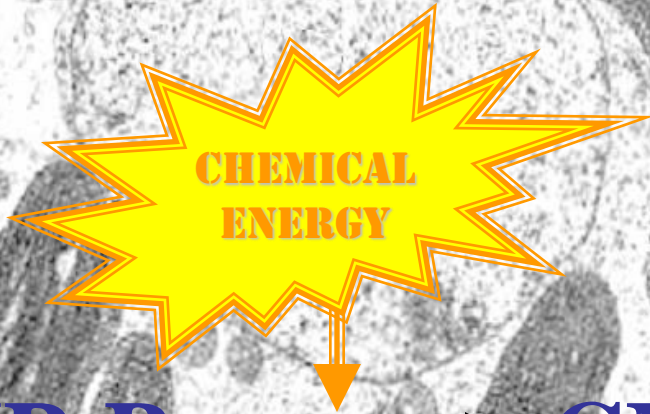


BIOCHEMICAL REACTION



**CHEMICAL ENERGY
USEFUL TO
METABOLISM**

BIOCHEMICAL REACTION



**CHEMICAL ENERGY
DRIVES**

BIOCHEMICAL REACTIONS



QUESTION

WHAT ORGANISMS

CONVERT

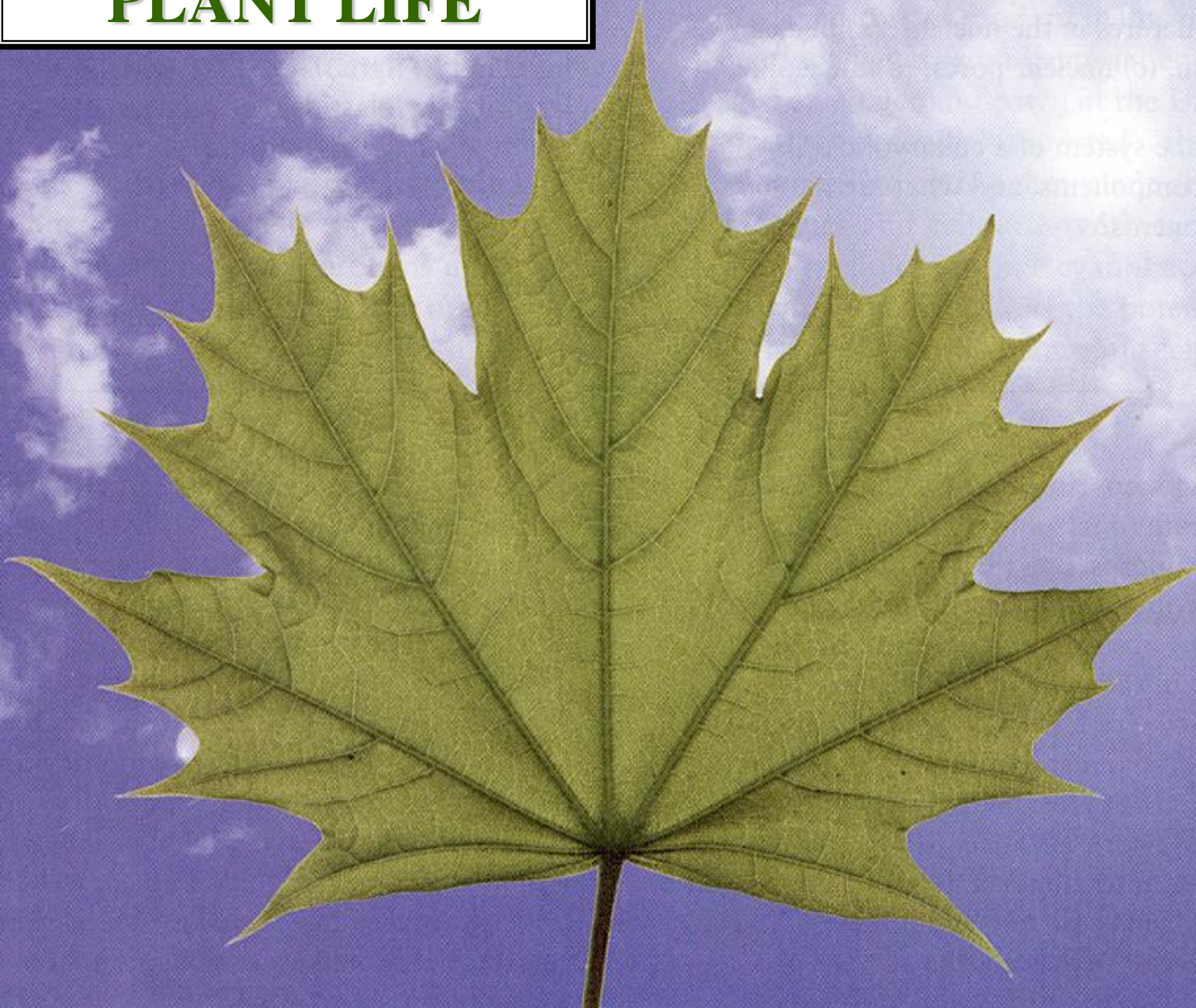
LIGHT ENERGY

TO

CHEMICAL ENERGY?

QUESTION

PLANT LIFE



PLANT LIFE



PHOTOSYNTHESIS



PHOTOSYNTHESIS

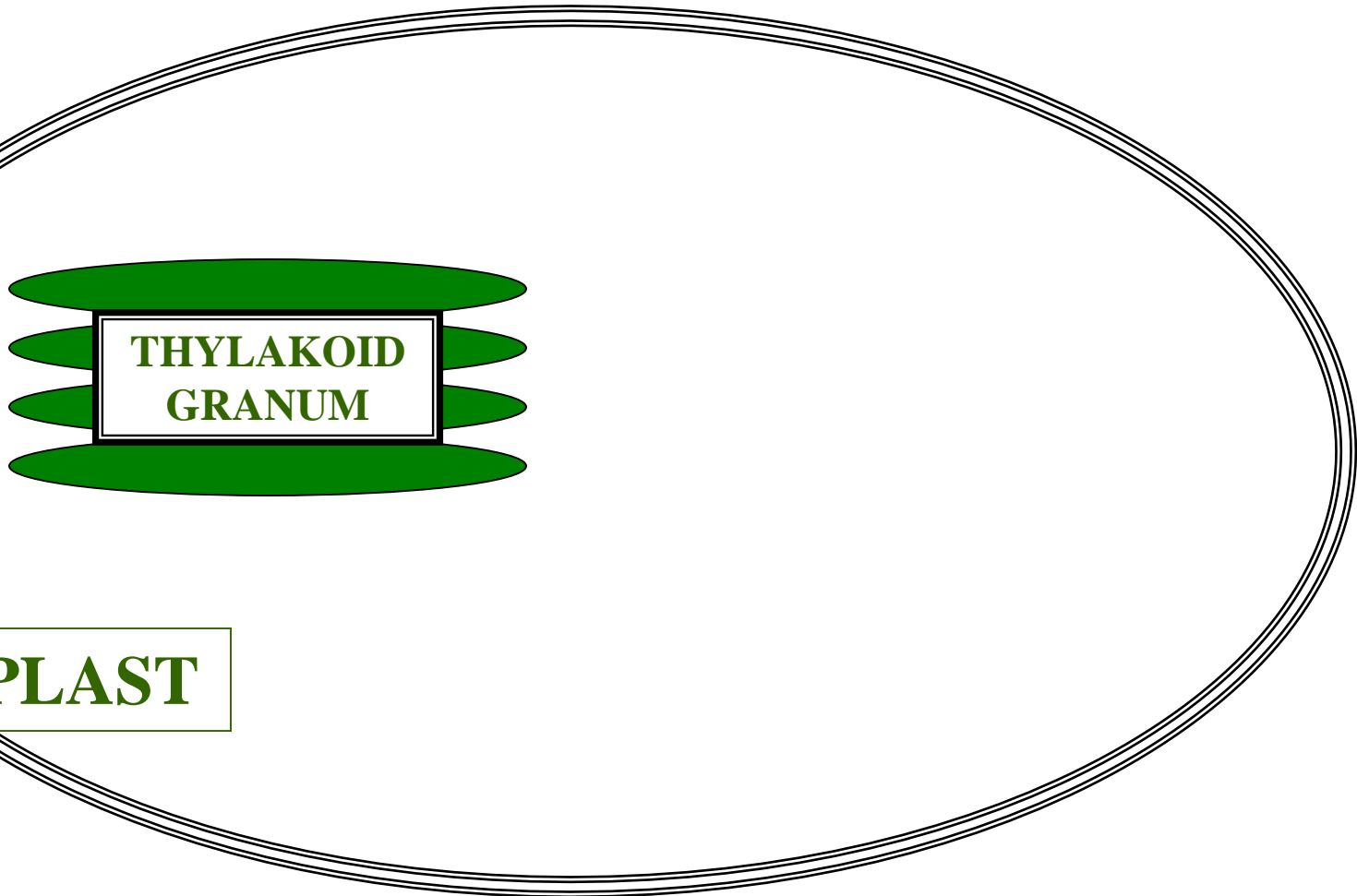
PLANT LIFE



PHOTOSYNTHESIS

PHOTOSYNTHESIS

LT



**THYLAKOID
GRANUM**

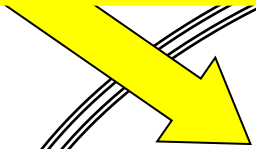
CHLOROPLAST

PHOTOSYNTHESIS

LR



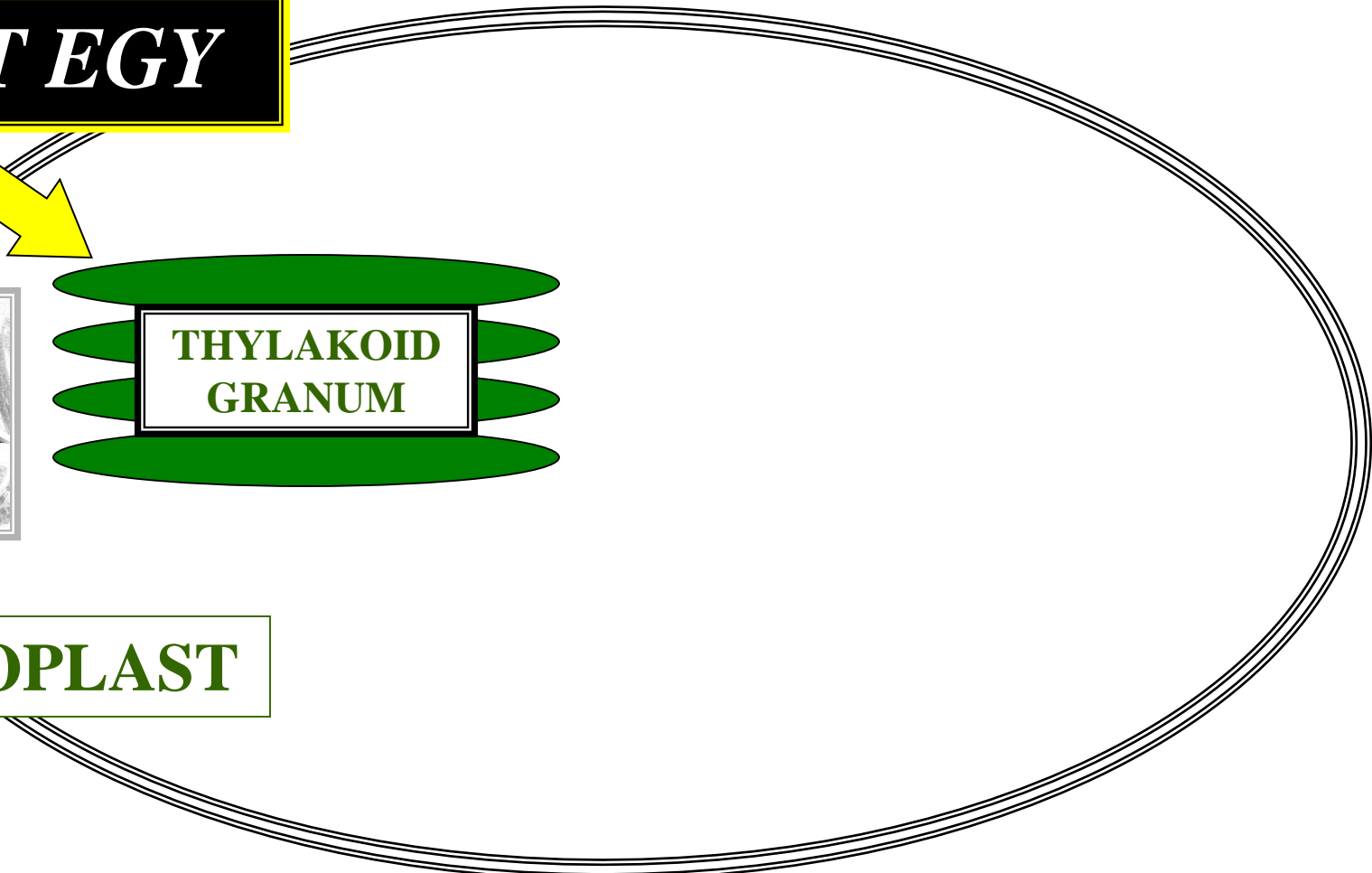
LIGHT ENERGY



**THYLAKOID
GRANUM**



CHLOROPLAST

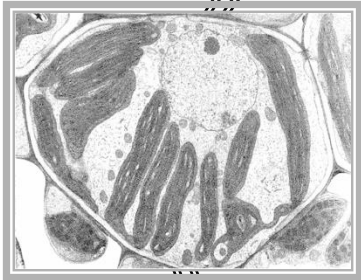
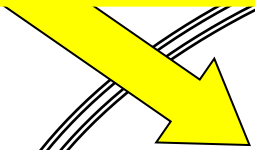


PHOTOSYNTHESIS

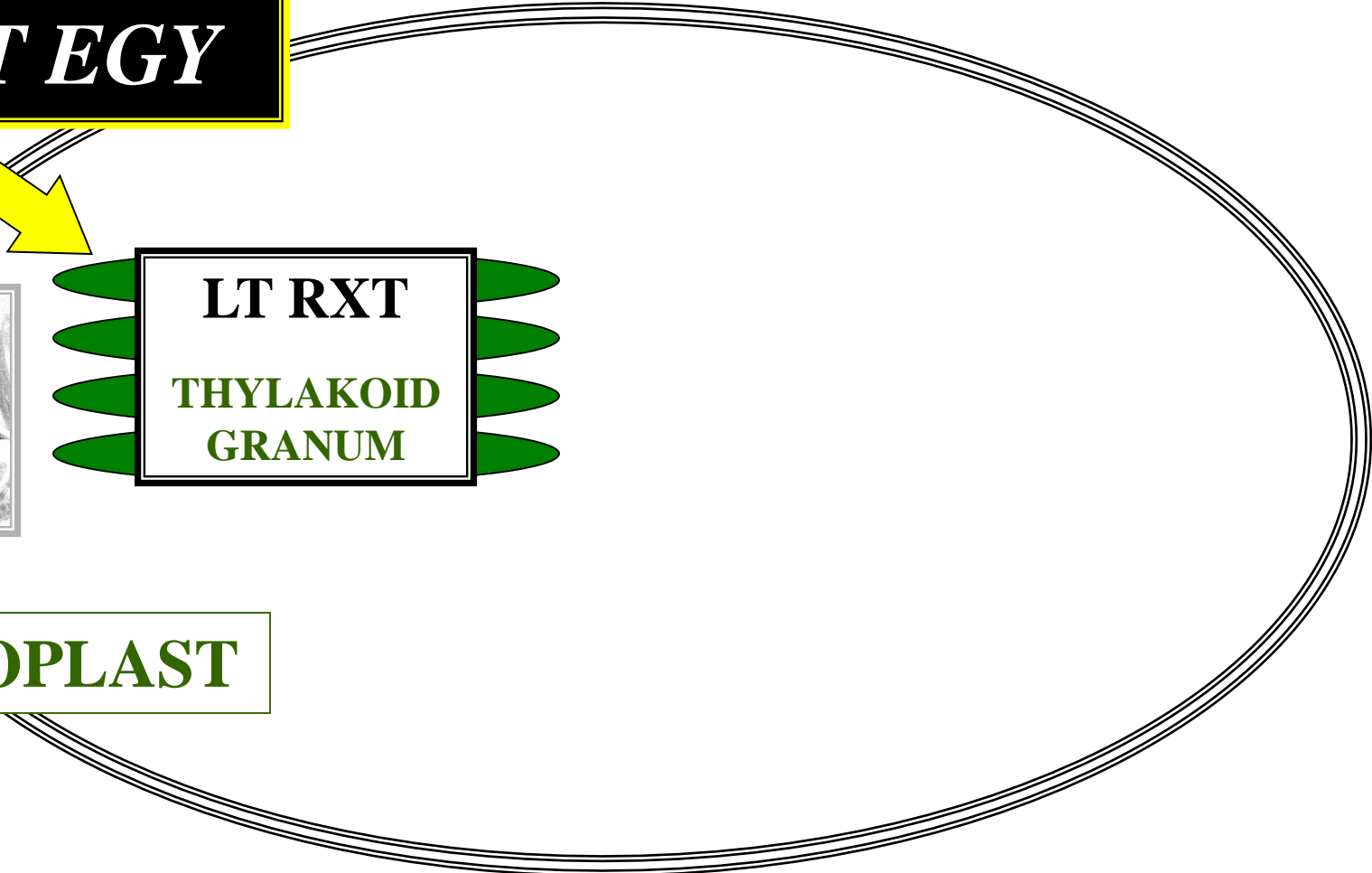
C



LIGHT ENERGY



CHLOROPLAST



PHOTOSYNTHESIS

DR



WATER

LIGHT ENERGY

E-

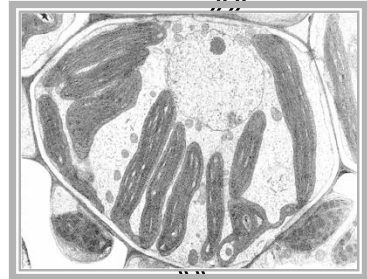
PHOTOLYSIS

LIGHT REACTION

THYLAKOID GRANUM

CHEMICAL ENERGY

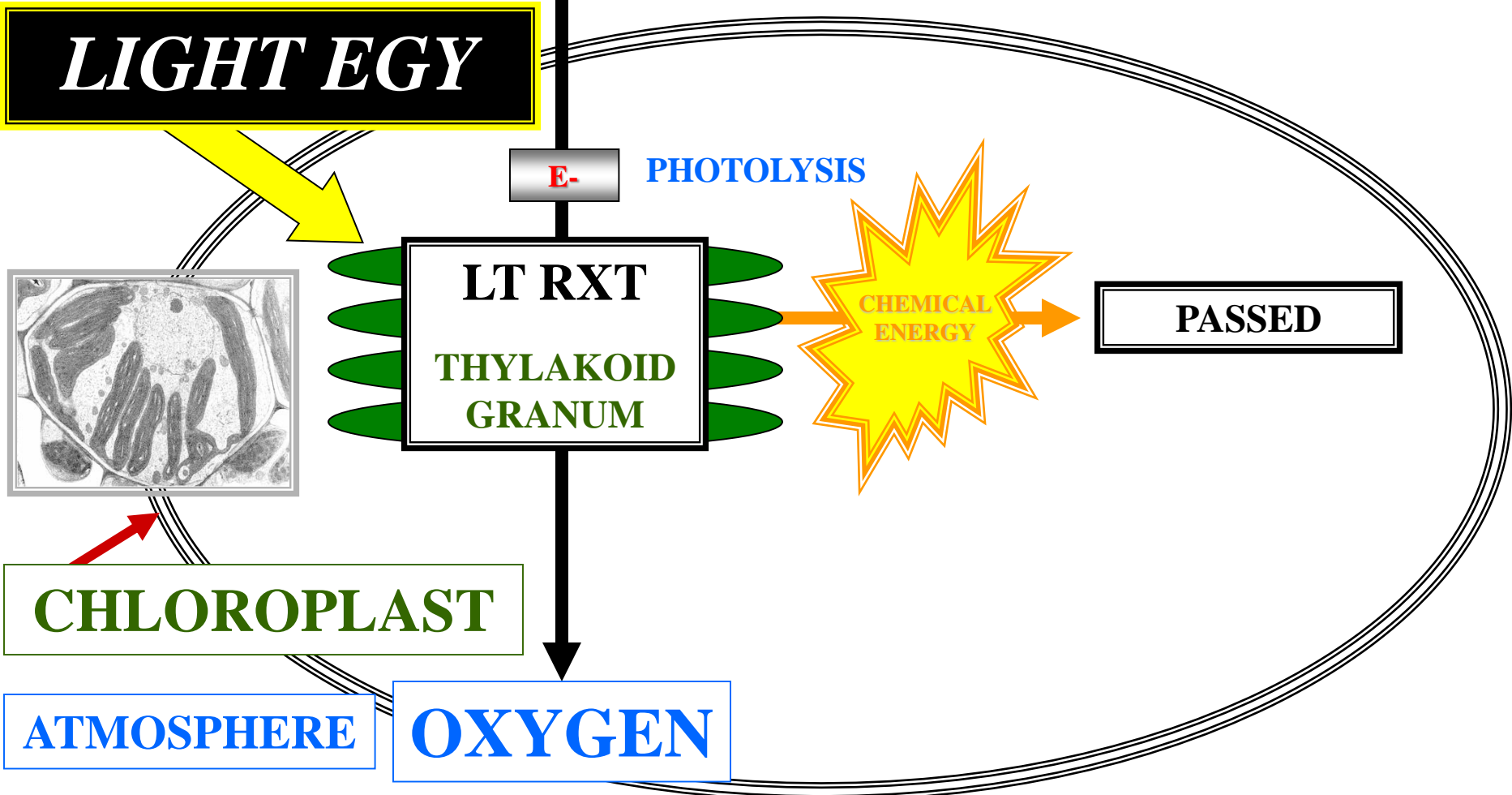
PASSED



CHLOROPLAST

ATMOSPHERE

OXYGEN



PHOTOSYNTHESIS

C



WATER

LIGHT ENERGY

E-

PHOTOLYSIS

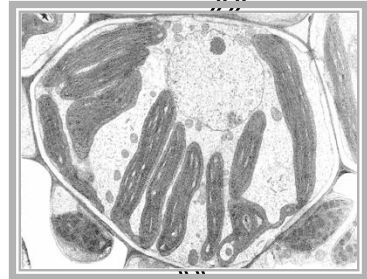
LT RXT

THYLAKOID
GRANUM

CHEMICAL
ENERGY

DK RXT

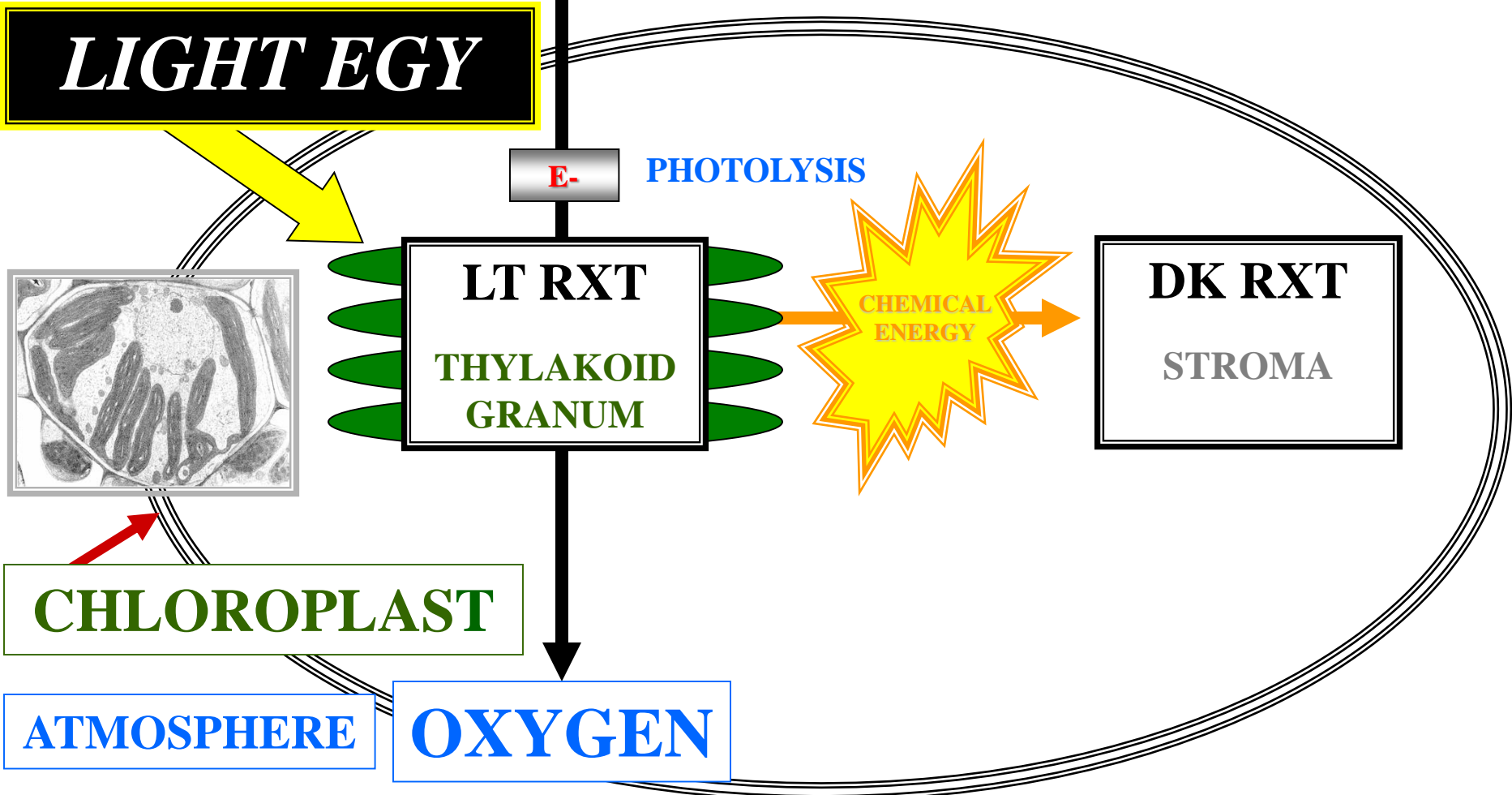
STROMA



CHLOROPLAST

ATMOSPHERE

OXYGEN



PHOTOSYNTHESIS

G



WATER

CO₂

LIGHT ENERGY

ATMOSPHERE

E- PHOTOLYSIS



LT RXT
THYLAKOID
GRANUM

CHEMICAL
ENERGY

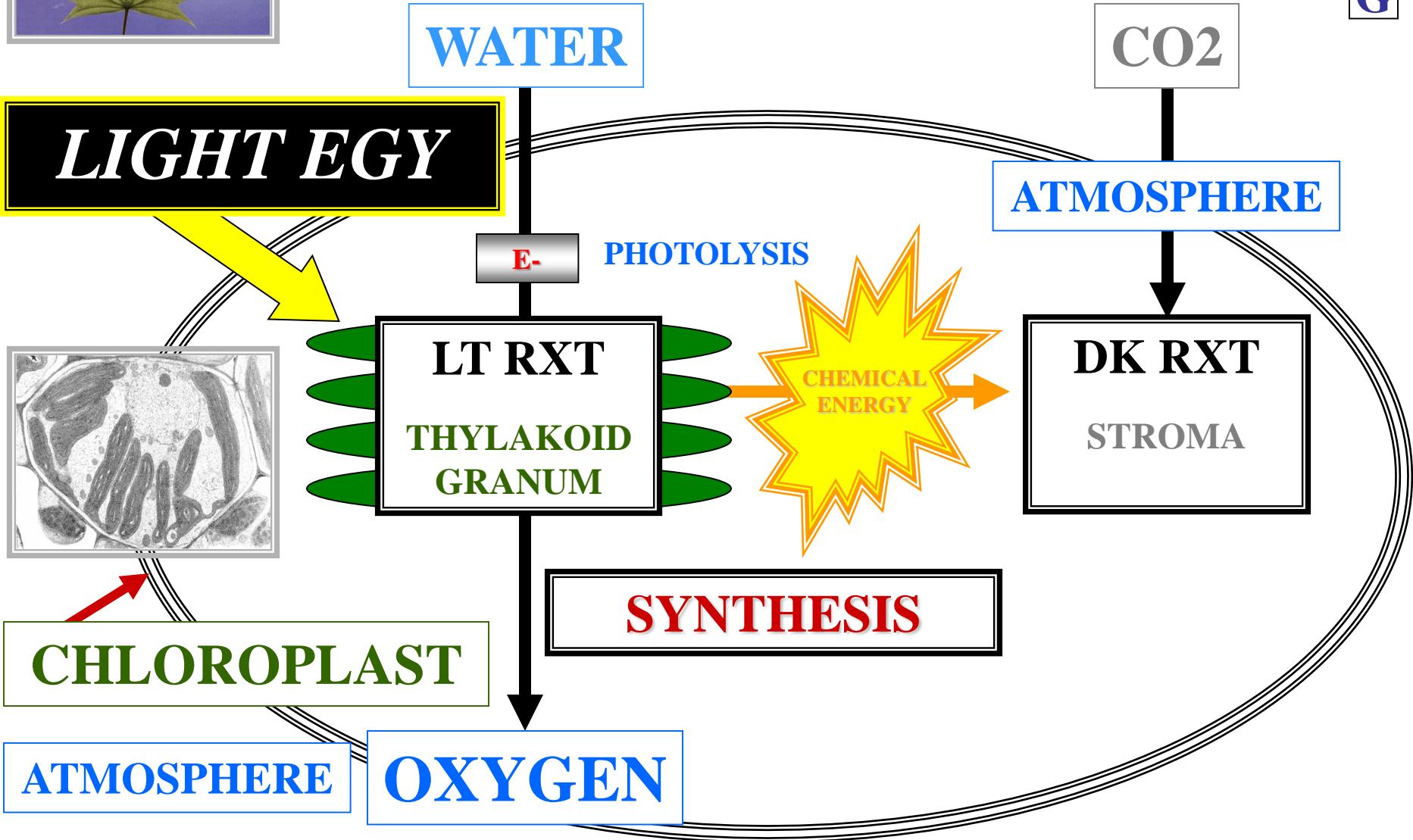
DK RXT
STROMA

CHLOROPLAST

SYNTHESIS

ATMOSPHERE

OXYGEN



PHOTOSYNTHESIS

AP



WATER

CO₂

LIGHT ENERGY

ATMOSPHERE

E-

PHOTOLYSIS

LT RXT

THYLAKOID
GRANUM

CHEMICAL
ENERGY

DK RXT

STROMA

SYNTHESIS

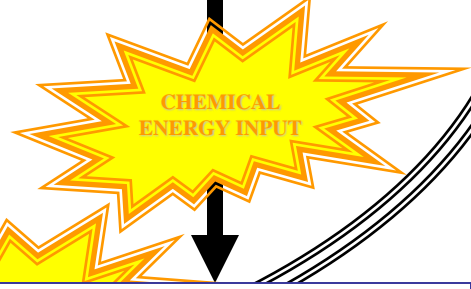
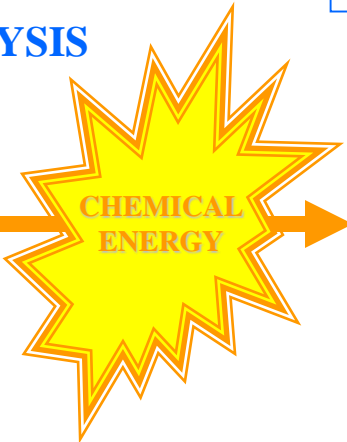
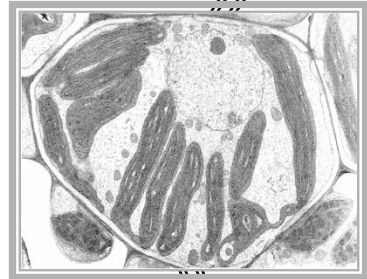
CHEMICAL
ENERGY INPUT

CHLOROPLAST

ATMOSPHERE

OXYGEN

GLUCOSE



PHOTOSYNTHESIS

ANABOLIC PATHWAY

EN

LIGHT ENERGY

ATMOSPHERE

E-

PHOTOLYSIS

LT RXT

THYLAKOID
GRANUM

CHEMICAL
ENERGY

DK RXT

STROMA

SYNTHESIS

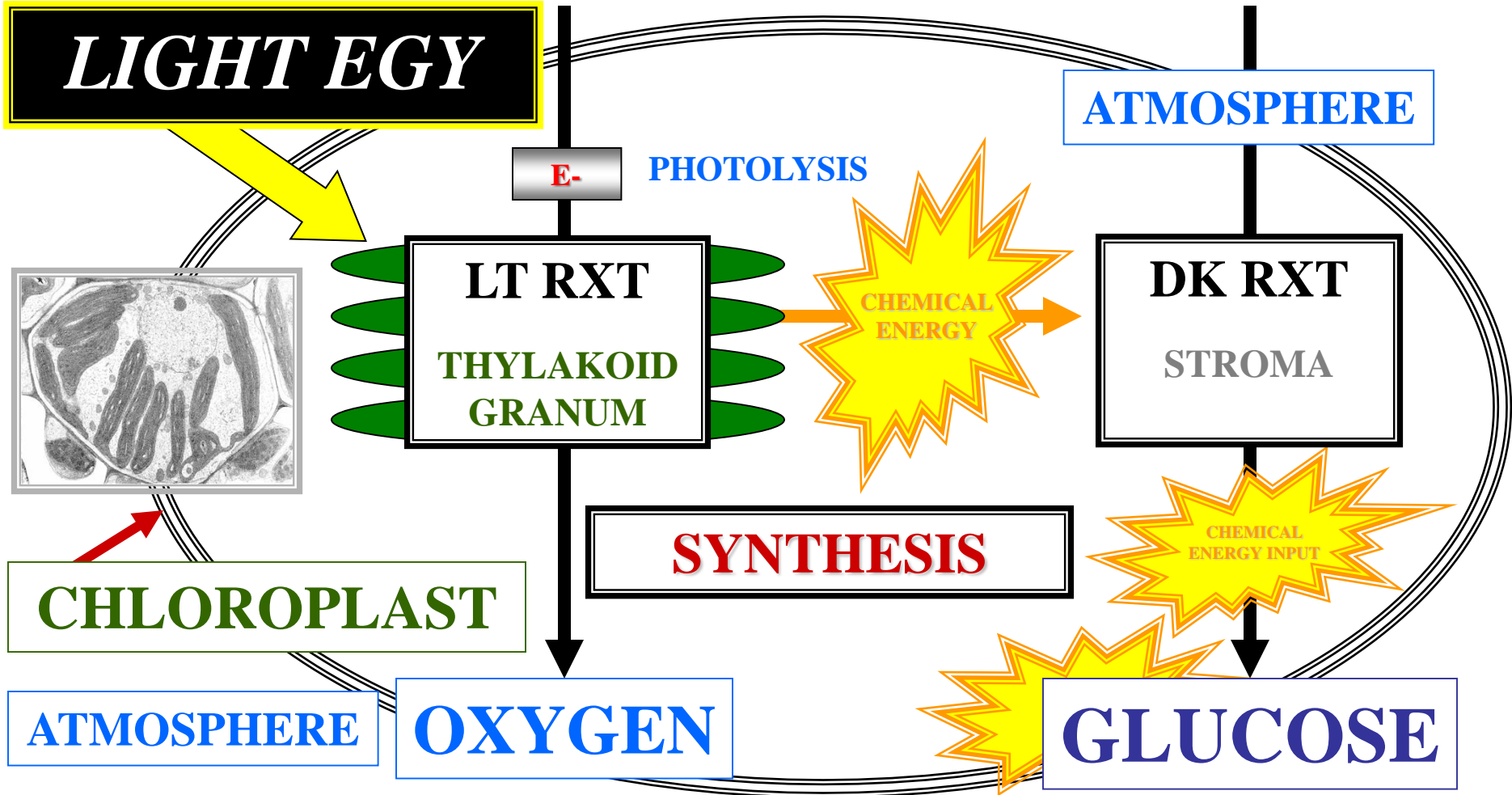
CHEMICAL
ENERGY INPUT

CHLOROPLAST

ATMOSPHERE

OXYGEN

GLUCOSE



PHOTOSYNTHESIS

ENDERGONIC REACTIONS



LIGHT ENERGY

G

ATMOSPHERE

E-

PHOTOLYSIS

LT RXT

THYLAKOID
GRANUM

CHEMICAL
ENERGY

DK RXT

STROMA

SYNTHESIS

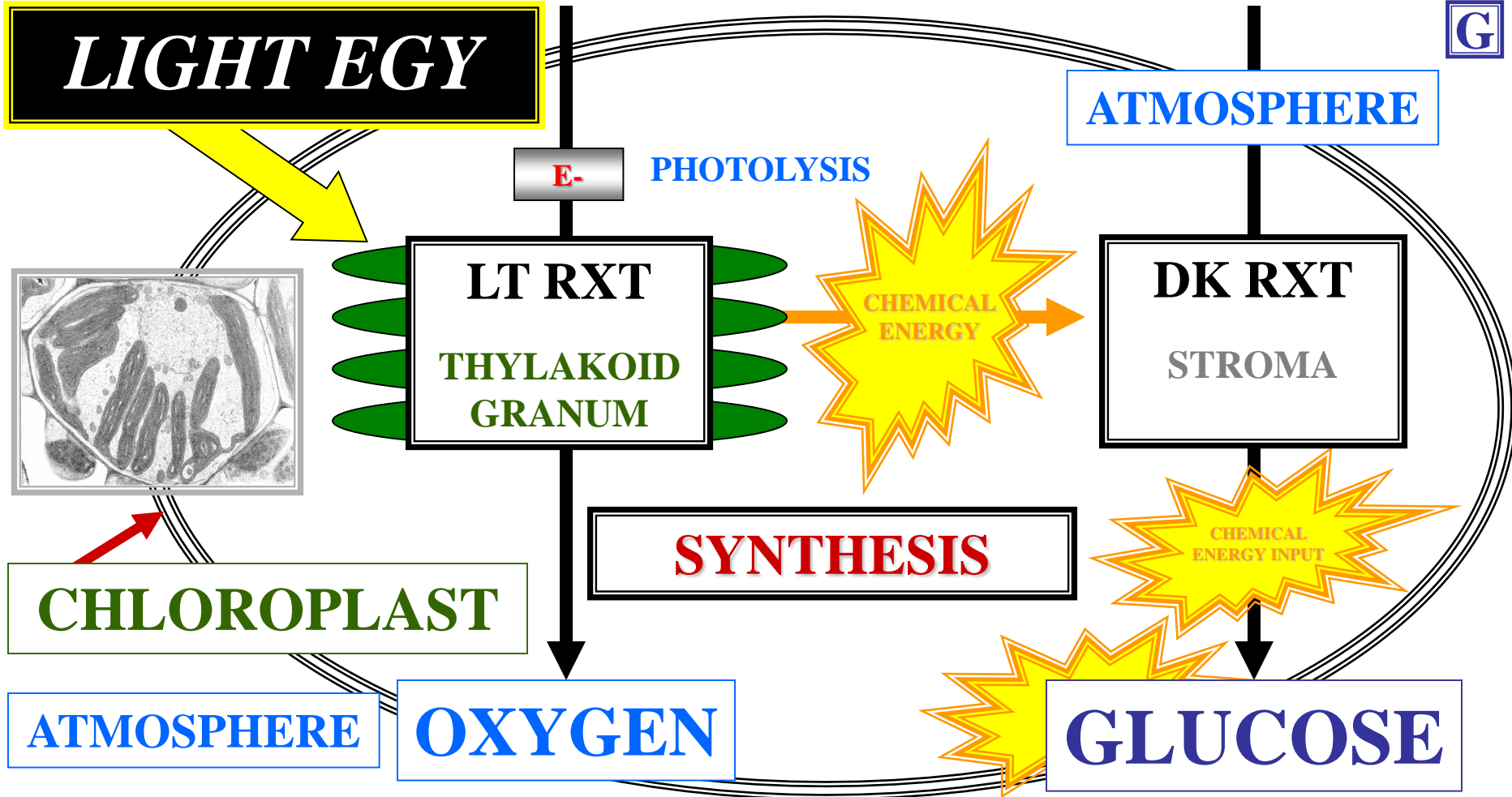
CHEMICAL
ENERGY INPUT

CHLOROPLAST

ATMOSPHERE

OXYGEN

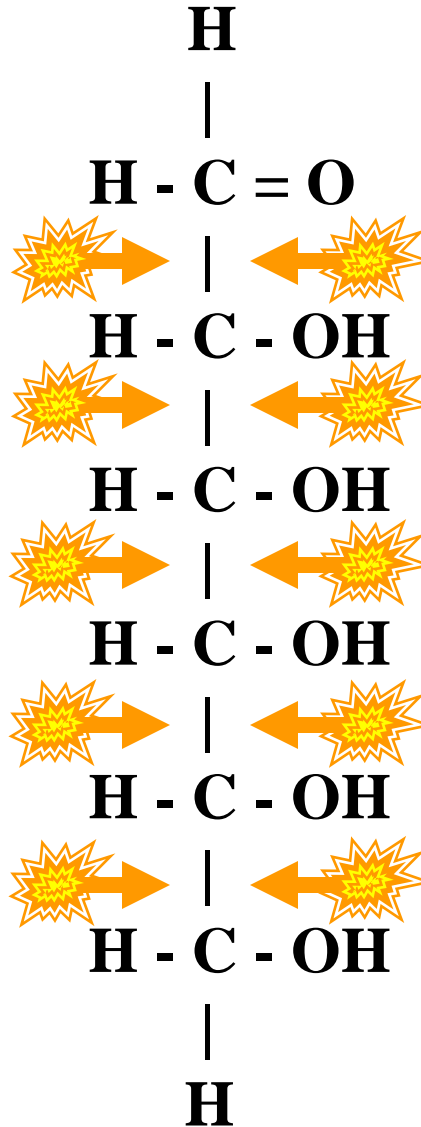
GLUCOSE



GLUCOSE



**CHEMICAL
ENERGY**



**CHEMICAL
ENERGY**



GLUCOSE

GLUCOSE

G



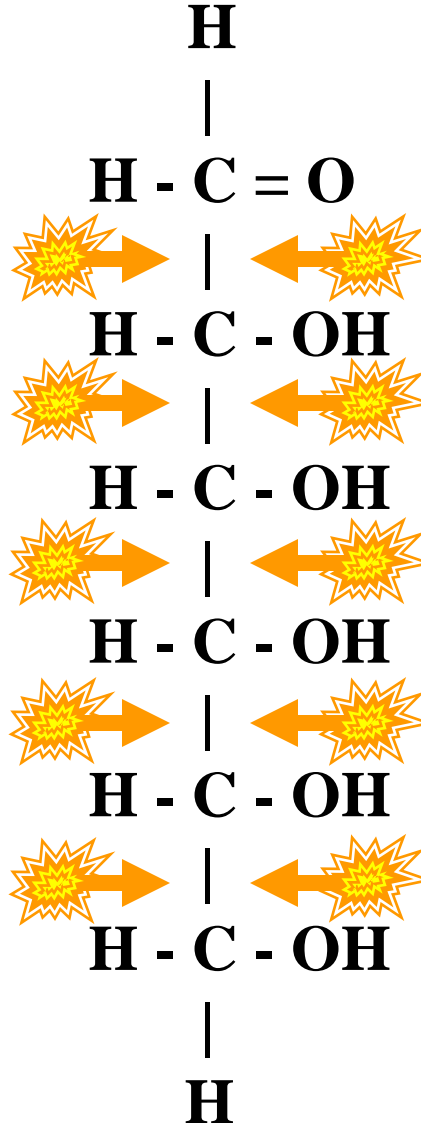
GLUCOSE

GLUCOSE

**ENTERS
RESPIRATION**

**CHEMICAL
ENERGY**

**ENTERS
RESPIRATION**



**ENTERS
RESPIRATION**

**CHEMICAL
ENERGY**

**ENTERS
RESPIRATION**

RESPIRATION

RESPIRATION

GLUCOSE

RESPIRATION

+

 = CHEM ENERGY

RED = ENZYME

RESPIRATION

GLUCOSE

RESPIRATION

CO₂

HEXOKINASE

ATP

EGY

ADP

GLUCOSE-6-PHOSPHATE

PHOSPHOGLUCOISOMERASE

FRUCTOSE-6-PHOSPHATE

PHOSPHOFRUCTOKINASE

ATP

EGY

ADP

FRUCTOSE-1-6-PHOSPHATE

 = **CHEM ENERGY**

RED = ENZYME

3-PHOSPHOGLYCERATE - PGA

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ADP



ATP

PYRUVATE

3-PHOSPHOGLYCERATE - PGA

CP

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ATP



ADP

PYRUVATE

RESPIRATION

CO2 IS RELEASED

3-PHOSPHOGLYCERATE - PGA

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ADP



ATP

PYRUVATE

3-PHOSPHOGLYCERATE - PGA



ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ATP



ADP

PYRUVATE

RESPIRATION

CATABOLIC PATHWAY

3-PHOSPHOGLYCERATE - PGA

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ADP



ATP

PYRUVATE

3-PHOSPHOGLYCERATE - PGA

EX

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ATP



ADP

PYRUVATE

RESPIRATION

CHEMICAL ENERGY IS RELEASED



3-PHOSPHOGLYCERATE - PGA

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ADP



ATP

PYRUVATE

3-PHOSPHOGLYCERATE - PGA

?

ENOLASE

3-PHOSPHOENOLPYRUVATE

PYRUVATE KINASE

ATP

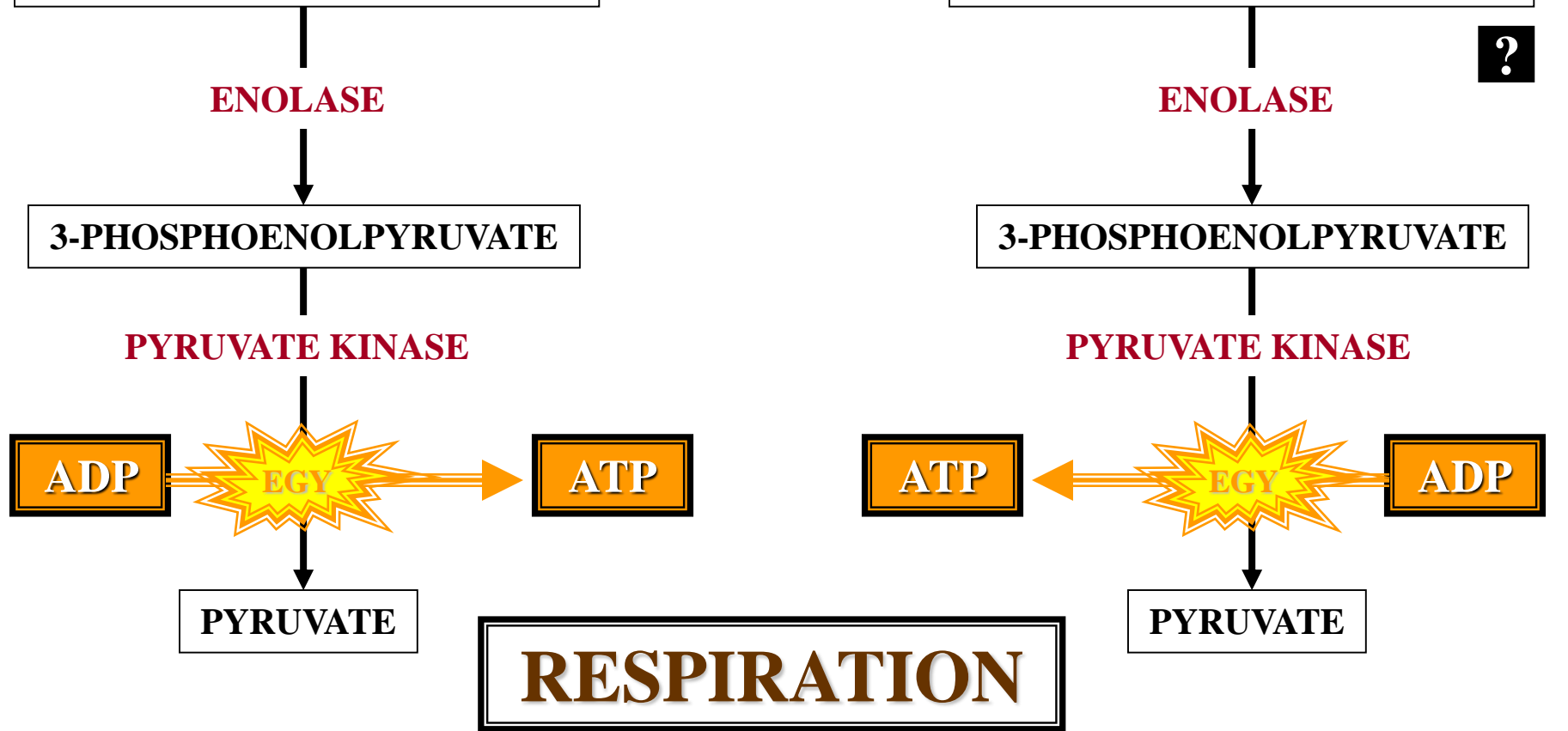


ADP

PYRUVATE

RESPIRATION

EXERGONIC REACTIONS



**ANABOLIC
METABOLISM
&
CATABOLIC
METABOLISM
?**

**ANABOLIC
METABOLISM
&
CATABOLIC
METABOLISM
*!!!COUPLED!!!***

**ENDERGONIC
REACTIONS
&
EXERGONIC
REACTIONS
?**

**ENDERGONIC
REACTIONS
&
EXERGONIC
REACTIONS**

!!!COUPLED!!!

PHOTOSYNTHESIS

PATHWAY



&

RESPIRATION

PATHWAY

?

PHOTOSYNTHESIS

PATHWAY

A

&

RESPIRATION

PATHWAY

!!!COUPLED!!!



ATP

BIOLOGICAL

ENERGY

MOLECULE

ATP
ADENOSINE
TRIPHOSPHATE

ATP

ADENOSINE

TRIPHOSPHATE



ADENOSINE TRIPHOSPHATE

ATP

DELIVERS CHEM-EGY

TO

BIO-CHEM RXTS

ATP

ADENOSINE TRIPHOSPHATE

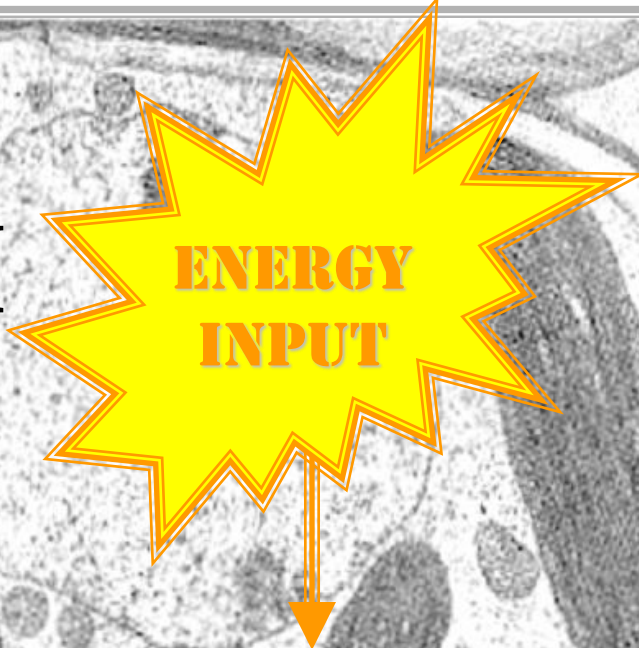


CELL METABOLISM



BIOCHEMICAL REACTION

CELL METABOLISM



BIOCHEMICAL REACTION

CELL METABOLISM

**CHEMICAL
ENERGY**



BIOCHEMICAL REACTION

CELL METABOLISM

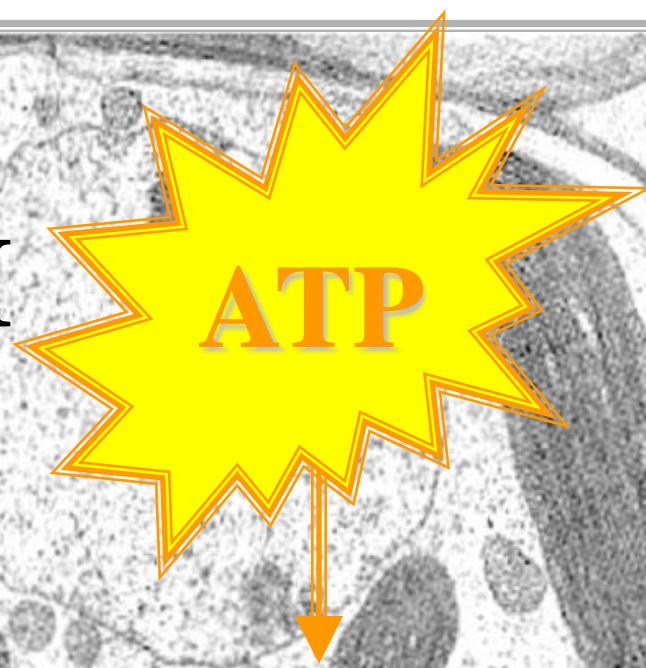
**CHEMICAL
ENERGY**



**ENDERGONIC
BIOCHEMICAL REACTIONS**

CELL METABOLISM

A
P



**ATP DELIVERS CHEM-EGY
TO
ENDERGONIC
BIOCHEMICAL REACTIONS**

**CELL
METABOLISM**



ATP



ATP

DRIVES

ENDERGONIC REACTIONS

TO A PRODUCT



ATP STRUCTURE

ATP STRUCTURAL COMPONENTS

ATP STRUCTURAL COMPONENTS

RIBOSE

**ATP STRUCTURE
COMPONENTS**

ATP STRUCTURAL COMPONENTS

RIBOSE

ADENINE

**ATP STRUCTURE
COMPONENTS**

ATP STRUCTURAL COMPONENTS



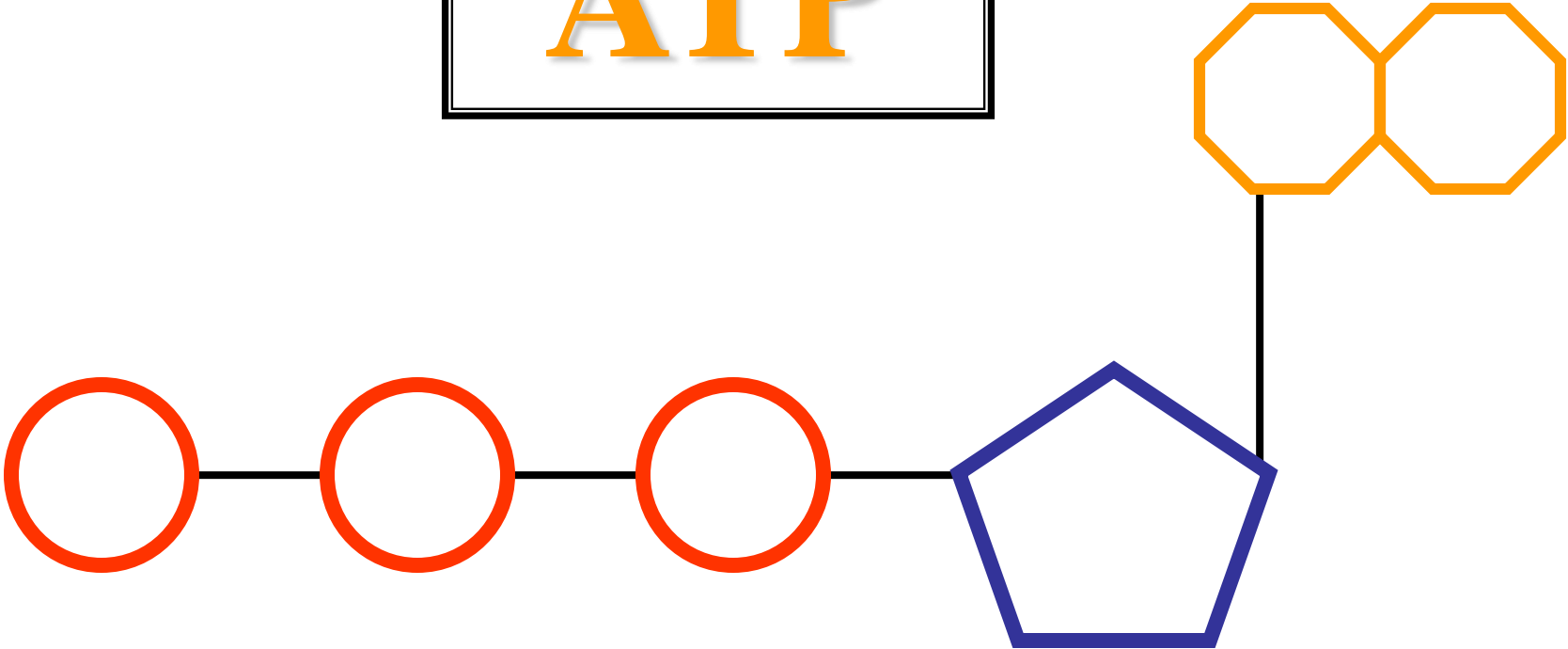
RIBOSE

ADENINE

3 PHOSPHATE GROUPS

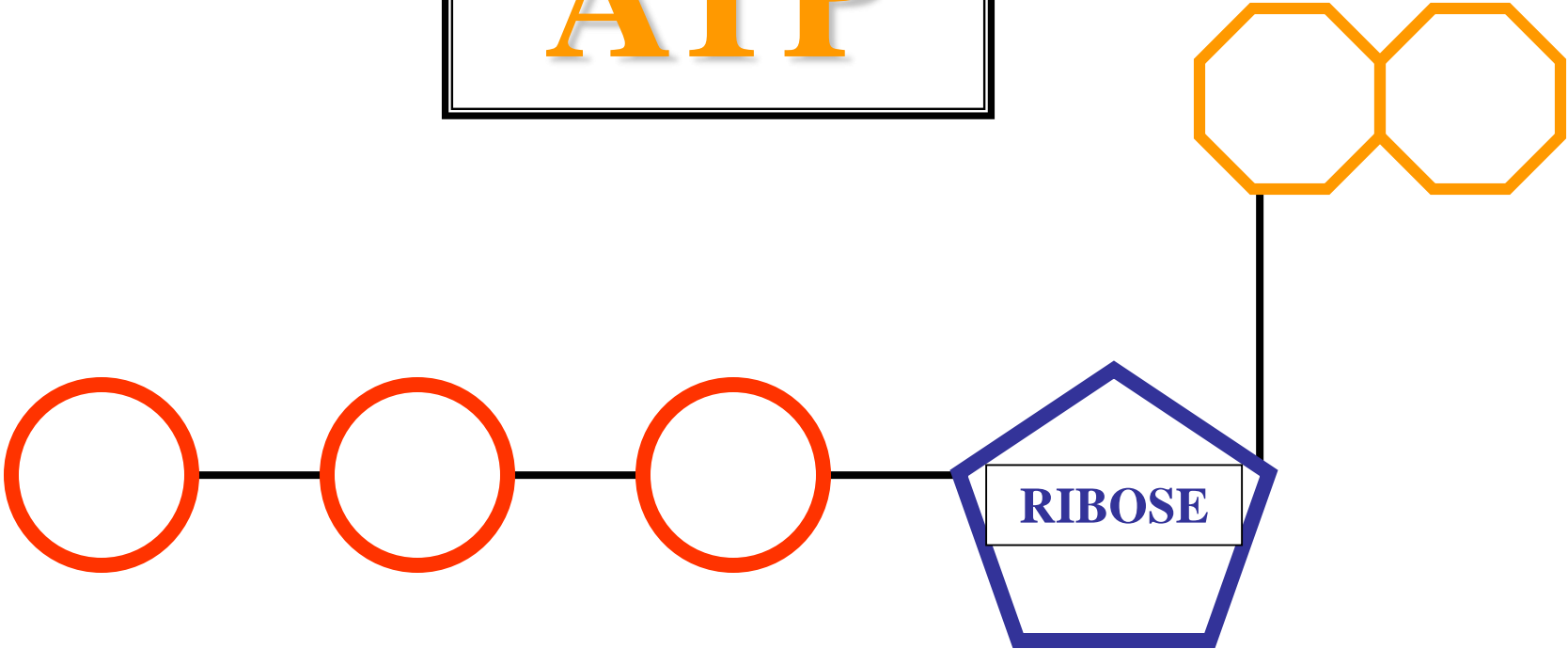
ATP STRUCTURE COMPONENTS

ATP



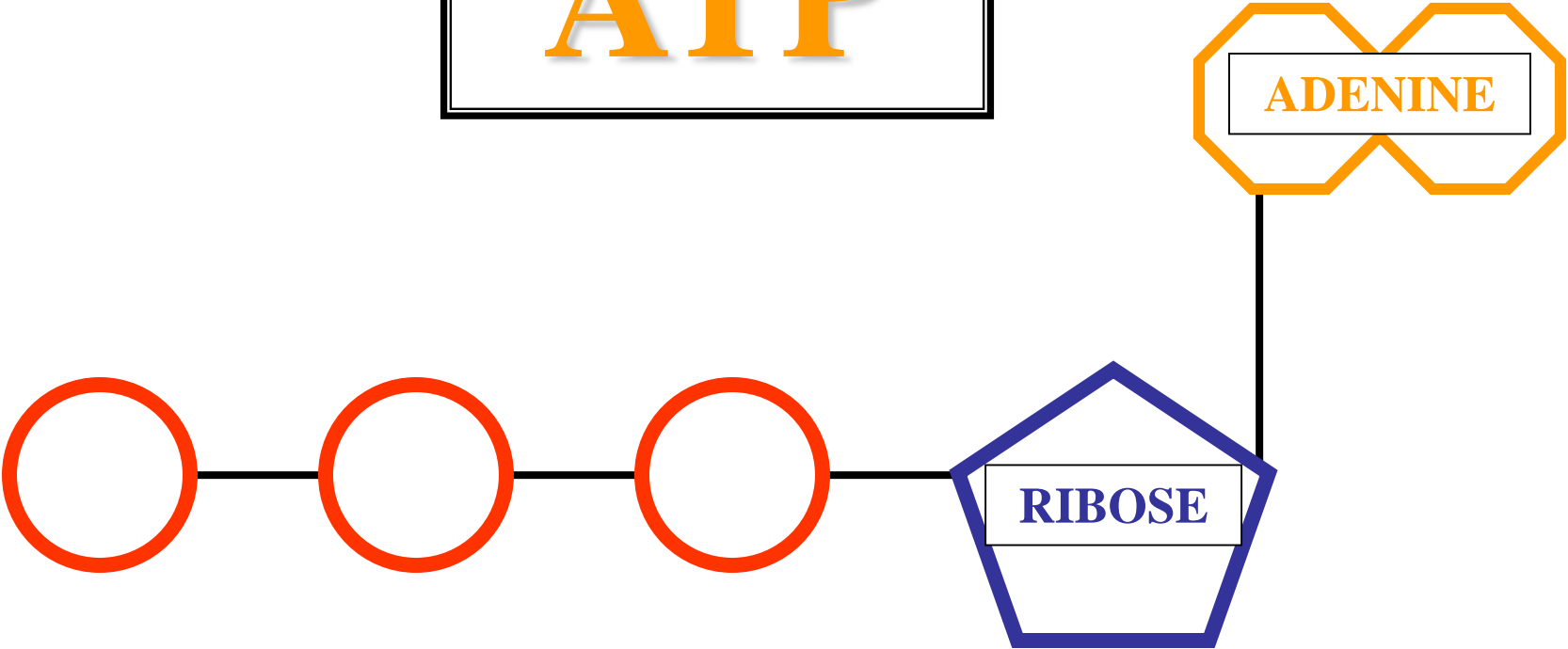
ATP
STRUCTURE

ATP



ATP
STRUCTURE

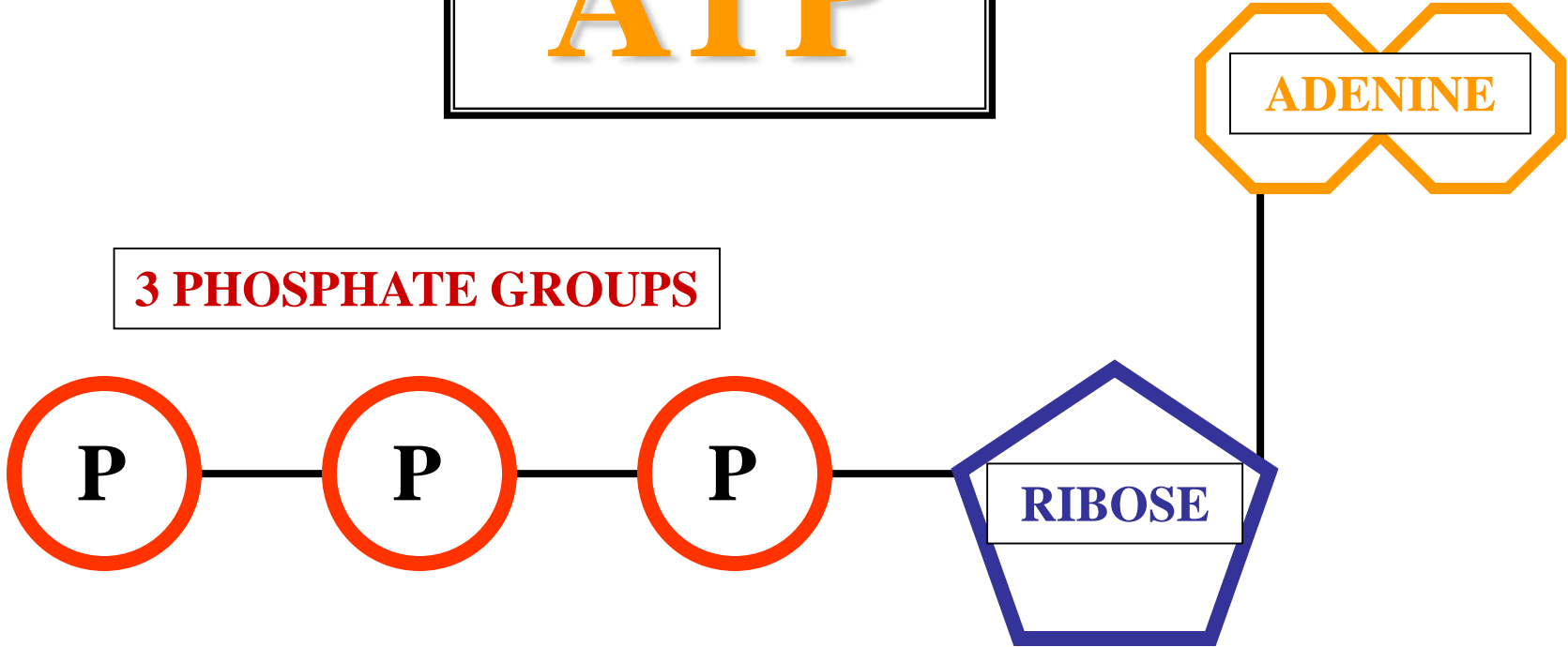
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ATP
STRUCTURE



ATP

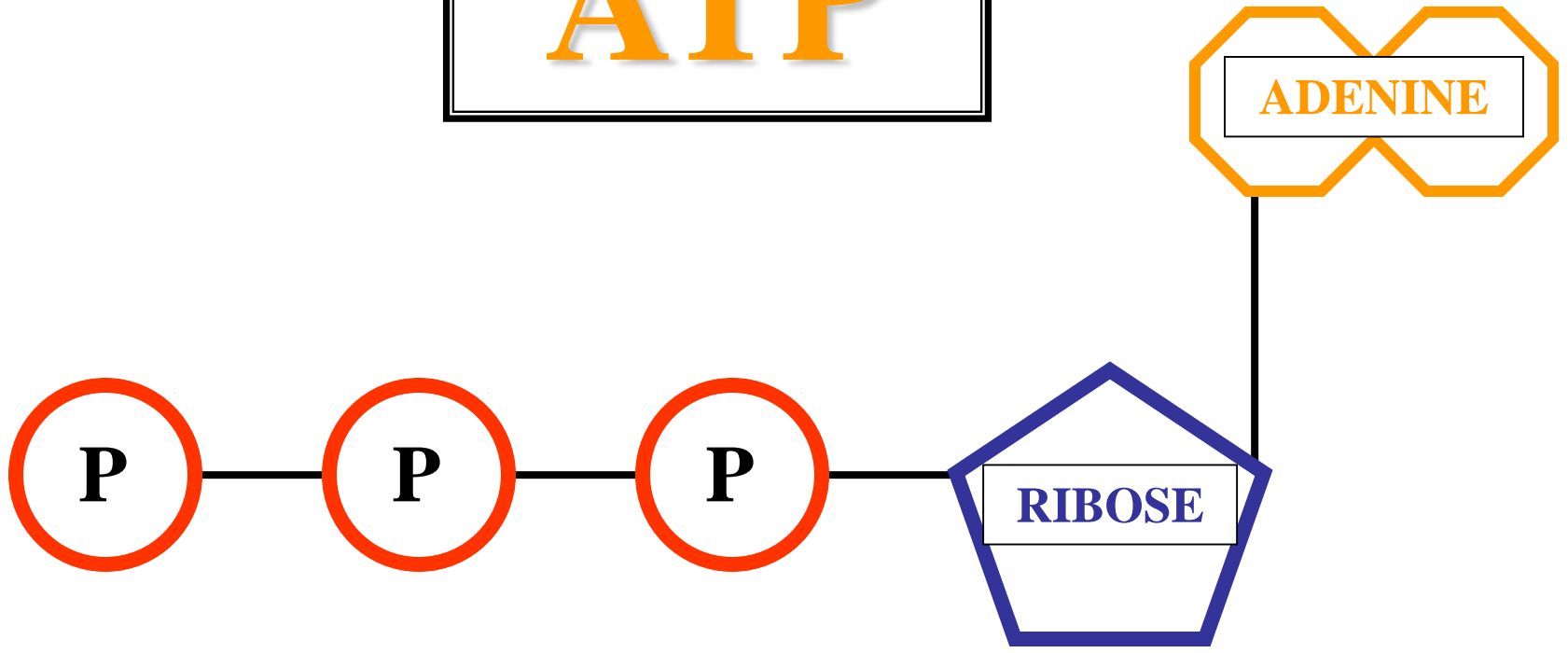


ATP
STRUCTURE



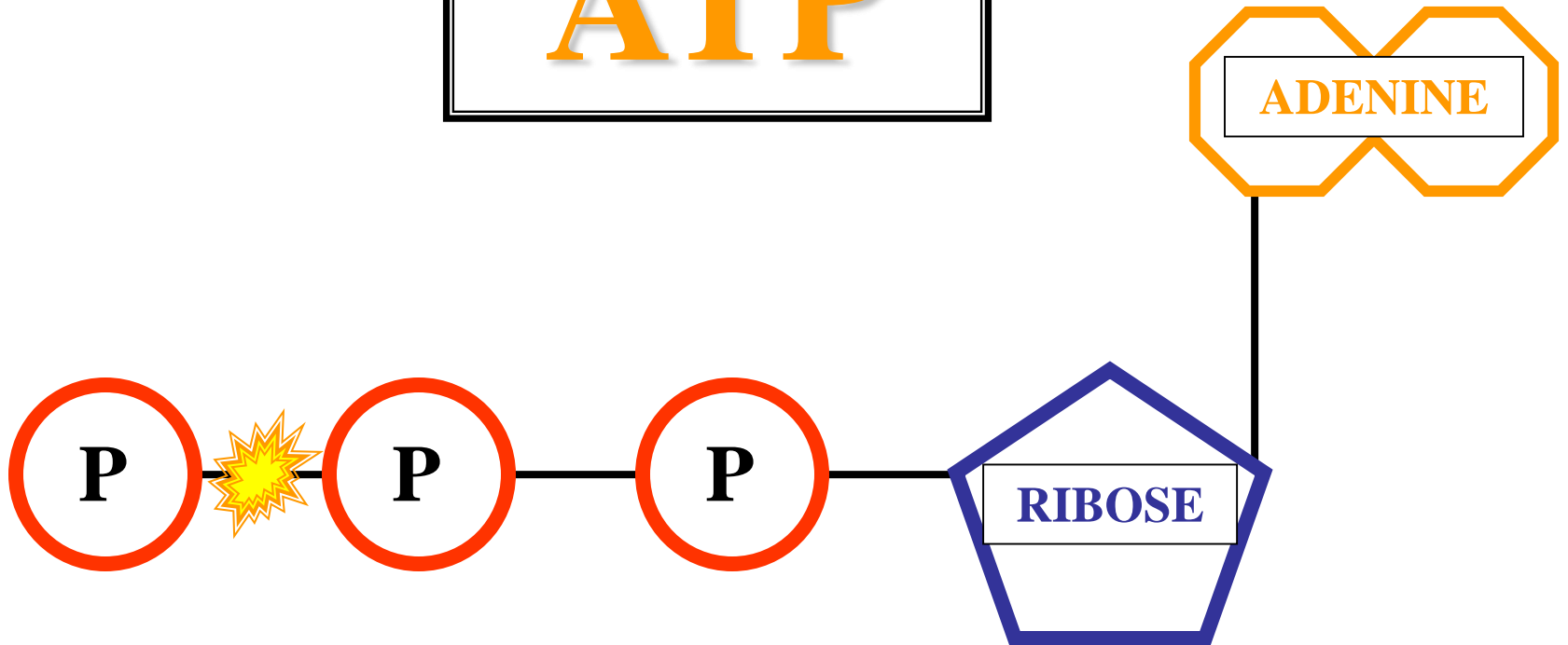
ATP HYDROLYSIS REACTION

ATP



**ATP
HYDROLYSIS**

ATP



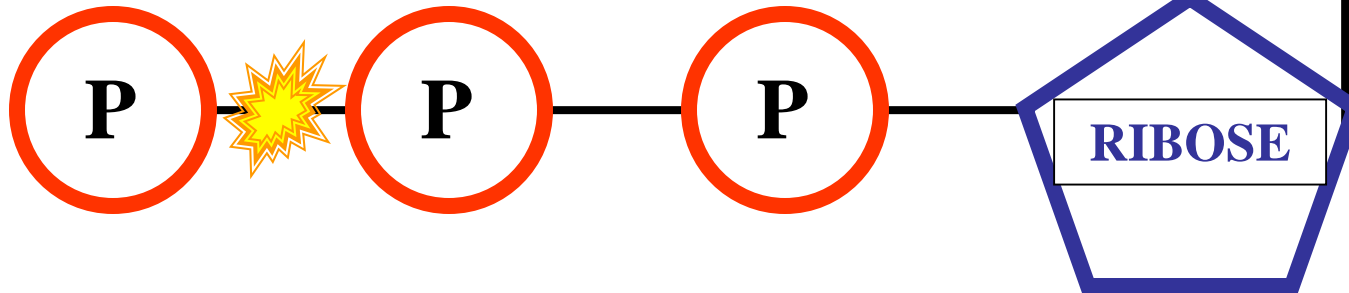
**3RD PHOSPHATE BOND
HOLDS BIOCHEMICAL ENERGY**

 **= HOLDS BIO-CHEM ENERGY**

ATP

ADENINE

HYDROLYSIS RXT



3RD PHOSPHATE BOND

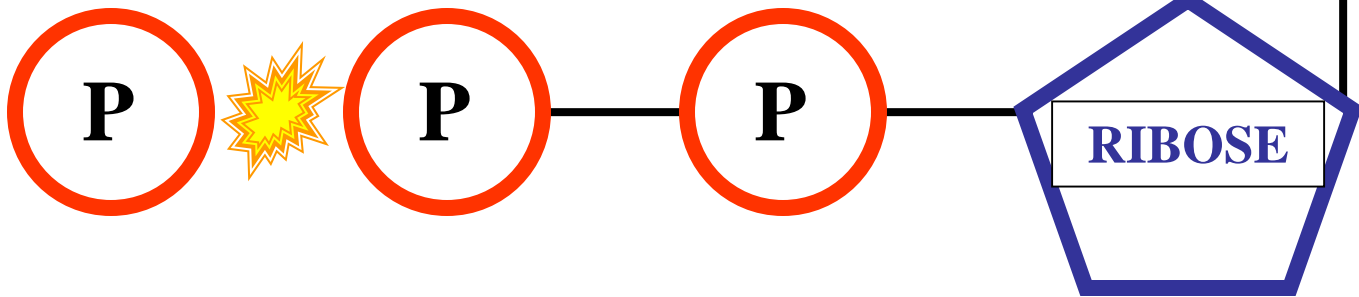
HOLDS BIOCHEMICAL ENERGY

 = **HOLDS BIO-CHEM ENERGY**

ATP



HYDROLYSIS RXT



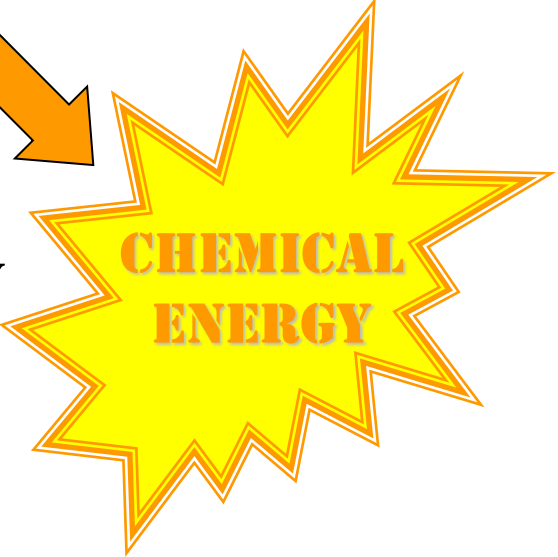
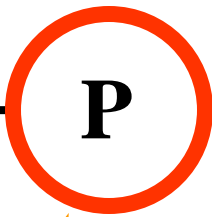
3RD PHOSPHATE BOND BREAKS

 = **HOLDS BIO-CHEM ENERGY**

EX

ATP

HYDROLYSIS RXT

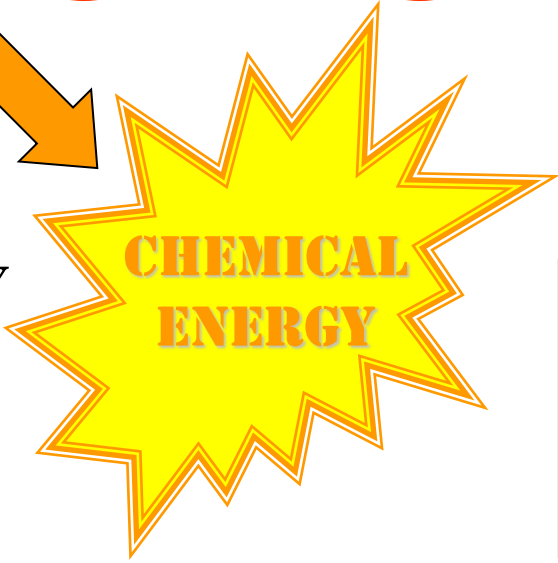
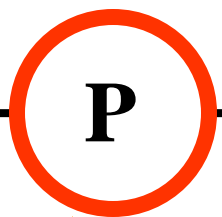
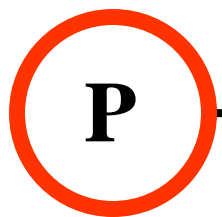


**CHEMICAL ENERGY
RELEASED**



ATP

HYDROLYSIS RXT



**CHEMICAL ENERGY
RELEASED**

**EXERGONIC
RXT**

EXERGONIC RXT

EN

CHEMICAL
ENERGY



BIOCHEMICAL REACTION

**EXERERGONIC
RXT**

**AT
PR**

**CHEMICAL
ENERGY**

CMP-A + CMP-B → CMP-C

**ENDERERGONIC
RXT**

CELL METABOLISM

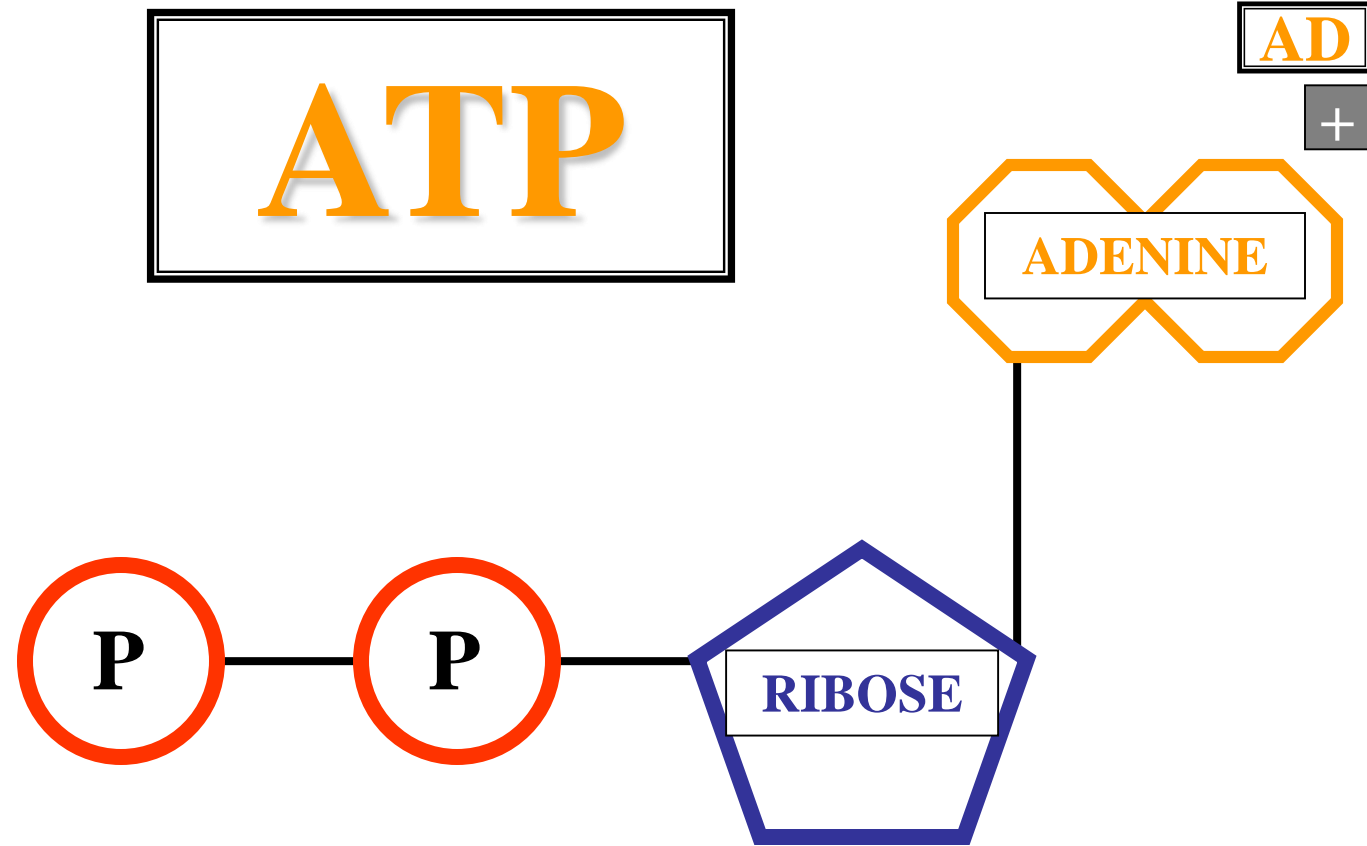
AT

+

ATP



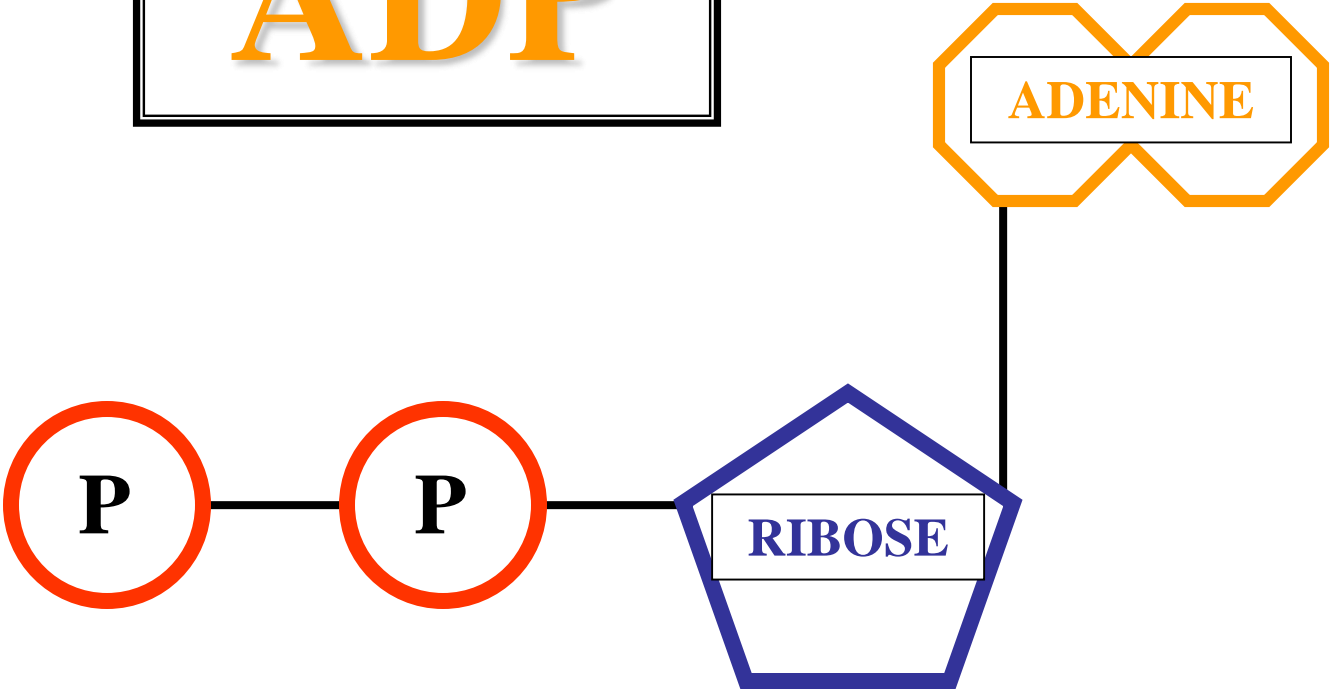
ATP CHEMICAL ENERGY
DRIVES
ENDERGONIC REACTIONS
TO A PRODUCT



ATP

HYDROLYSIS

ADP



ADENOSINE DIPHOSPHATE

ADP
ADENOSINE
DIPHOSPHATE

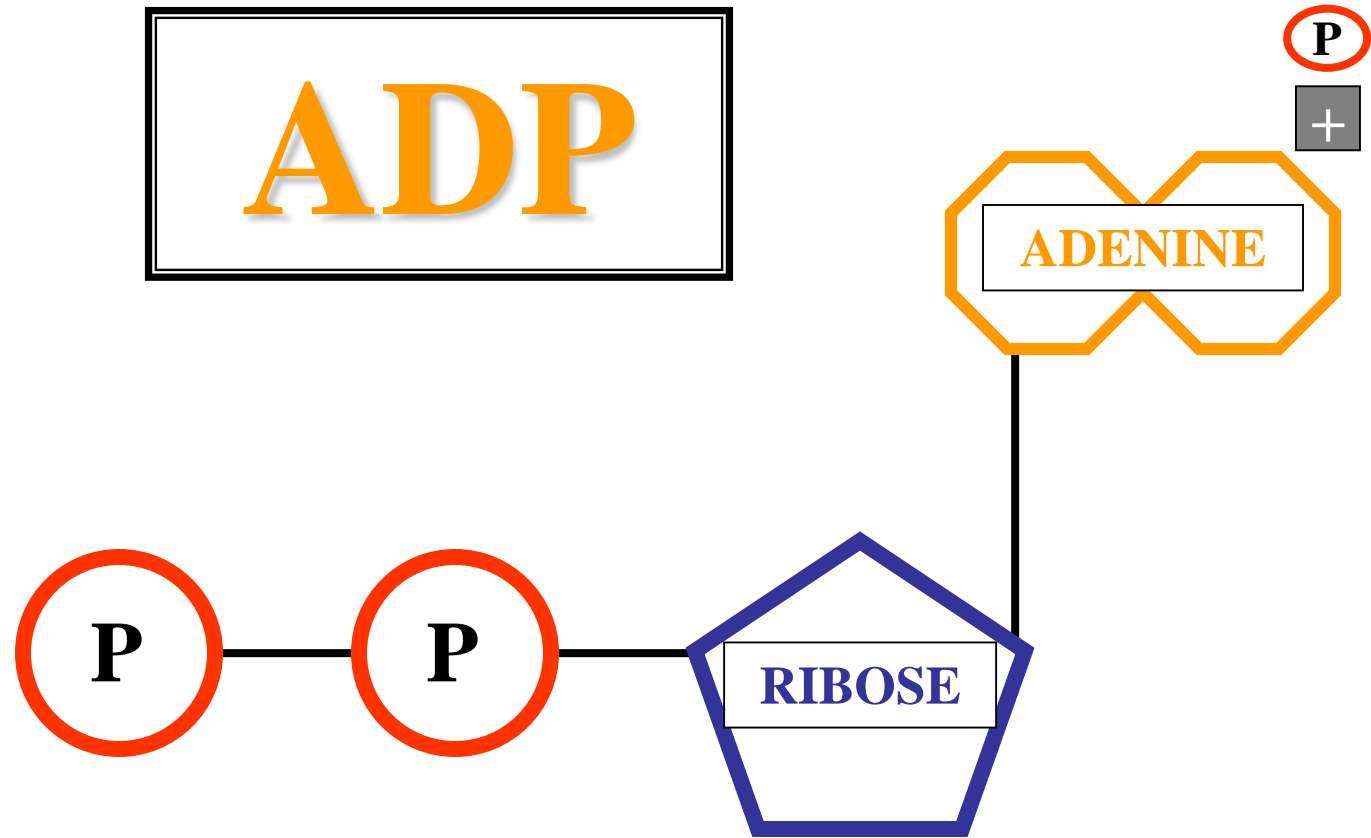
ADENOSINE DIPHOSPHATE

ADP

2 PHOSPHATE GROUPS

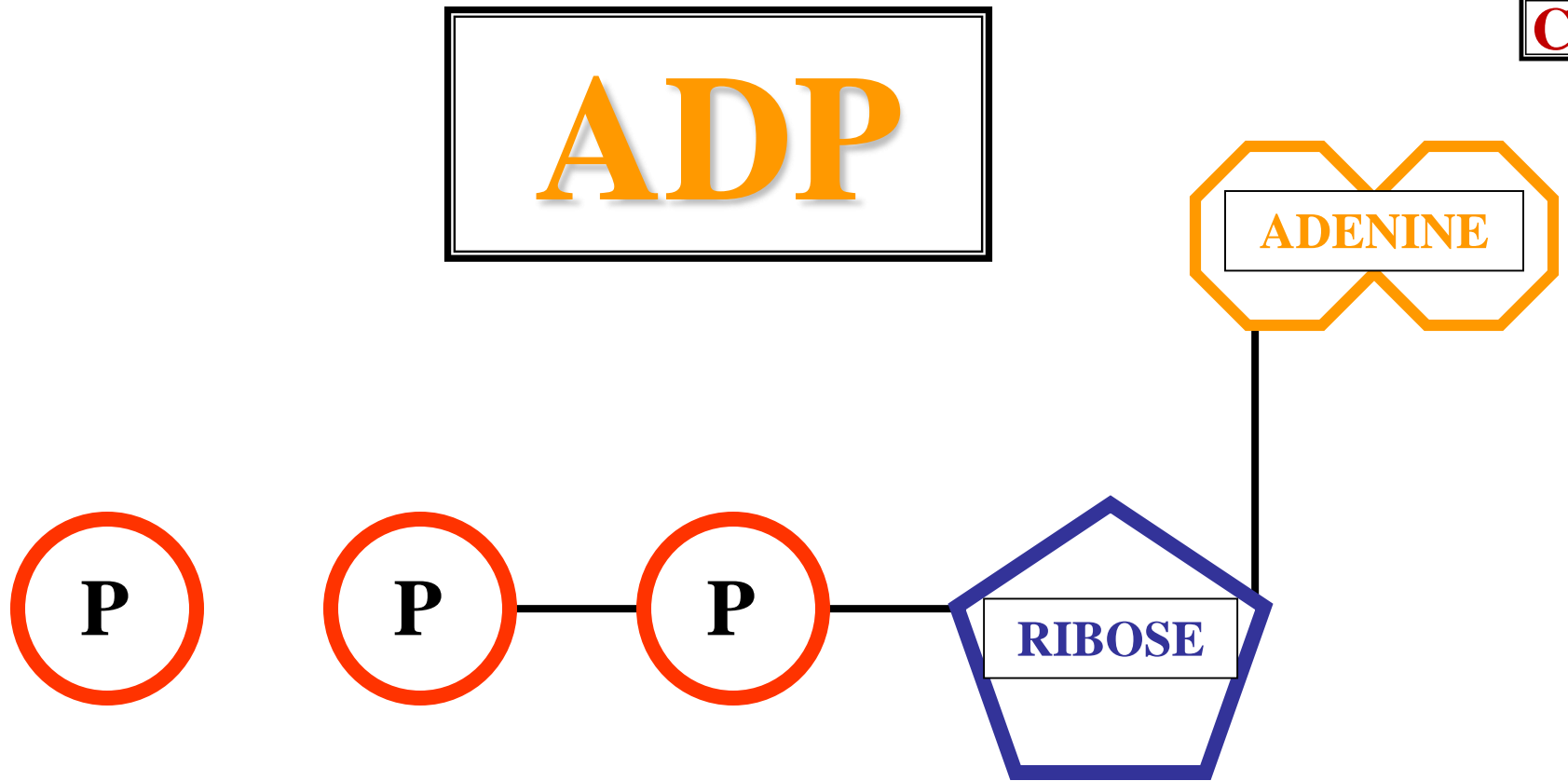
ADP

ADENOSINE DIPHOSPHATE



ADP

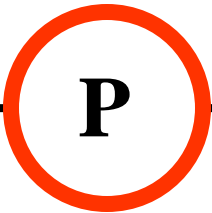
ADENOSINE DIPHOSPHATE



**REESTABLISH
THE 3RD HIGH ENERGY
PHOSPHATE BOND**



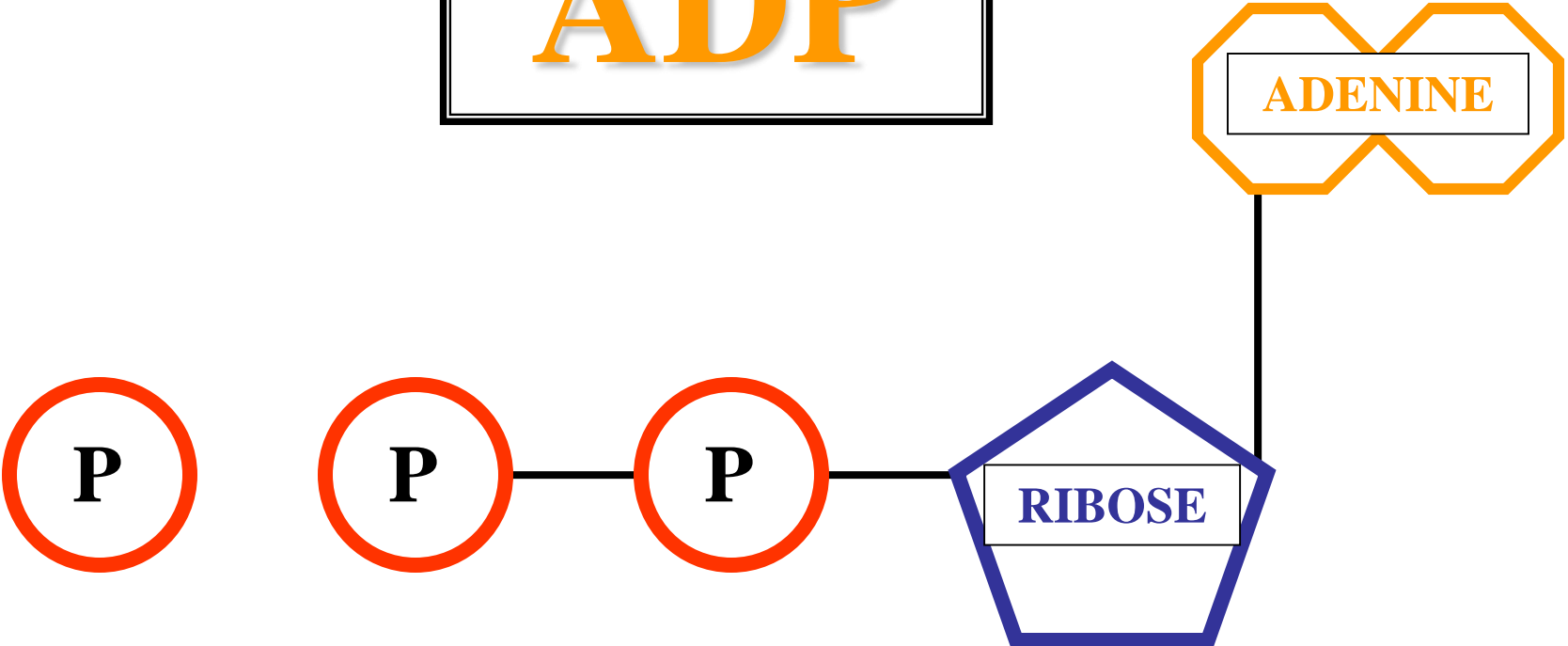
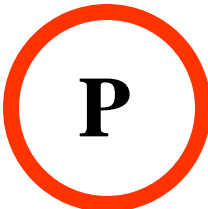
ADP



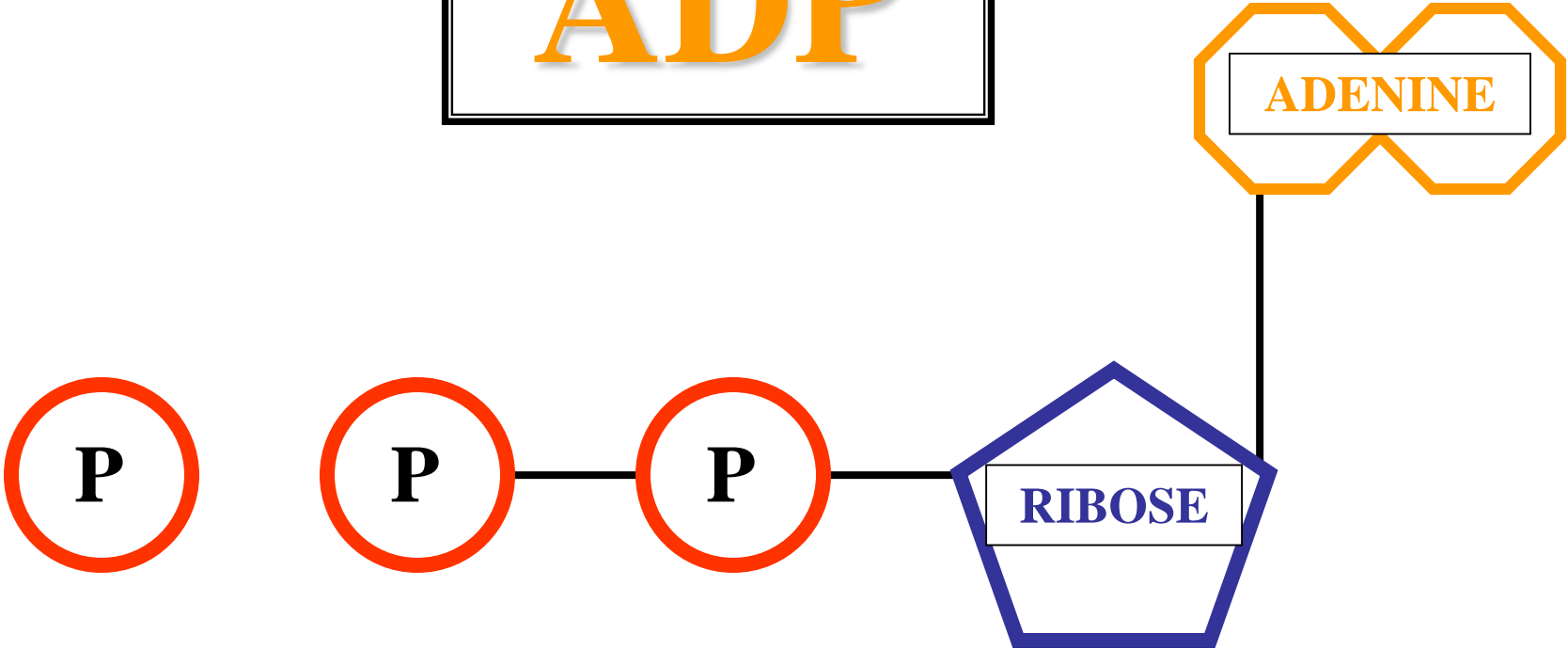
**CONDENSATION
REACTION**

ADP CONDENSATION REACTION

ADP



ADP

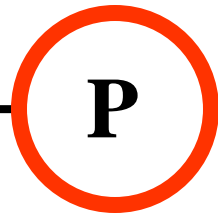
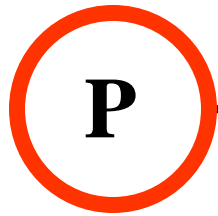
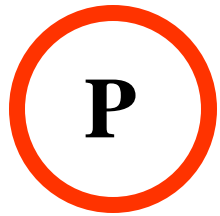


**3RD PHOSPHATE BOND
HOLDS BIOCHEMICAL ENERGY**

ADP

ADENINE

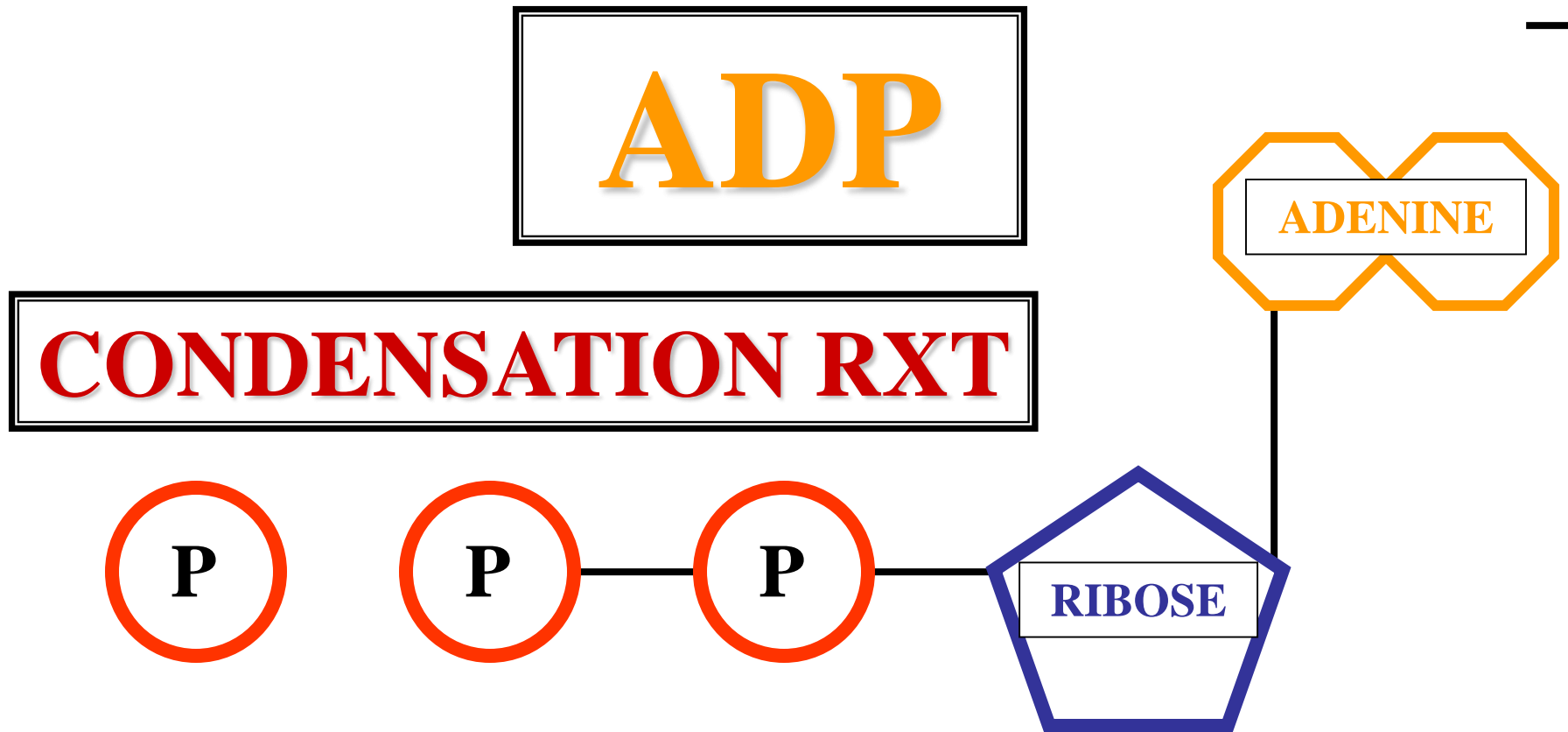
CONDENSATION RXT



RIBOSE

3RD PHOSPHATE BOND

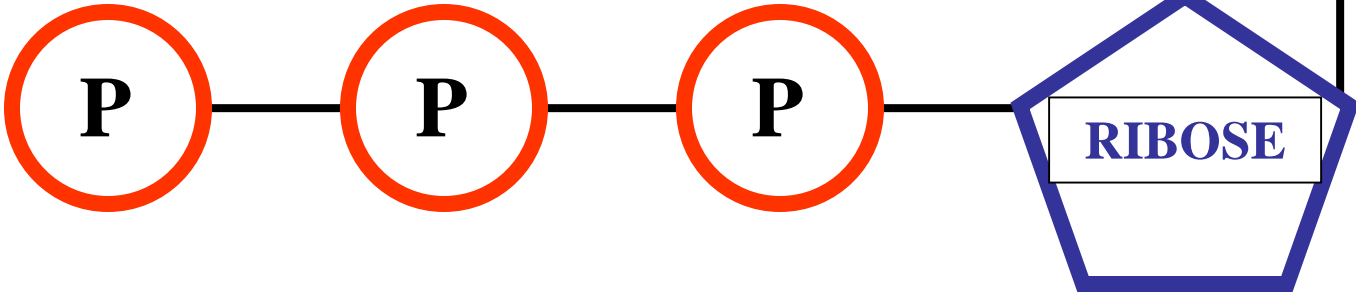
HOLDS BIOCHEMICAL ENERGY





ADP

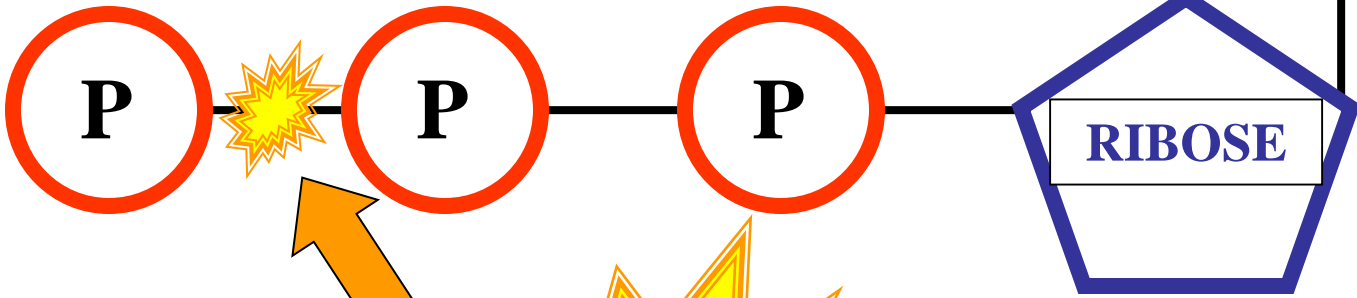
CONDENSATION RXT



3RD PHOSPHATE BOND FORMS

ADP

CONDENSATION RXT

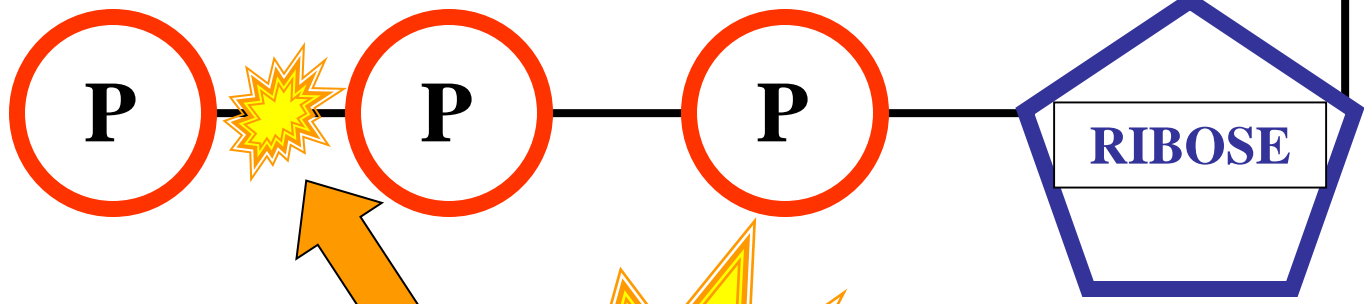


CHEMICAL ENERGY IN PUT

AT

ADP

CONDENSATION RXT

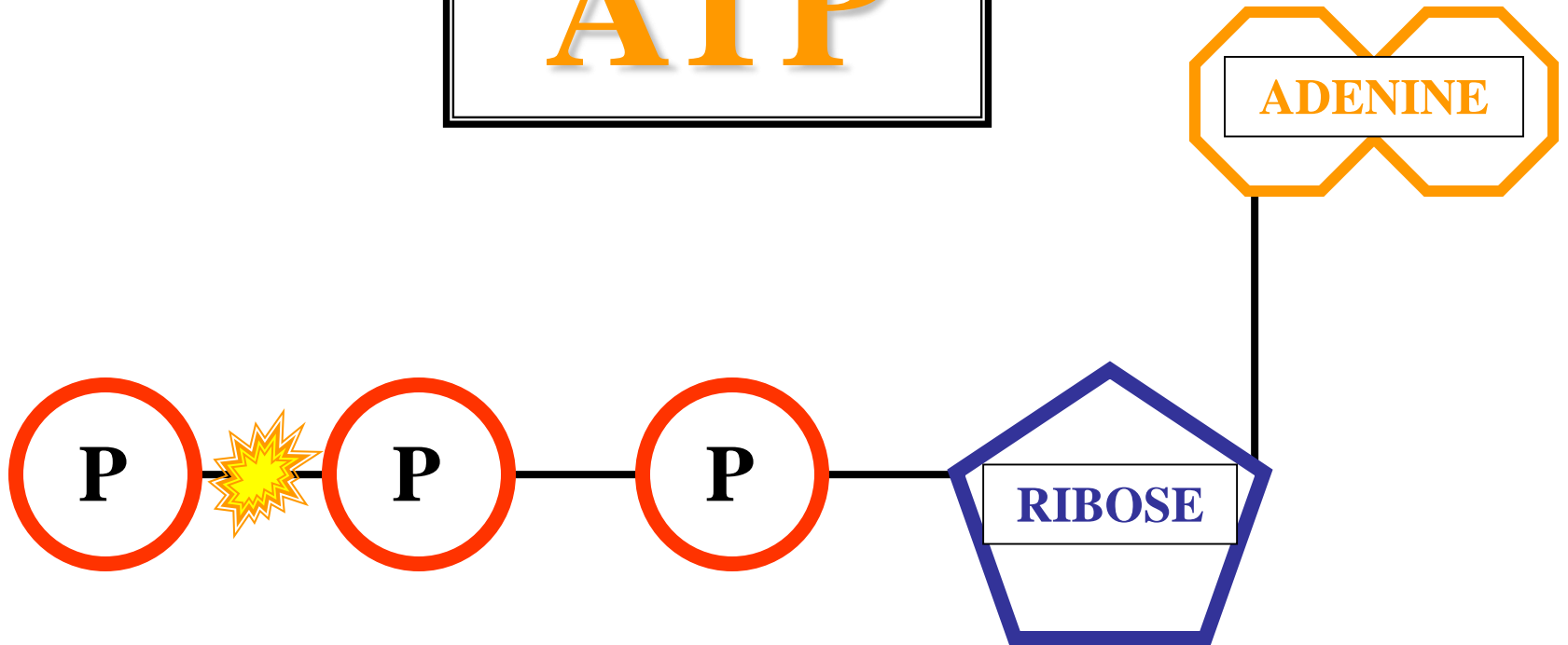


CHEMICAL ENERGY IN PUT

ENDERGONIC RXT



ATP

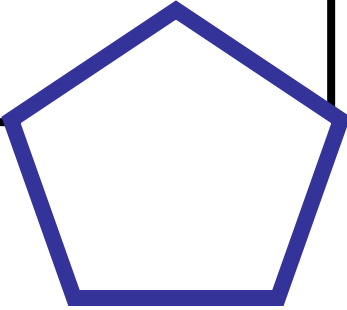
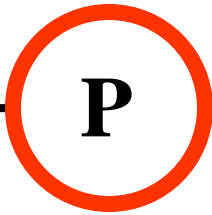
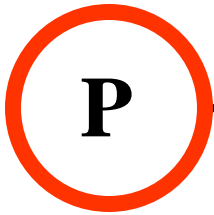


ADENOSINE TRIPHOSPHATE

 = HOLDS BIO-CHEM ENERGY

**ADP
CONDENSATION
REACTION
SUMMARY**

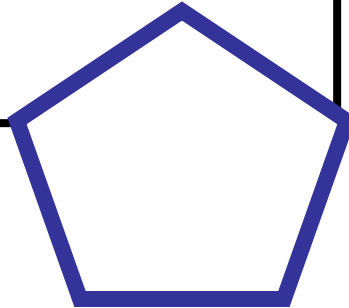
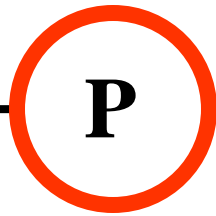
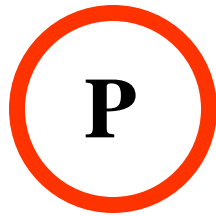
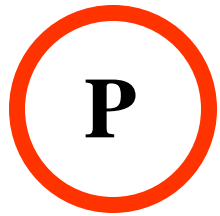
ADP



ADP

ADENINE

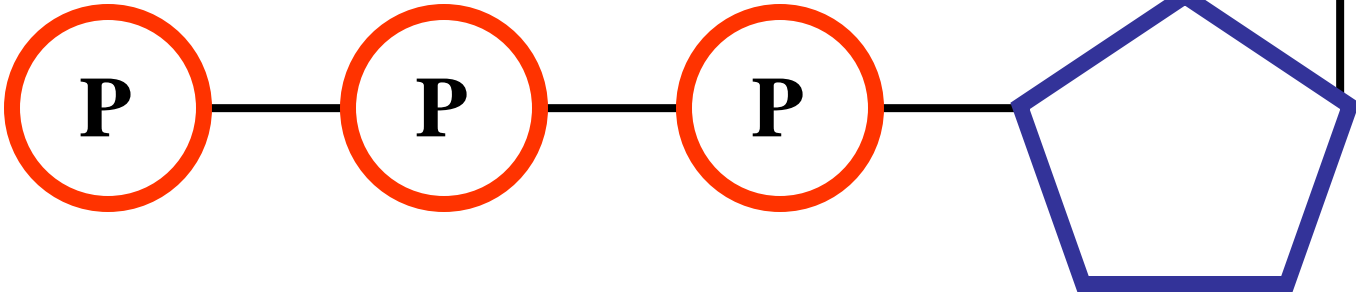
CONDENSATION RXT





ADP

CONDENSATION RXT

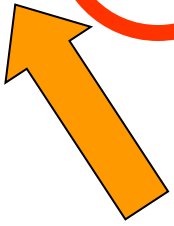
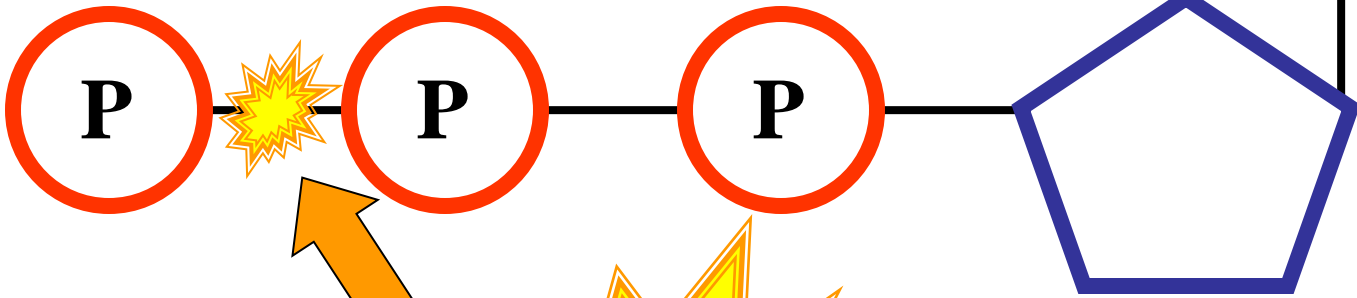


3RD PHOSPHATE BOND FORMS

ADP

CONDENSATION RXT

ADENINE



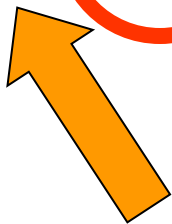
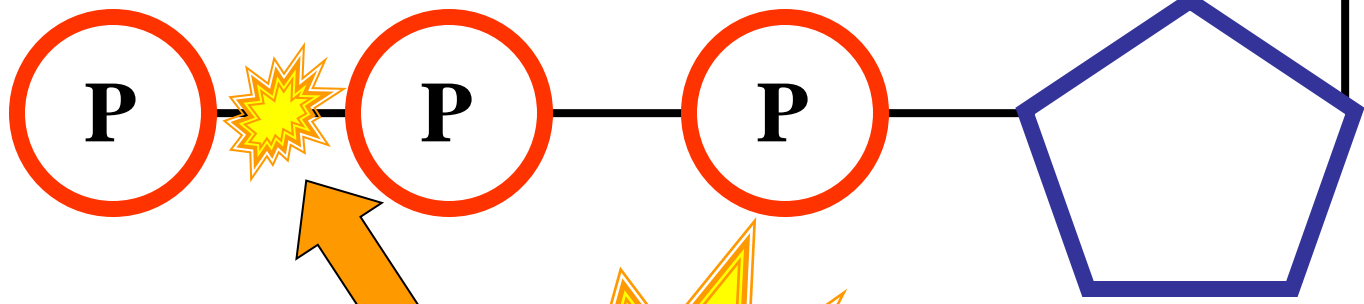
CHEMICAL ENERGY IN PUT

AT

ADP

CONDENSATION RXT

ADENINE



CHEMICAL
ENERGY
INPUT

ENDERGONIC
RXT

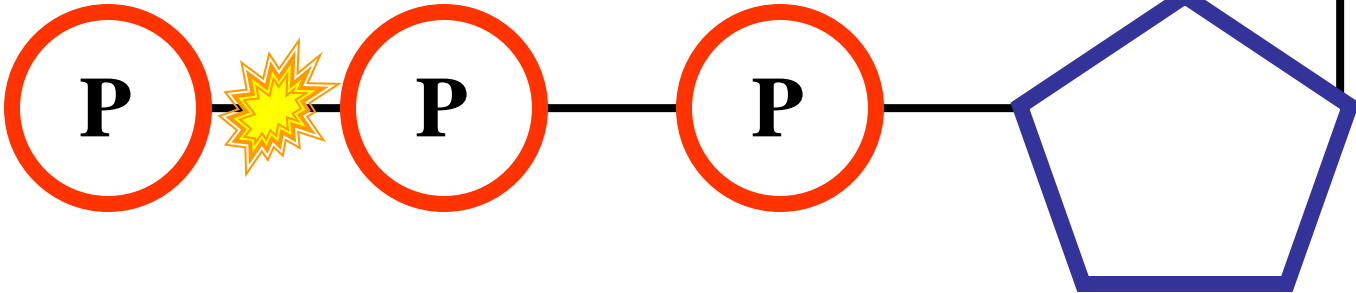
ATP

AD

=



CONDENSATION RXT



ADENOSINE TRIPHOSPHATE

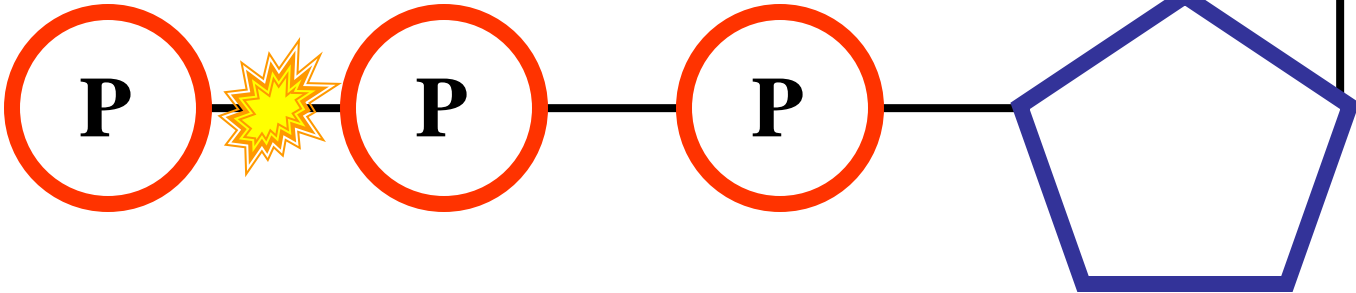
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ATP

P
=



CONDENSATION RXT



ADP CONDENSATION RXT

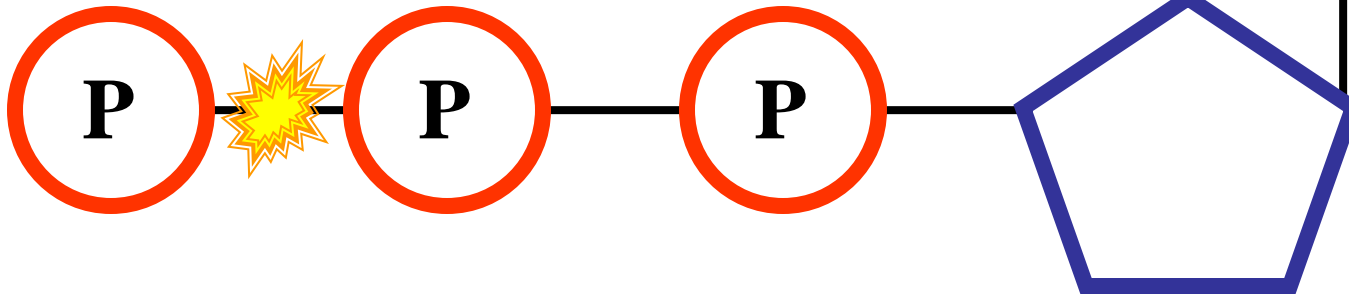
 = **HOLDS BIO-CHEM ENERGY**

ATP



ADENINE

CONDENSATION RXT



PHOSPHORYLATION

 = HOLDS BIO-CHEM ENERGY



ADP CONDENSATION

SYNONYMOUS

PHOSPHORYLATION



PHOSPHORYLATION

ATP

PHOSPHORYLATION

ESSENTIAL

CELL METABOLISM

PHOSPHORYLATION QUESTIONS

PHOSPHORYLATION QUESTIONS



1ST QUESTION

PHOSPHORYLATION QUESTIONS

QUESTION

IN WHICH METABOLIC
PATHWAYS DOES ATP
PHOSPHORYLATION
OCCUR?

QUESTION

**ATP
PHOSPHORYLATION
OCCURS DURING
PHOTOSYNTHESIS**

PHOSPHORYLATION QUESTIONS



2ND QUESTION

PHOSPHORYLATION QUESTIONS

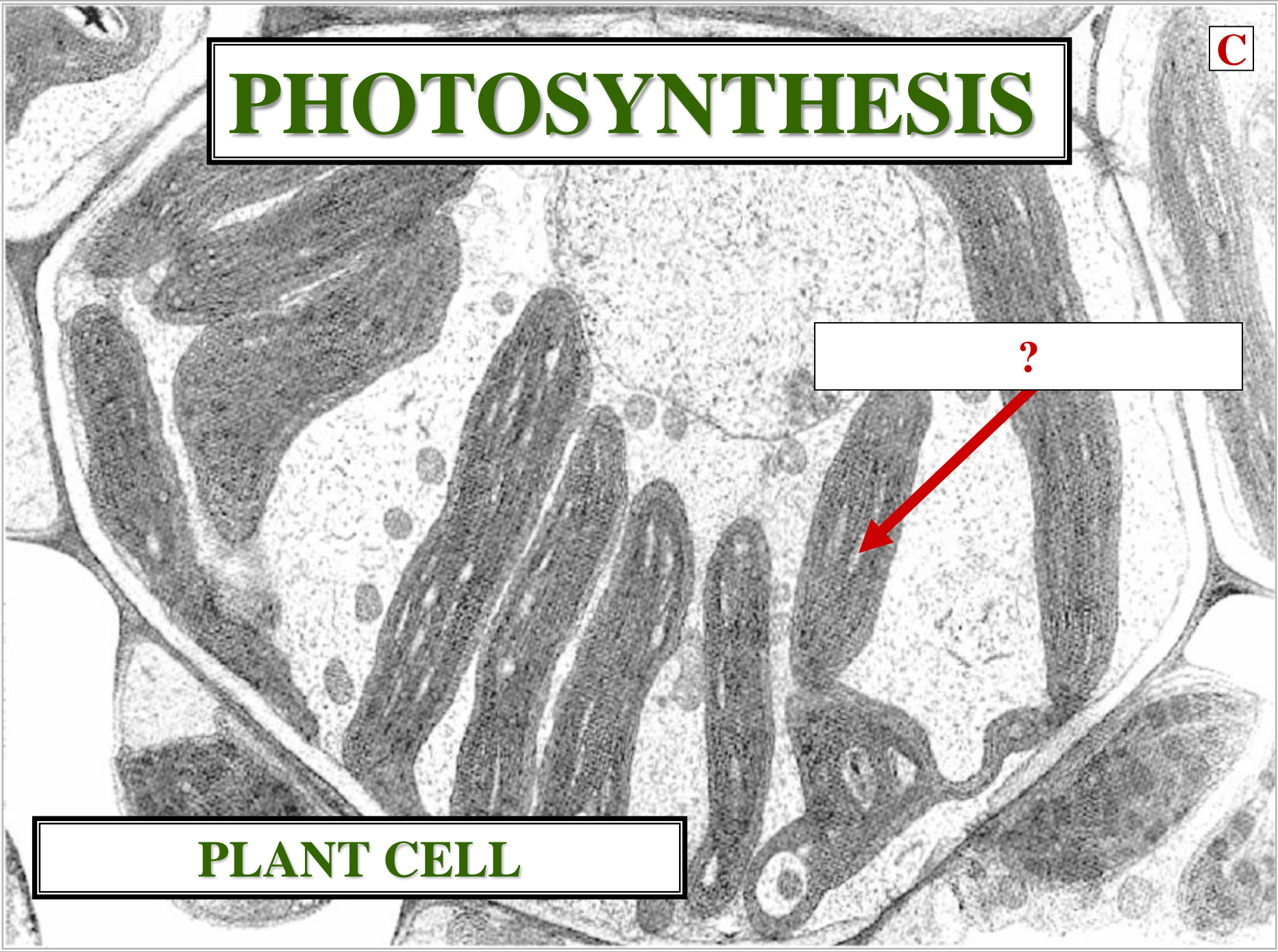
QUESTION



WHERE WITHIN THE
CELL DOES ATP
PHOTOSYNTHESIS
PHOSPHORYLATION
OCCUR?

QUESTION

PHOTOSYNTHESIS



?

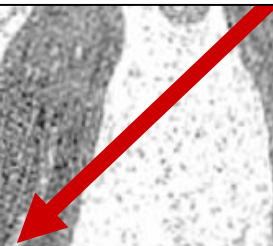
PLANT CELL

PHOTOSYNTHESIS

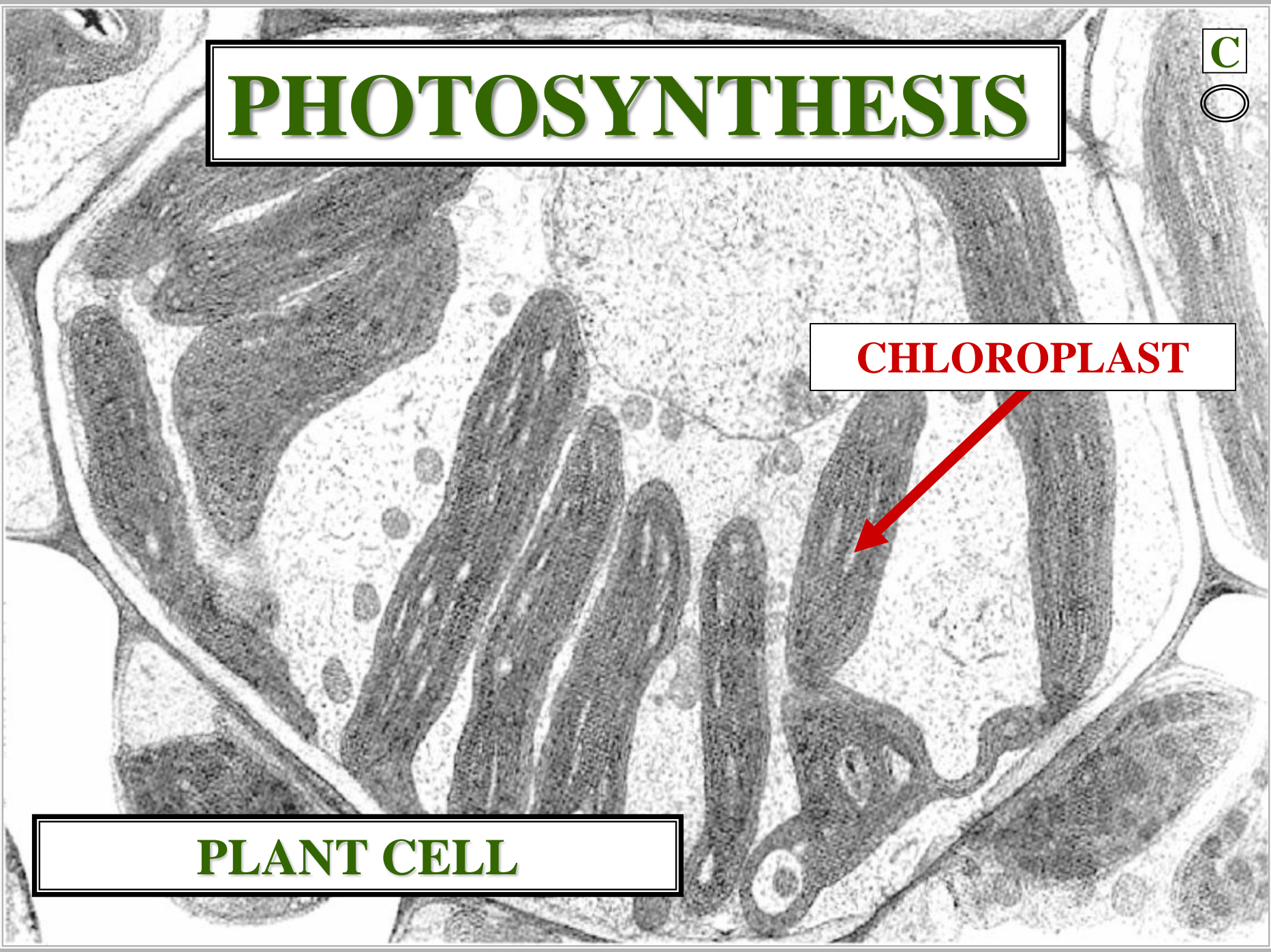
C



CHLOROPLAST



PLANT CELL

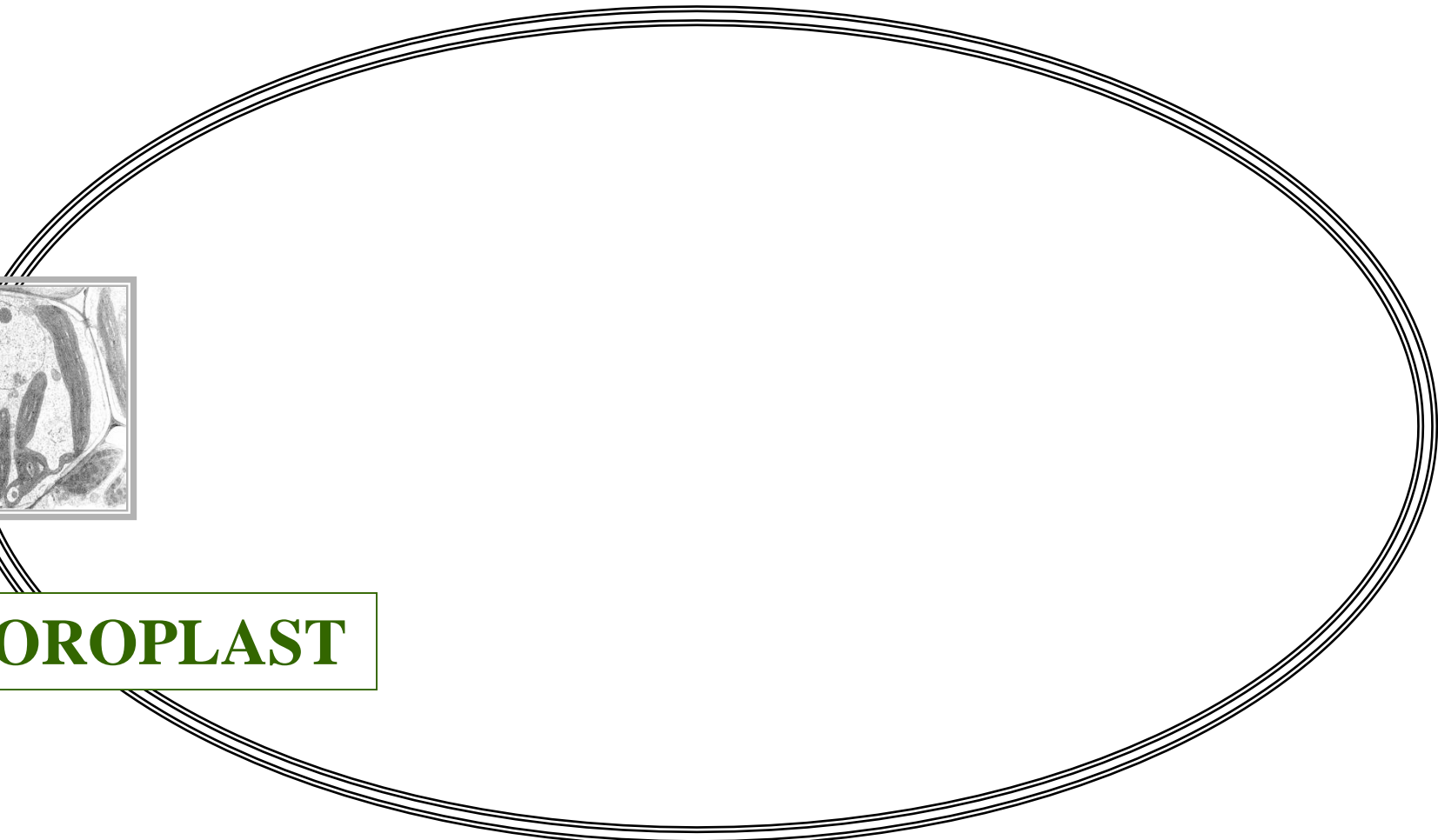


PHOTOSYNTHESIS

LT



CHLOROPLAST

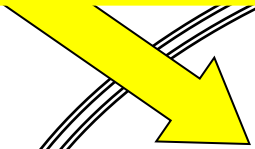


PHOTOSYNTHESIS

LR



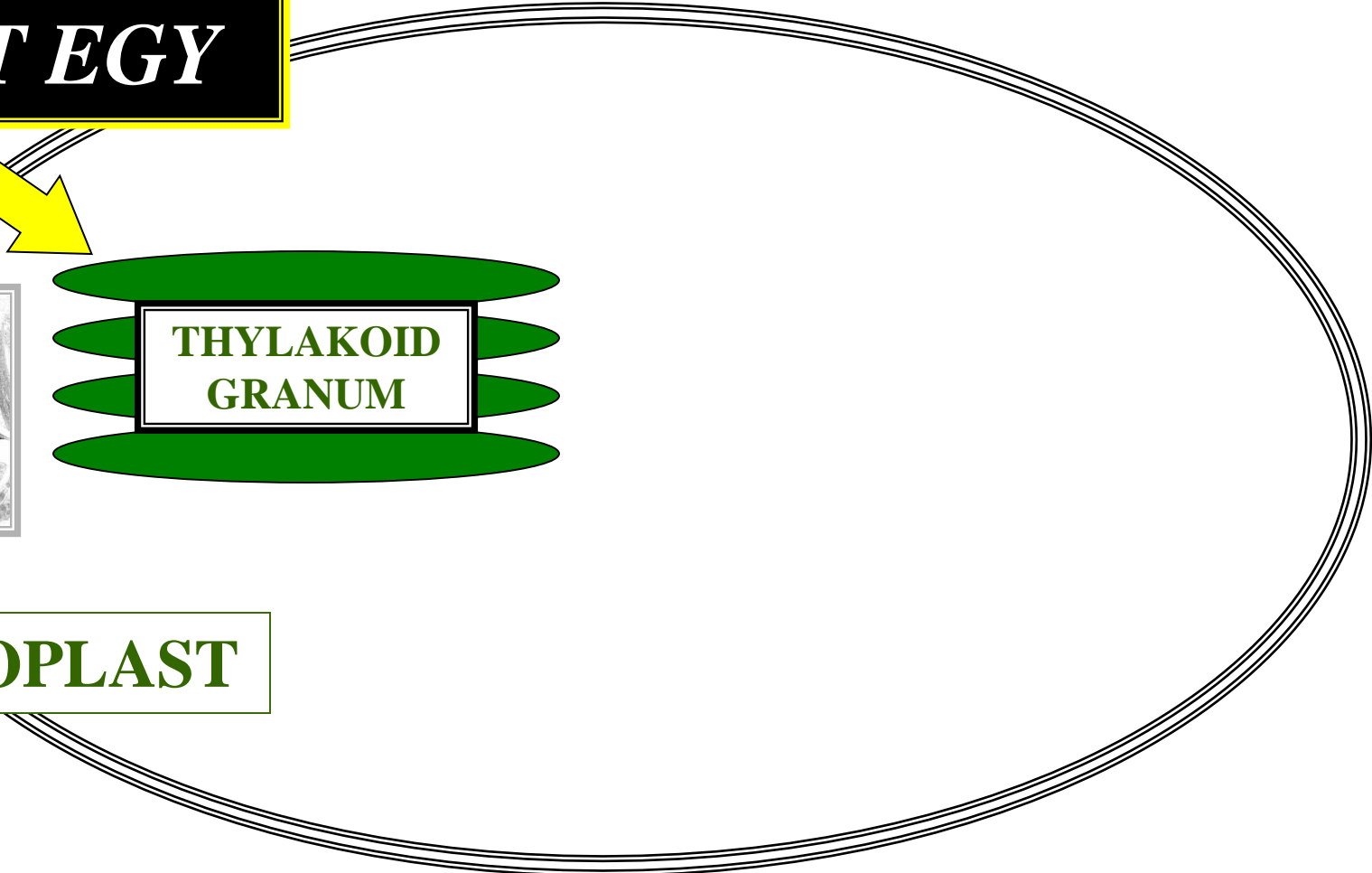
LIGHT ENERGY



**THYLAKOID
GRANUM**



CHLOROPLAST



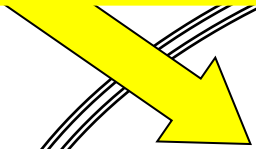
PHOTOSYNTHESIS



C



LIGHT ENERGY



CHLOROPLAST

