



AEROBIC RESPIRATION

ATP NET / GLUCOSE

36 ATP

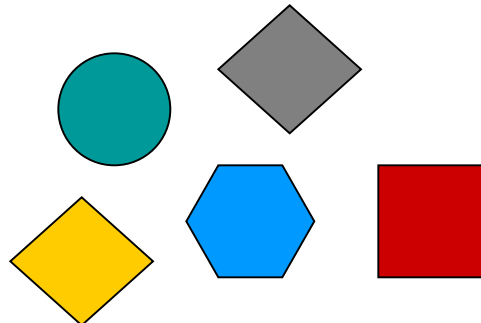
METABOLISM

GLUCOSE



**CATABOLIC
METABOLISM**

**AEROBIC
RESPIRATION**



BUILDING BLOCKS



METABOLISM

GLUCOSE

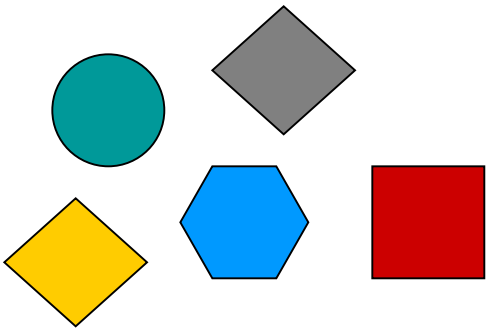
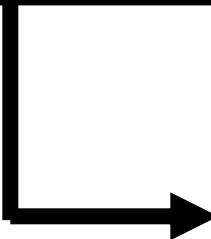


CATABOLIC METABOLISM

AEROBIC RESPIRATION



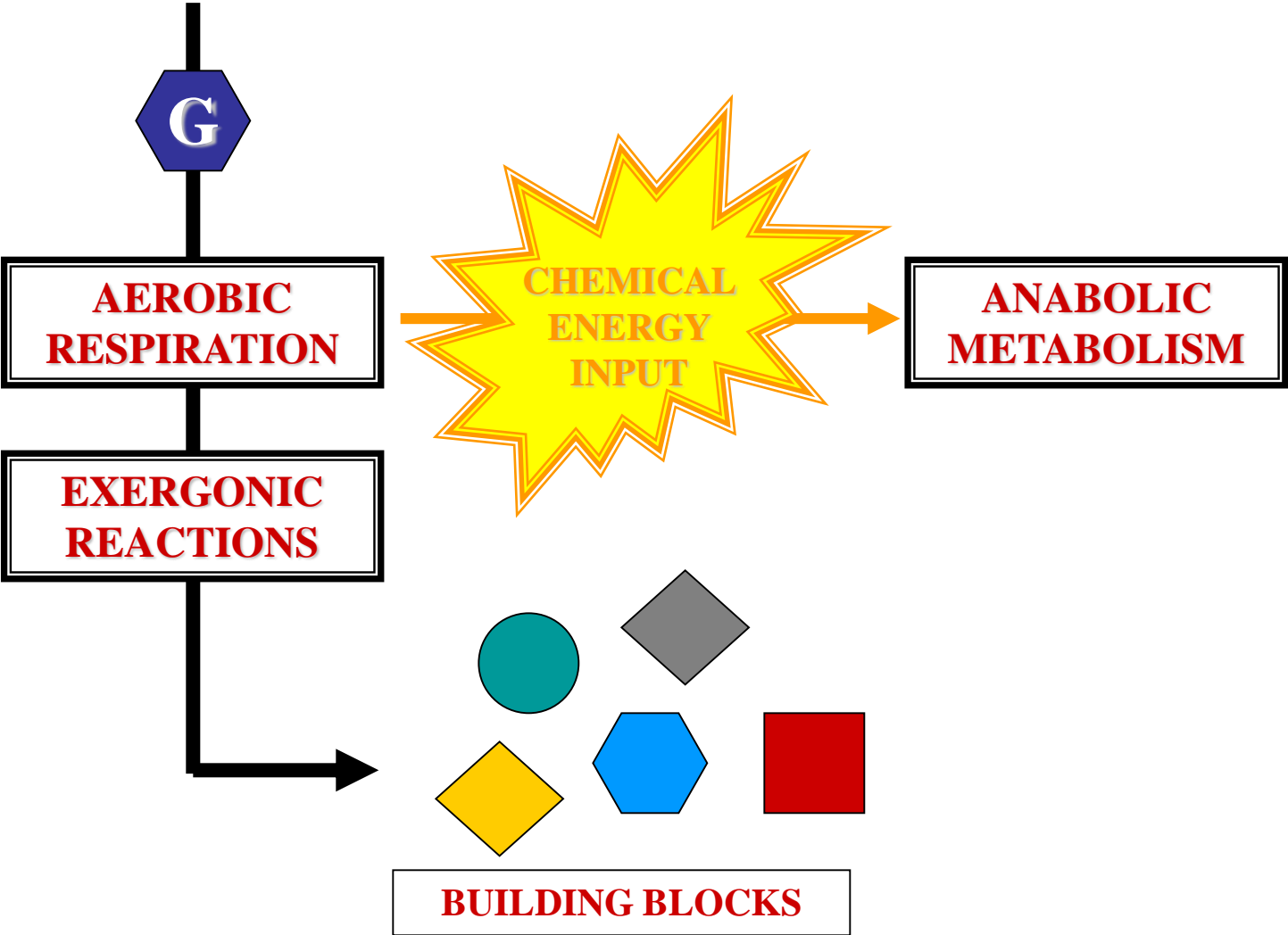
ANABOLIC METABOLISM



BUILDING BLOCKS

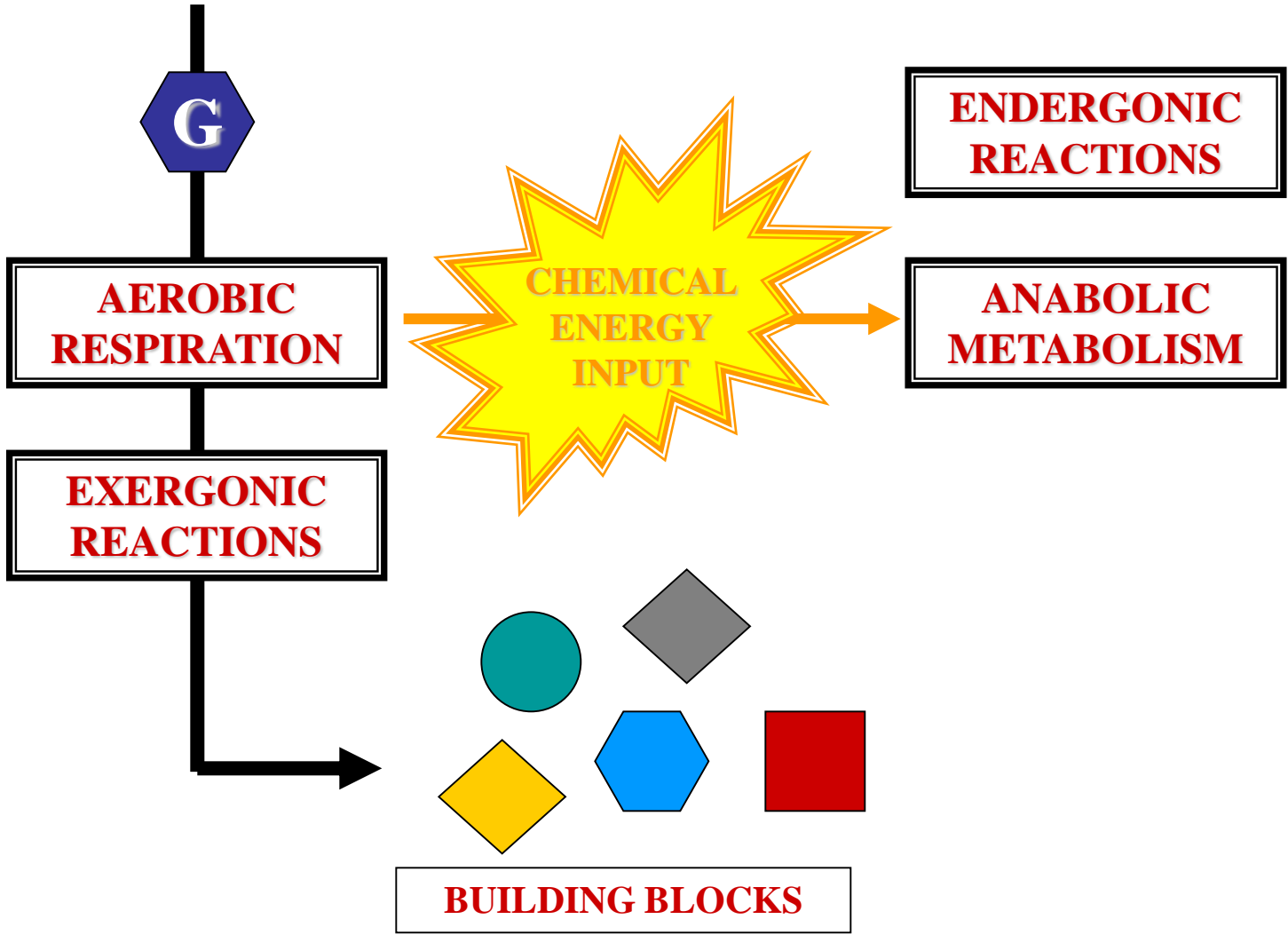
METABOLISM

GLUCOSE



METABOLISM

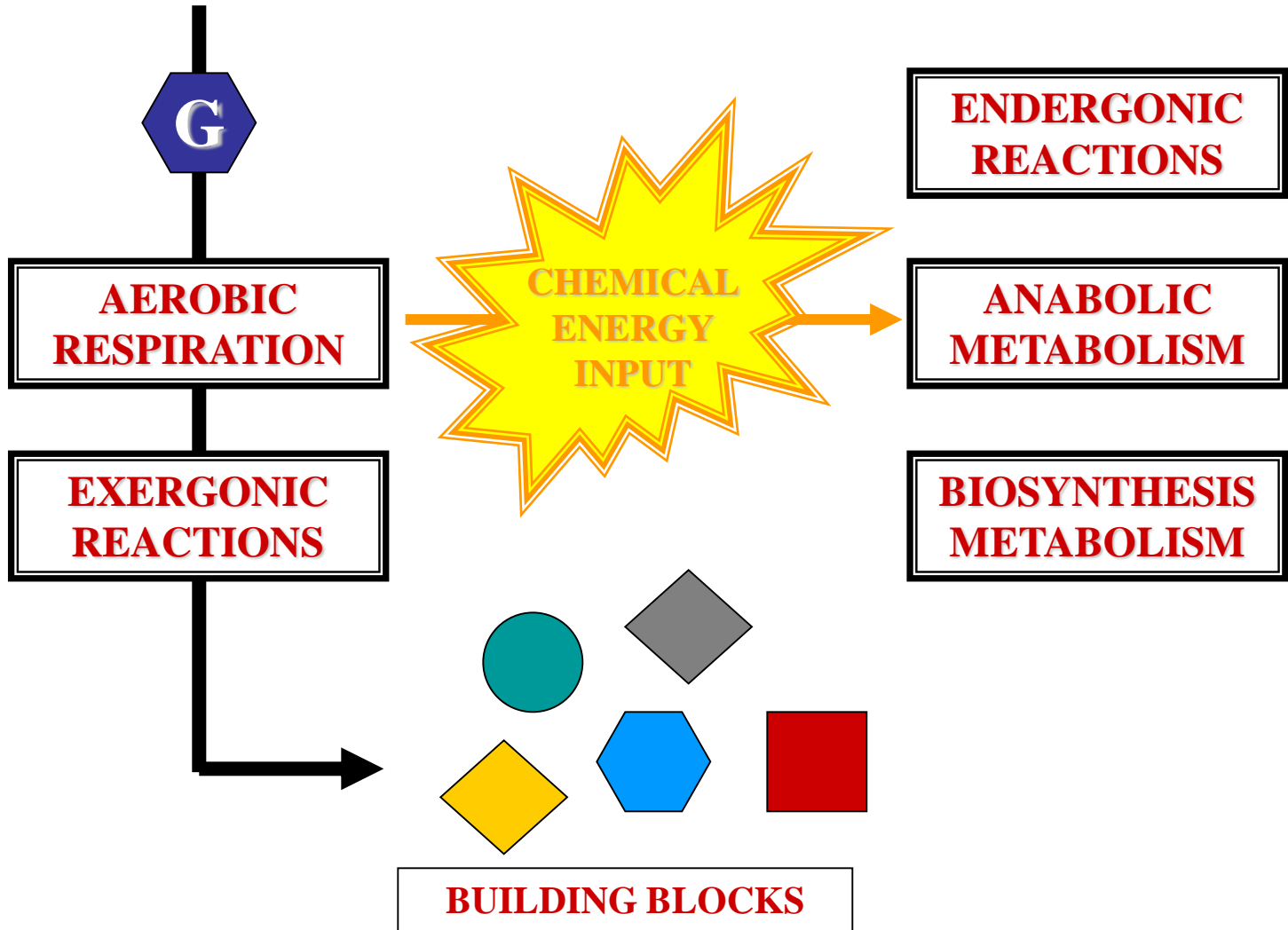
GLUCOSE





METABOLISM

GLUCOSE

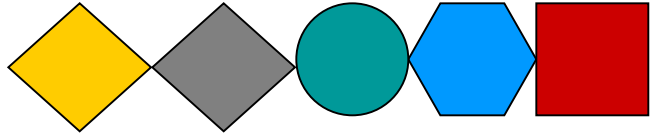




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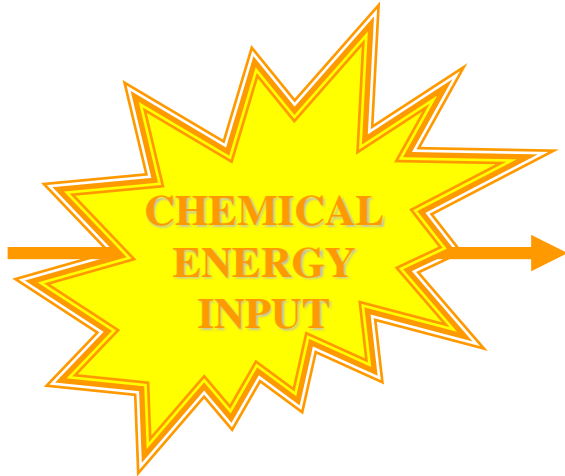
GLUCOSE

COMPLEX BIO-CHEM-CMPS



**AEROBIC
RESPIRATION**

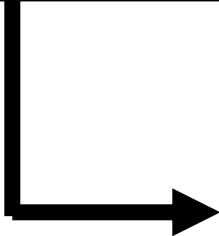
**EXERGONIC
REACTIONS**



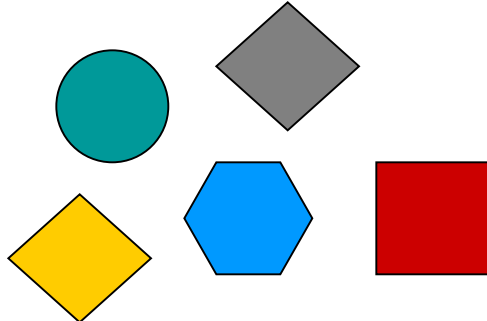
**ENDERGONIC
REACTIONS**

**ANABOLIC
METABOLISM**

**BIOSYNTHESIS
METABOLISM**



BUILDING BLOCKS



***CELL
GROWTH
&
MAINTENANCE***

S

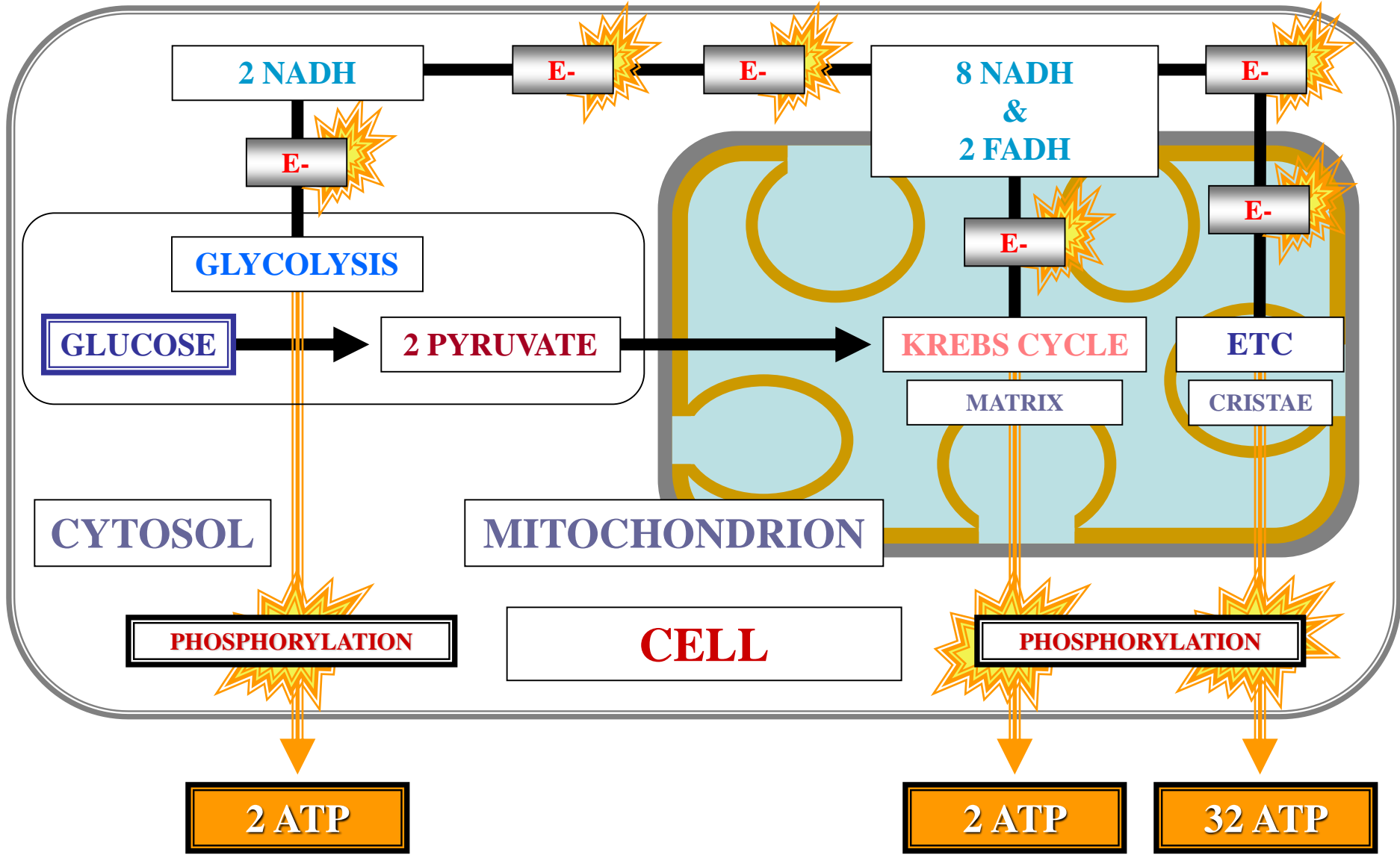
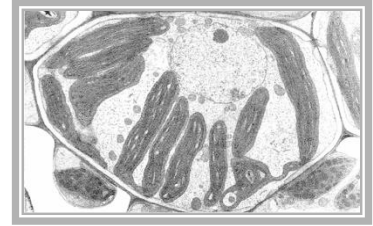
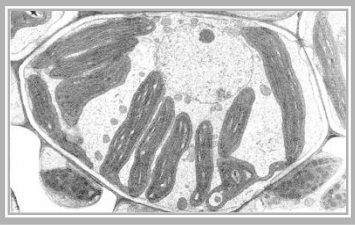


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HOMEOSTASIS

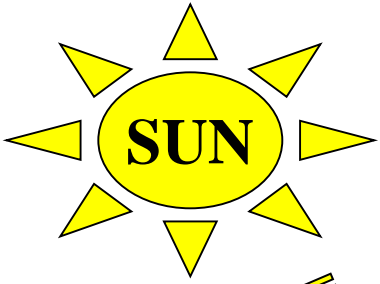


AEROBIC RESPIRATION

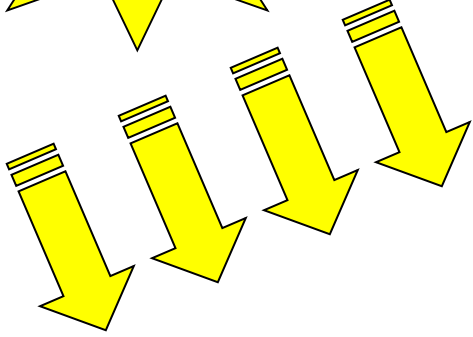


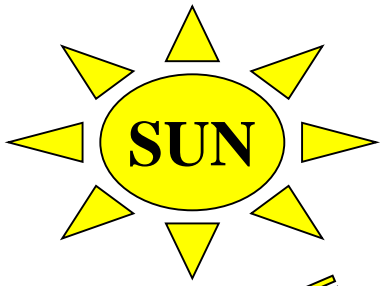


**RELATIONSHIP
PHOTOSYNTHESIS
&
AEROBIC
RESPIRATION**

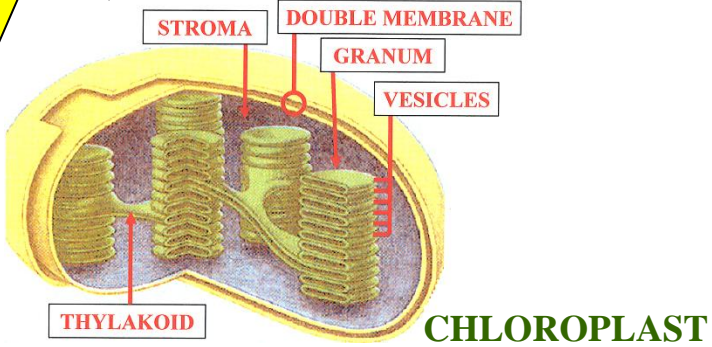
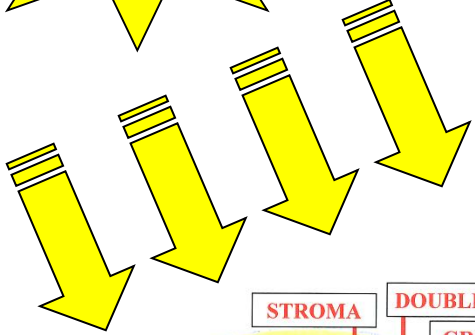


LIGHT EGY

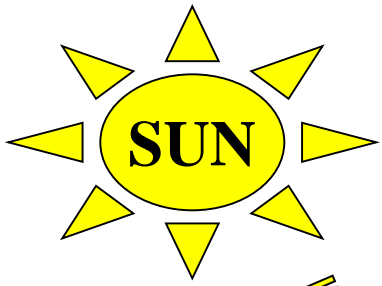




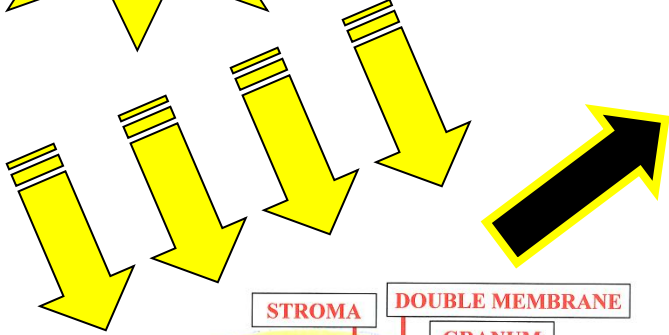
LIGHT ENERGY



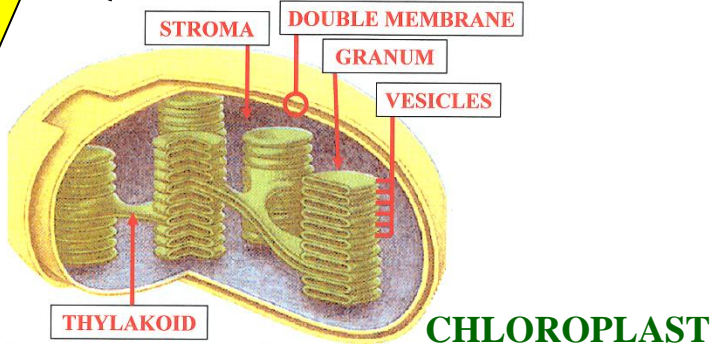
PHOTOSYNTHESIS



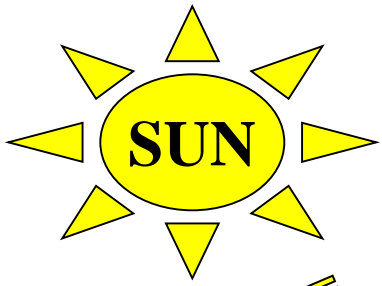
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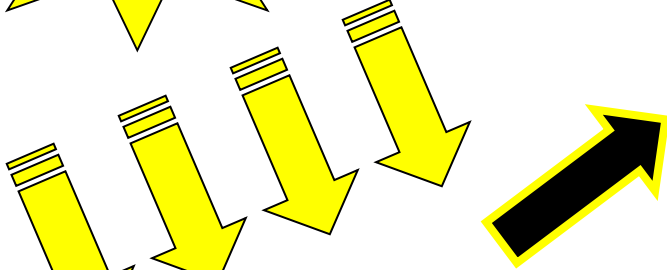
CHEMICAL ENERGY



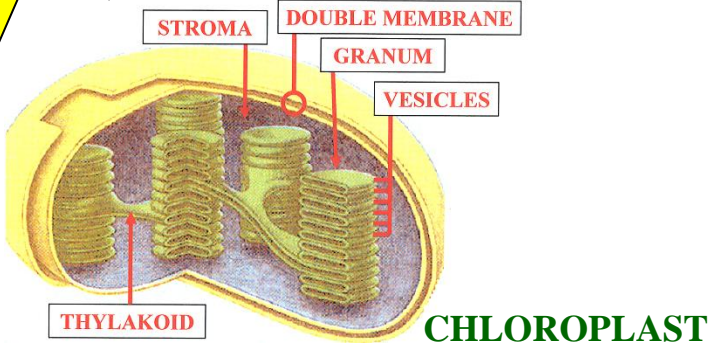
PHOTOSYNTHESIS



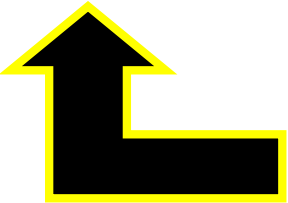
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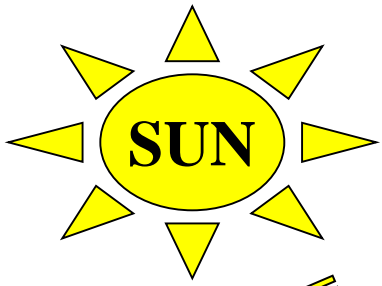
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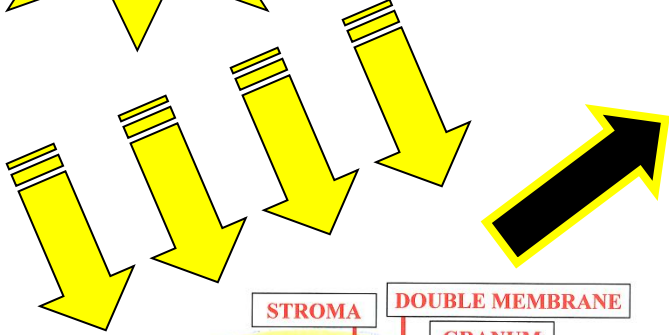
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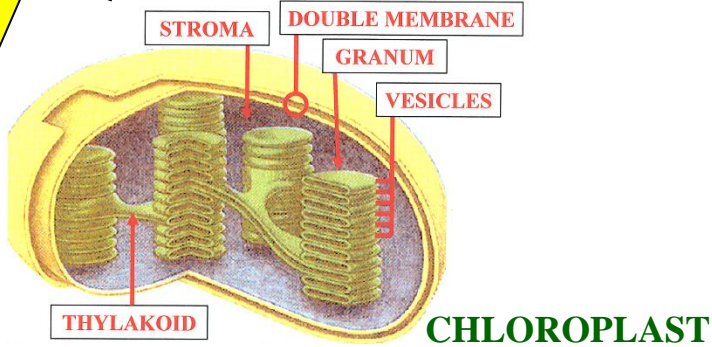
CARBON DIOXIDE
WATER



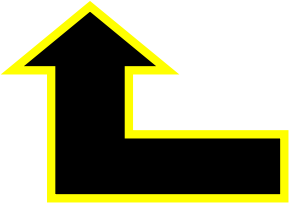
LIGHT ENERGY



GLUCOSE
OXYGEN

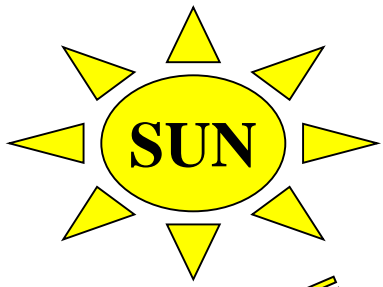


PHOTOSYNTHESIS

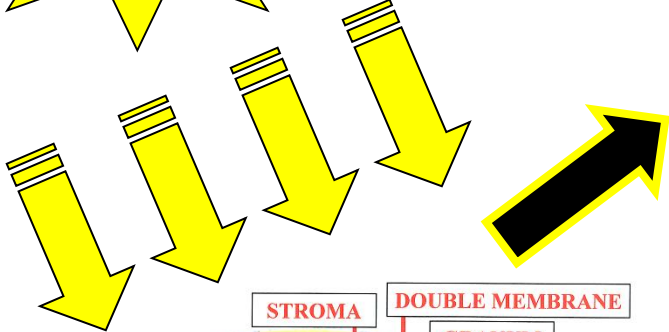


CARBON DIOXIDE
WATER

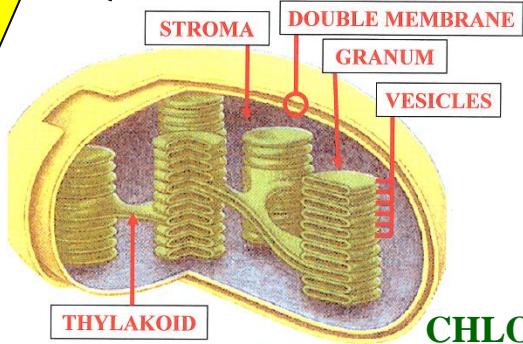
 = **CHEMICAL ENERGY**



LIGHT ENERGY

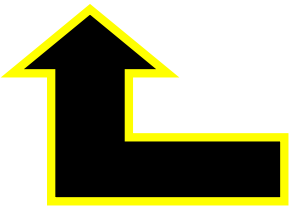


**GLUCOSE
OXYGEN**



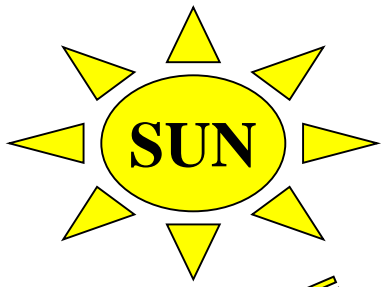
CHLOROPLAST

!!!ANABOLIC PATHWAY!!!

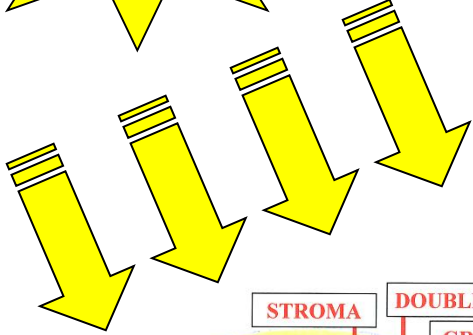


**CARBON DIOXIDE
WATER**

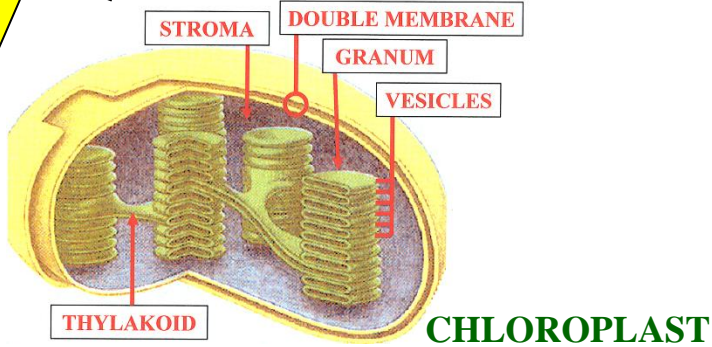
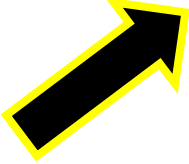
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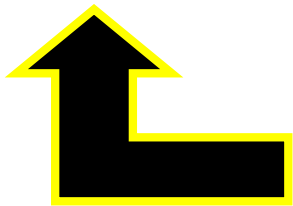
LIGHT ENERGY



**GLUCOSE
OXYGEN**

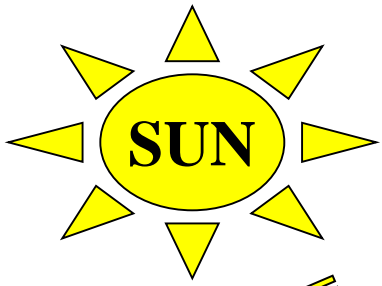


!!!ANABOLIC & ENDEBERGONIC PATHWAY!!!

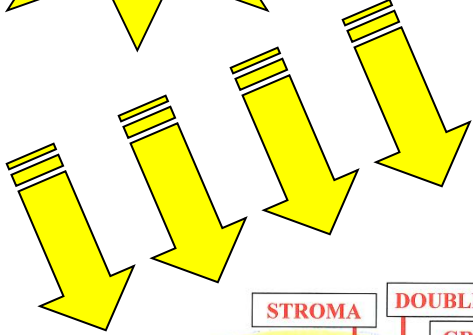


**CARBON DIOXIDE
WATER**

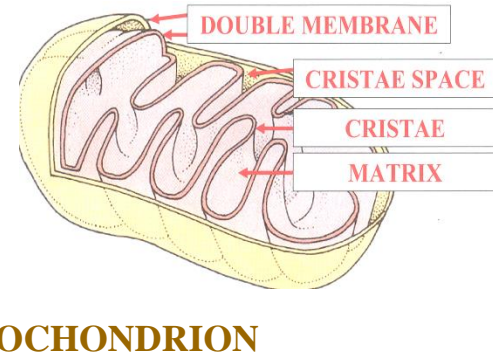
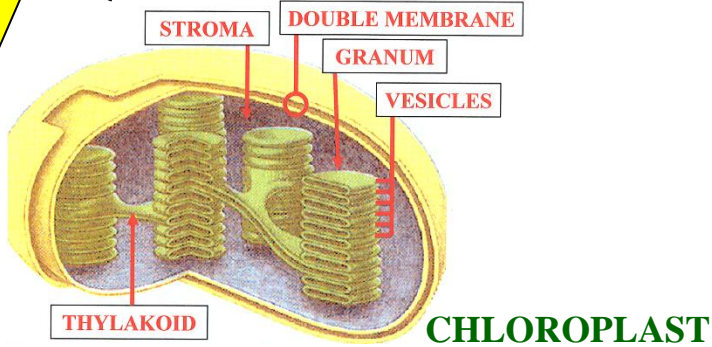
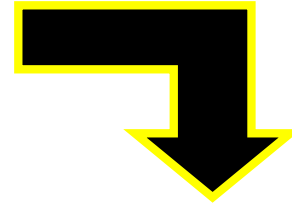
= **CHEMICAL ENERGY**



LIGHT ENERGY

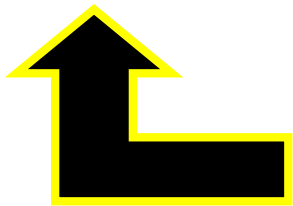


GLUCOSE
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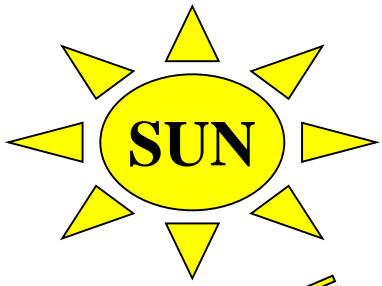
PHOTOSYNTHESIS

RESPIRATION

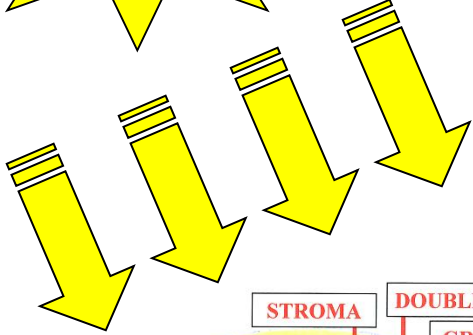


CARBON DIOXIDE
WATER

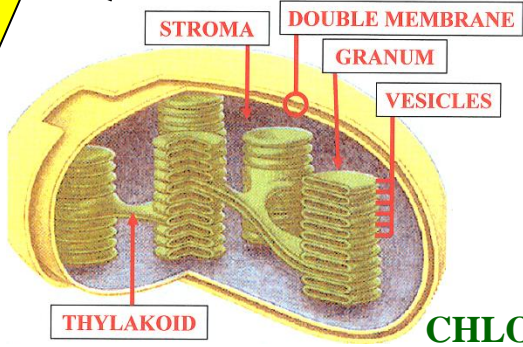
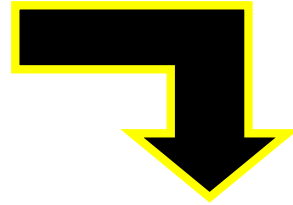
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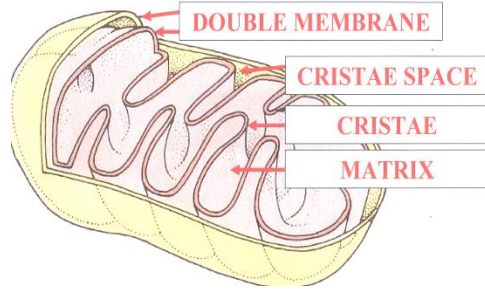
LIGHT ENERGY



**GLUCOSE
OXYGEN**



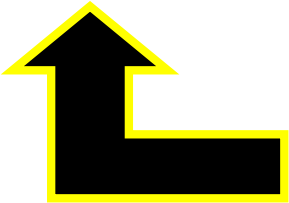
CHLOROPLAST



MITOCHONDRION

PHOTOSYNTHESIS

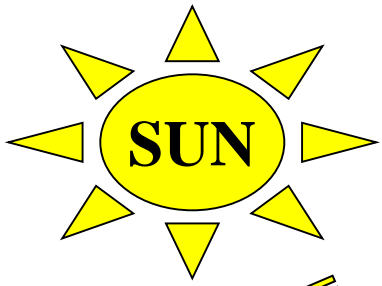
RESPIRATION



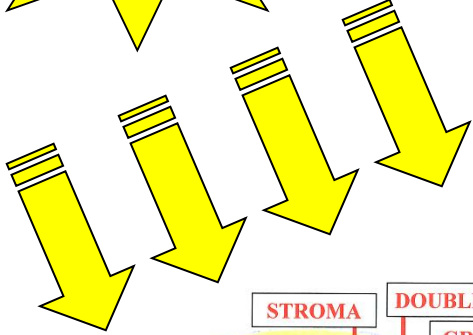
**CARBON DIOXIDE
WATER**



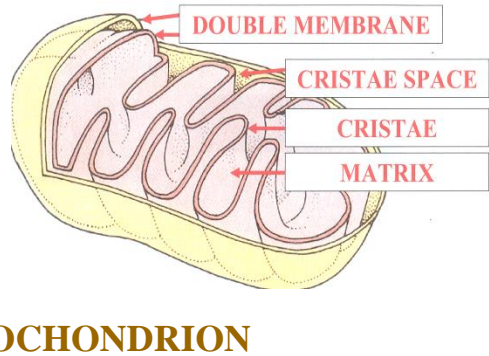
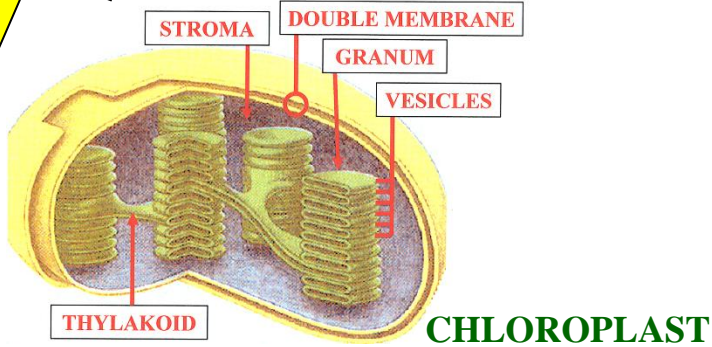
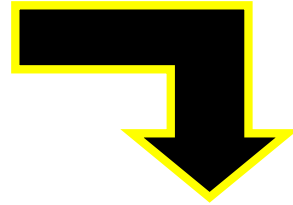
 = CHEMICAL ENERGY



LIGHT ENERGY

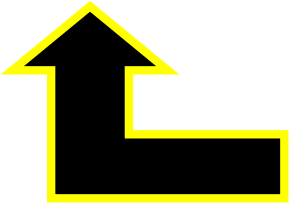


**GLUCOSE
OXYGEN**

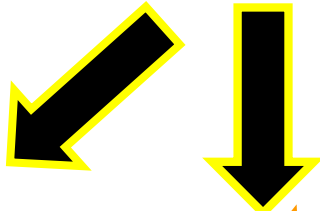


PHOTOSYNTHESIS

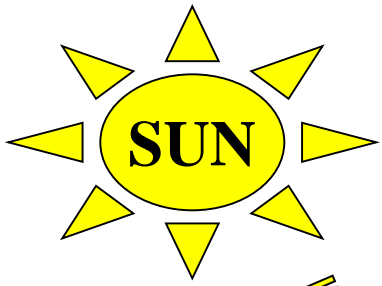
RESPIRATION



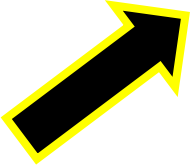
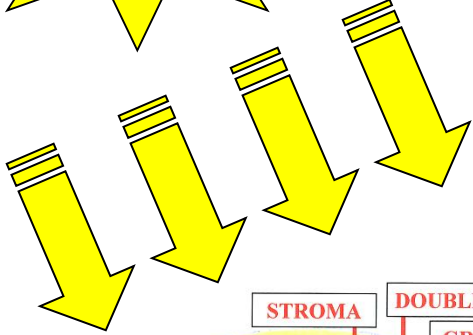
**CARBON DIOXIDE
WATER**



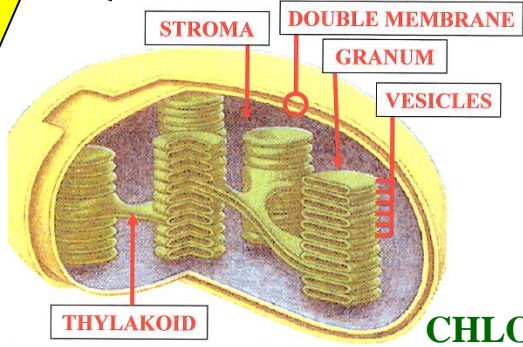
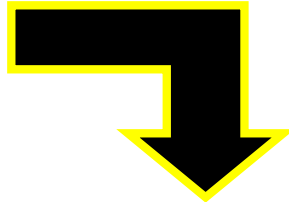
**CHEMICAL
ENERGY
RELEASE**



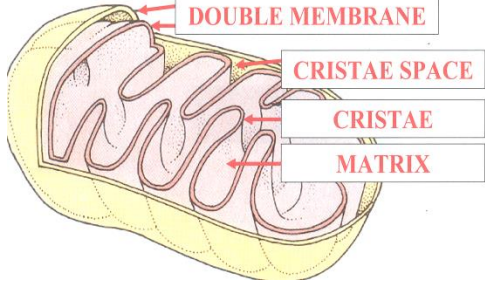
LIGHT ENERGY



**GLUCOSE
OXYGEN**



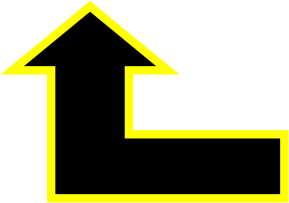
CHLOROPLAST



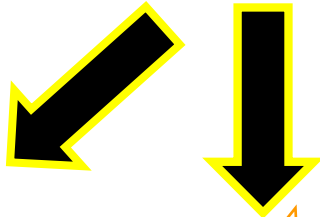
MITOCHONDRION

PHOTOSYNTHESIS

RESPIRATION

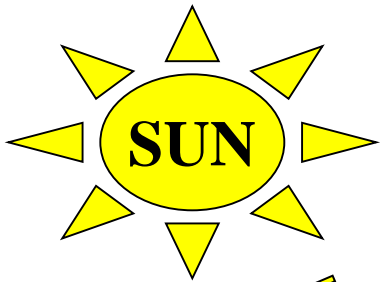


**CARBON DIOXIDE
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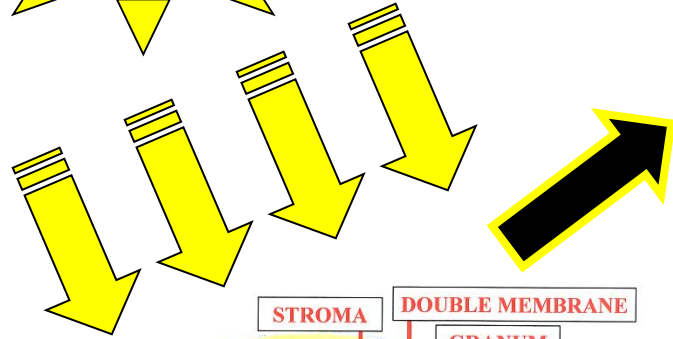


PHOSPHORYLATION

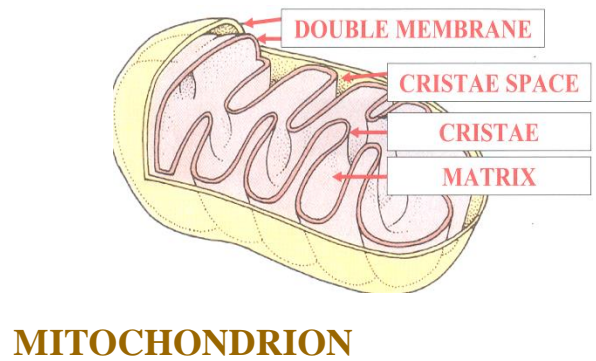
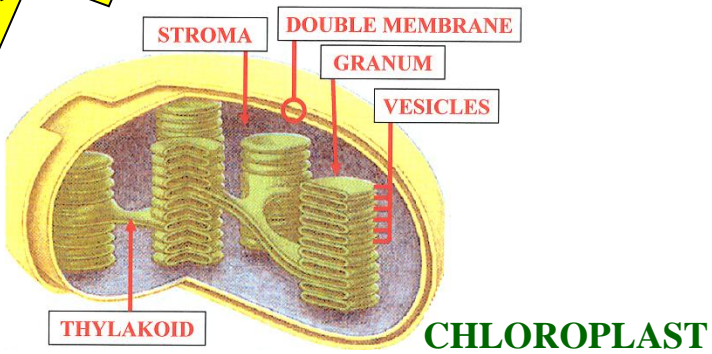
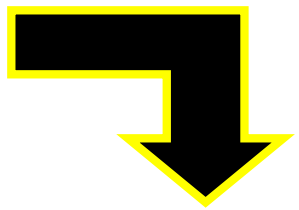




LIGHT ENERGY

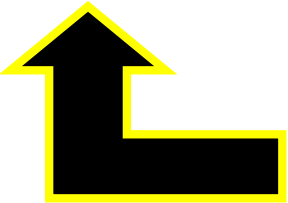


**GLUCOSE
OXYGEN**

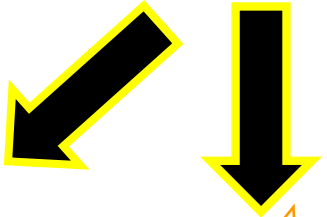


PHOTOSYNTHESIS

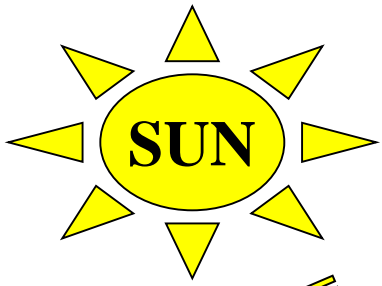
RESPIRATION



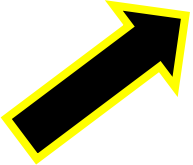
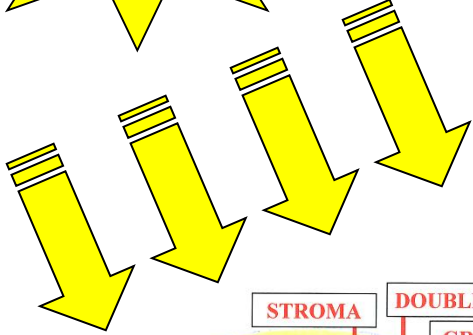
**CARBON DIOXIDE
WATER**



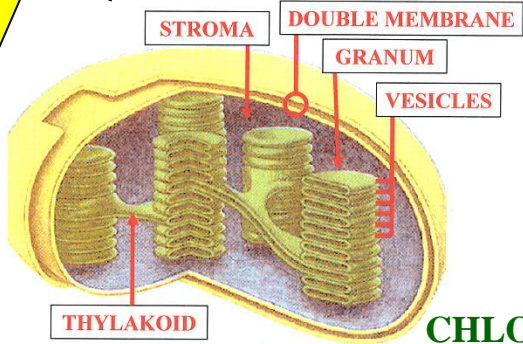
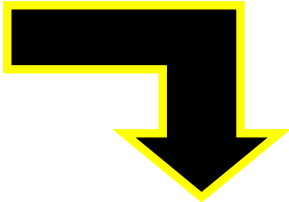
36 ATP



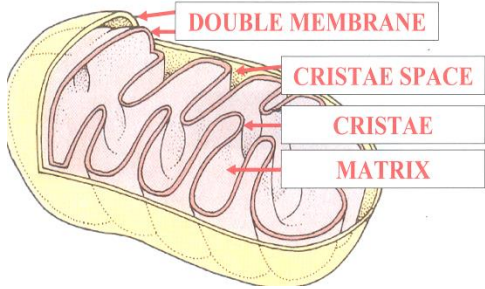
LIGHT EGY



**GLUCOSE
OXYGEN**

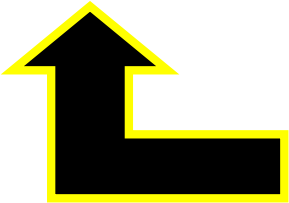


CHLOROPLAST

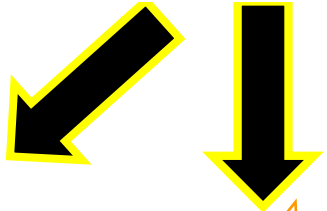


MITOCHONDRION

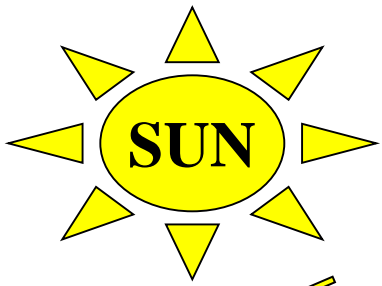
!!!CATABOLIC PATHWAY!!!



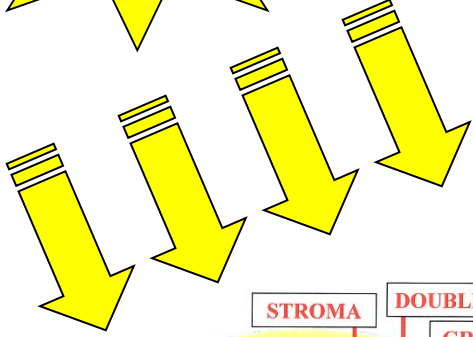
**CARBON DIOXIDE
WATER**



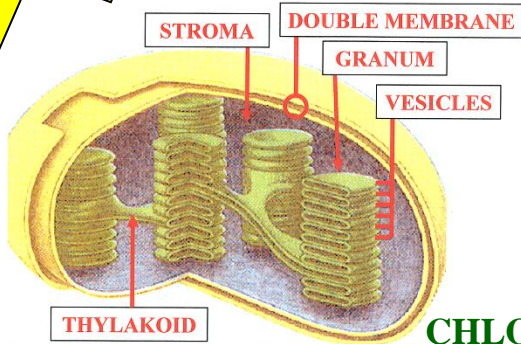
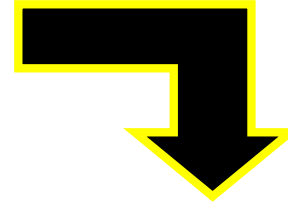
36 ATP



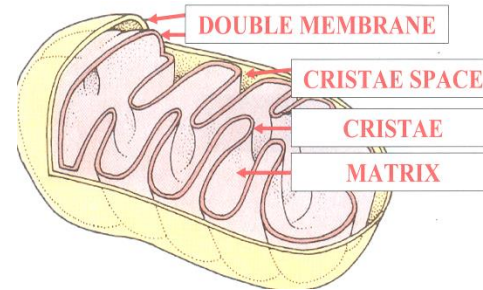
LIGHT ENERGY



**GLUCOSE
OXYGEN**

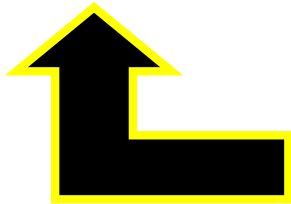


CHLOROPLAST

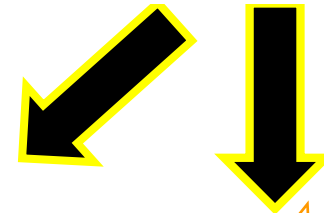


MITOCHONDRION

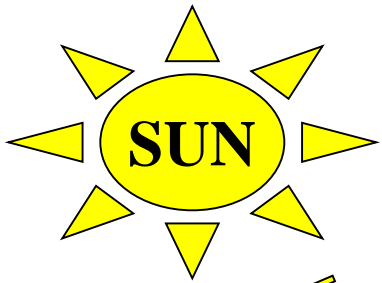
!!!CATABOLIC & EXERGONIC PATHWAY!!!



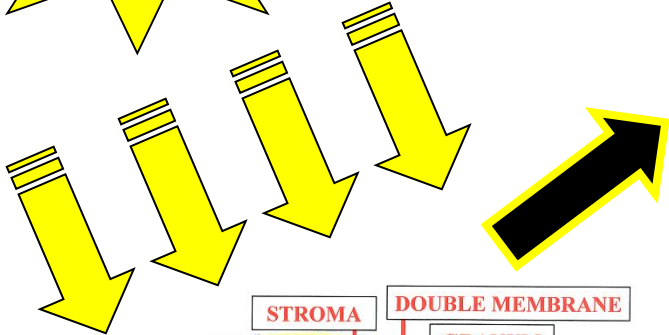
**CARBON DIOXIDE
WATER**



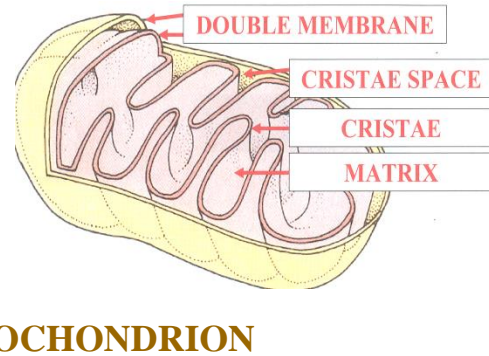
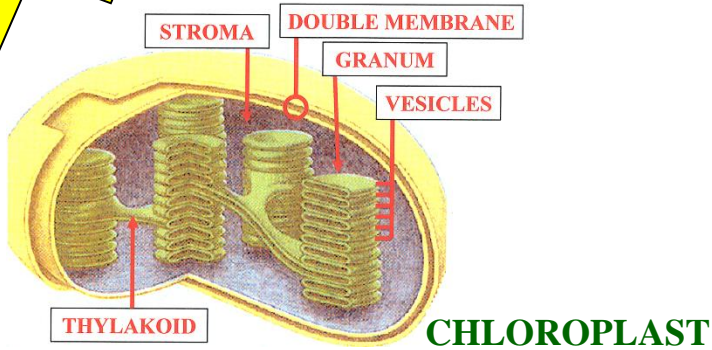
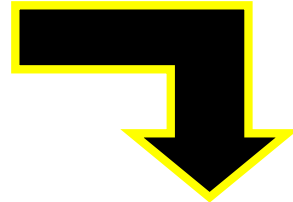
36 ATP



LIGHT ENERGY

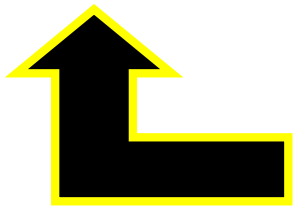


**GLUCOSE
OXYGEN**

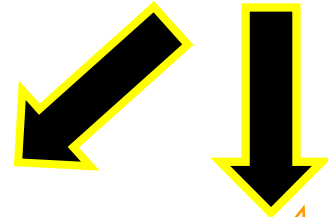


PHOTOSYNTHESIS

RESPIRATION



**CARBON DIOXIDE
WATER**



36 ATP

PHOTOSYNTHESIS

&

AEROBIC

RESPIRATION

?

**CATABOLIC
METABOLISM
&
ANABOLIC
METABOLISM
?**





**EXERGONIC
REACTIONS
&
ENDERGONIC
REACTIONS
?**

**REDUCTION
REACTIONS
&
OXIDATION
REACTIONS
?**





**LIGHT
REACTION
&
DARK
REACTION
?**

PHOTOSYNTHESIS

&

AEROBIC

RESPIRATION

?

PHOTOSYNTHESIS

&

AEROBIC

RESPIRATION

!!!COUPLED!!!



ANAEROBIC RESPIRATION

METABOLISM

GLUCOSE



 = CHEMICAL ENERGY

METABOLISM

GLUCOSE



**CATABOLIC
METABOLISM**

**ANAEROBIC
RESPIRATION**



 = CHEMICAL ENERGY



METABOLISM

GLUCOSE



CATABOLIC METABOLISM

ANAEROBIC RESPIRATION

CO₂

ETHANOL





METABOLISM

GLUCOSE



CATABOLIC
METABOLISM

ANAEROBIC
RESPIRATION

OXYGEN REQUIRED ?

CO₂

ETHANOL

 = CHEMICAL ENERGY



METABOLISM

GLUCOSE



CATABOLIC
METABOLISM

ANAEROBIC
RESPIRATION

OXYGEN NOT REQUIRED

CO₂

ETHANOL



= CHEMICAL ENERGY

METABOLISM

GLUCOSE



ANAEROBIC
RESPIRATION

EXERGONIC
REACTIONS



CO₂

ETHANOL



PHOSPHORYLATIONS





METABOLISM

GLUCOSE



ANAEROBIC
RESPIRATION



EXERGONIC
REACTIONS

PHOSPHORYLATIONS



CO₂

ETHANOL



ANAEROBIC RESPIRATION COMPONENT PATHWAYS

**ANAEROBIC
RESPIRATION
COMPONENT PATHWAYS**

GLYCOLYSIS

**ANAEROBIC
RESPIRATION
COMPONENT PATHWAYS**



**ANAEROBIC
RESPIRATION
COMPONENT PATHWAYS**

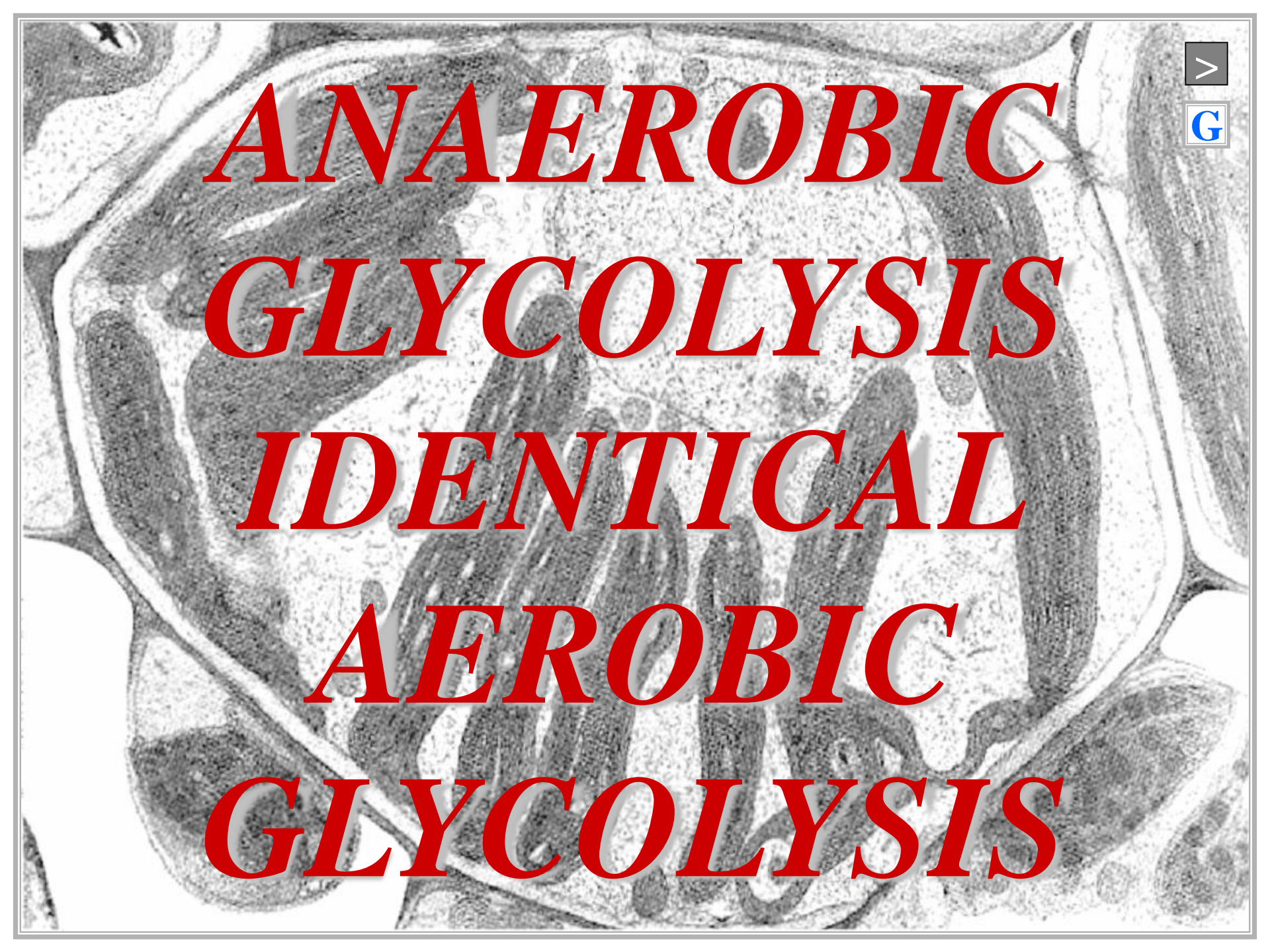
GLYCOLYSIS

FERMENTATION

**ANAEROBIC
RESPIRATION
COMPONENT PATHWAYS**



ANAEROBIC RESPIRATION GLYCOLYSIS

A grayscale electron micrograph of muscle tissue, showing various organelles and structures. The image is used as a background for text. In the top right corner, there are two small icons: a gray square with a white right-pointing chevron and a blue square with a white letter 'G'.

***ANAEROBIC
GLYCOLYSIS
IDENTICAL
AEROBIC
GLYCOLYSIS***

GLYCOLYSIS

GLUCOSE

GLYCOLYSIS

+

 = CHEM ENERGY

GLYCOLYSIS

GLUCOSE

GLYCOLYSIS

HEXOKINASE

ATP
EXPENDED

EGY

ADP

GLUCOSE-6-PHOSPHATE

PHOSPHOGLUCOISOMERASE

FRUCTOSE-6-PHOSPHATE

PHOSPHOFRUCTOKINASE

ATP
EXPENDED

EGY

ADP

FRUCTOSE-1-6-BISPHOSPHATE

RED = ENZYME

= CHEM ENERGY

+

FRUCTOSE-1-6-BISPHOSPHATE

ALDOLASE
ISOMERASE

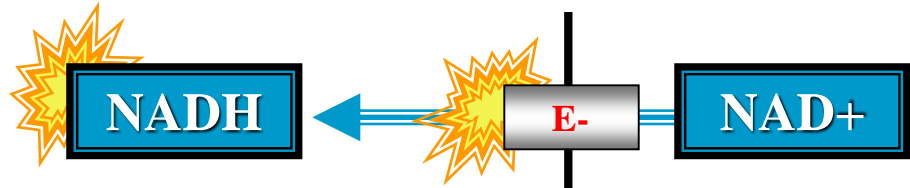
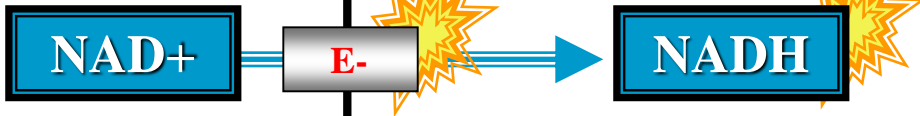
 = CHEM ENERGY

PHOSPHOGLYCERALDEHYDE - PGAL

PHOSPHOGLYCERALDEHYDE - PGAL

TRI-PHOSPHATE DEHYDROGENASE

TRI-PHOSPHATE DEHYDROGENASE

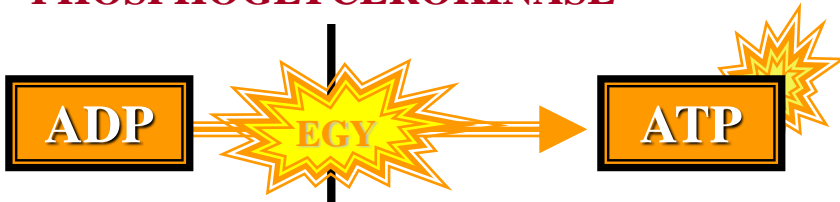


1-3-BISPHOSPHOGLYCERATE

1-3-BISPHOSPHOGLYCERATE

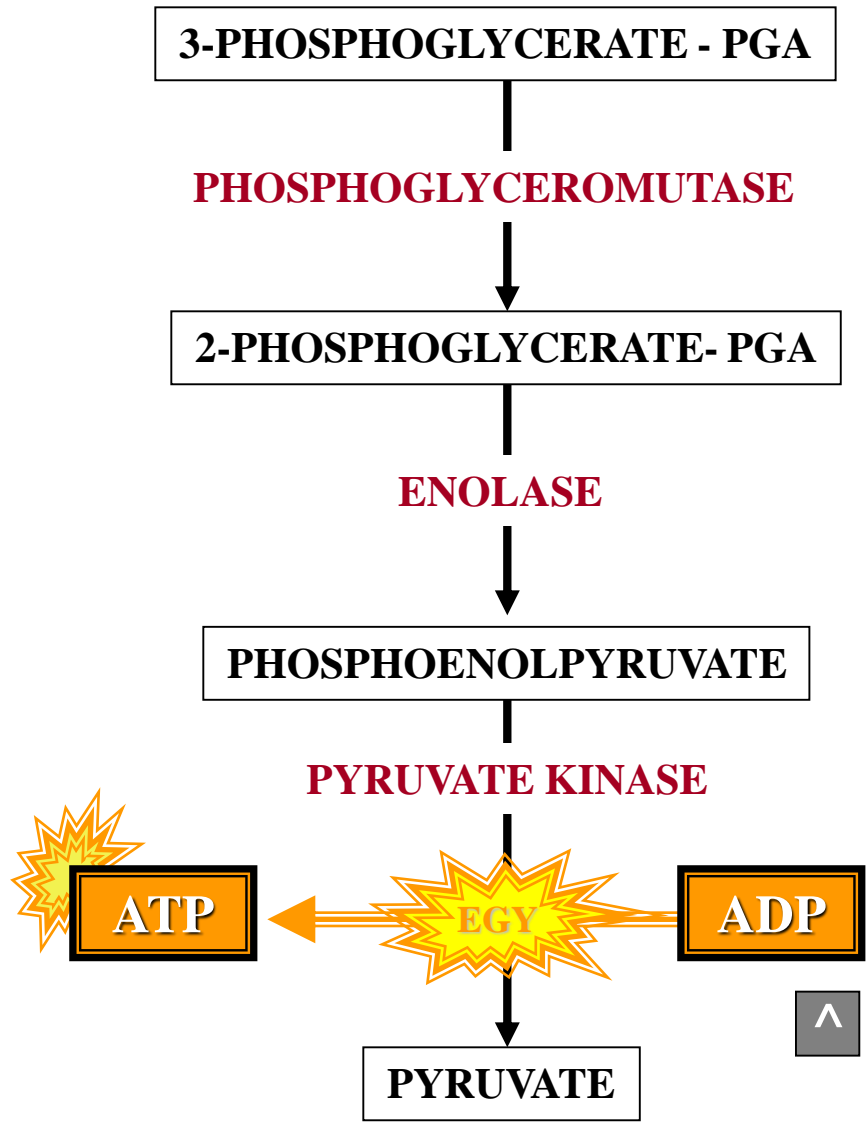
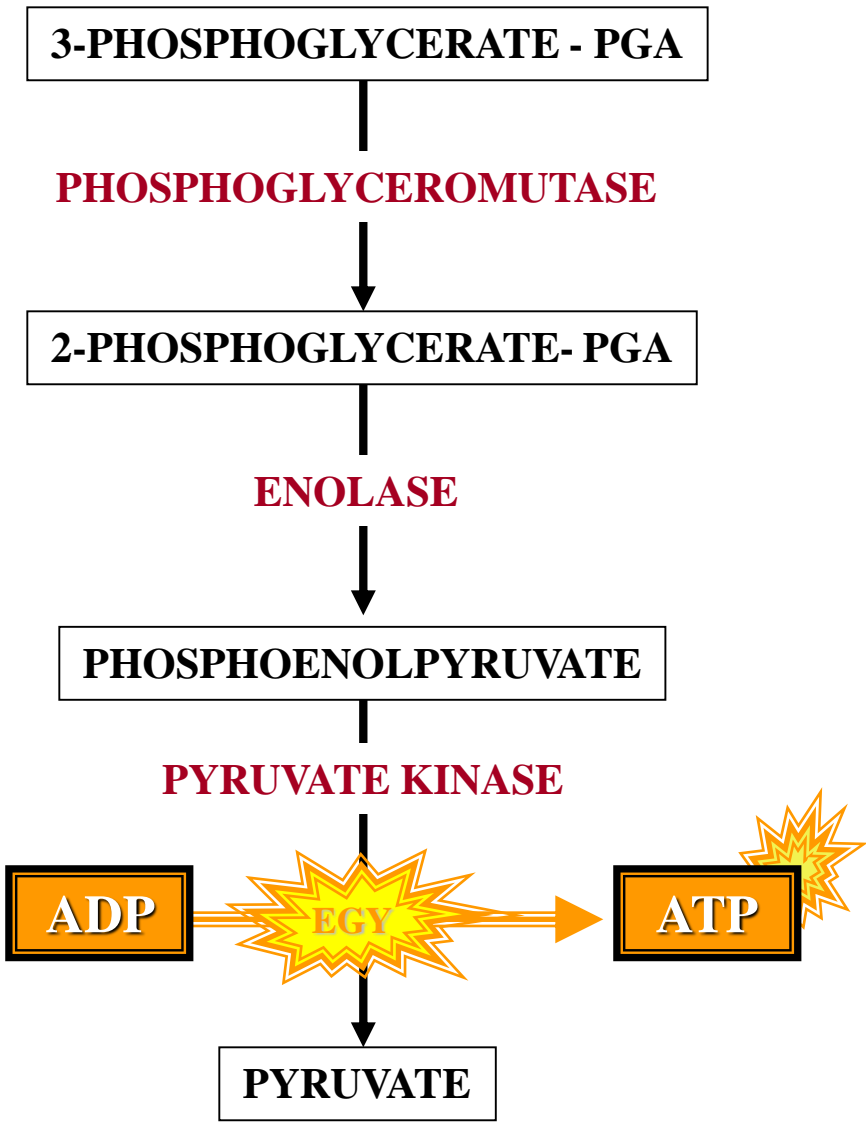
PHOSPHOGLYCEROKINASE

PHOSPHOGLYCEROKINASE



3-PHOSPHOGLYCERATE - PGA

3-PHOSPHOGLYCERATE - PGA



!!!CONSULT: AEROBIC GLYCOLYSIS NOTES!!!



ANAEROBIC GLYCOLYSIS OUTCOME

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

? ATP:

? NADH:

? PYRUVATE:

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP:

? NADH:

? PYRUVATE:

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP:

2 NADH:

? PYRUVATE:



GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP:

2 NADH:

2 PYRUVATE:

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: **→**

2 NADH:

2 PYRUVATE:



GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:

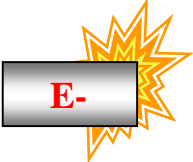
2 PYRUVATE:

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  →

2 PYRUVATE:

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → AEROBIC RESPIRATION

2 PYRUVATE:

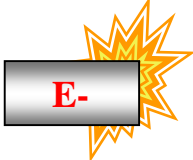


GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

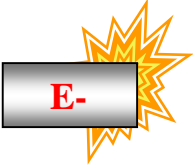

2 NADH:  → ETC

2 PYRUVATE:

GLYCOLYSIS OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → 

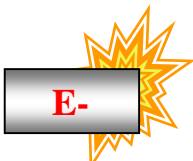

2 PYRUVATE:

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  **→** 

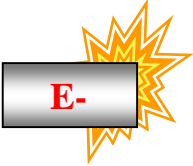
2 PYRUVATE: →

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → ~~ETC~~

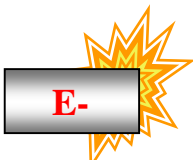

2 PYRUVATE: → AEROBIC RESPIRATION



GLYCOLYSIS OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

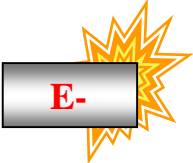
2 NADH:  → 

2 PYRUVATE: → KREBS CYCLE

GLYCOLYSIS OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → ~~ETC~~

2 PYRUVATE: → ~~KREBS~~ CYCLE

**ANAEROBIC
ENVIRONMENT**

?

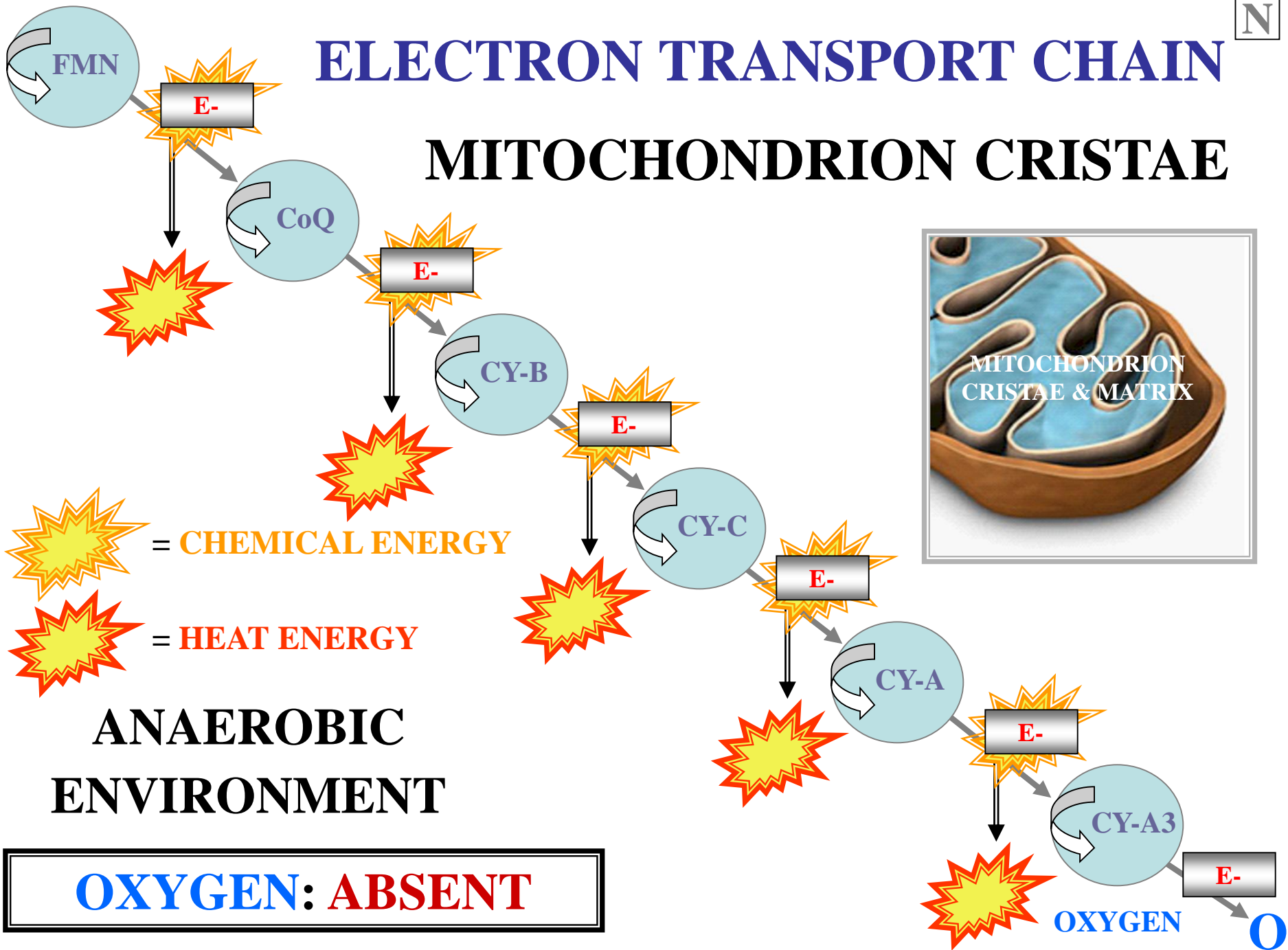
ABSENT



**ANAEROBIC
ENVIRONMENT
OXYGEN
ABSENT**

ELECTRON TRANSPORT CHAIN

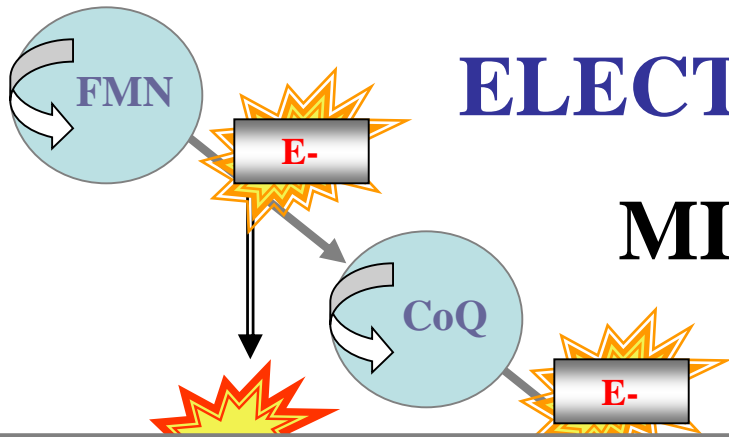
MITOCHONDRION CRISTAE





ELECTRON TRANSPORT CHAIN

MITOCHONDRION CRISTAE

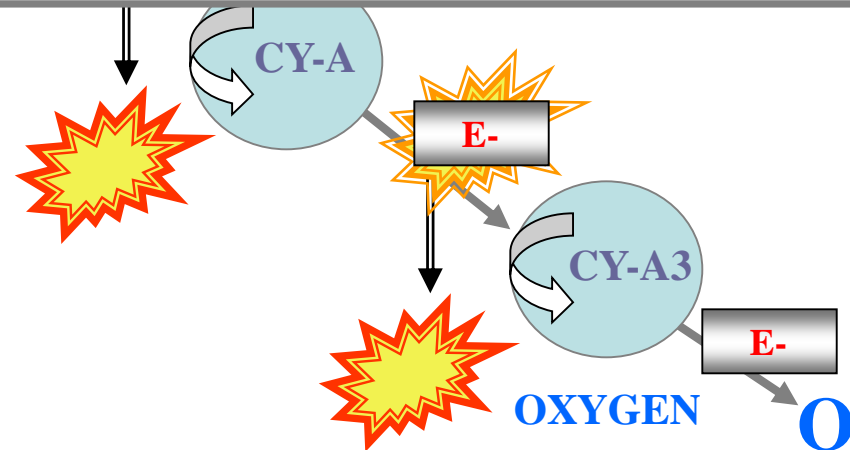


ETC

NON-FUNCTIONAL

**ANAEROBIC
ENVIRONMENT**

OXYGEN: ABSENT



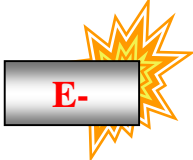


GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → ETC

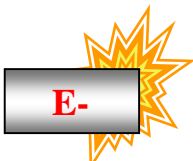
2 PYRUVATE: → KREBS CYCLE

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  **→ ~~ETC~~**

2 PYRUVATE: → KREBS CYCLE

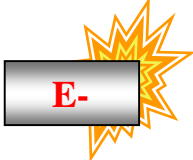
GLYCOLYSIS

OUTCOME



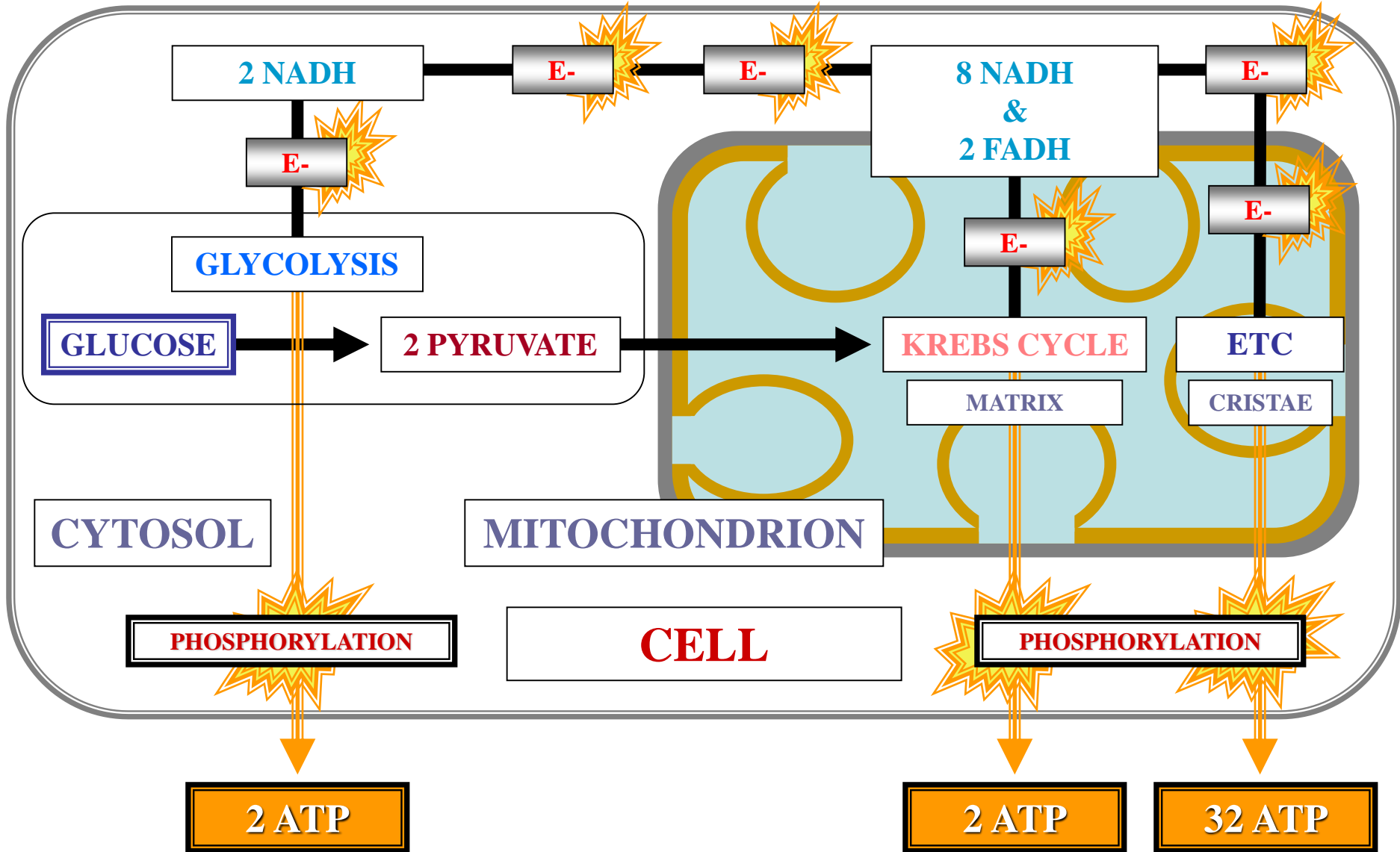
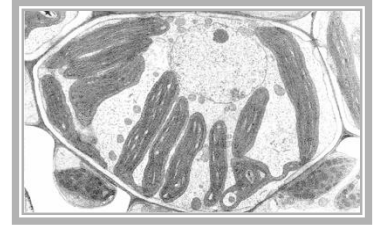
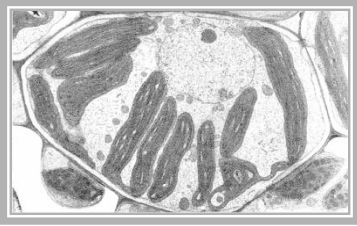
OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → BY PASS ETC

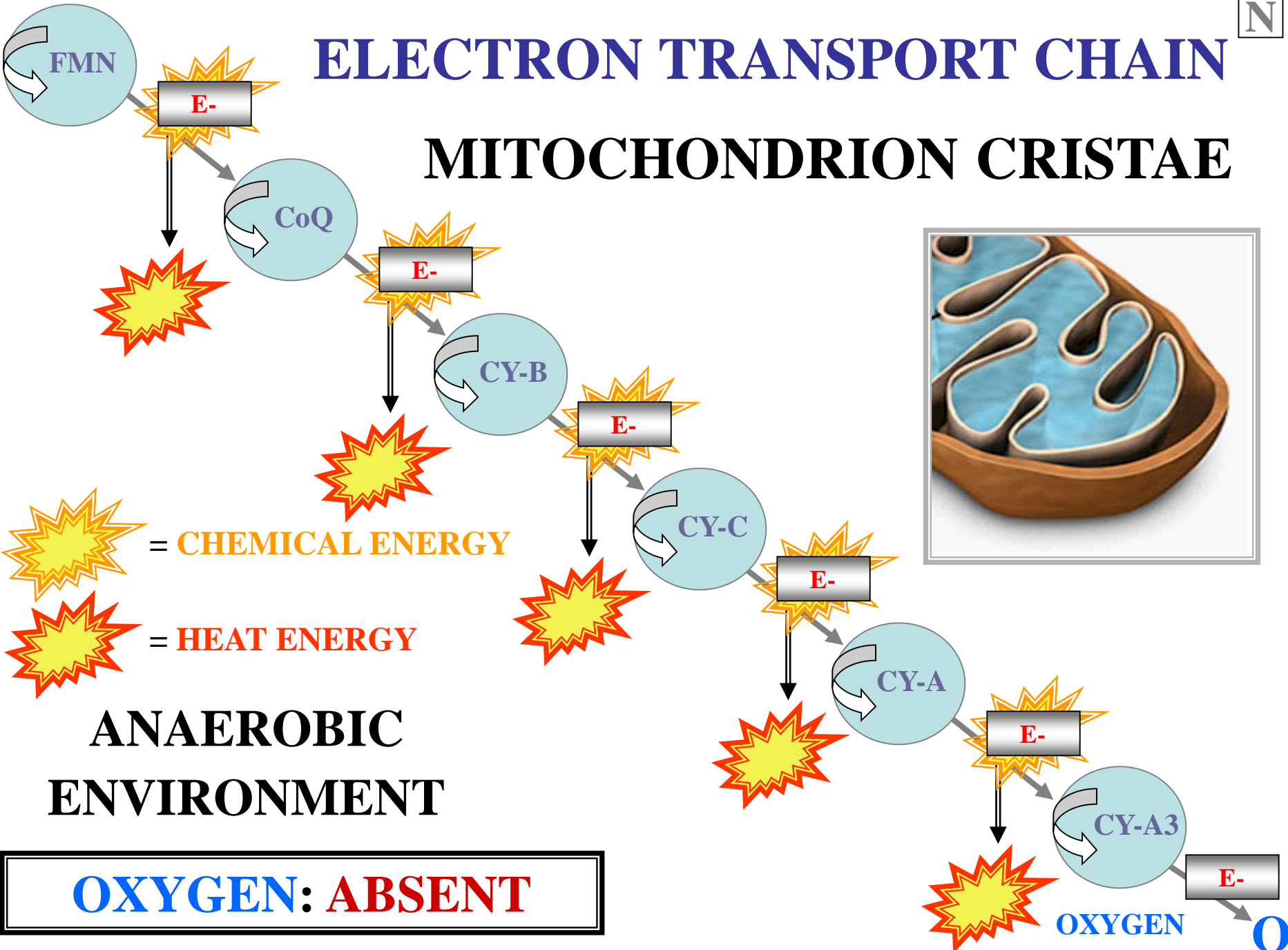
2 PYRUVATE: → KREBS CYCLE

AEROBIC RESPIRATION



ELECTRON TRANSPORT CHAIN

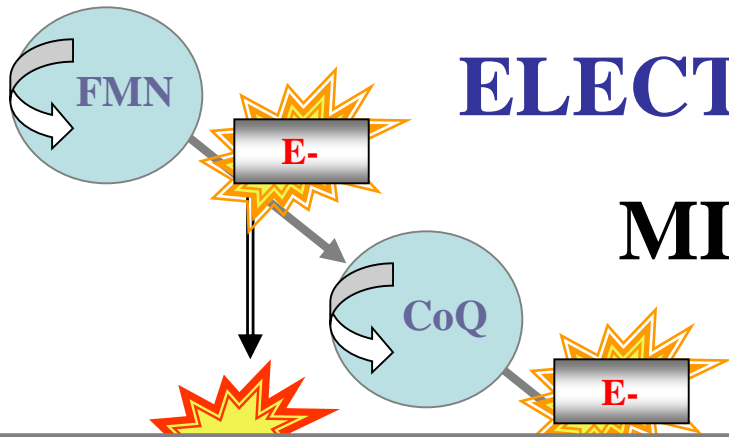
MITOCHONDRION CRISTAE





ELECTRON TRANSPORT CHAIN

MITOCHONDRION CRISTAE

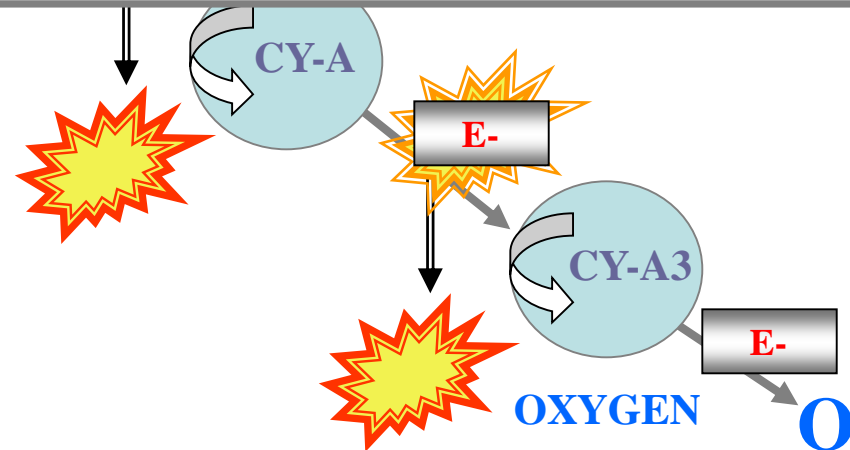


ETC

NON-FUNCTIONAL

**ANAEROBIC
ENVIRONMENT**

OXYGEN: ABSENT

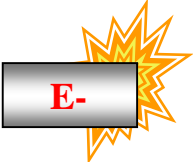




GLYCOLYSIS OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → BY PASS ETC

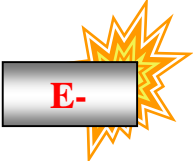
2 PYRUVATE: → KREBS CYCLE

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → BY PASS ETC

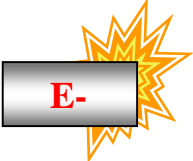
2 PYRUVATE: → ~~KREBS CYCLE~~

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → BY PASS ETC

2 PYRUVATE: → BY PASS KREBS CYCLE

GLYCOLYSIS

OUTCOME

OUTCOME / GLUCOSE:

2 ATP: → METABOLISM

2 NADH:  → **FERMENTATION**

2 PYRUVATE: → **FERMENTATION**



FERMENTATION

FERMENTATION TYPES

**ANAEROBIC
RESPIRATION
FERMENTATION**

ALCOHOLIC FERMENTATION

**ANAEROBIC
RESPIRATION
FERMENTATION**



**ANAEROBIC
RESPIRATION
FERMENTATION**

**ALCOHOLIC FERMENTATION
LACTIC ACID FERMENTATION**

**ANAEROBIC
RESPIRATION
FERMENTATION**

ALCOHOLIC FERMENTATION

ALCOHOLIC FERMENTATION

ALCOHOLIC FERMENTATION

PYRUVATE
CONVERTED TO
ETHANOL & CO₂

ALCOHOLIC FERMENTATION





ALCOHOLIC FERMENTATION

PYRUVATE + **NADH**

ALCOHOLIC FERMENTATION

ALCOHOLIC FERMENTATION

PYRUVATE + NADH

GLYCOLYSIS

ALCOHOLIC FERMENTATION



ALCOHOLIC FERMENTATION

PYRUVATE + **NADH**

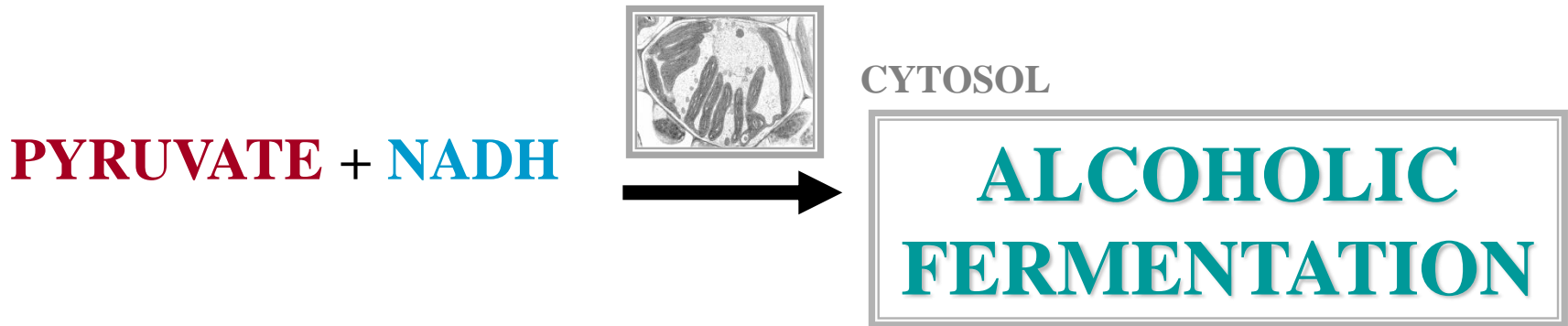


CYTOSOL



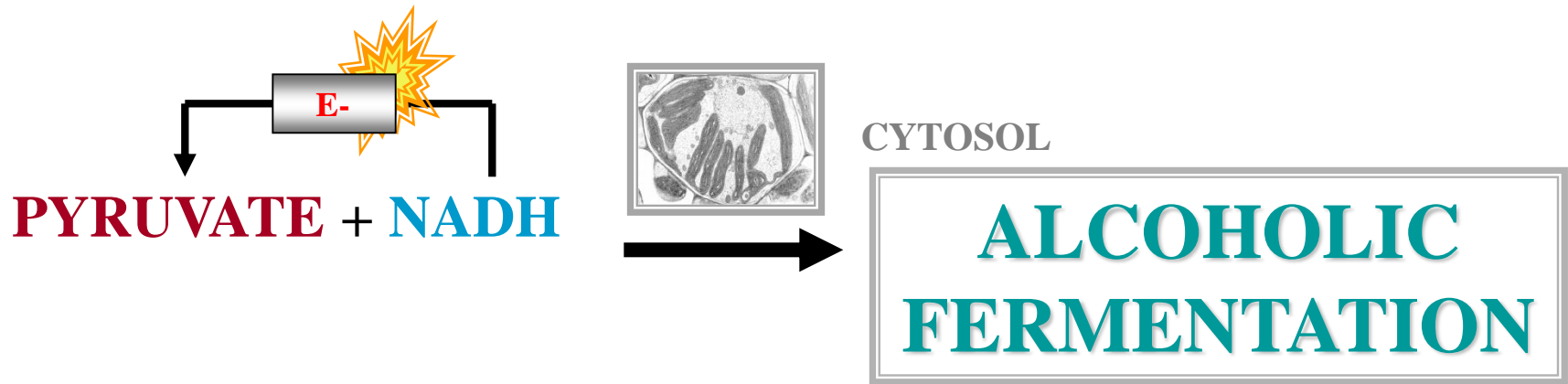
ALCOHOLIC FERMENTATION

ALCOHOLIC FERMENTATION



ALCOHOLIC FERMENTATION

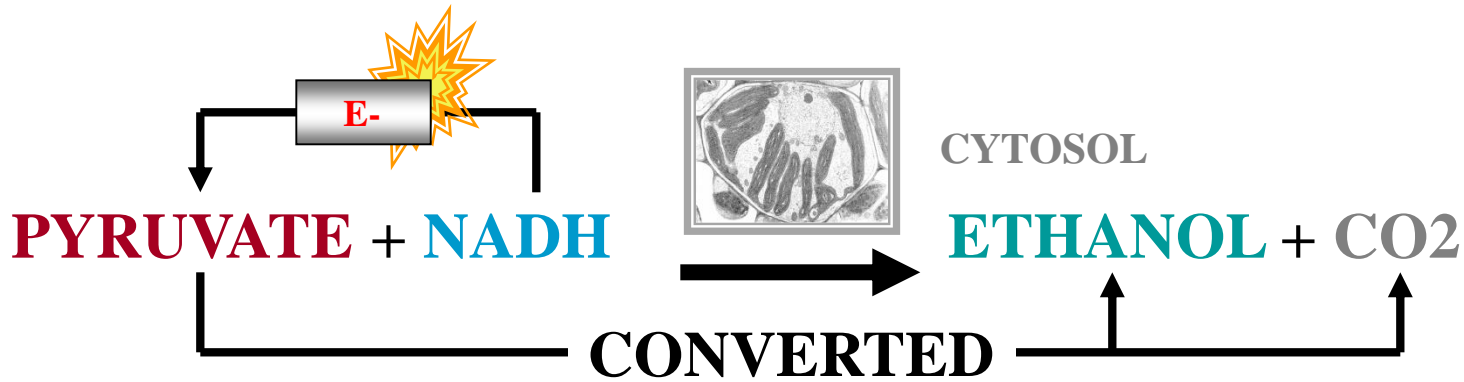
ALCOHOLIC FERMENTATION



ALCOHOLIC FERMENTATION

 = CHEMICAL ENERGY

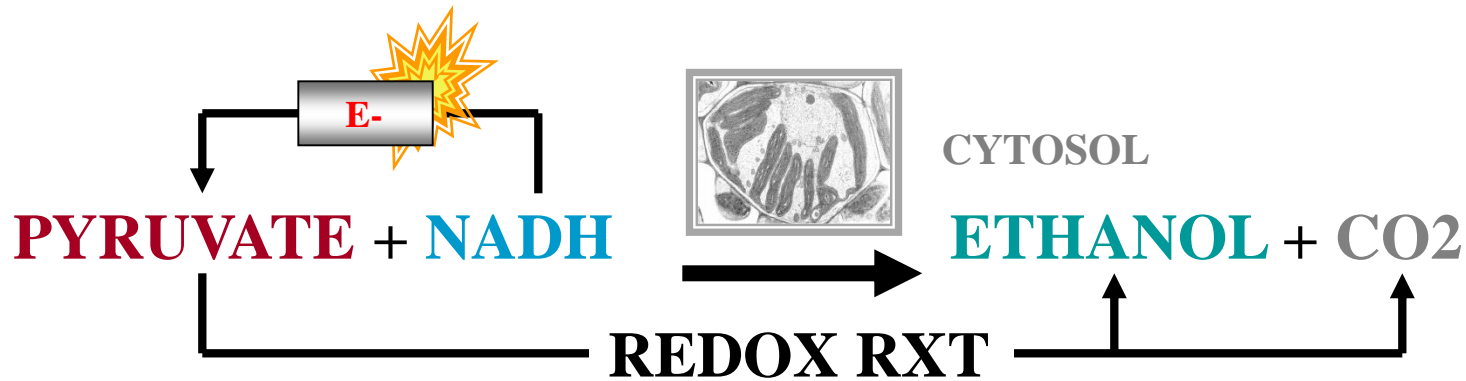
ALCOHOLIC FERMENTATION



ALCOHOLIC FERMENTATION

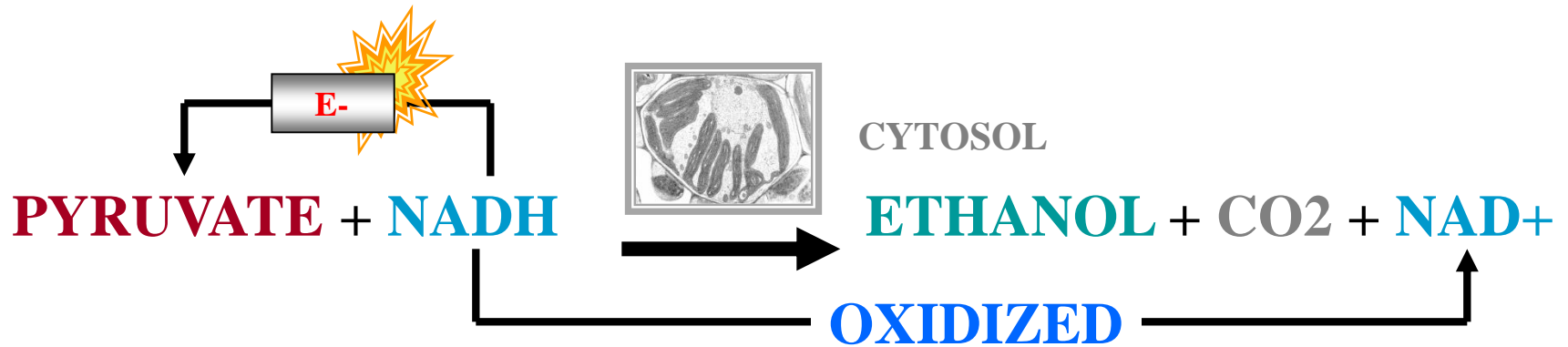
 = CHEMICAL ENERGY

ALCOHOLIC FERMENTATION



ALCOHOLIC FERMENTATION

ALCOHOLIC FERMENTATION

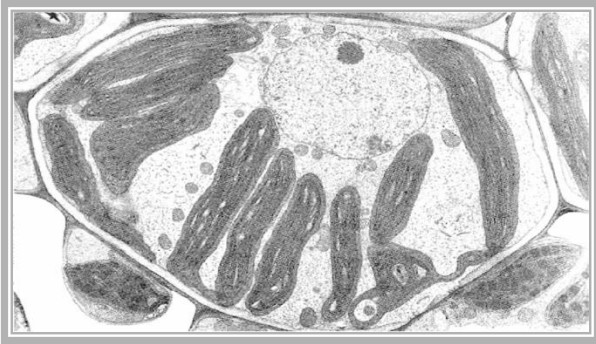


ALCOHOLIC FERMENTATION

 = CHEMICAL ENERGY



ALCOHOLIC FERMENTATION



NAD⁺



ALCOHOLIC FERMENTATION



***ALCOHOLIC
FERMENTATION
REGENERATES***

NAD⁺

LACTIC ACID FERMENTATION

LACTIC ACID FERMENTATION

**LACTIC ACID
FERMENTATION**

**PYRUVATE
CONVERTED TO
LACTIC ACID**

**LACTIC ACID
FERMENTATION**



LACTIC ACID FERMENTATION

PYRUVATE + **NADH**

LACTIC ACID FERMENTATION