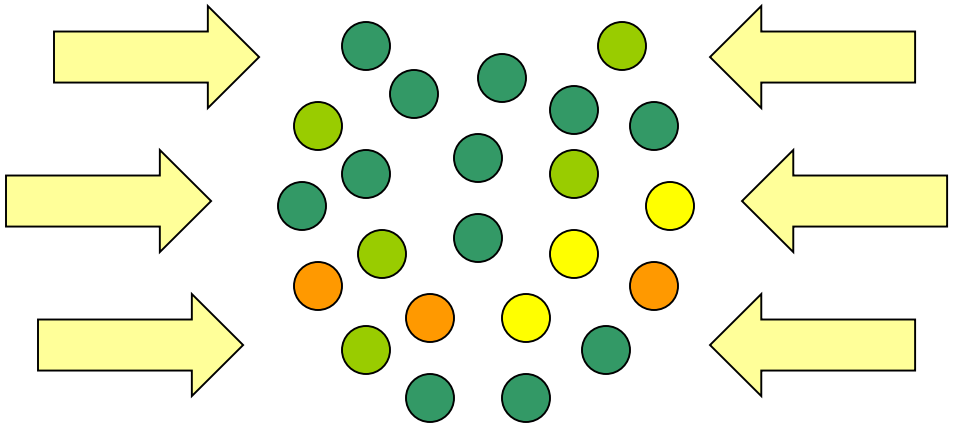


LT EGY

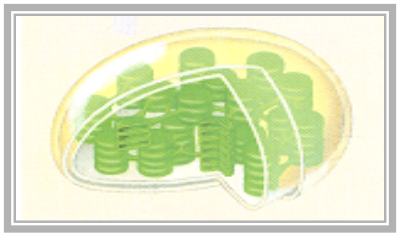


LT EGY

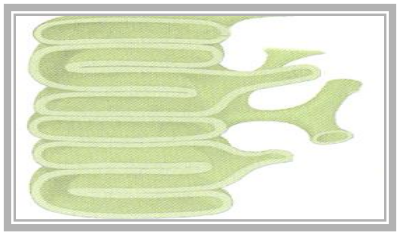
CHLOROPLAST

PS-II

THYLAKOID



ANTENNA MOLECULES



R

LT EGY

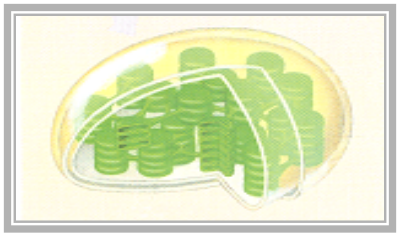
LT EGY

LT EGY

CHLOROPLAST

PS-II

THYLAKOID



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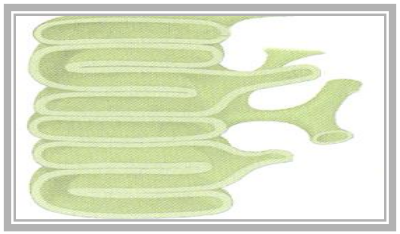
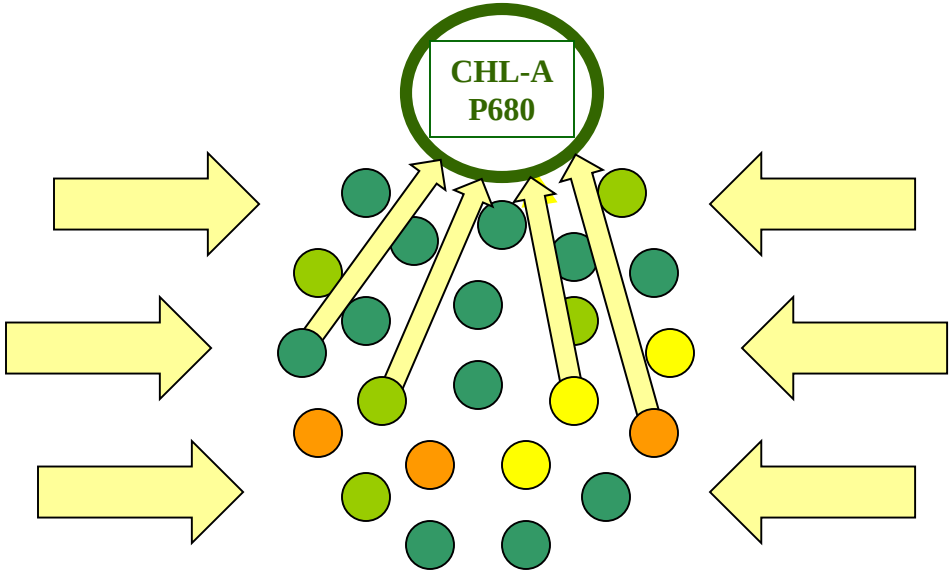


R

REACTION CENTER

LT EGY



LT EGY

REACTION CENTER PS-II

REACTION CENTER PS-II

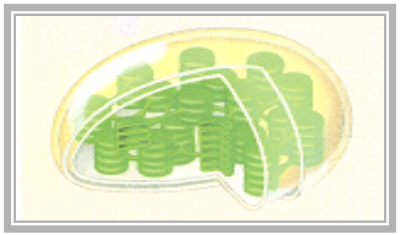
CHL A/PROTEIN COMPLEX
PIGMENT 680
P680

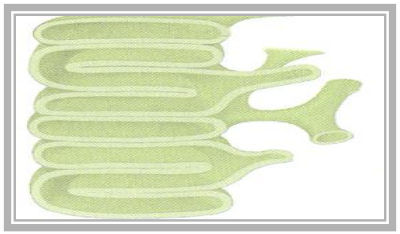
REACTION CENTER PS-II

CHLOROPLAST

PS-II

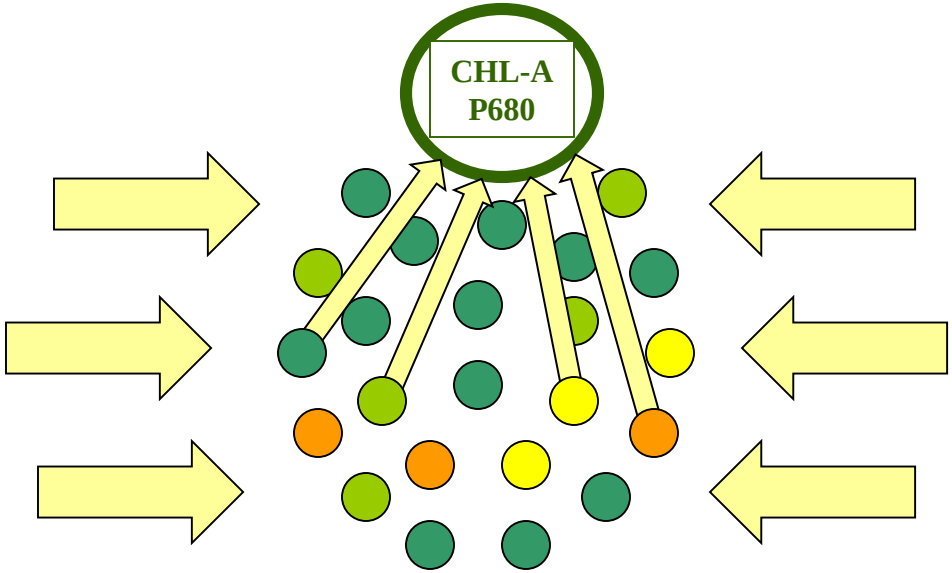
THYLAKOID





Mg

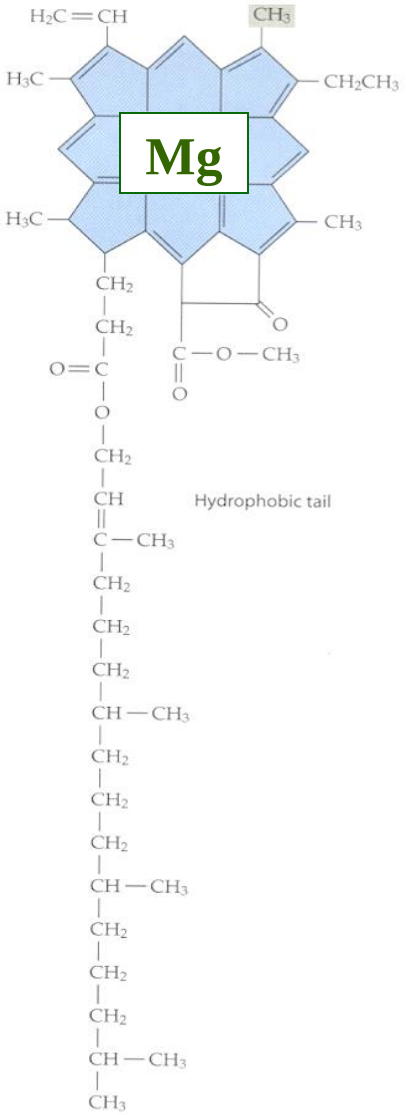
REACTION CENTER



LT EGY

LT EGY

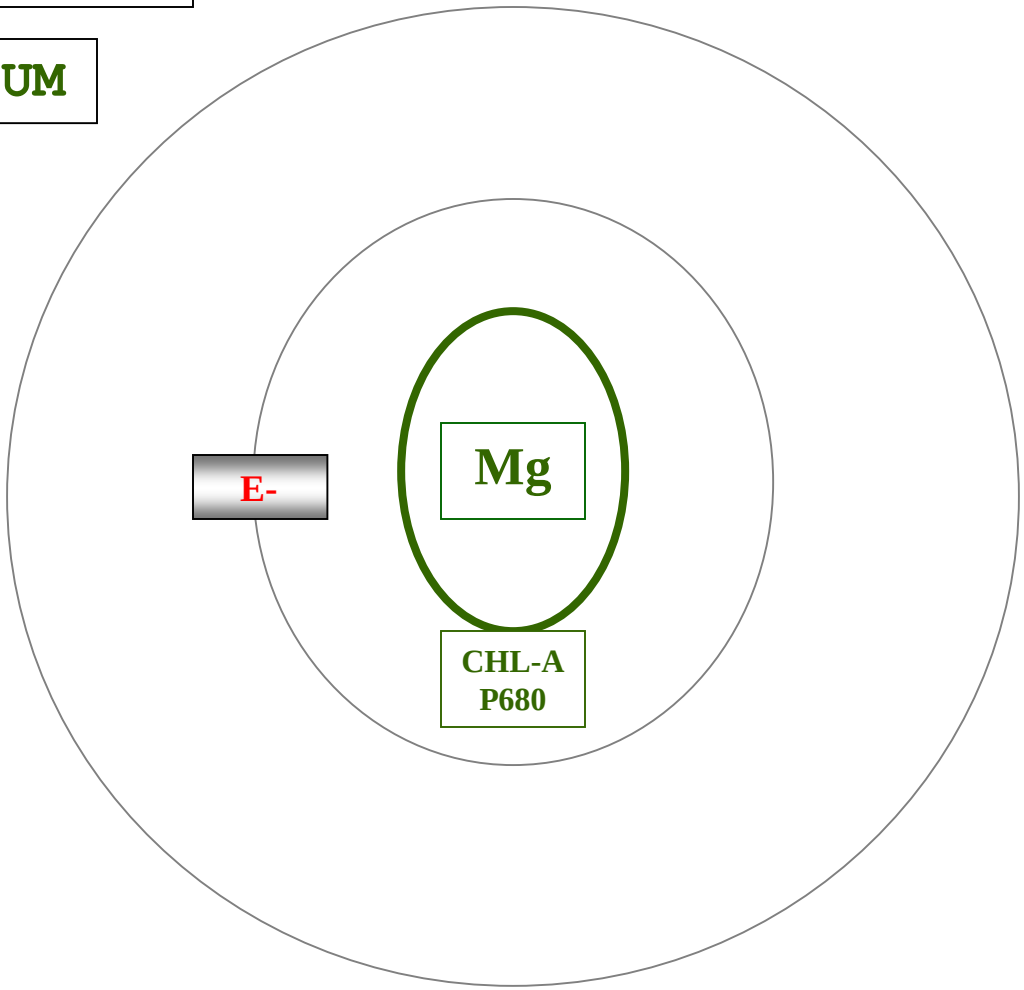
RXT CENTER
CHL-A / PROTEIN COMPLEX = P680
Mg E- ENERGIZED



Mg = MAGNESIUM

REACTION CENTER

Mg = MAGNESIUM



ANTENNA MOLECULES

CHL-A

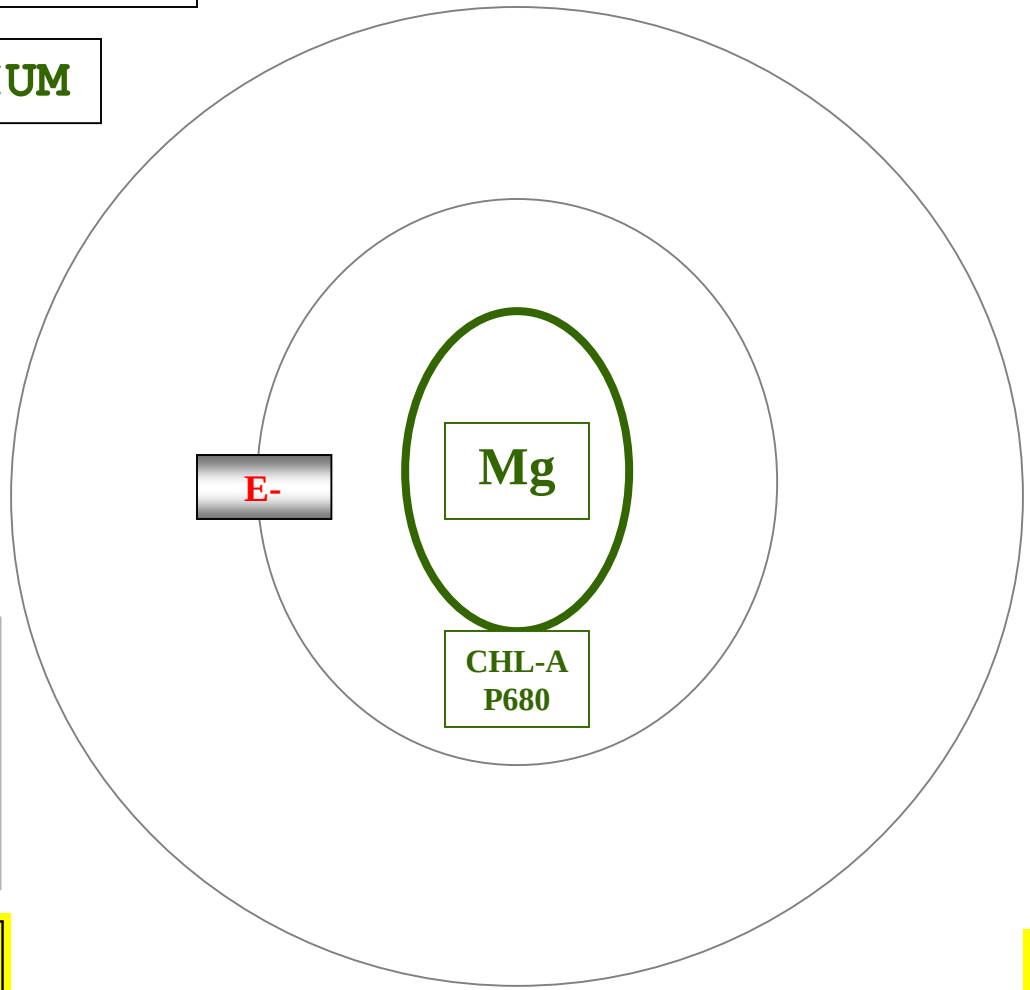
CHL-B

CAROTENES

XANYHOPHYLLS

REACTION CENTER

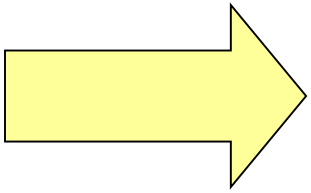
Mg = MAGNESIUM

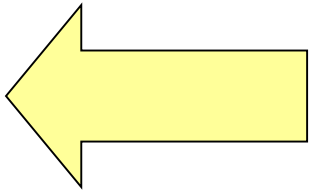


LT EGY

LT EGY

ANTENNA MOLECULES





REACTION CENTER

Mg = MAGNESIUM

E-

LT EGY

LT EGY

E-

Mg

CHL-A
P680

CHL-A

CHL-B

CAROTENES

XANYHOPHYLLS

REACTION CENTER

Mg = MAGNESIUM

E-

ENERGIZED E-

E-

Mg

CHL-A
P680

LT EGY

LT EGY

CHL-A

CHL-B

CAROTENES

XANYHOPHYLLS

REACTION CENTER

Mg = MAGNESIUM

E-

ENERGIZED E-

Mg

CHL-A
P680

ANTENNA MOLECULES

CHL-A

CHL-B

CAROTENES

XANYHOPHYLLS

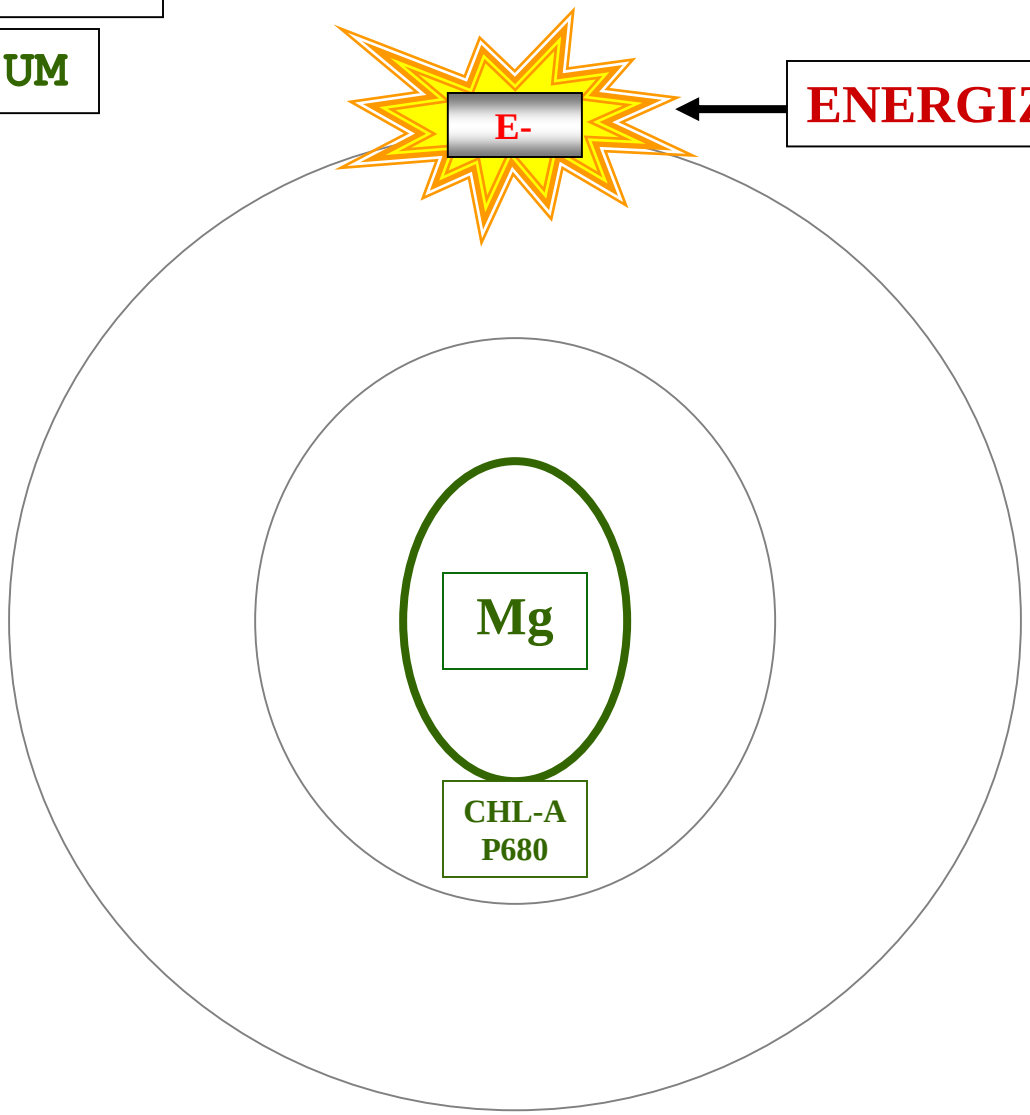
ENERGIZED E-POSSIBLE ENERGY ROUTES

E- ACCEPTOR ABSENT

REACTION CENTER

Mg = MAGNESIUM

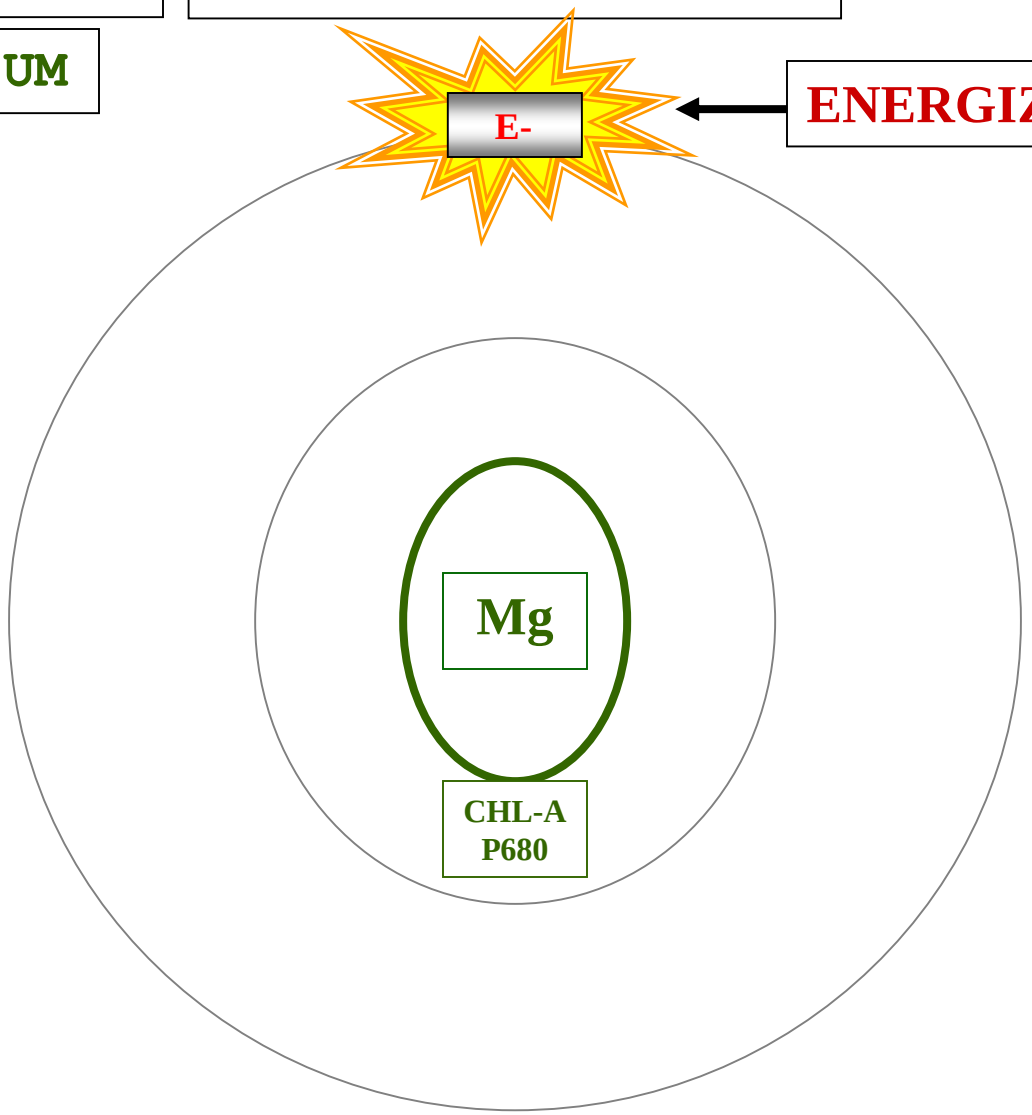
AB



REACTION CENTER

Mg = MAGNESIUM

E- ACCEPTOR: ABSENT

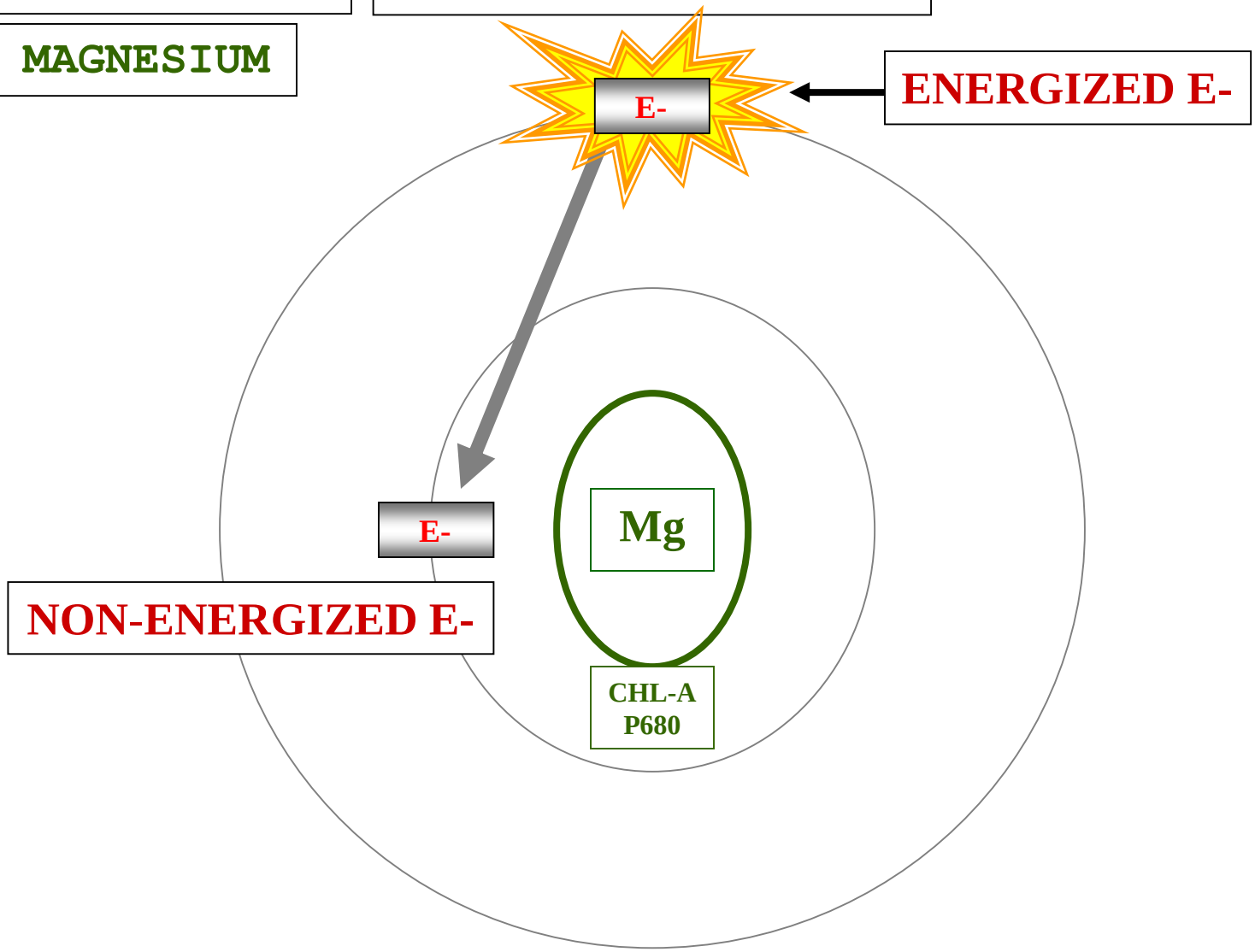


REACTION CENTER

E- ACCEPTOR: ABSENT

?

Mg = MAGNESIUM

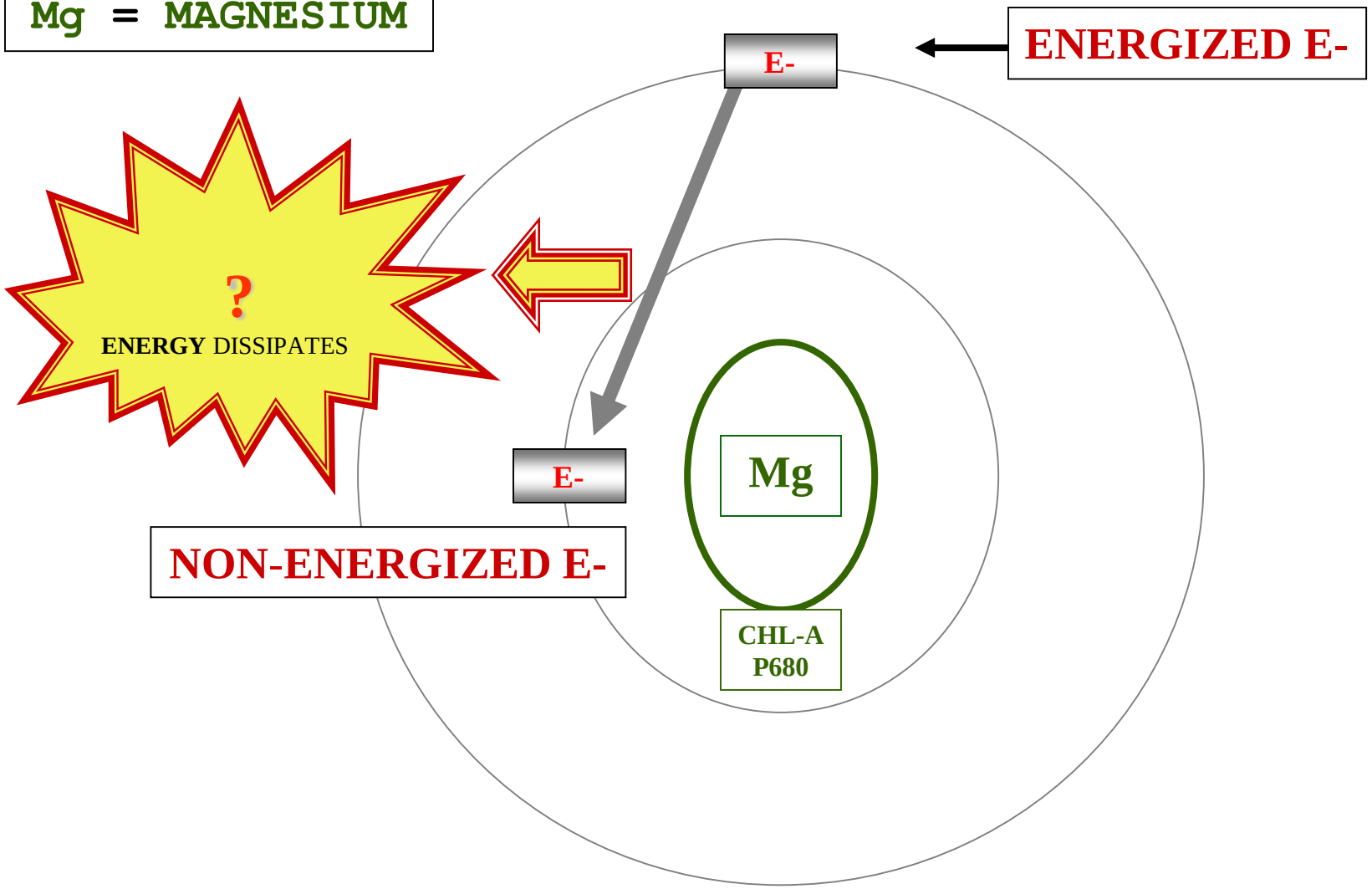


REACTION CENTER

E- ACCEPTOR: ABSENT

H

Mg = MAGNESIUM

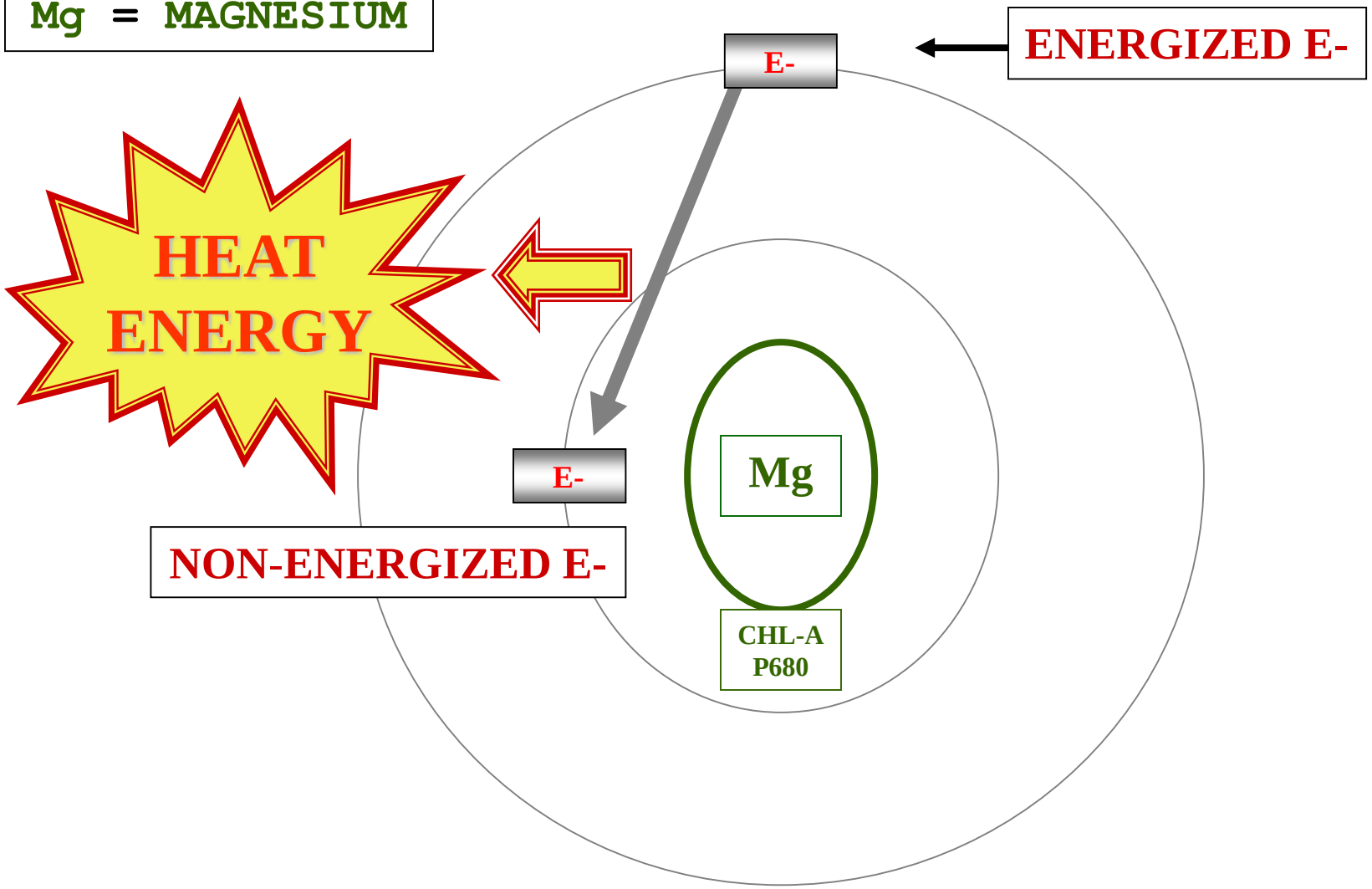


REACTION CENTER

E- ACCEPTOR: ABSENT

>

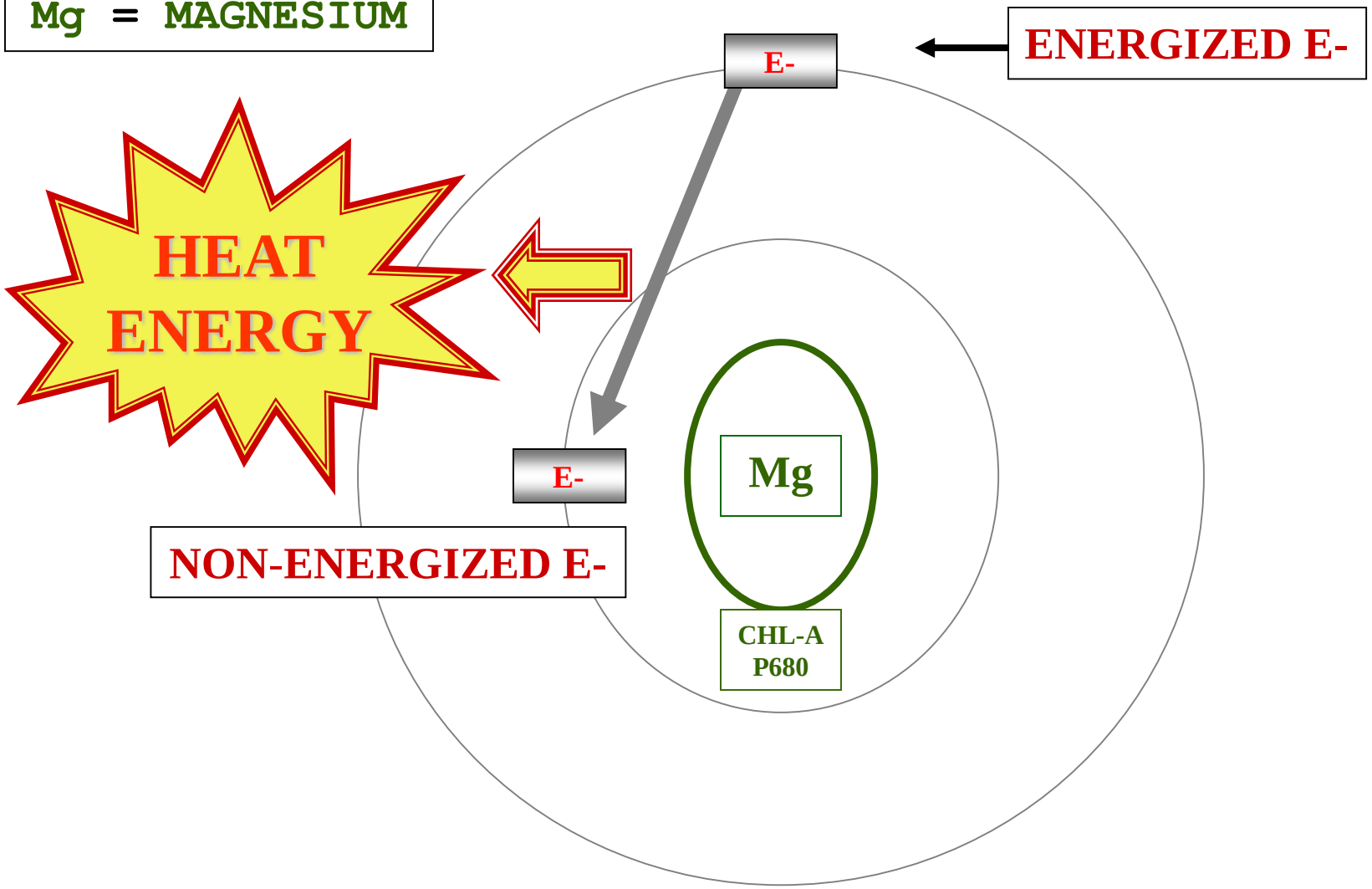
Mg = MAGNESIUM



REACTION CENTER

E- ACCEPTOR: ABSENT

Mg = MAGNESIUM



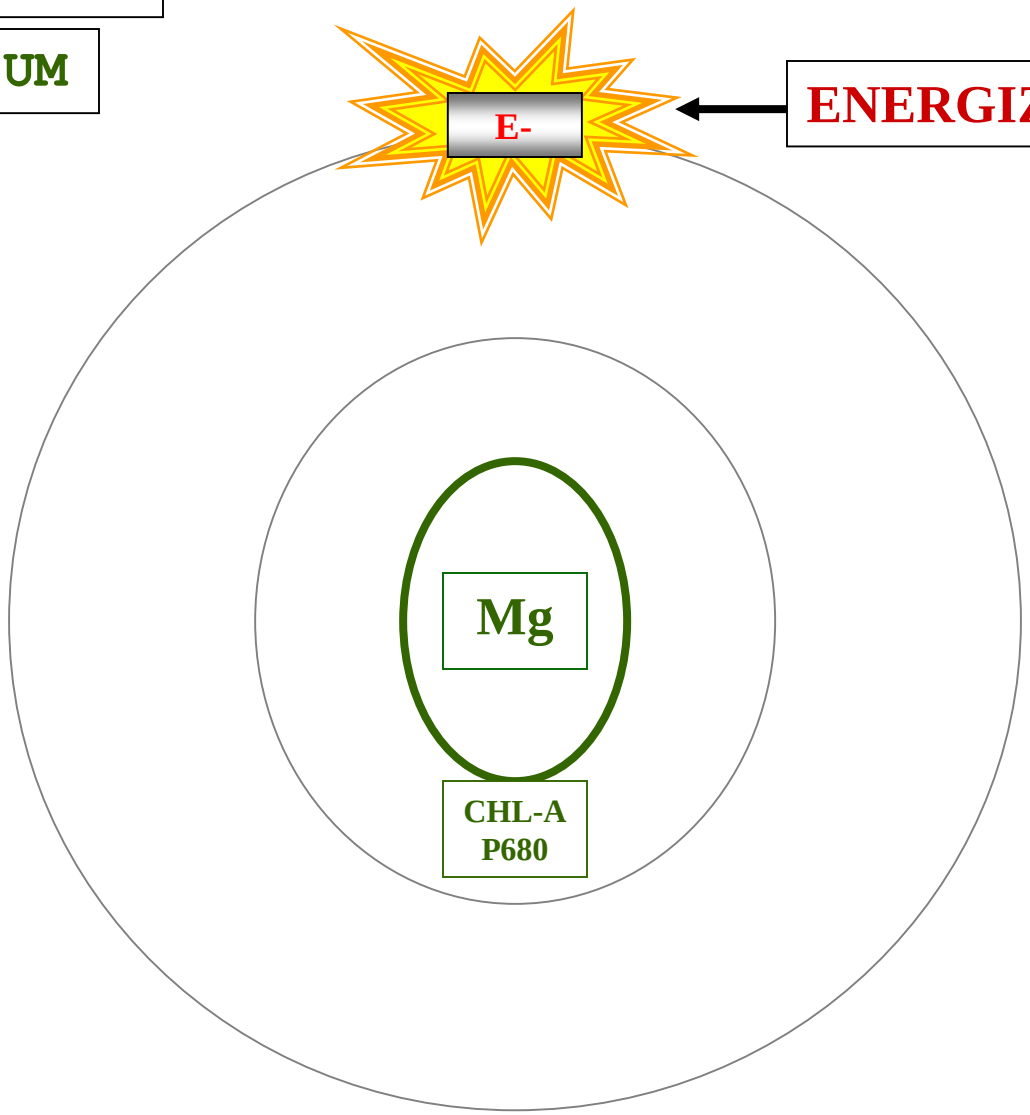
DOES NOT OCCUR DURING PSYN

E- ACCEPTOR PRESENT

REACTION CENTER

Mg = MAGNESIUM

PR

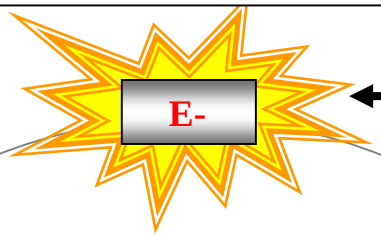


REACTION CENTER

E- ACCEPTOR: PRESENT

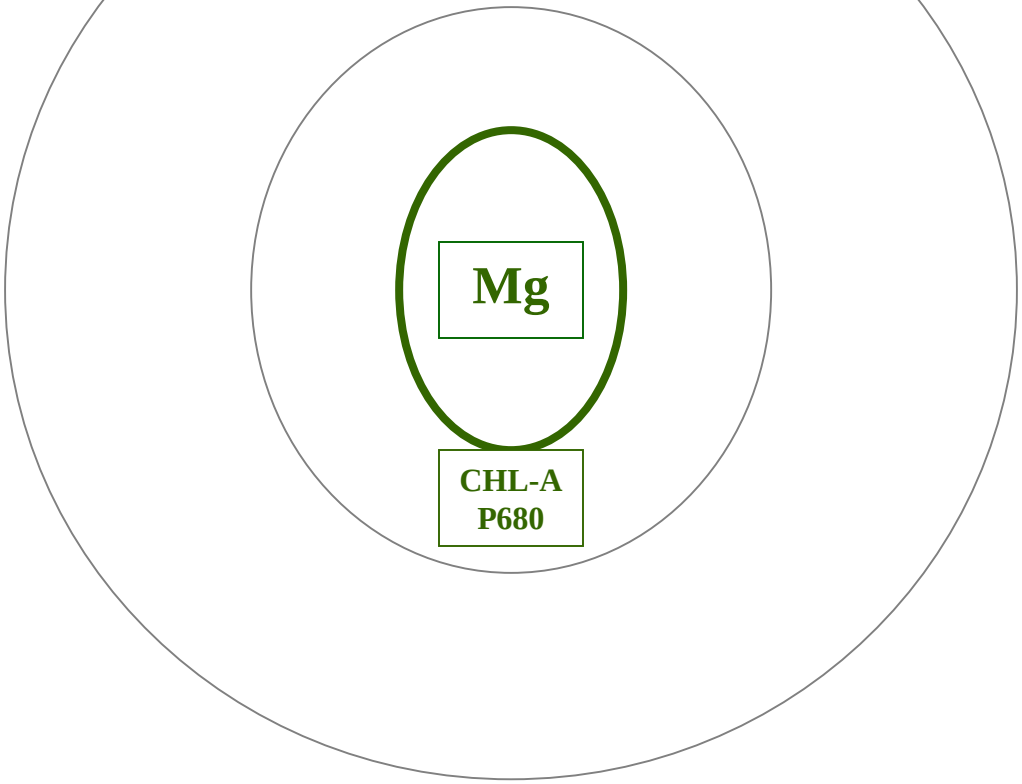
LT

Mg = MAGNESIUM



ENERGIZED E-

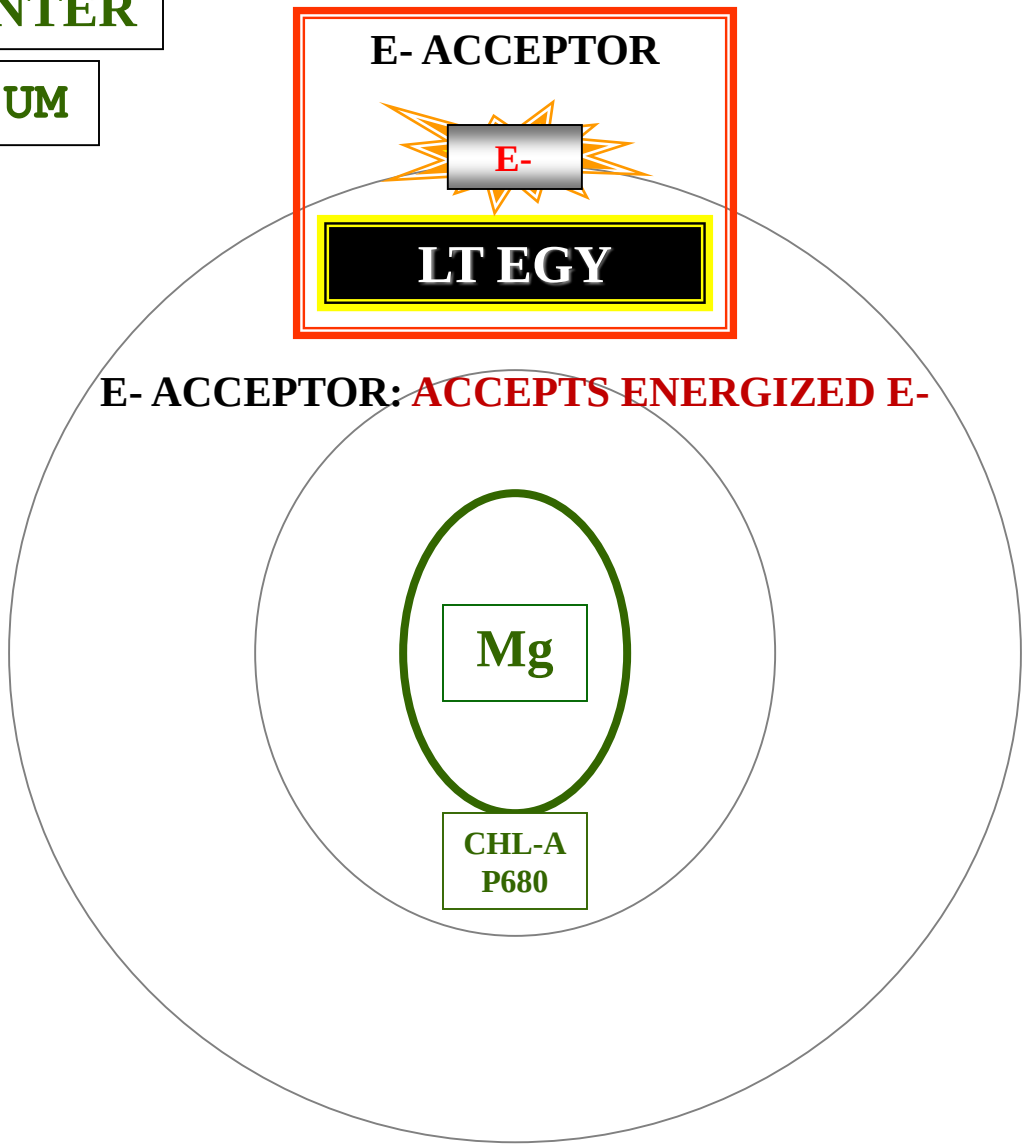
E- ACCEPTOR: ACCEPTS ENERGIZED E-



C

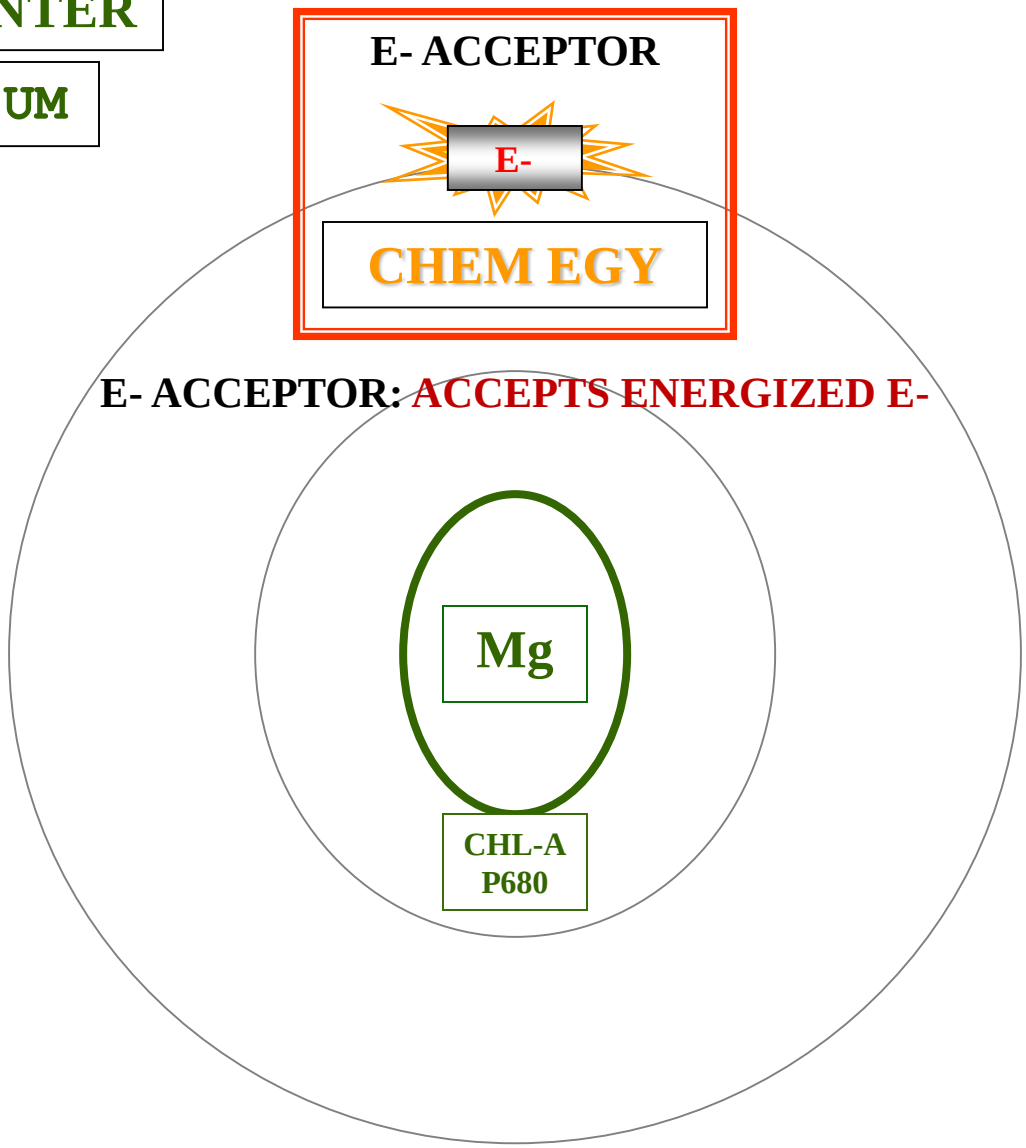
REACTION CENTER

Mg = MAGNESIUM



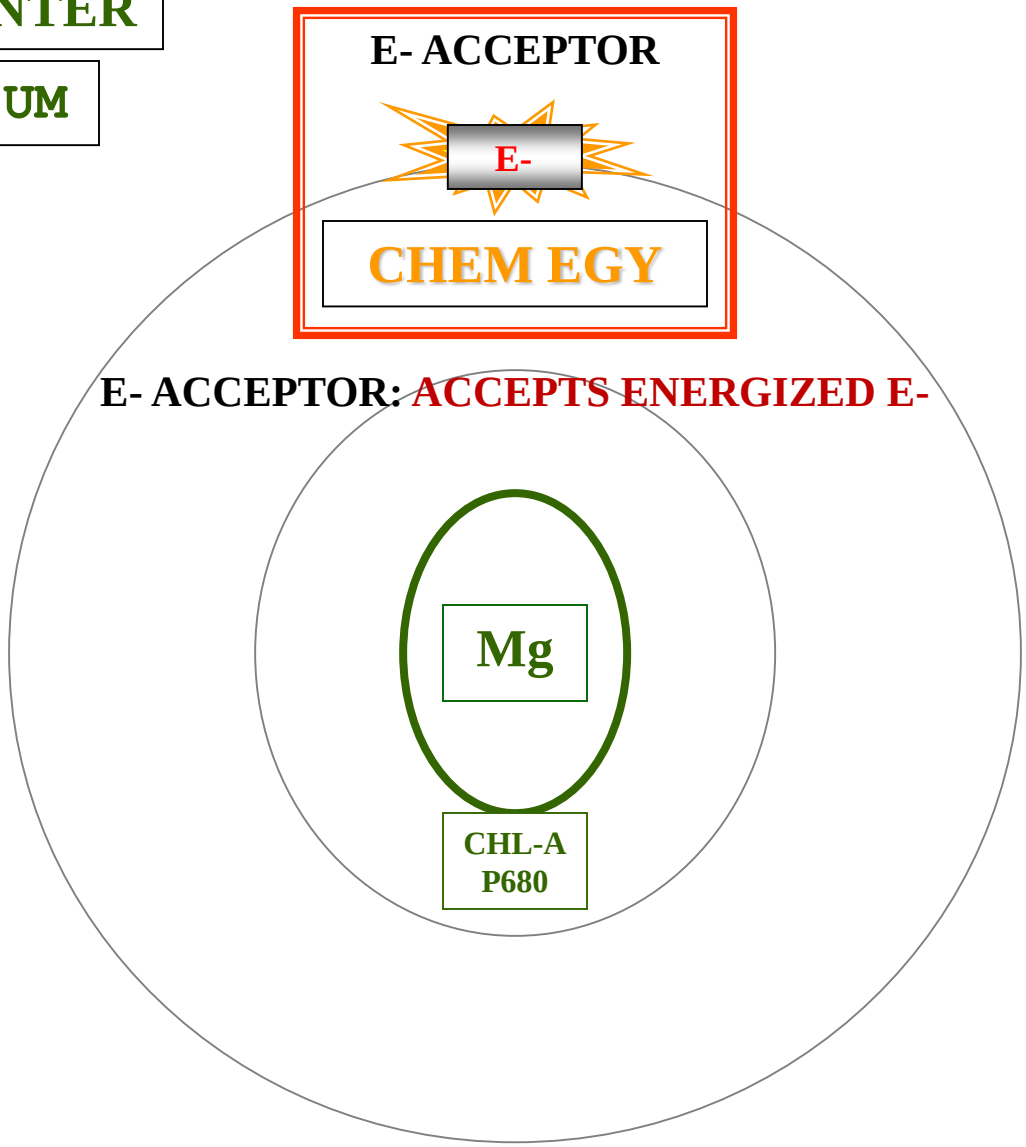
REACTION CENTER

Mg = MAGNESIUM



REACTION CENTER

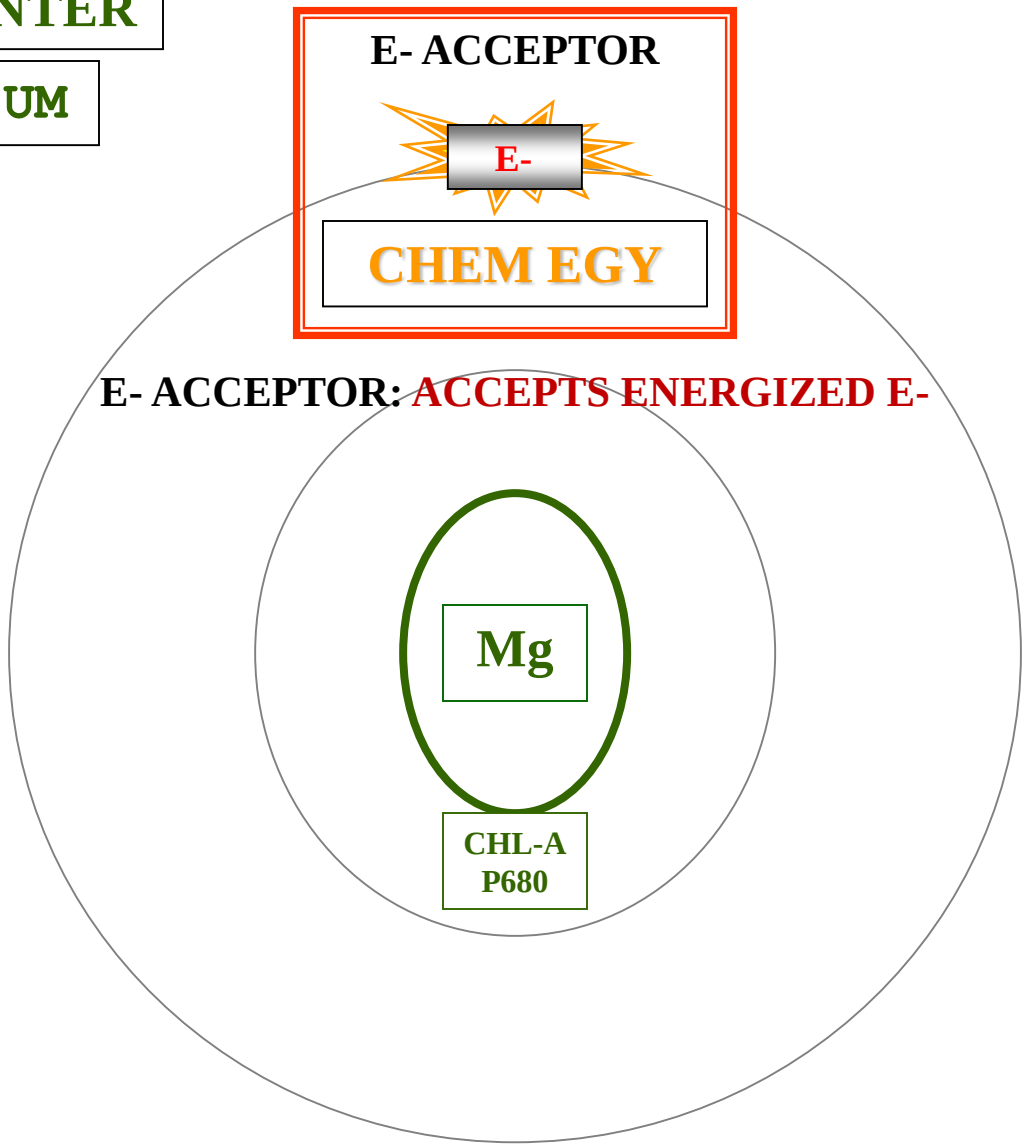
Mg = MAGNESIUM



DOES OCCUR DURING PSYN

REACTION CENTER

Mg = MAGNESIUM



REACTION ESENTIAL TO LIFE

CELL METABOLISM

EN

CHEMICAL ENERGY

CMP-A + CMP-B → CMP-C

BIOCHEMICAL REACTION

CELL METABOLISM

PR

CHEMICAL ENERGY

CMP-A + CMP-B → CMP-C

ENDERGONIC BIOCHEMICAL REACTIONS

CELL METABOLISM

CHEMICAL ENERGY

CMP-A + CMP-B → CMP-C

CHEMICAL ENERGY DRIVES ENDERGONIC REACTIONS TO A PRODUCT

EFFICIENT METABOLISM


E
ORANIZATION
INCREASES

H

ENTROPY DECREASES

HOMEOSTASIS

EG

ENERGIZED E-APPLIED

EXAMPLE

SUMMER BEACH

S

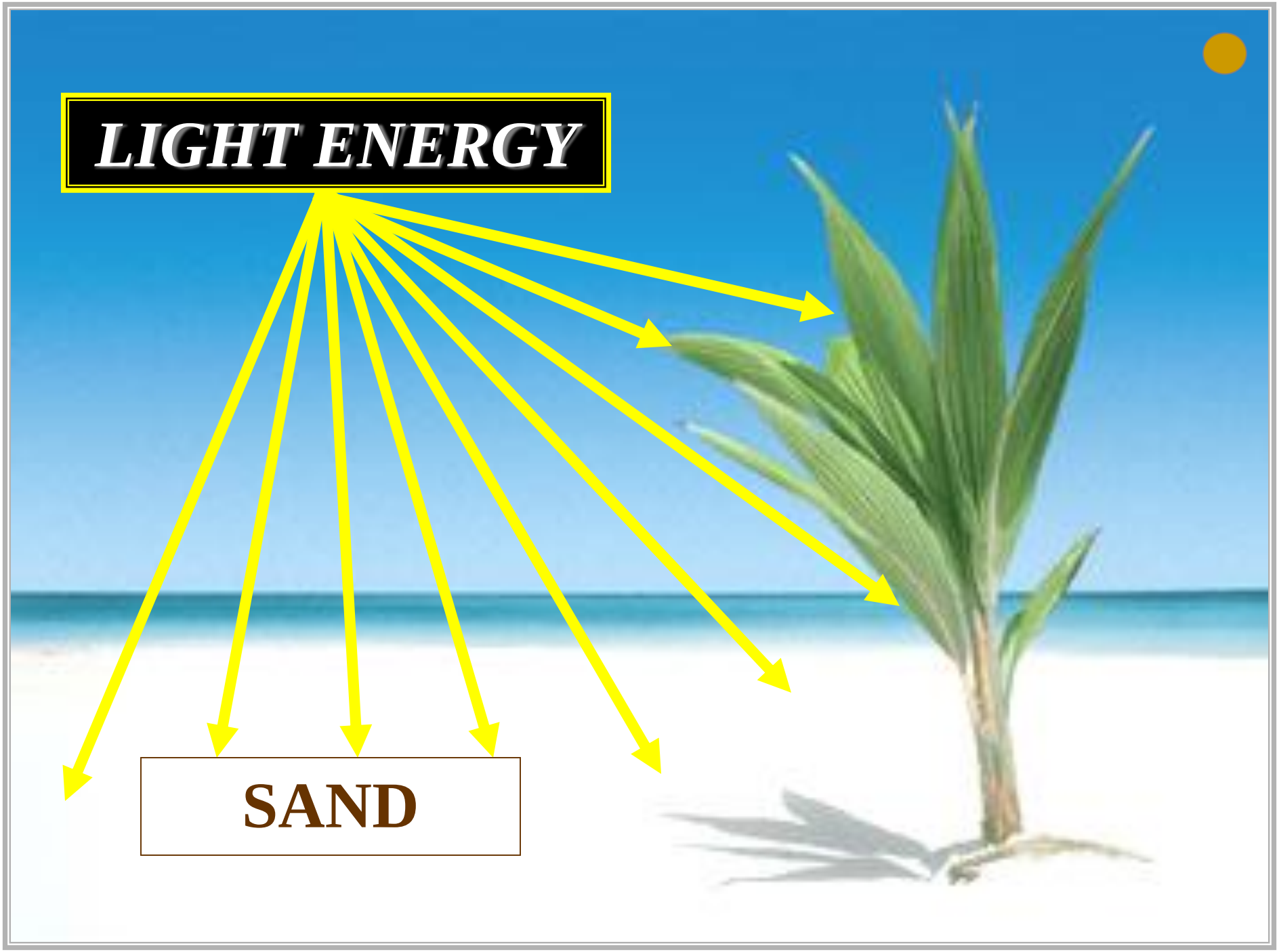
SUMMER BEACH

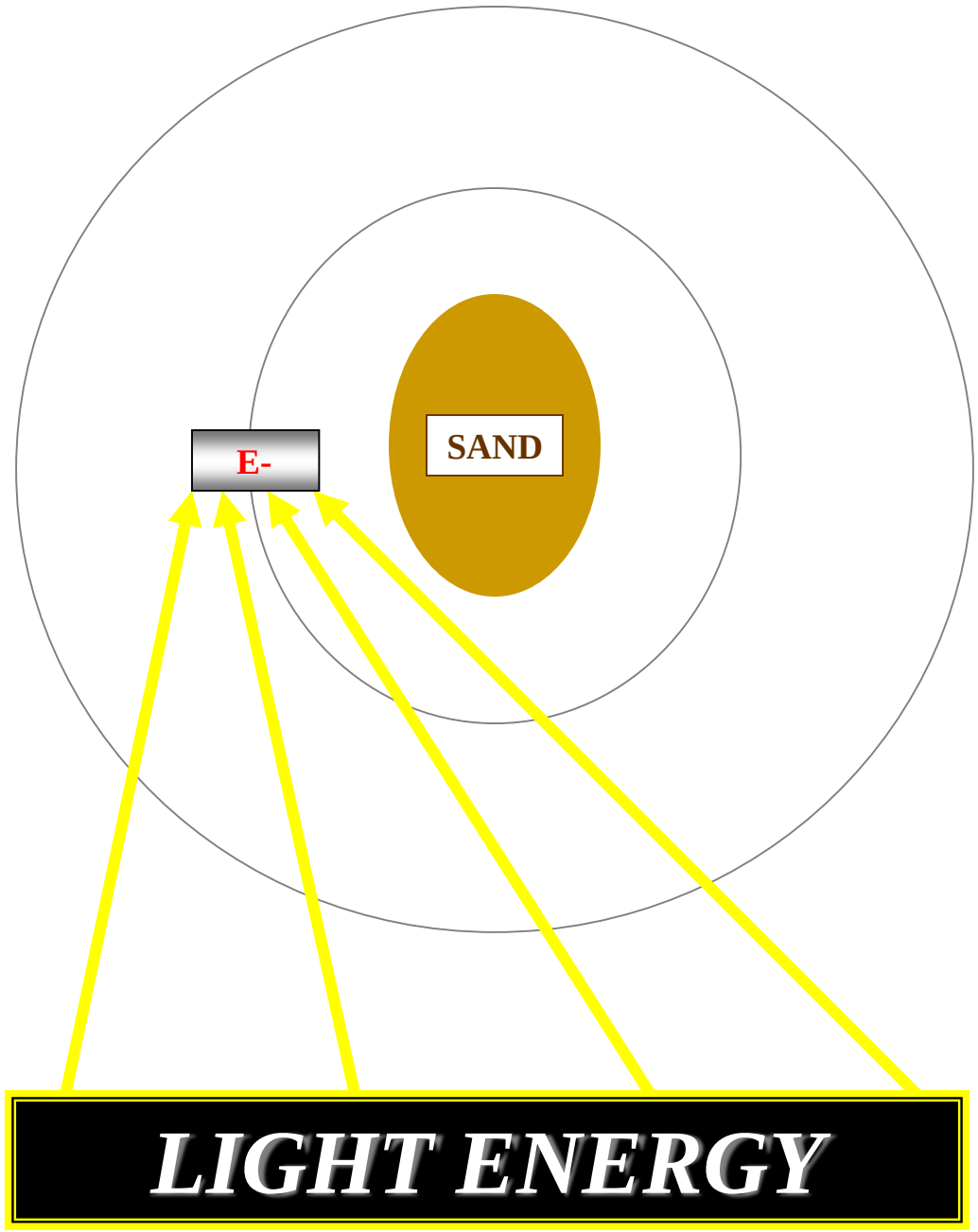
SAND

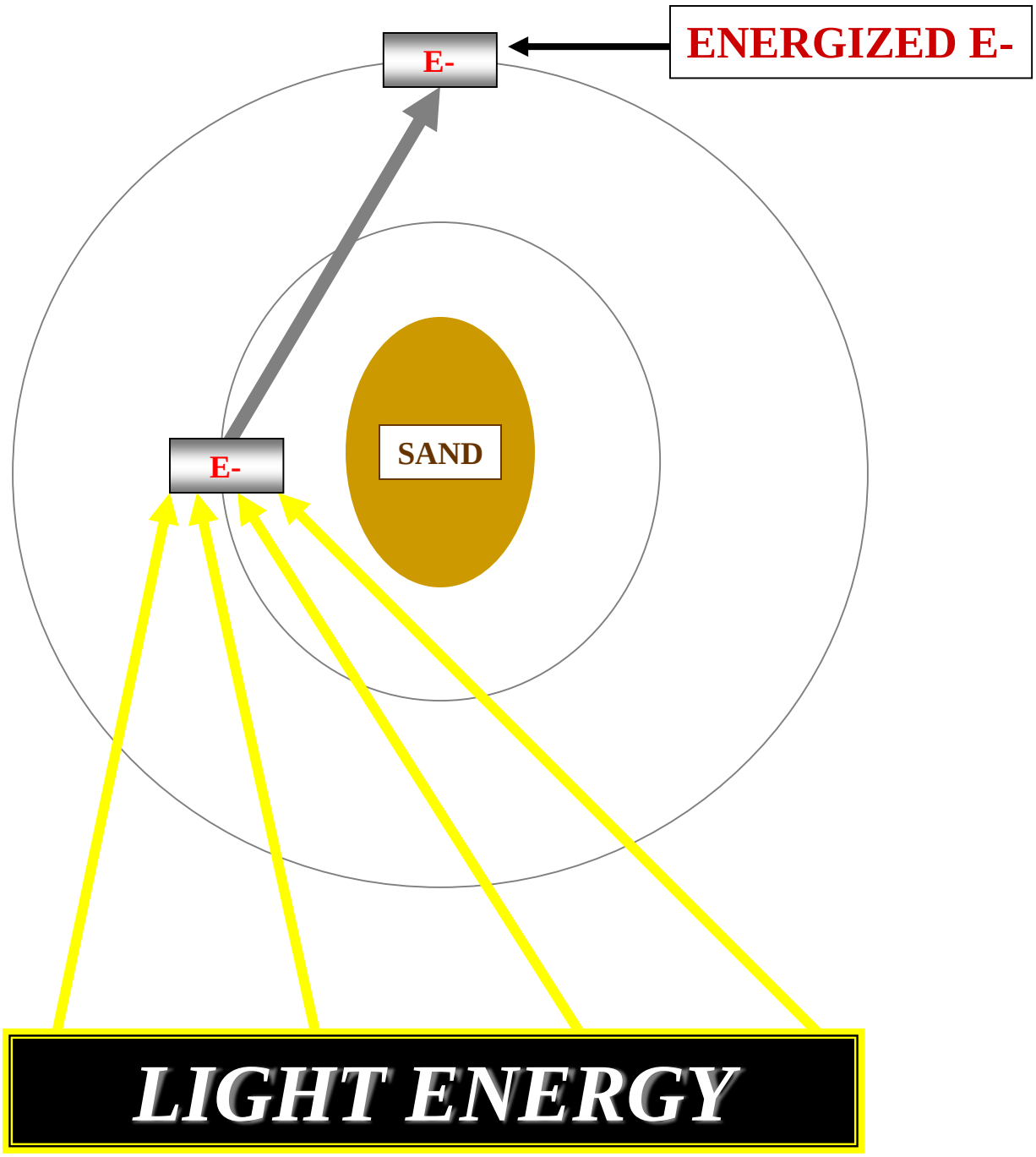
PLANT

SUMMER BEACH

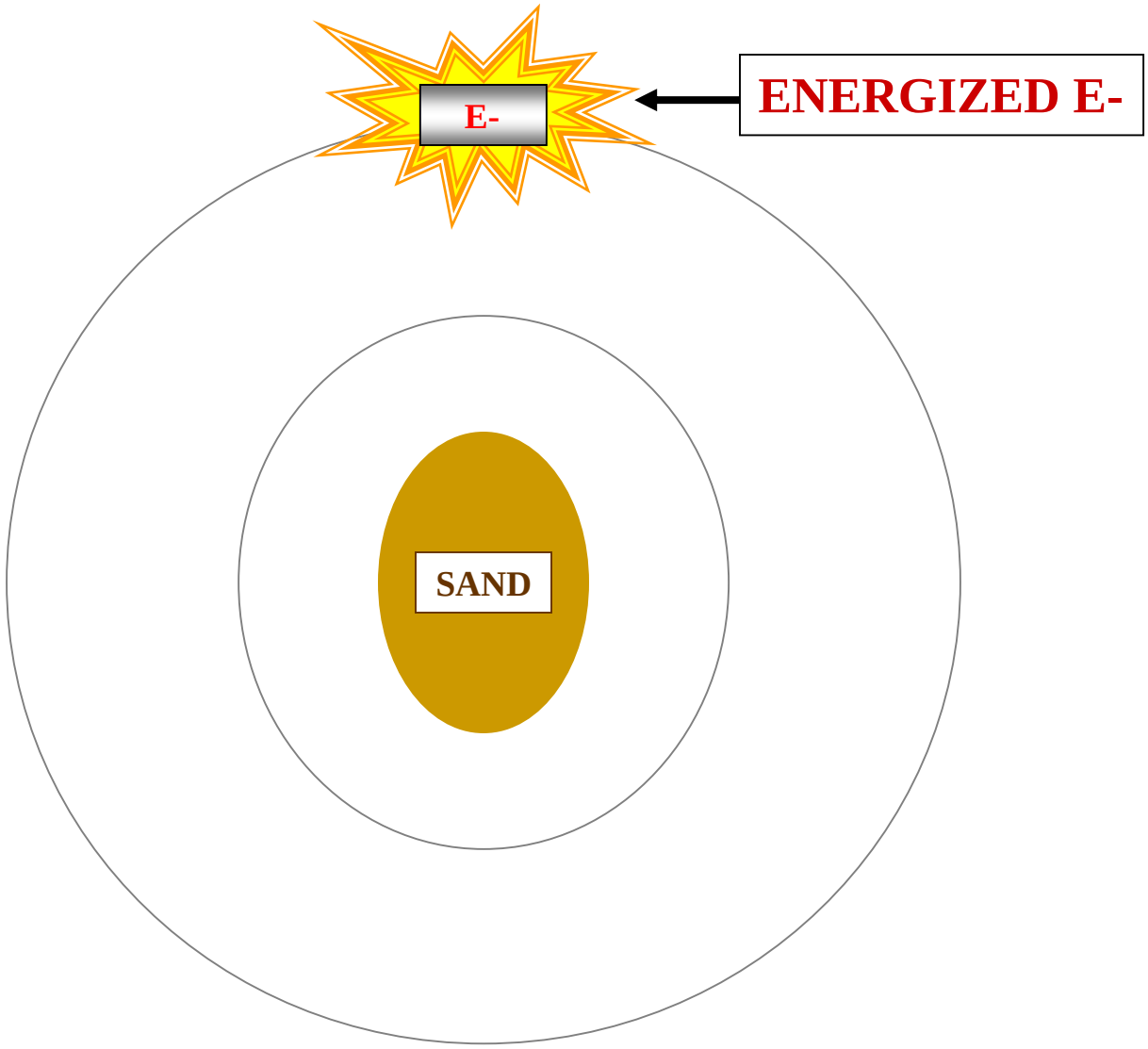
SAND

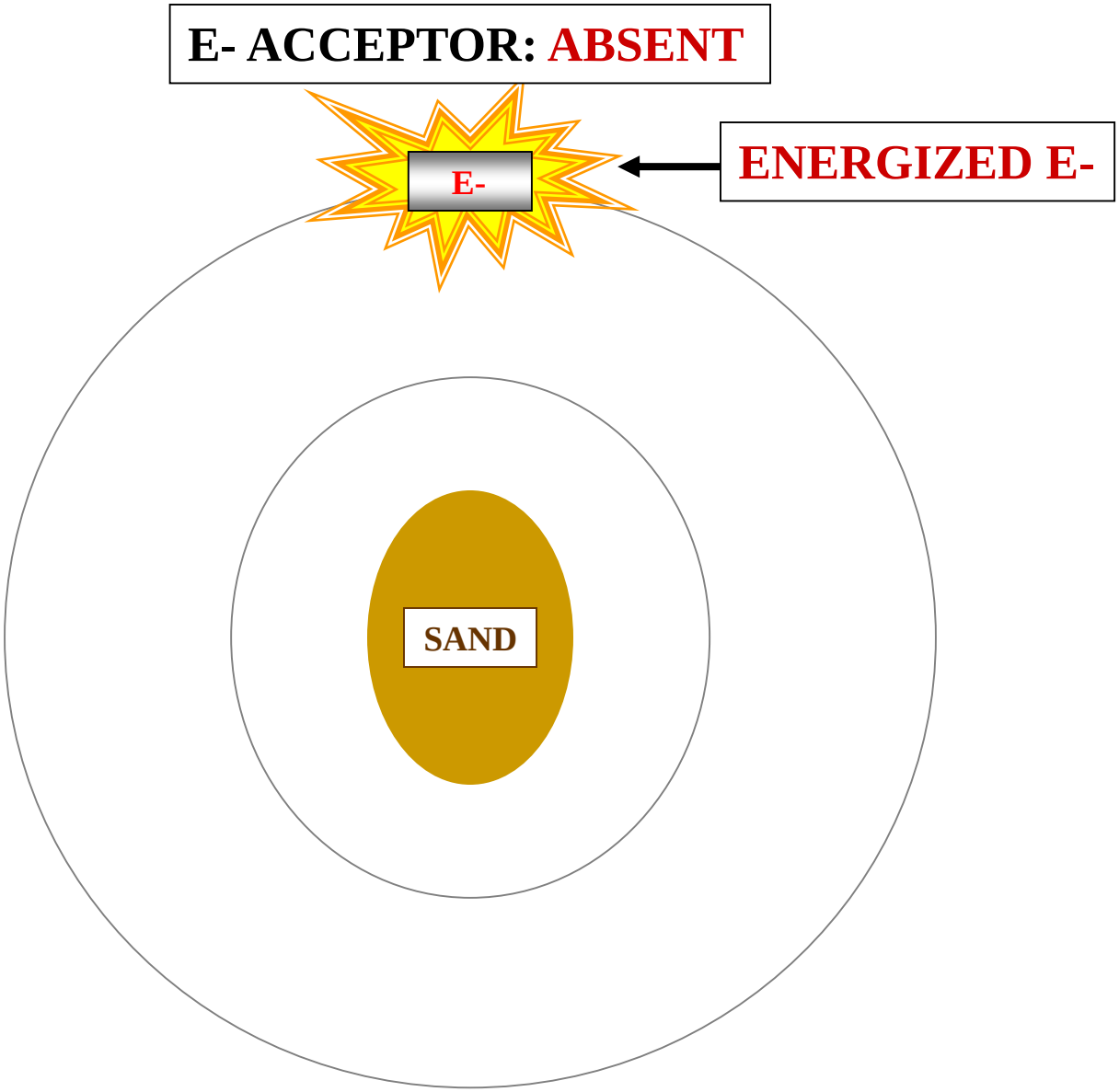

LIGHT ENERGY
SAND

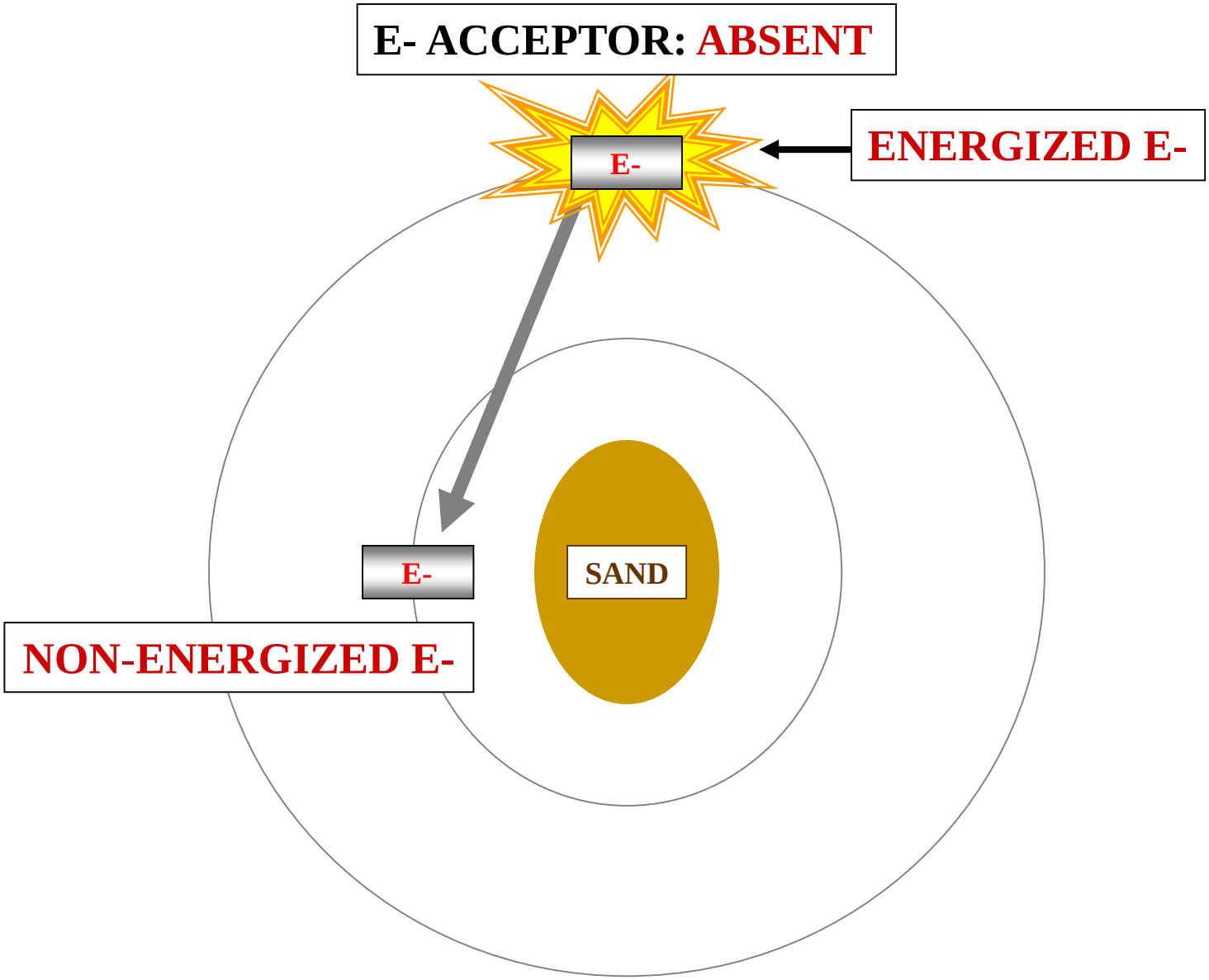

E-
SAND
E-
LIGHT ENERGY


ENERGIZED E-
E-
E-
SAND
LIGHT ENERGY

AB

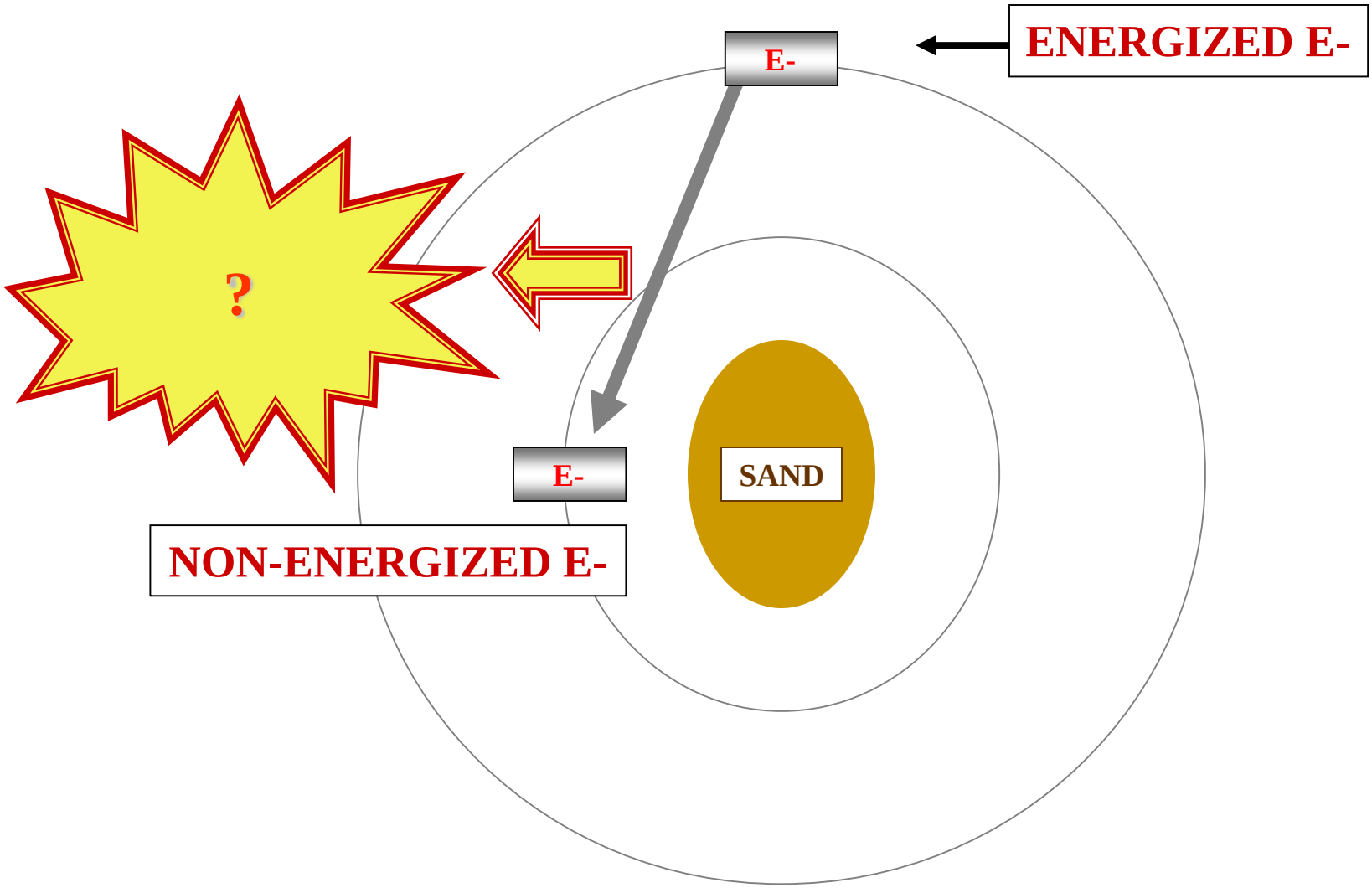



E- ACCEPTOR: ABSENT
E-
ENERGIZED E-
SAND

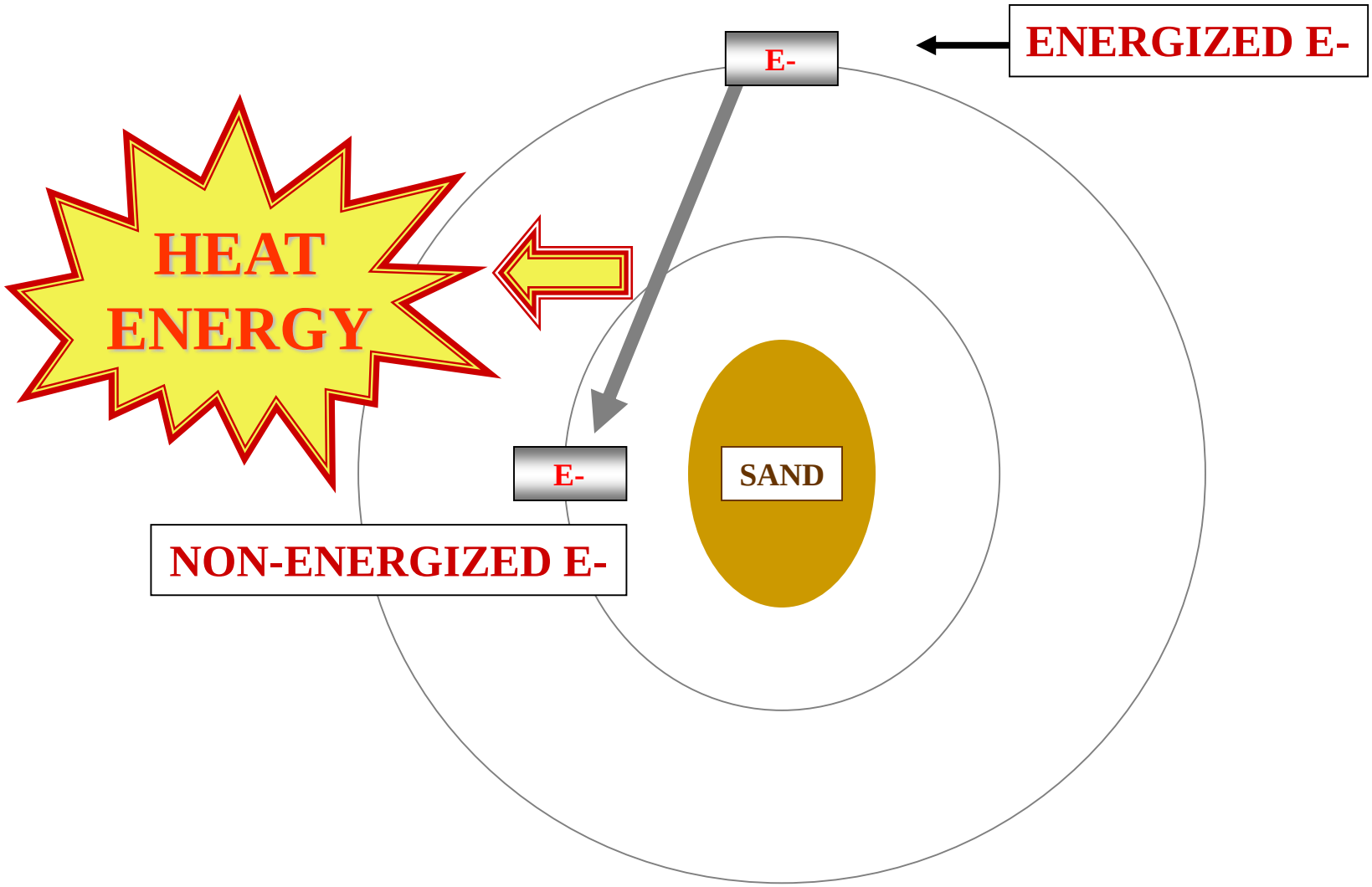

E- ACCEPTOR: ABSENT
?
E-
ENERGIZED E-
E-
SAND
NON-ENERGIZED E-

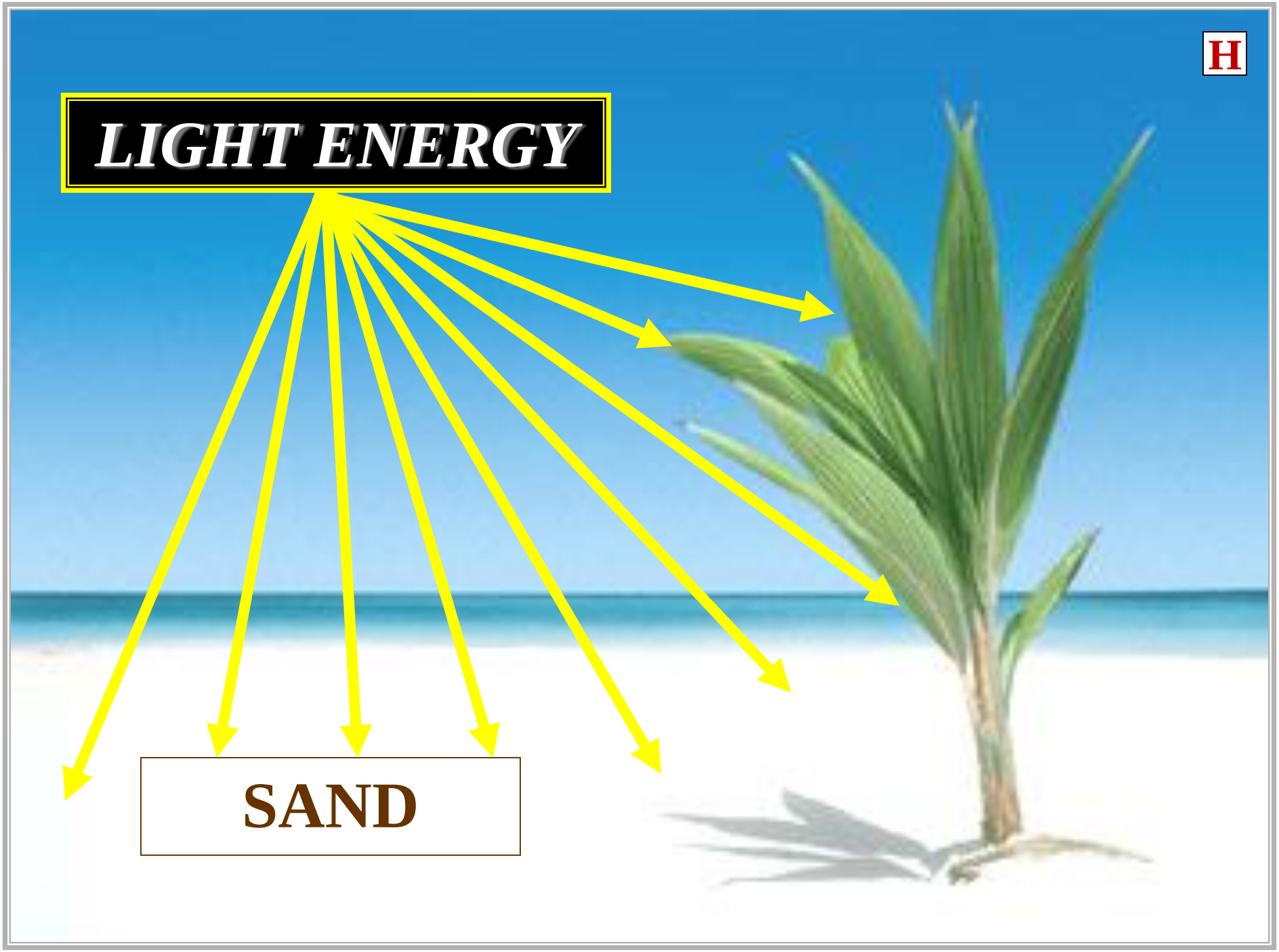
E- ACCEPTOR: ABSENT

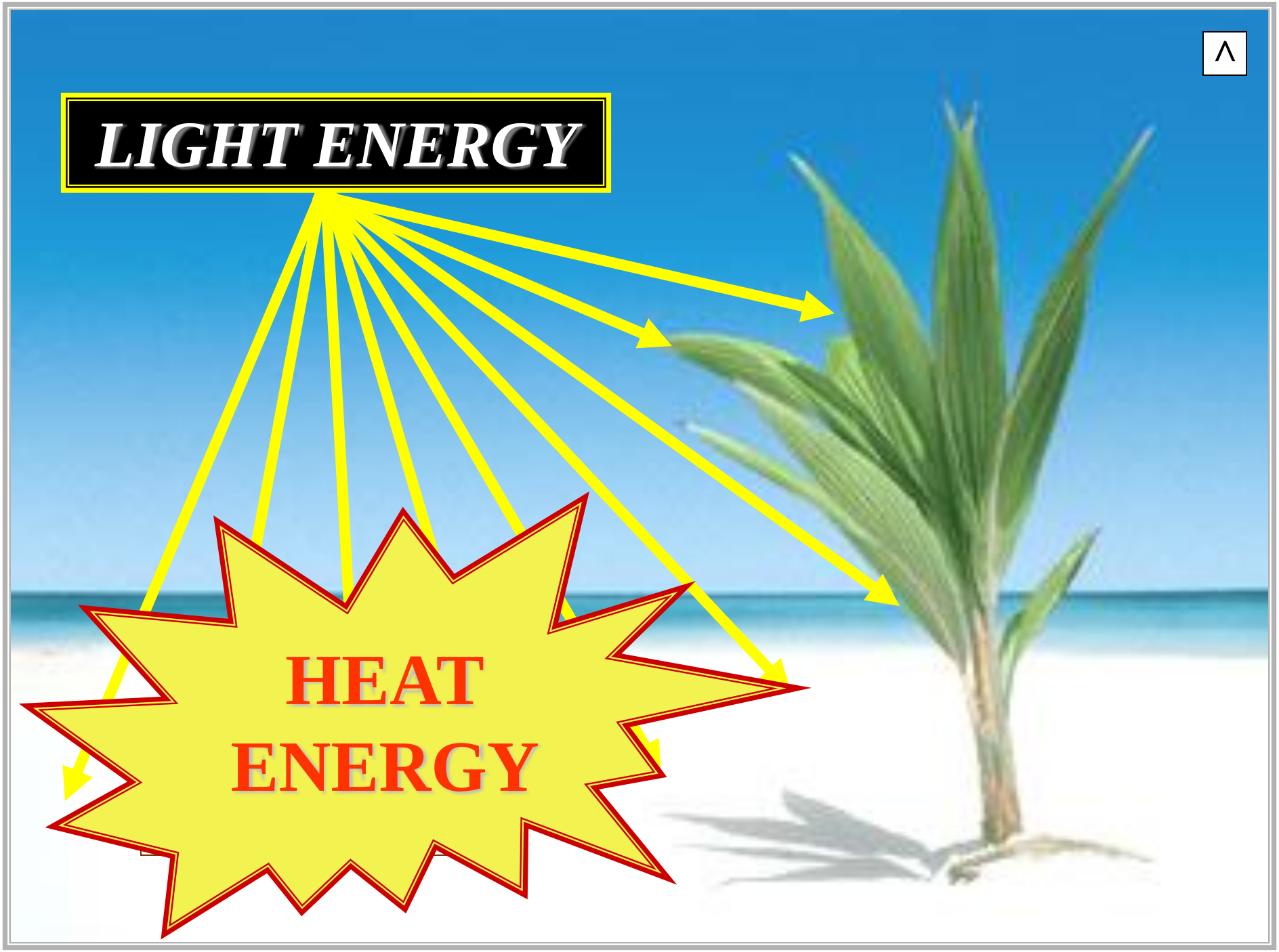
H



E- ACCEPTOR: ABSENT




LIGHT ENERGY
SAND


LIGHT ENERGY
HEAT
ENERGY

P

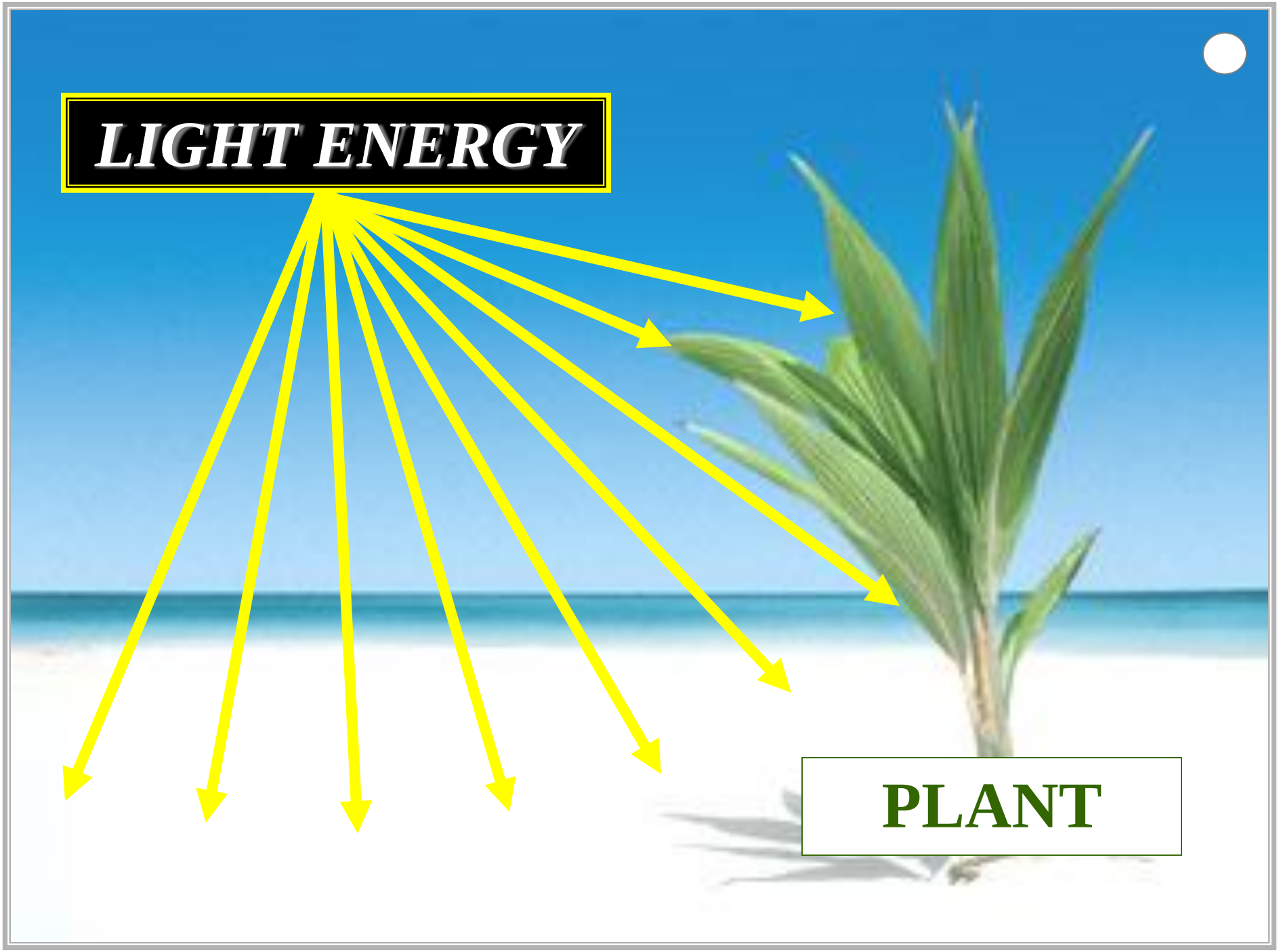
SUMMER BEACH

SAND

PLANT

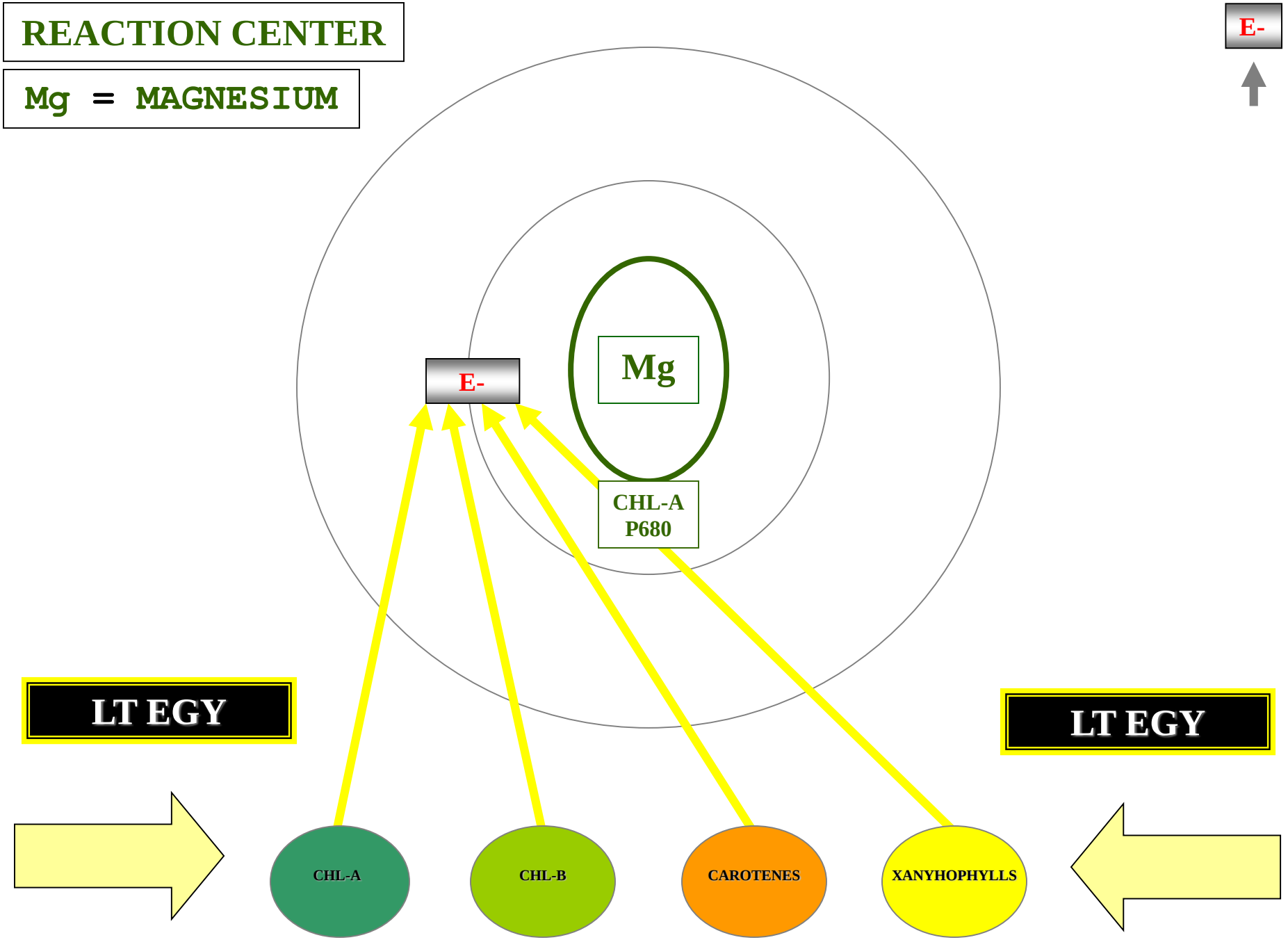
SUMMER BEACH

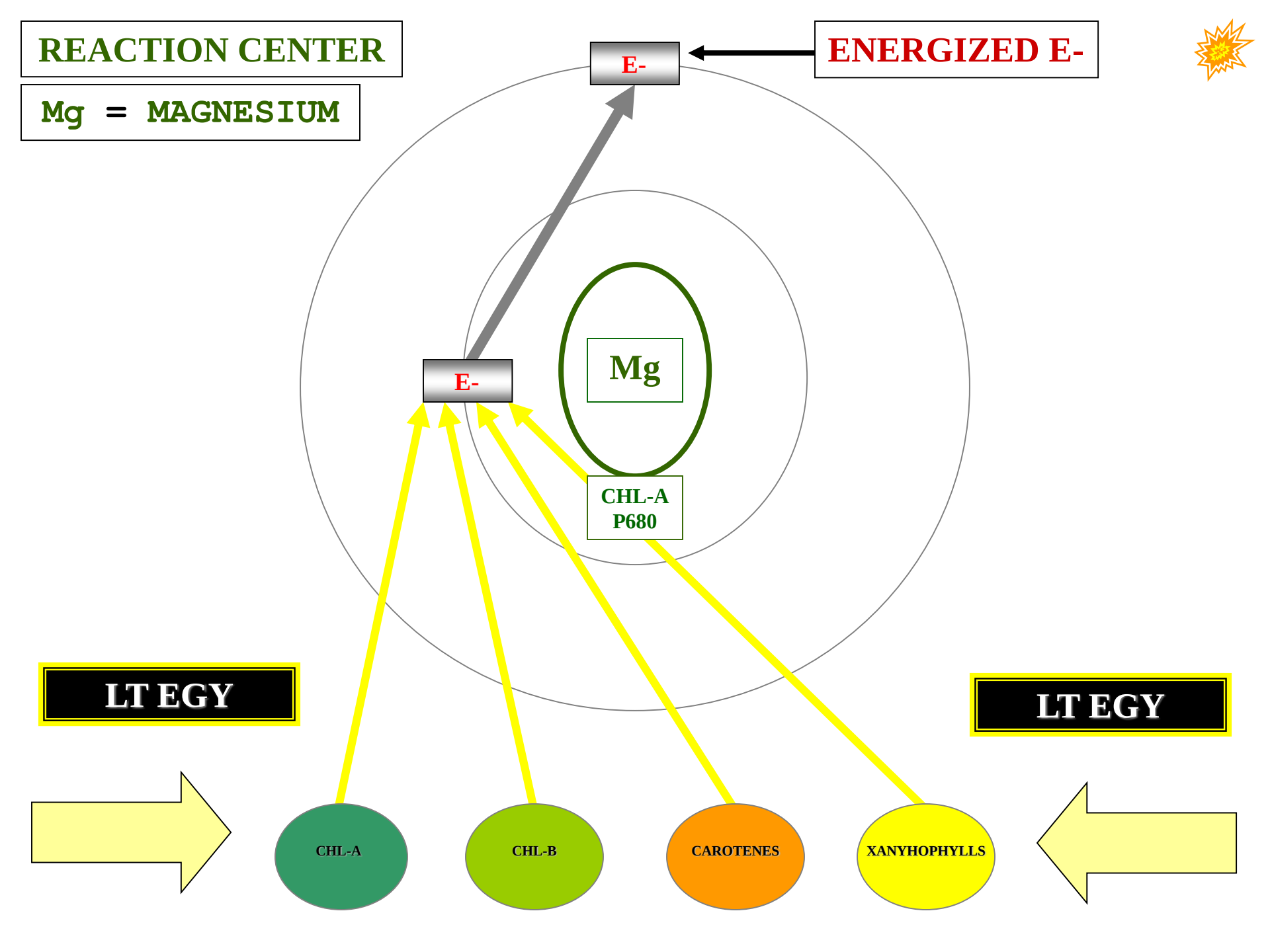
PLANT


LIGHT ENERGY
PLANT

REACTION CENTER

Mg = MAGNESIUM

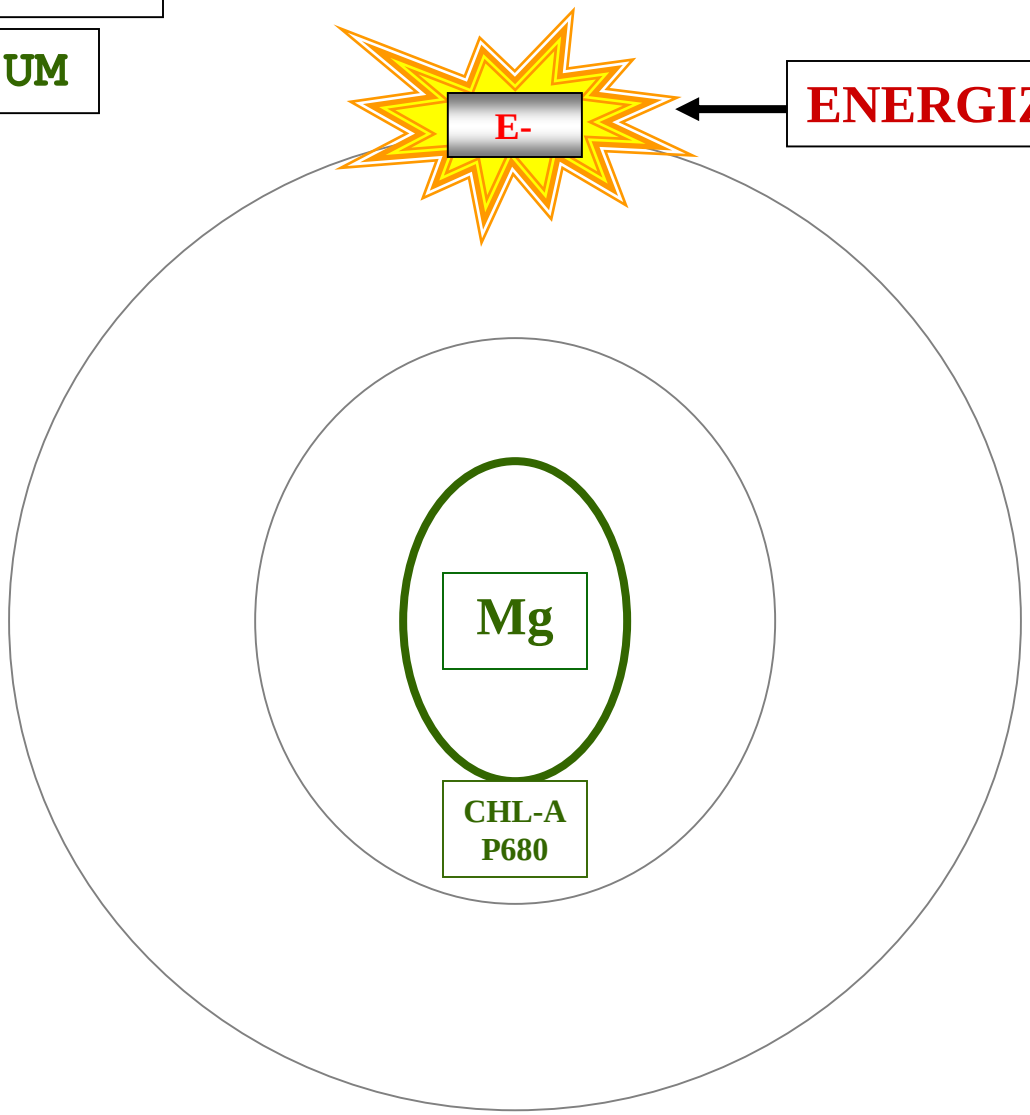



REACTION CENTER
Mg = MAGNESIUM
E-
ENERGIZED E-
E-
Mg
CHL-A
P680
LT EGY
LT EGY
CHL-A
CHL-B
CAROTENES
XANYHOPHYLLS

REACTION CENTER

Mg = MAGNESIUM

PR

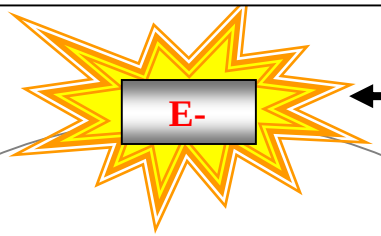


REACTION CENTER

E- ACCEPTOR: PRESENT

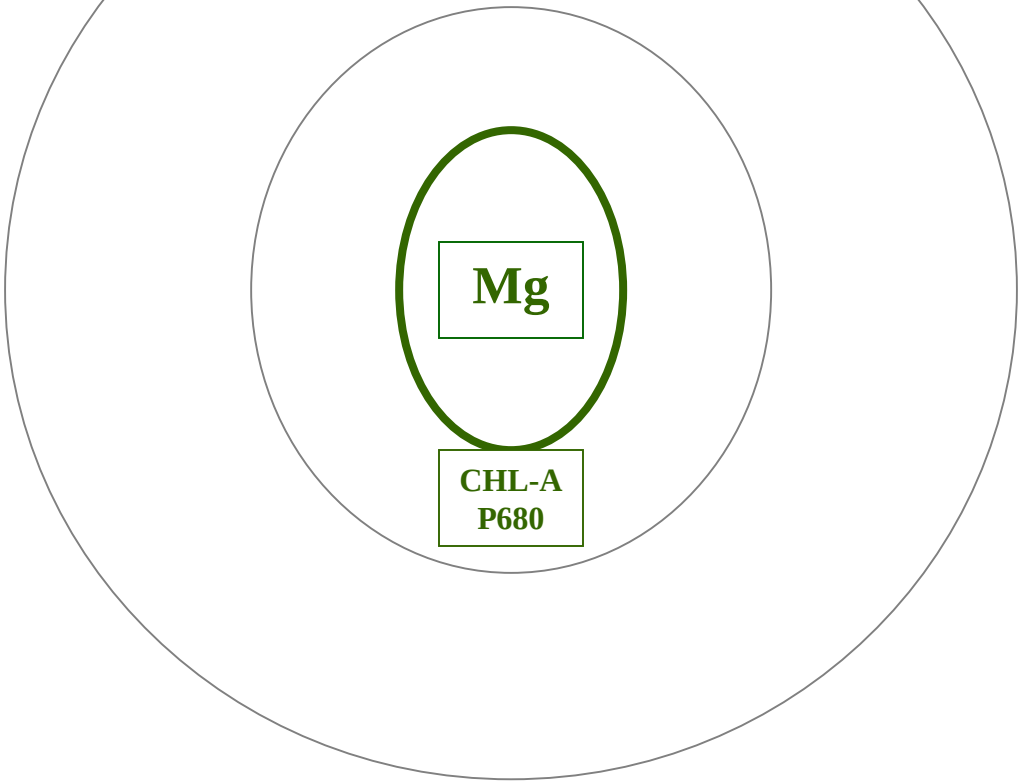
LT

Mg = MAGNESIUM



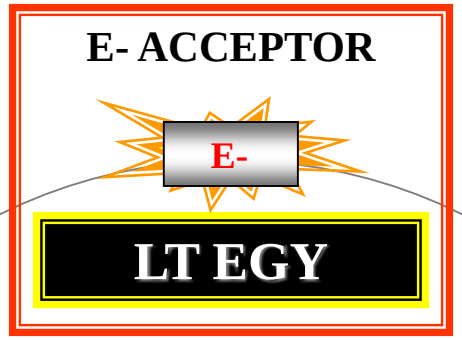
ENERGIZED E-

E- ACCEPTOR: ACCEPTS ENERGIZED E-

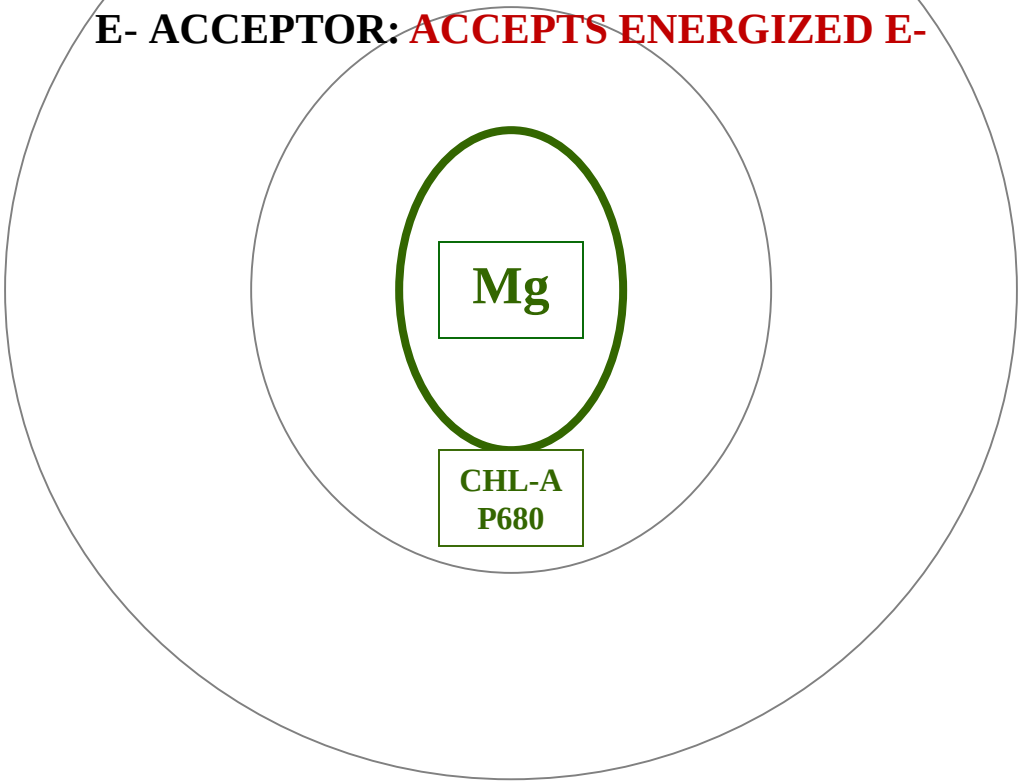


REACTION CENTER

Mg = MAGNESIUM



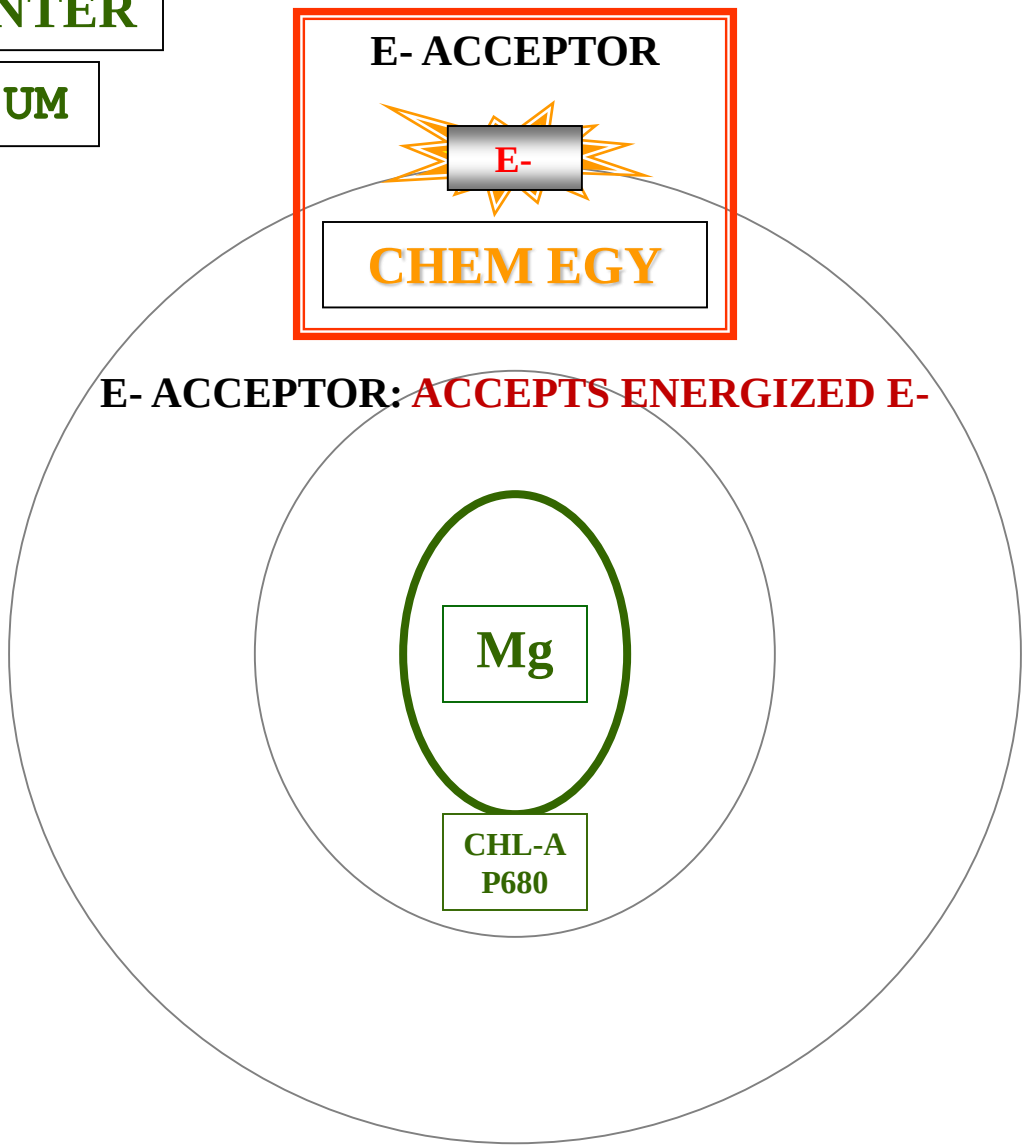
E- ACCEPTOR: ACCEPTS ENERGIZED E-



C

REACTION CENTER

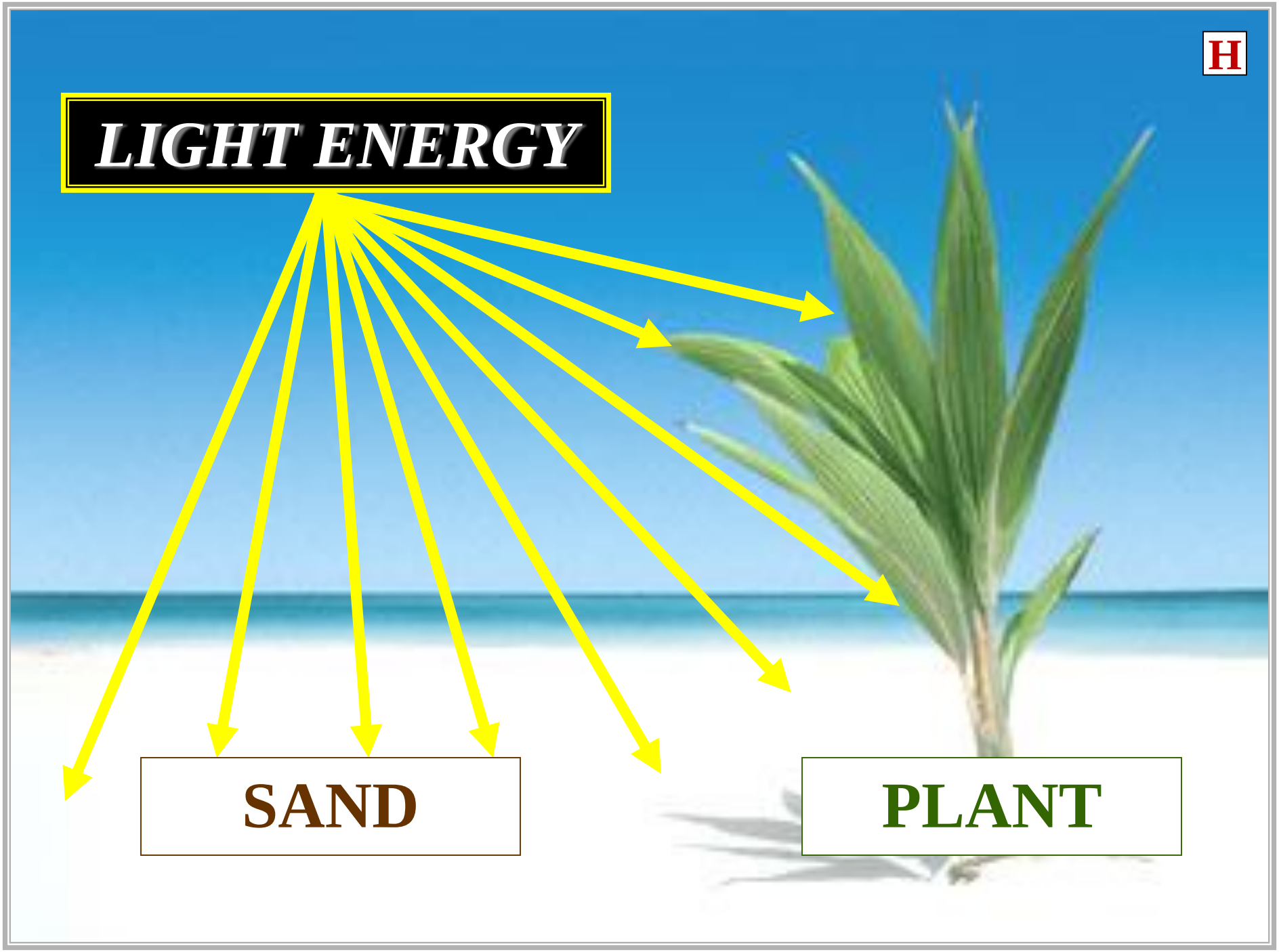
Mg = MAGNESIUM

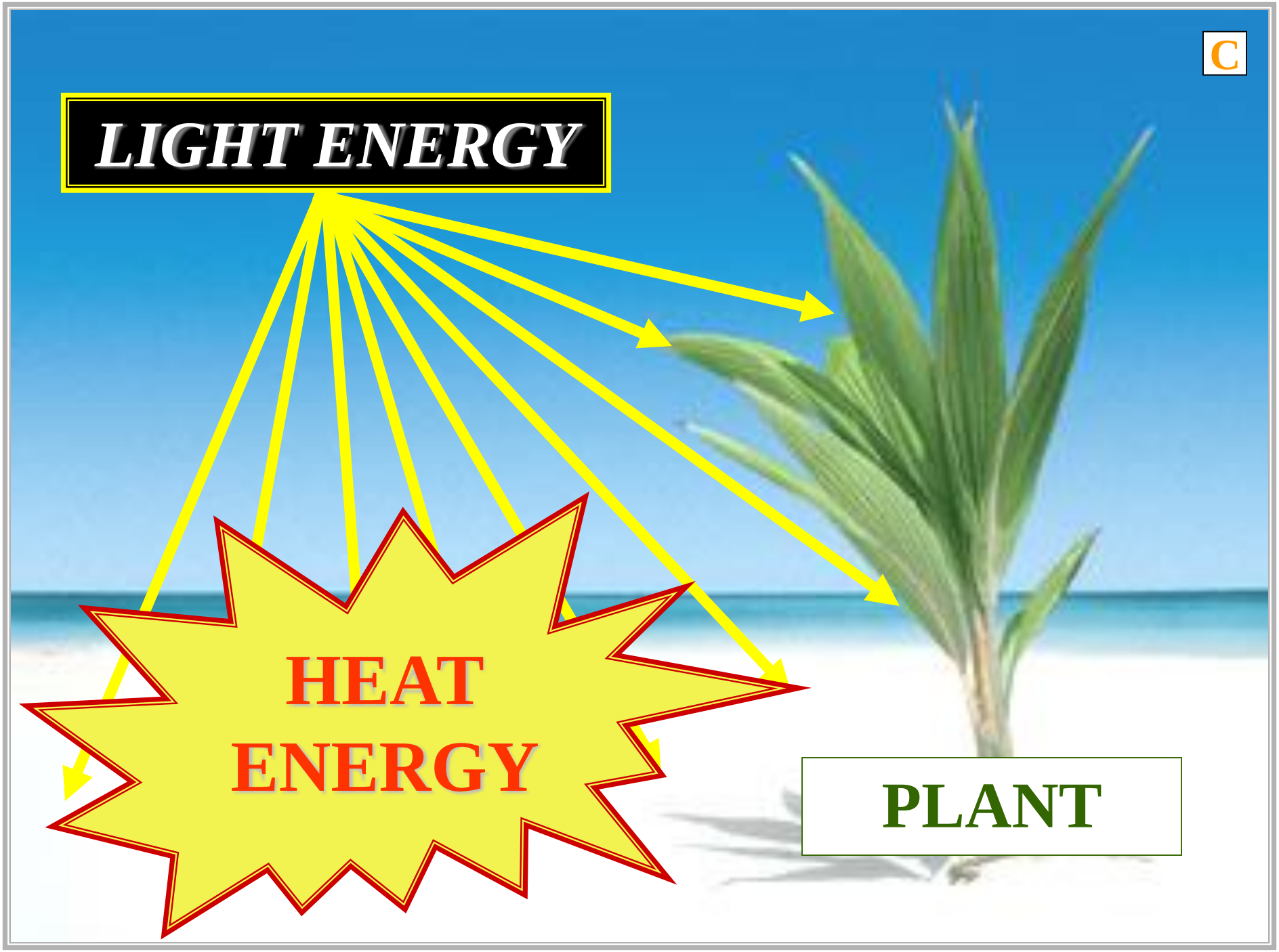


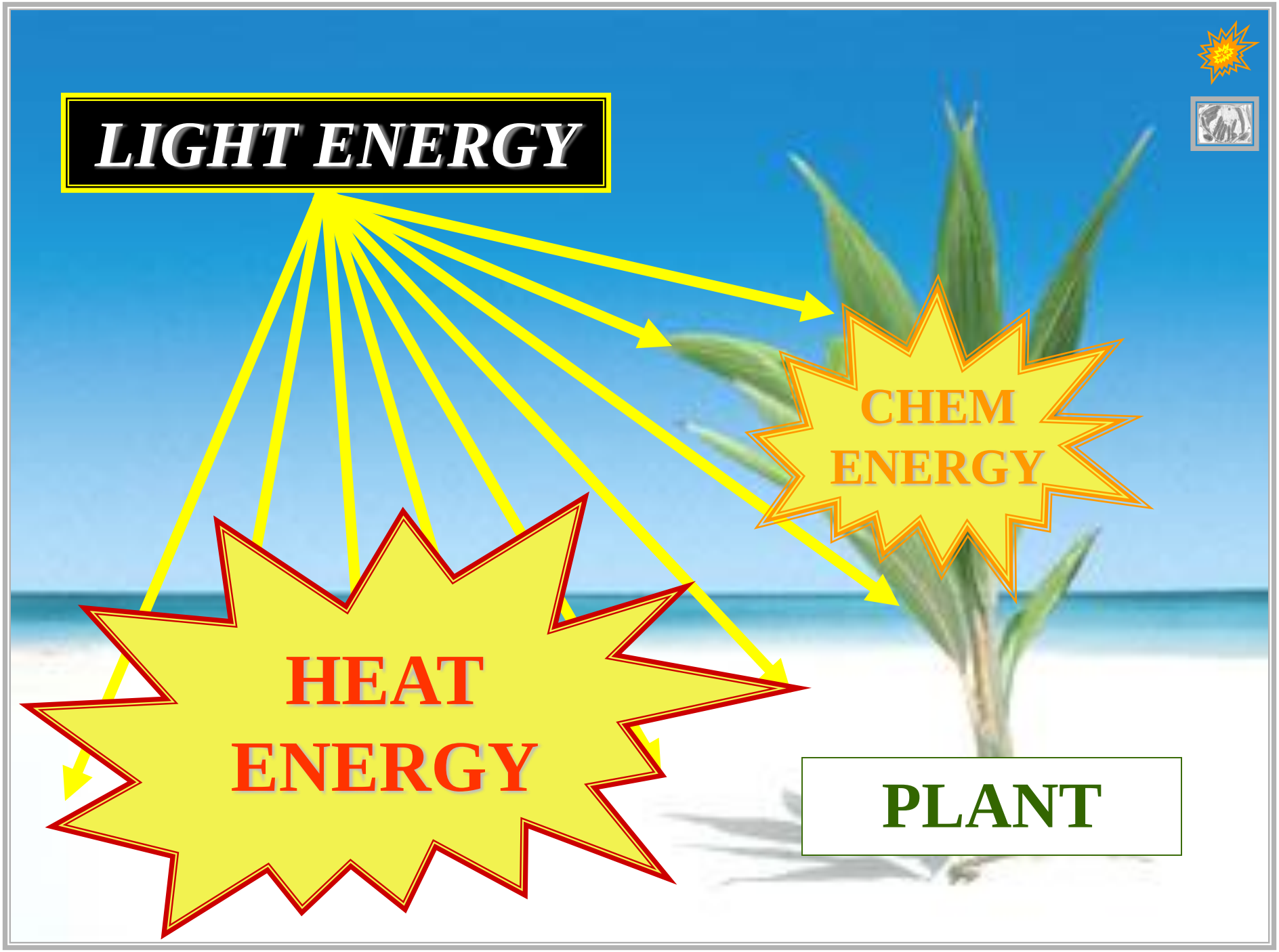
SUMMER BEACH

SAND

PLANT


LIGHT ENERGY
SAND
PLANT


C
LIGHT ENERGY
HEAT ENERGY
PLANT


LIGHT ENERGY
CHEM ENERGY
HEAT ENERGY
PLANT

CELL METABOLISM

EN

CHEMICAL ENERGY

CMP-A + CMP-B → CMP-C

BIOCHEMICAL REACTION

CELL METABOLISM

PR

CHEMICAL ENERGY

CMP-A + CMP-B → CMP-C

ENDERGONIC BIOCHEMICAL REACTIONS

CELL METABOLISM

CHEMICAL ENERGY

CMP-A + CMP-B → CMP-C

CHEMICAL ENERGY DRIVES ENDERGONIC REACTIONS TO A PRODUCT

EFFICIENT METABOLISM


E
ORANIZATION
INCREASES

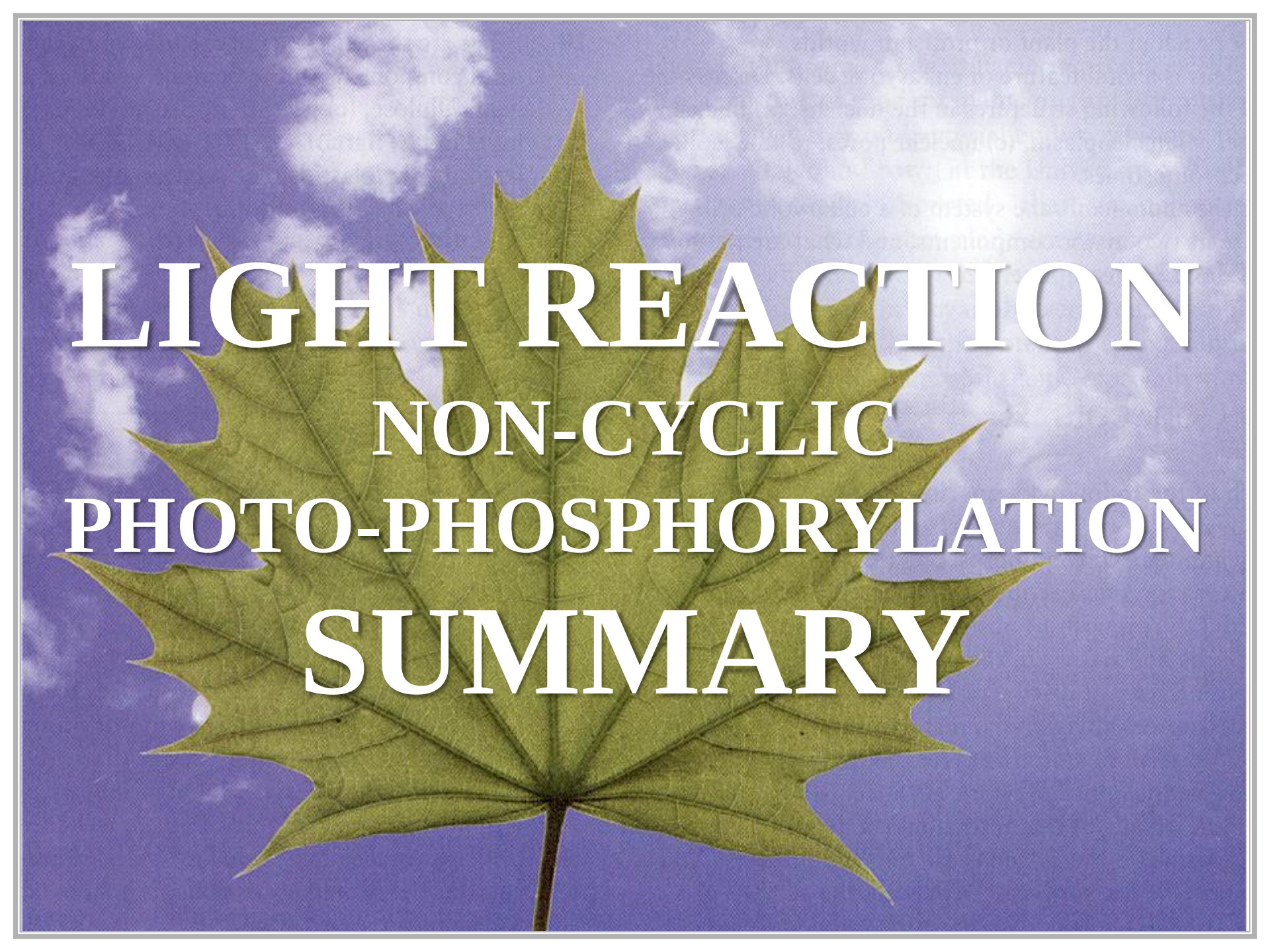
H

ENTROPY DECREASES

S

NC

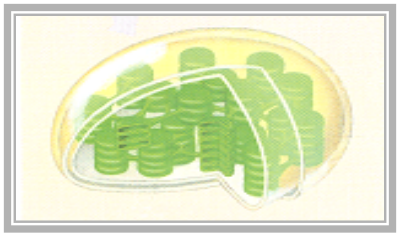
HOMEOSTASIS


LIGHT REACTION
NON-CYCLIC
PHOTO-PHOSPHORYLATION
SUMMARY

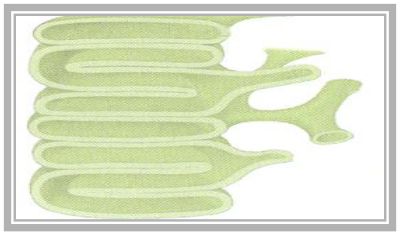
CHLOROPLAST

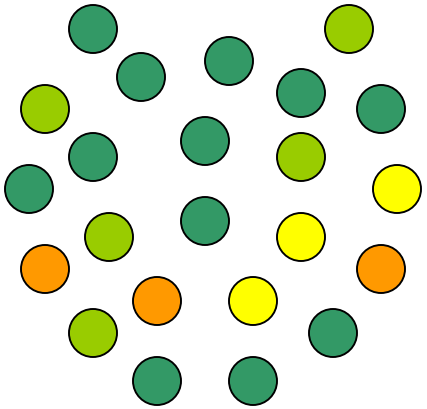
PS-II

THYLAKOID



ANTENNA MOLECULES

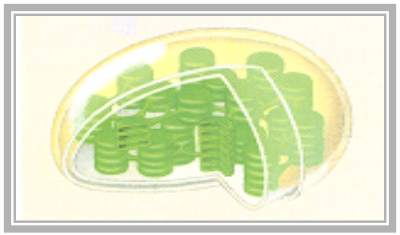




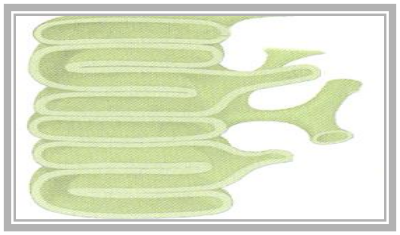
CHLOROPLAST

PS-II

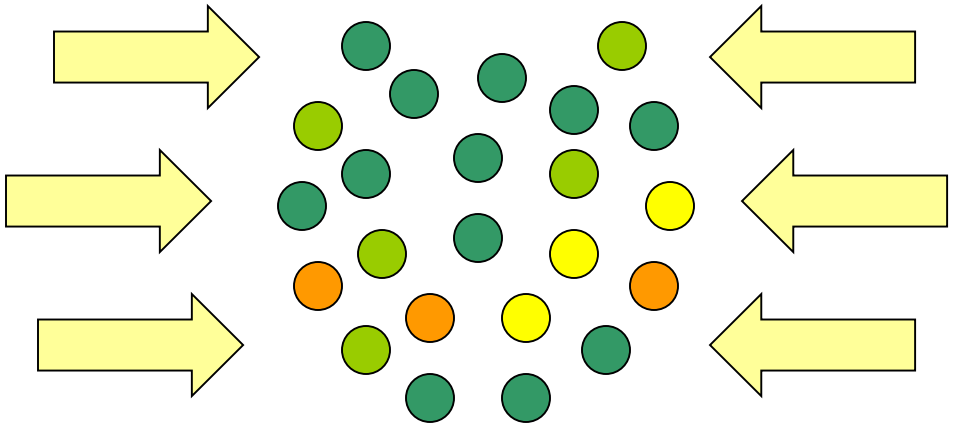
THYLAKOID



ANTENNA MOLECULES



LT EGY

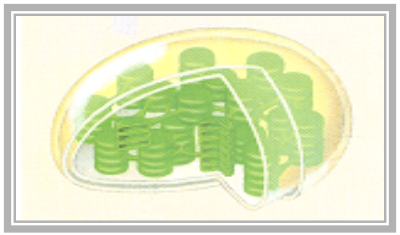


LT EGY

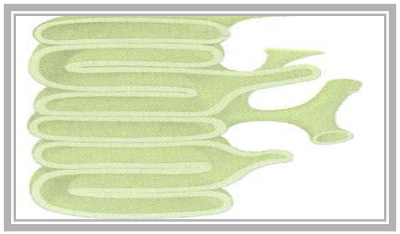
CHLOROPLAST

PS-II

THYLAKOID



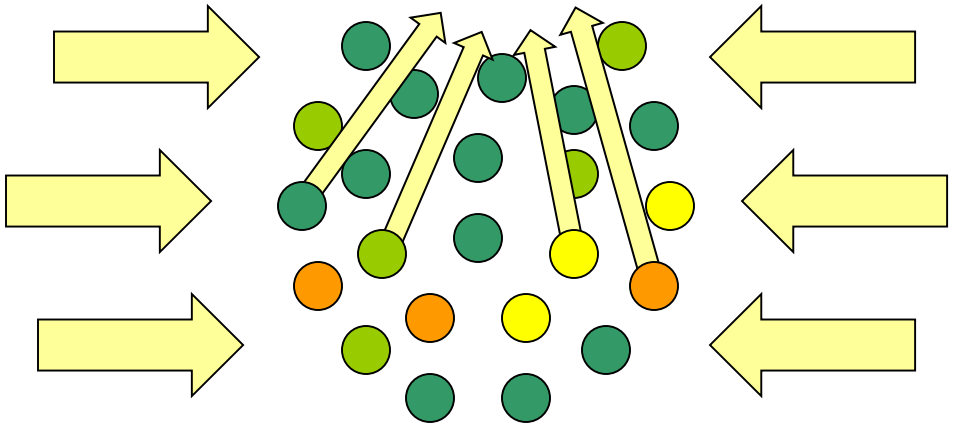
ANTENNA MOLECULES



R

LT EGY

LT EGY

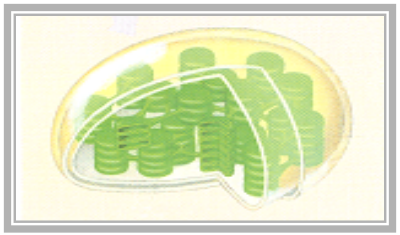


LT EGY

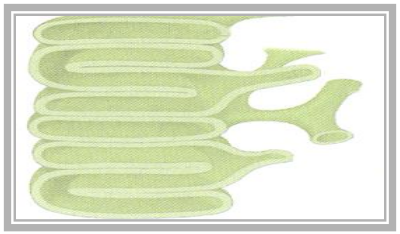
CHLOROPLAST

PS-II

THYLAKOID



ANTENNA MOLECULES

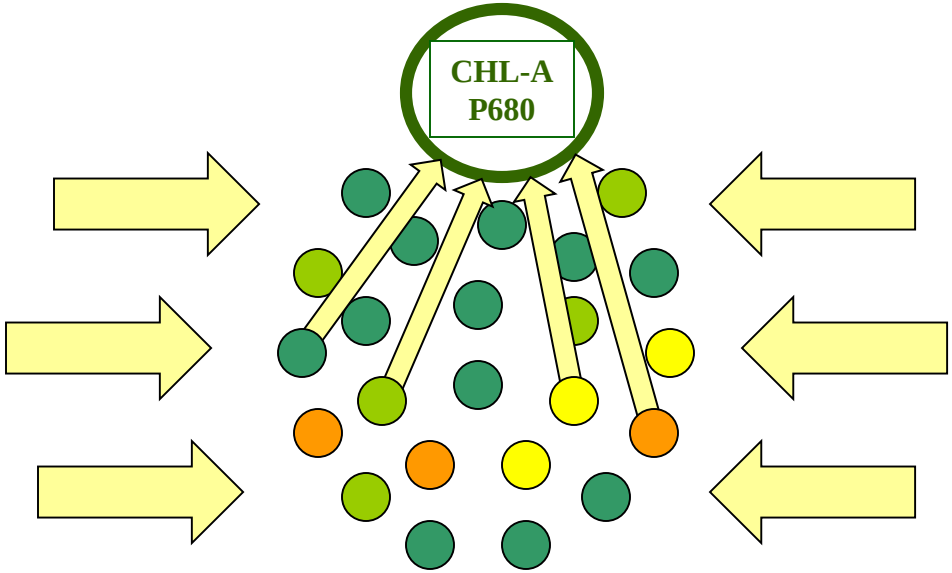


E-

REACTION CENTER: ABSORBS SUFFICIENT LIGHT ENERGY

REACTION CENTER

LT EGY

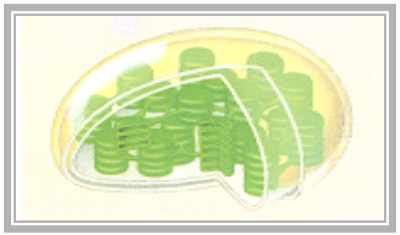


LT EGY

CHLOROPLAST

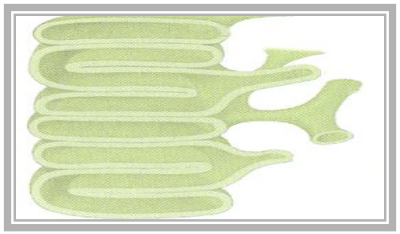
PS-II

THYLAKOID



E-

ENERGIZED E-



A

Q

= ENERGY

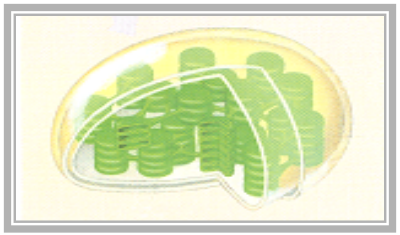
LT EGY

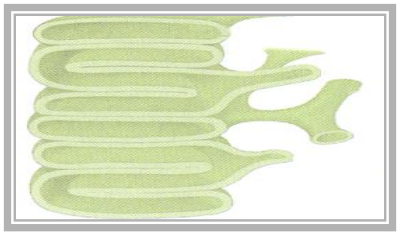
CHL-A
P680

LT EGY

CHLOROPLAST

THYLAKOID





E- ACCEPTOR "Q"

E-

LT EGY

E- ACCEPTOR "Q": ACCEPTS ENERGIZED E-

C

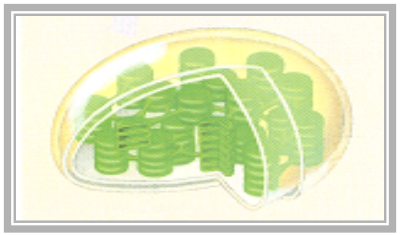
= ENERGY

LT EGY

LT EGY

CHL-A P680

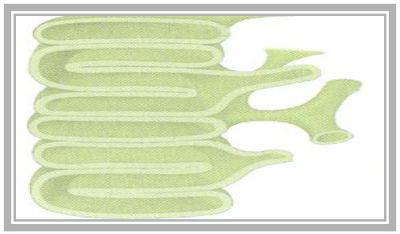
CHLOROPLAST



E- ACCEPTOR "Q"

CHEM EGY

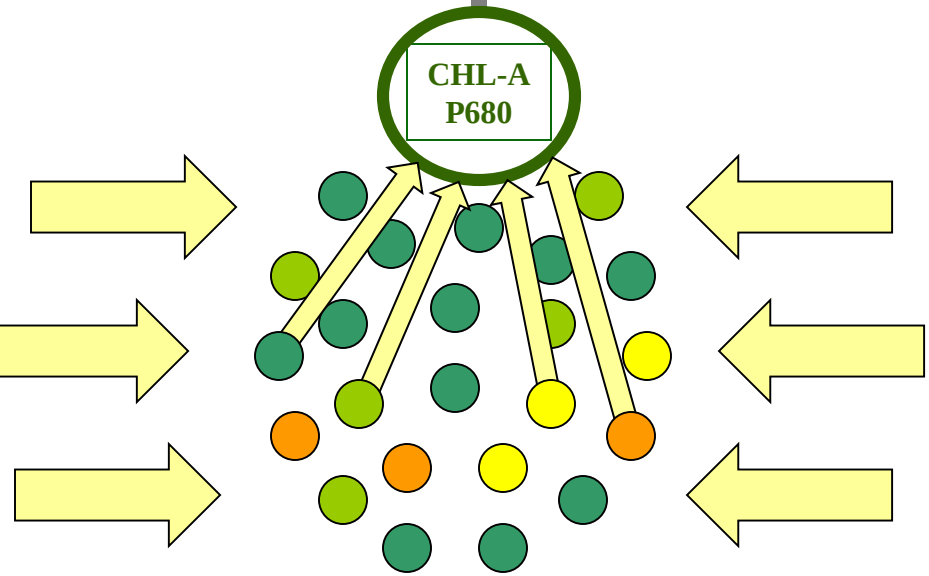
THYLAKOID



E- ACCEPTOR "Q": ACCEPTS ENERGIZED E-

= **ENERGY**

LT EGY



LT EGY

Q

P680
REDOX RXT

CHLOROPLAST

E- ACCEPTOR "Q"

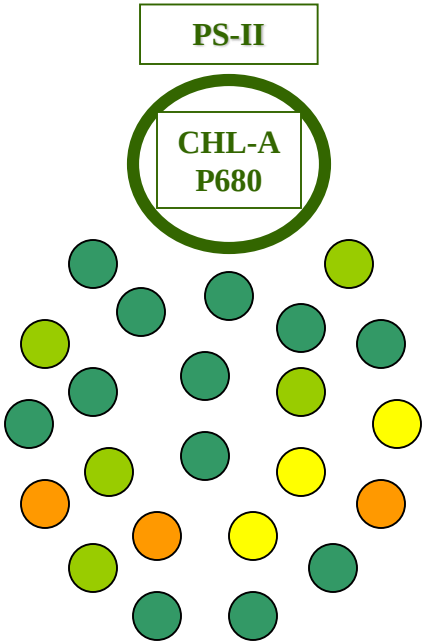
E-

CHEM EGY

THYLAKOID

R

E- ACCEPTOR "Q": ACCEPTS ENERGIZED E-



CHLOROPLAST

E- ACCEPTOR "Q"

E-

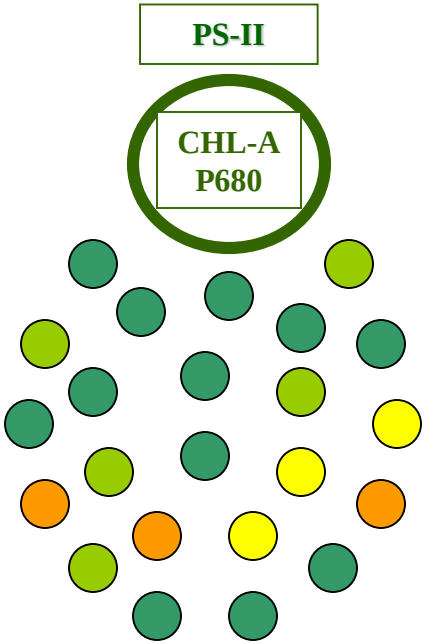
CHEM EGY

THYLAKOID

"Q" REDUCED

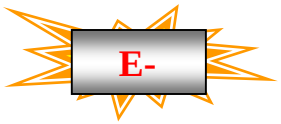
O

E- ACCEPTOR "Q": ACCEPTS ENERGIZED E-



CHLOROPLAST

E- ACCEPTOR "Q"



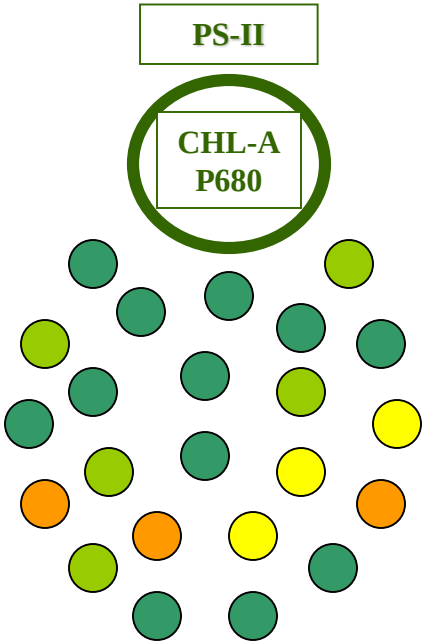
CHEM EGY

THYLAKOID

"Q" REDUCED

C

E- ACCEPTOR "Q": ACCEPTS ENERGIZED E-



P680 OXIDIZED

CHLOROPLAST

E- ACCEPTOR “Q”

E-

CHEM EGY

THYLAKOID

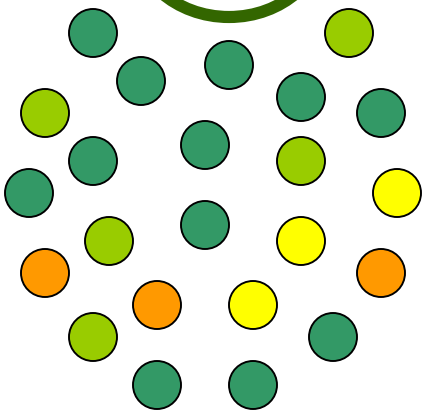
“Q” REDUCED → E-

COUPLED

P680 OXIDIZED

PS-II

CHL-A
P680



CHLOROPLAST

E- ACCEPTOR "Q"

E-

CHEM EGY

THYLAKOID

"Q" REDUCED

W

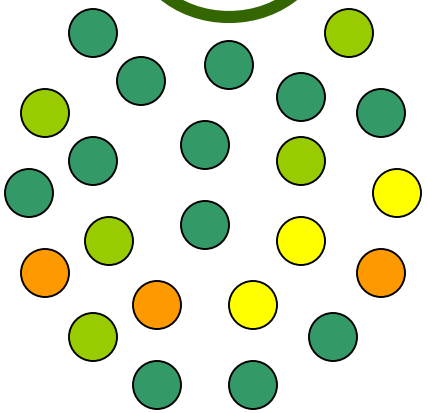
COUPLED

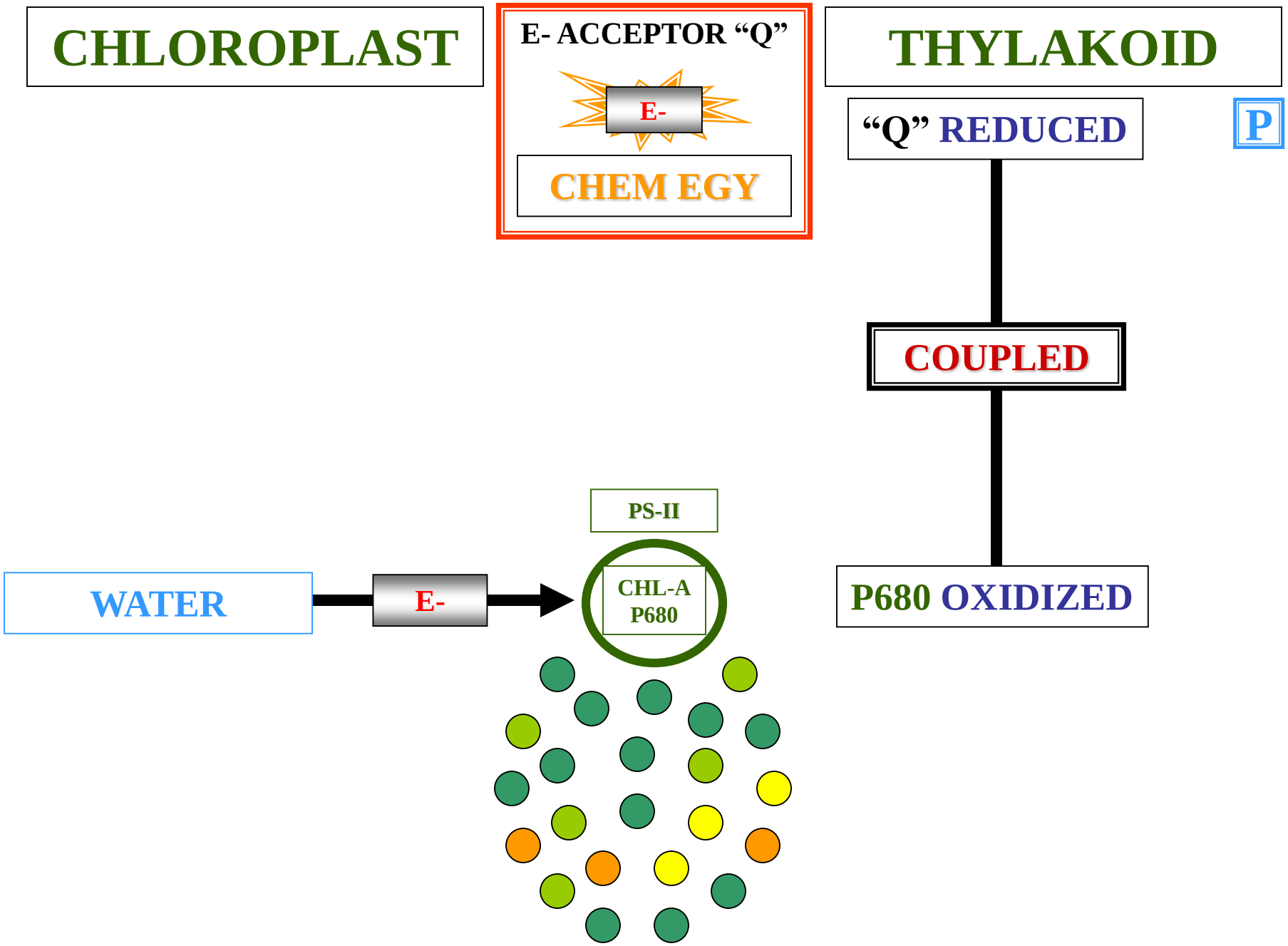
P680 OXIDIZED

PS-II

E-

CHL-A
P680




CHLOROPLAST
E- ACCEPTOR "Q"
E-
CHEM EGY
THYLAKOID
"Q" REDUCED
P
COUPLED
PS-II
WATER
E-
CHL-A
P680
P680 OXIDIZED

CHLOROPLAST

E- ACCEPTOR "Q"

E-

CHEM EGY

THYLAKOID

"Q" REDUCED

COUPLED

P680 OXIDIZED

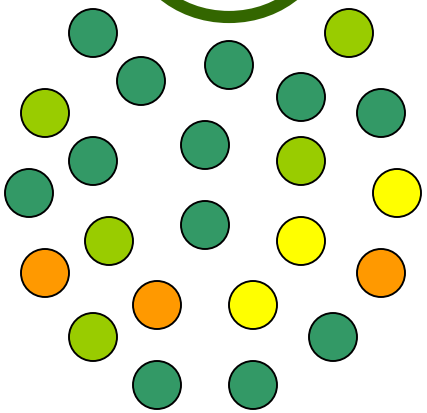
PHOTOLYSIS

WATER

E-

PS-II

CHL-A
P680



P

PHOTOLYSIS

PHOTOLYSIS

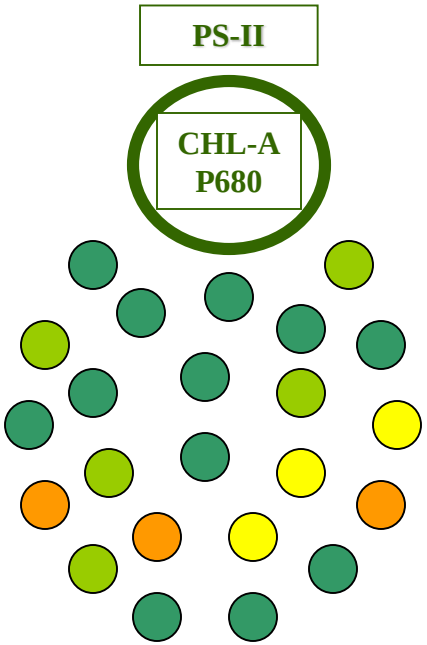
PHOTOLYSIS

LIGHT ENERGY SPLITTING OF WATER

PHOTOLYSIS

LIGHT ENERGY

PHOTOLYSIS



P680 OXIDIZED

SPLIT

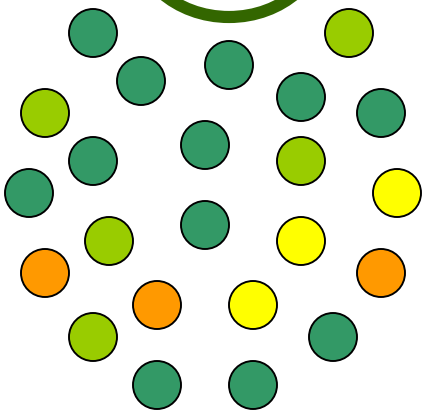
LIGHT ENERGY

WATER

PHOTOLYSIS

PS-II

CHL-A
P680

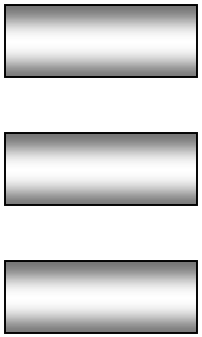


P680 OXIDIZED

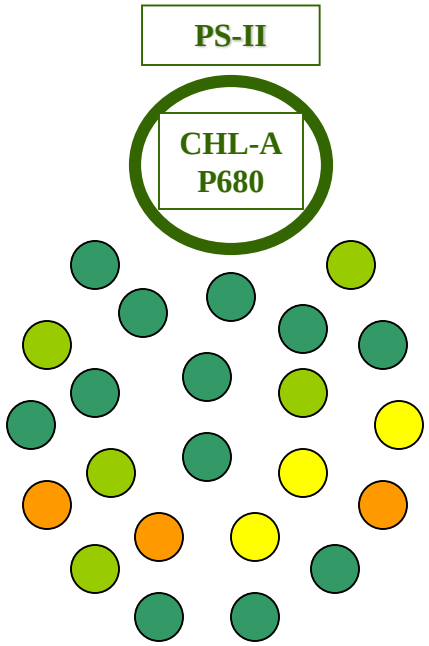
EZ

LIGHT ENERGY

WATER → SPLIT →



PHOTOLYSIS



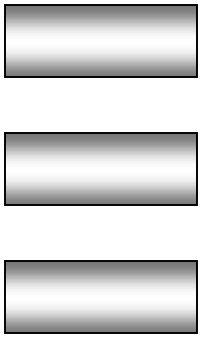
P680 OXIDIZED

Mn

LIGHT ENERGY

WATER → **SPLIT** →

ENZYME COMPLEX REQUIRED

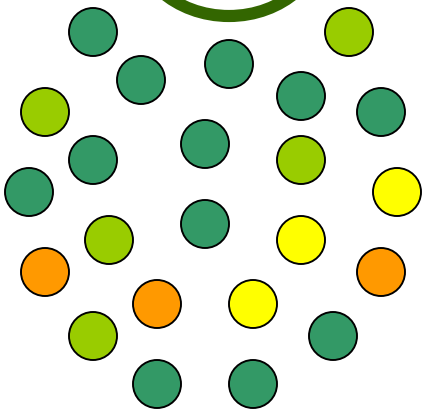


PHOTOLYSIS

PS-II

CHL-A P680

P680 OXIDIZED

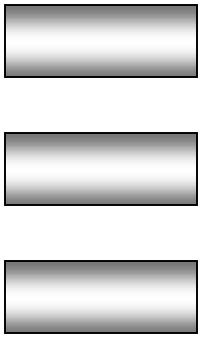


Cof

LIGHT ENERGY

WATER → SPLIT →

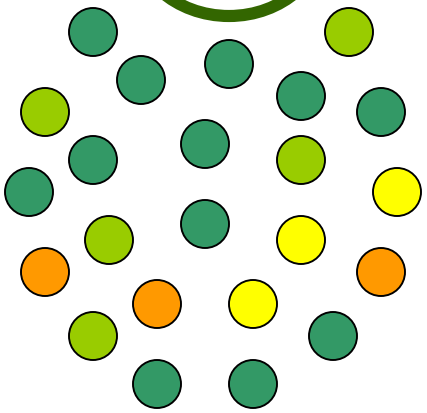
ENZYME COMPLEX
Mn
Manganese
REQUIRED



PHOTOLYSIS

PS-II

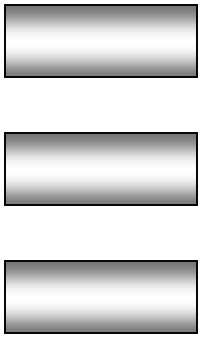
CHL-A
P680



P680 OXIDIZED

LIGHT ENERGY

WATER → SPLIT →

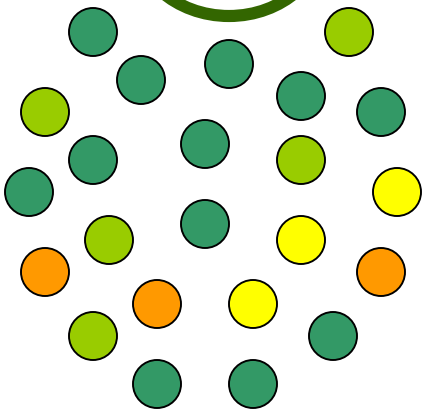


ENZYME COMPLEX
Mn
Manganese
COFACTOR

PHOTOLYSIS

PS-II

CHL-A
P680



P680 OXIDIZED

LIGHT ENERGY

WATER → **SPLIT** →

H+

ENZYME COMPLEX
Mn
Manganese
COFACTOR

PHOTOLYSIS

PS-II

CHL-A
P680

P680 OXIDIZED