?

KREBS CYCLE

?

P

PYRUVATE

KREBS CYCLE

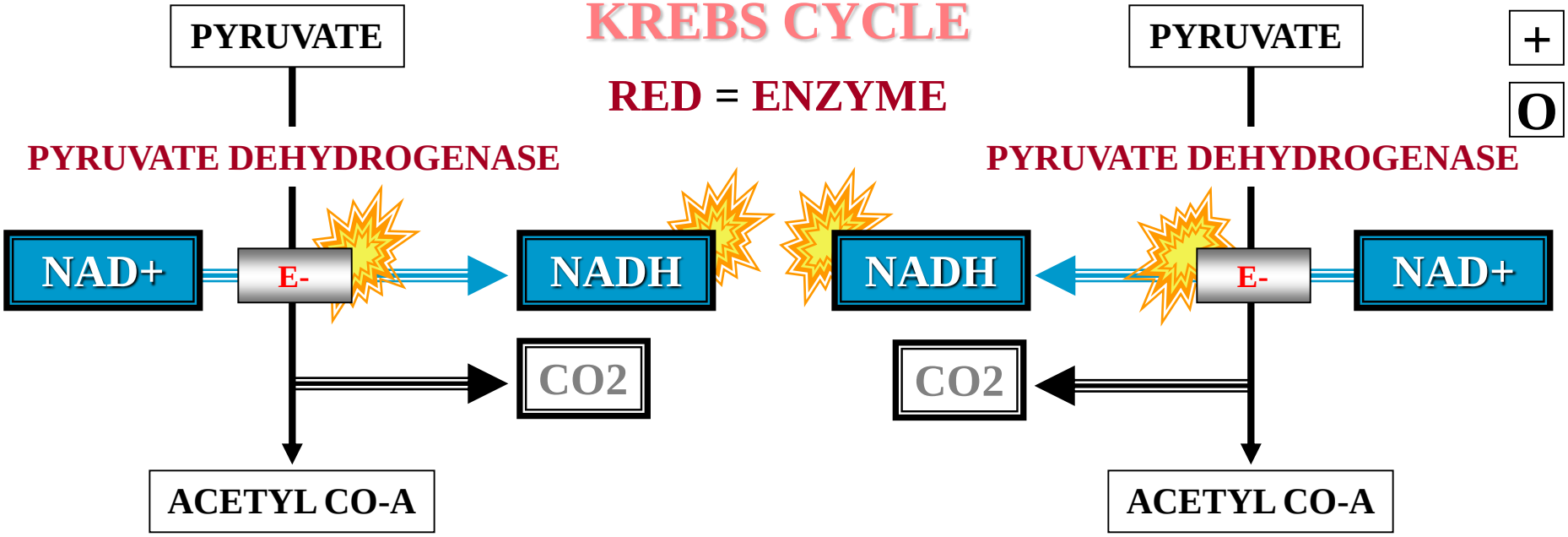
PYRUVATE

2

A

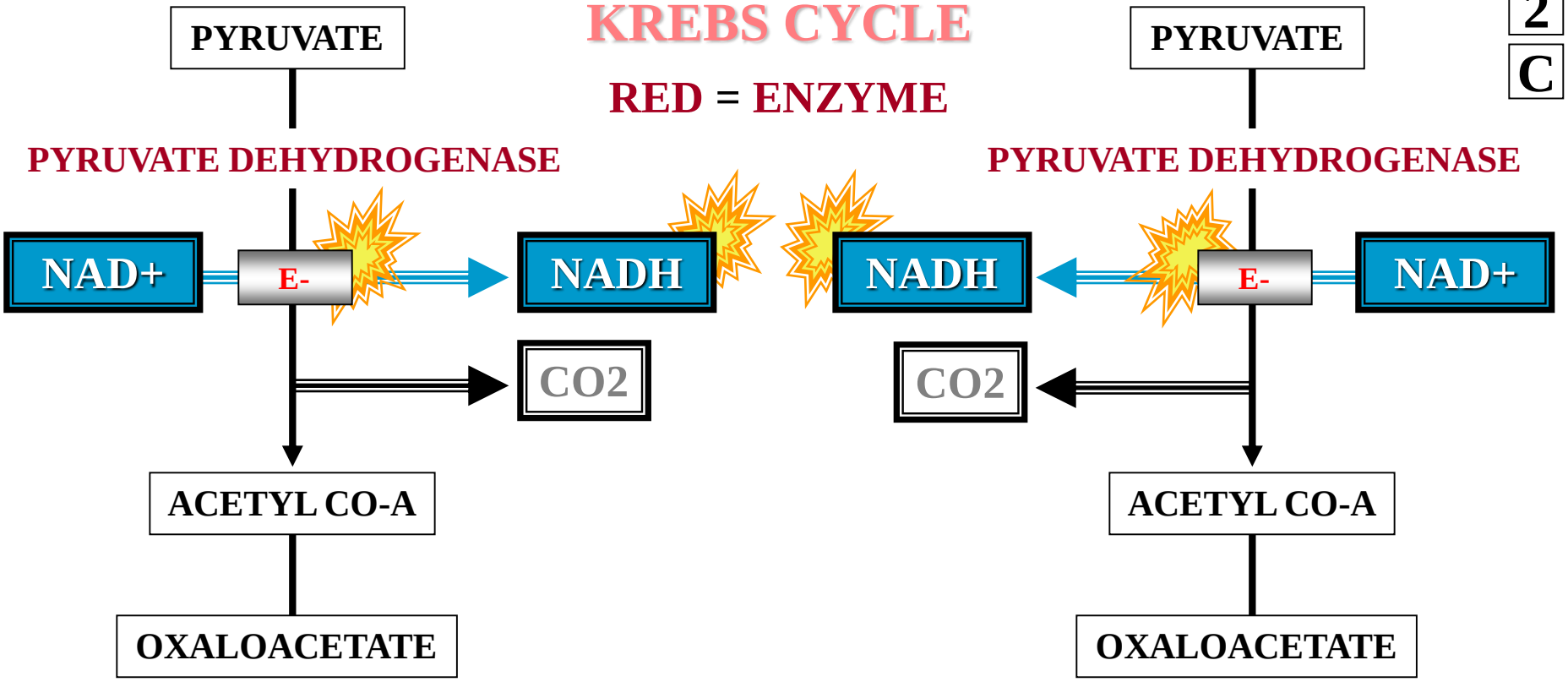
KREBS CYCLE

RED = ENZYME



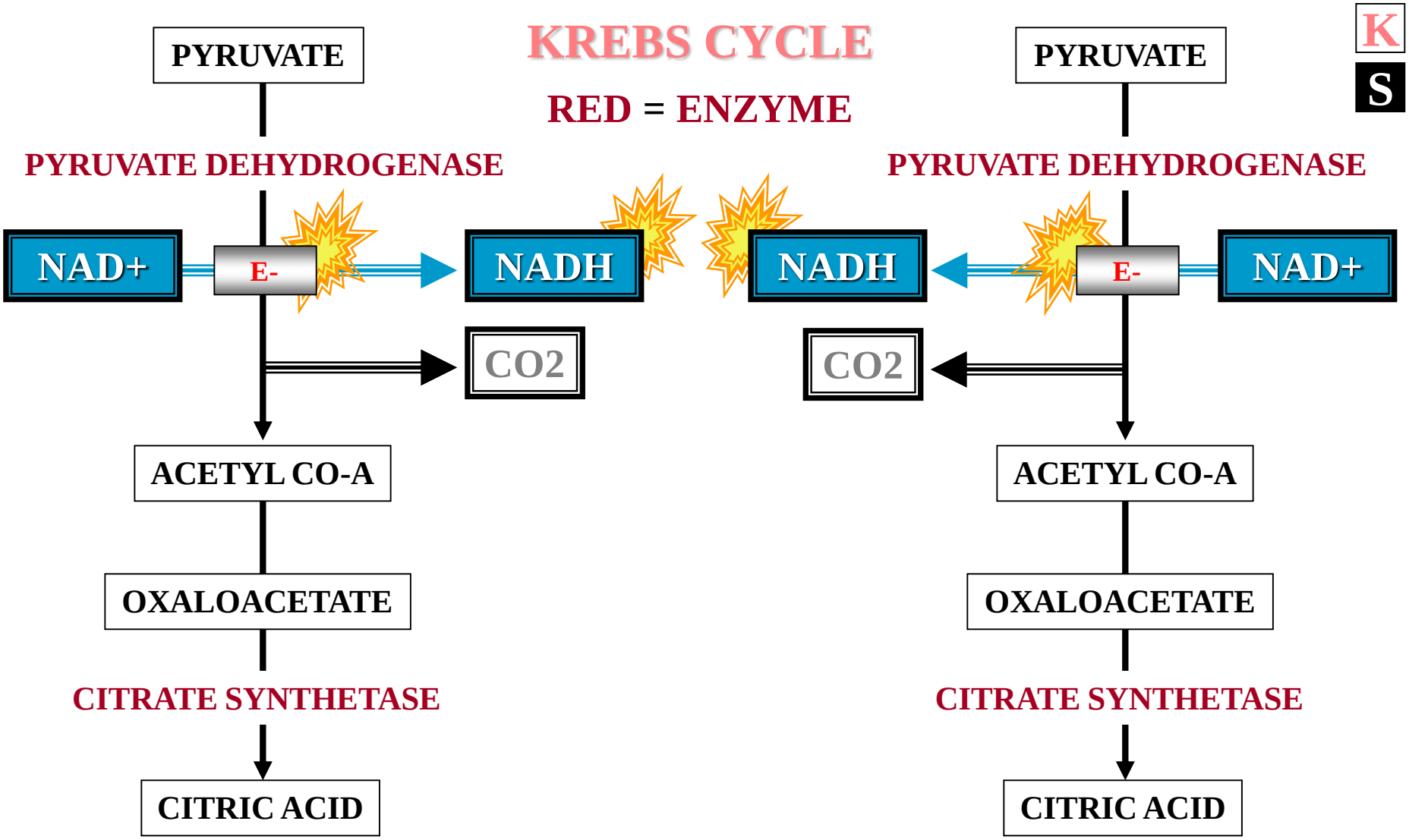
KREBS CYCLE

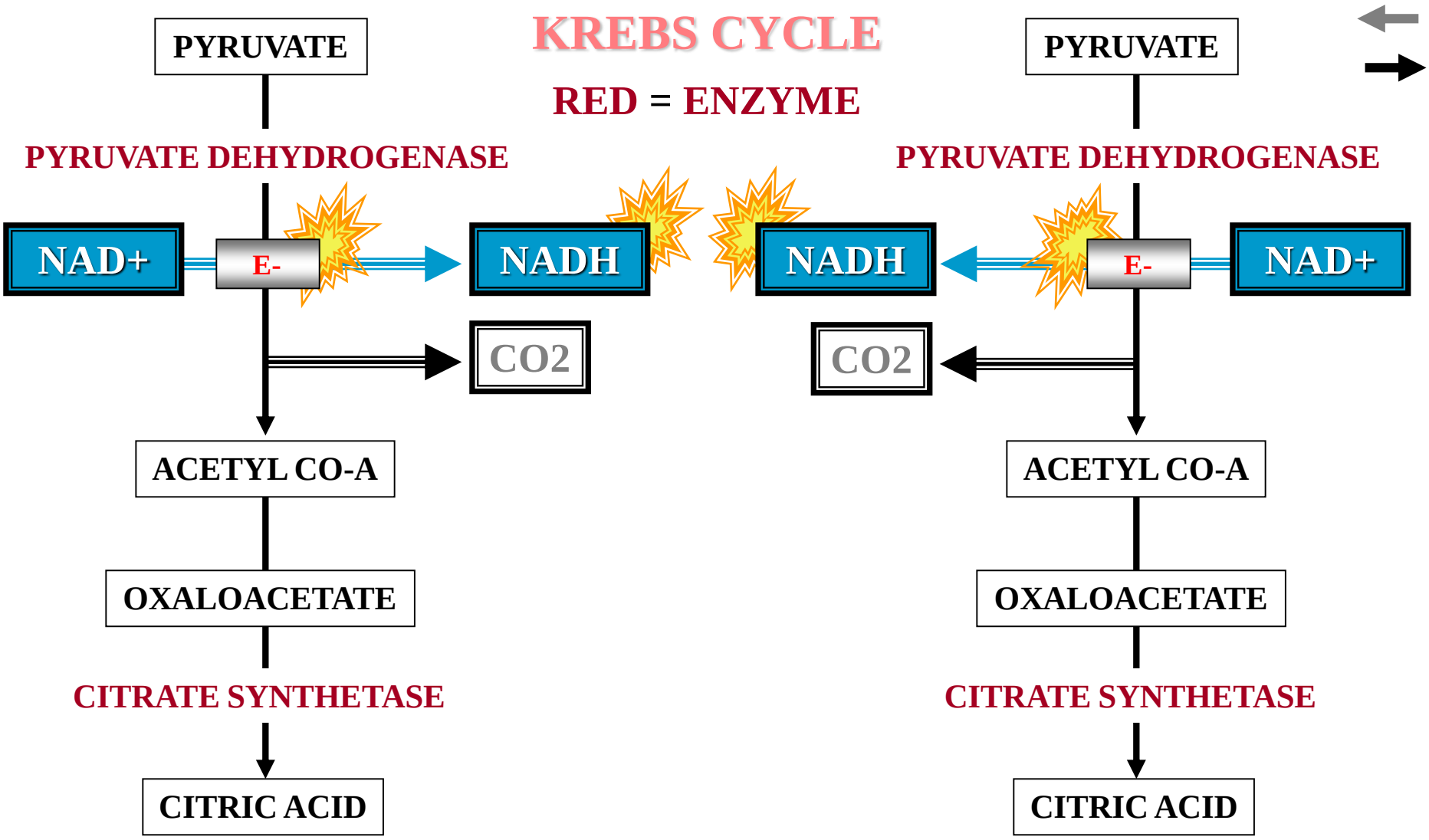
RED = ENZYME



KREBS CYCLE

RED = ENZYME

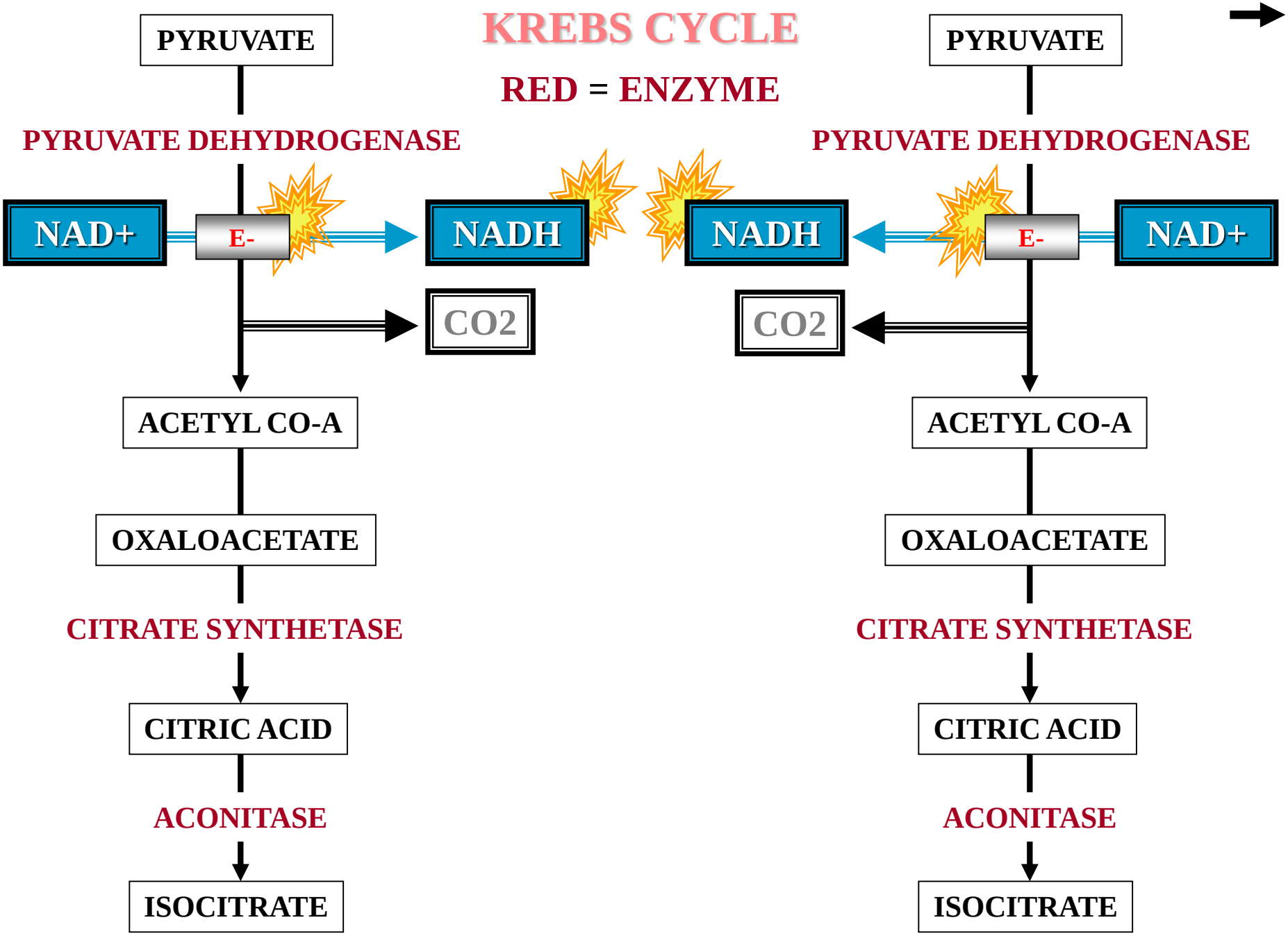


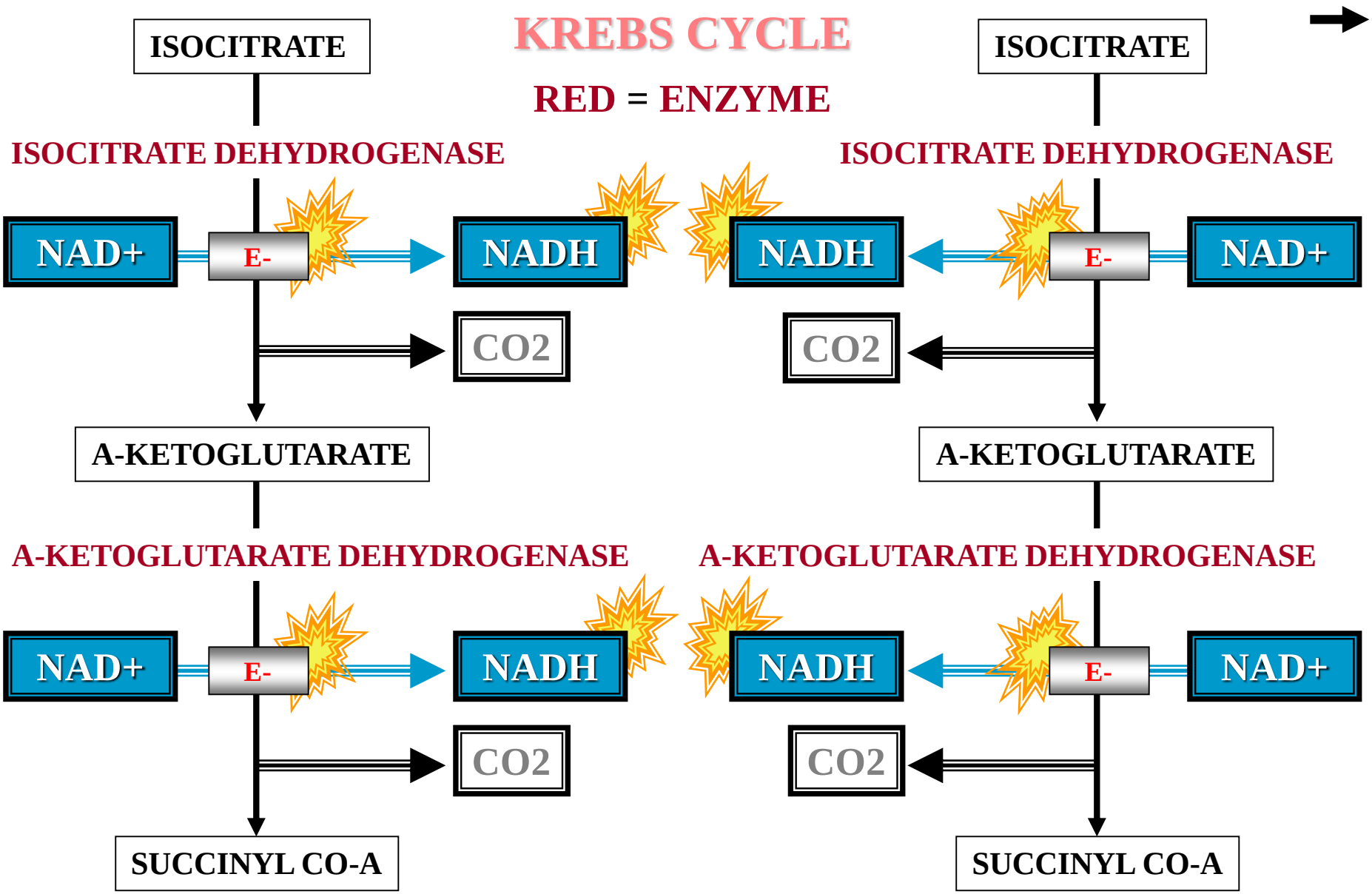


!!!KREBS CYCLE = CITRIC ACID CYCLE!!!

KREBS CYCLE

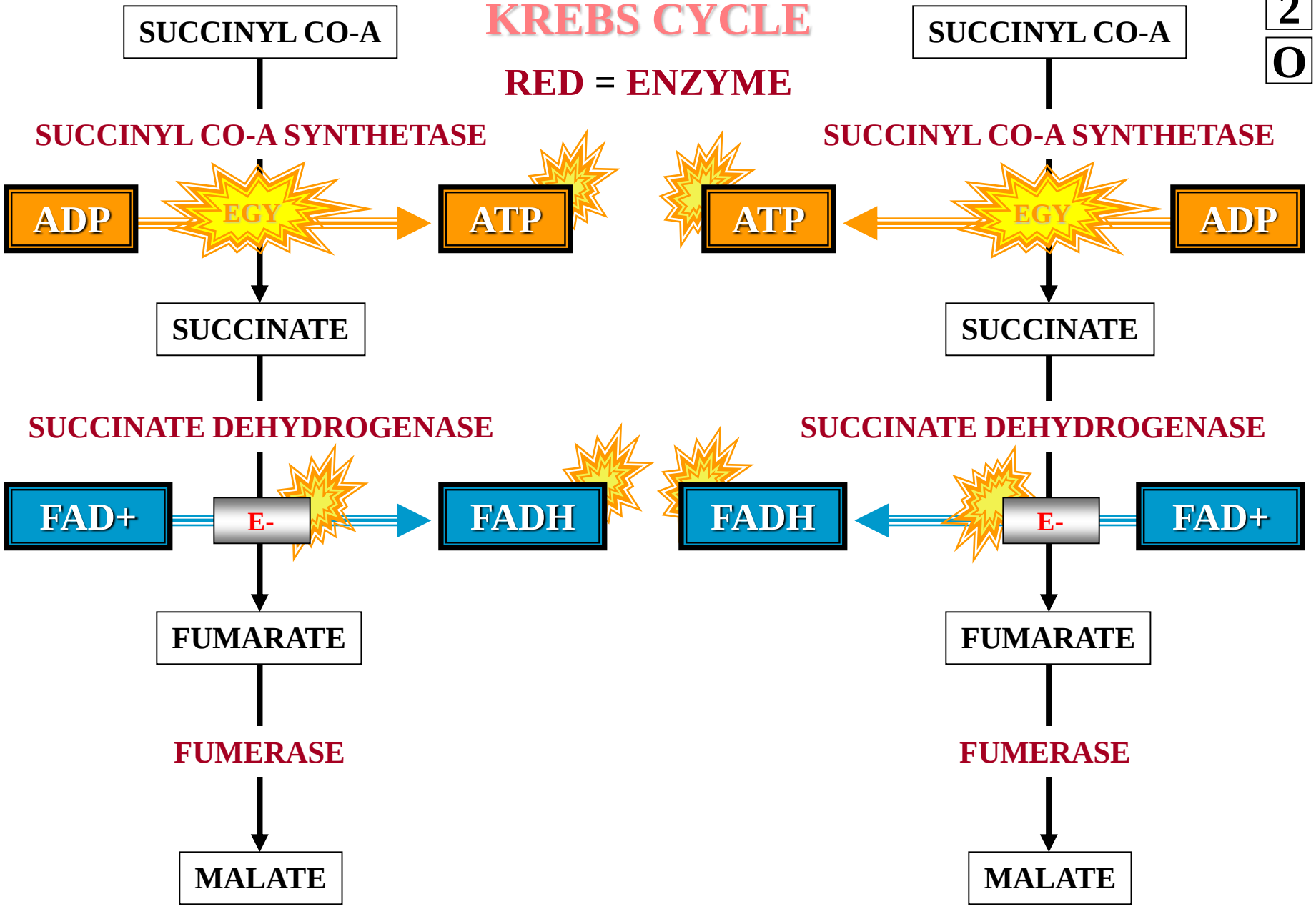
RED = ENZYME




KREBS CYCLE
RED = ENZYME
ISOCITRATE
ISOCITRATE DEHYDROGENASE
NAD+
E-
NADH
CO2
A-KETOGLUTARATE
A-KETOGLUTARATE DEHYDROGENASE
SUCCINYL CO-A
ISOCITRATE
ISOCITRATE DEHYDROGENASE
NADH
E-
NAD+
CO2
A-KETOGLUTARATE
A-KETOGLUTARATE DEHYDROGENASE
NADH
E-
NAD+
CO2
SUCCINYL CO-A

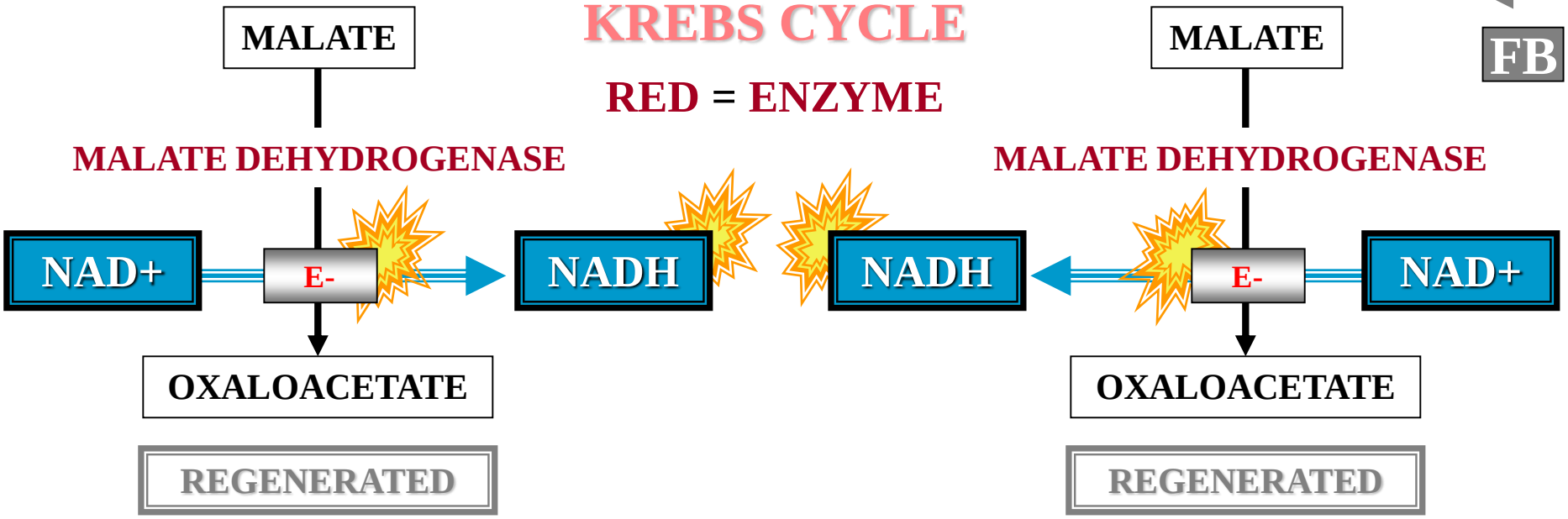
KREBS CYCLE

RED = ENZYME



KREBS CYCLE

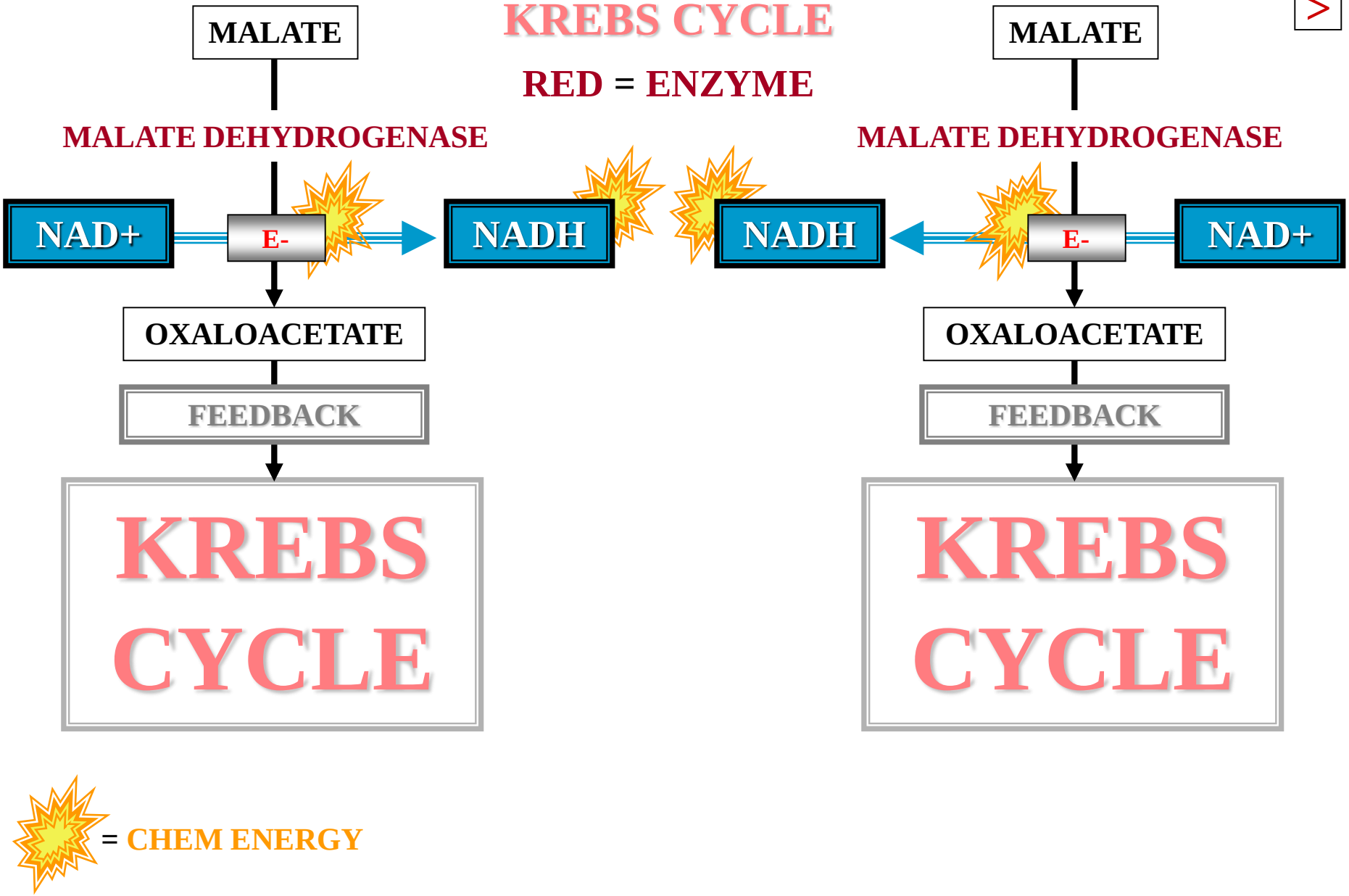
RED = ENZYME



FB

KREBS CYCLE

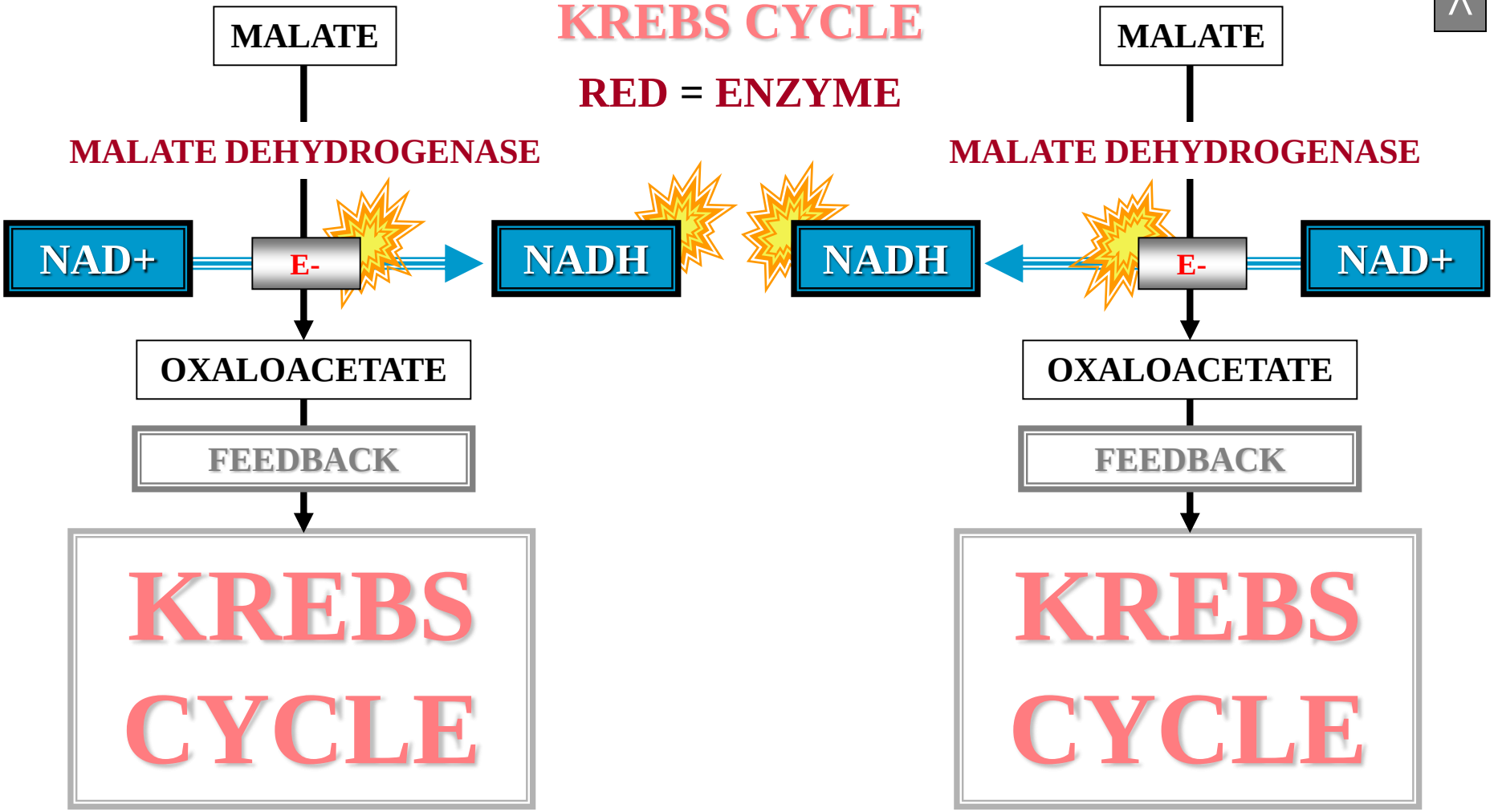
RED = ENZYME



= CHEM ENERGY

KREBS CYCLE

RED = ENZYME



!!!KREBS CYCLE: DO NOT MEMORIZE!!!

KREBS CYCLE OUTCOME

C

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

CO2:

NADH:

FADH:

ATP:

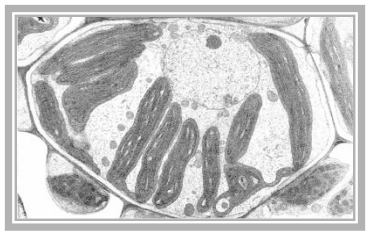
?

CO_2

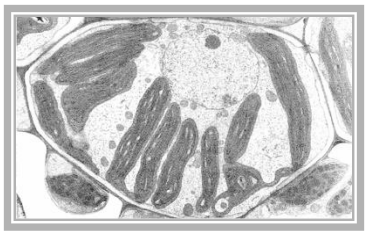
2

P

? CO2 / PYRUVATE



AEROBIC RESPIRATION



2

P

+

GLYCOLYSIS

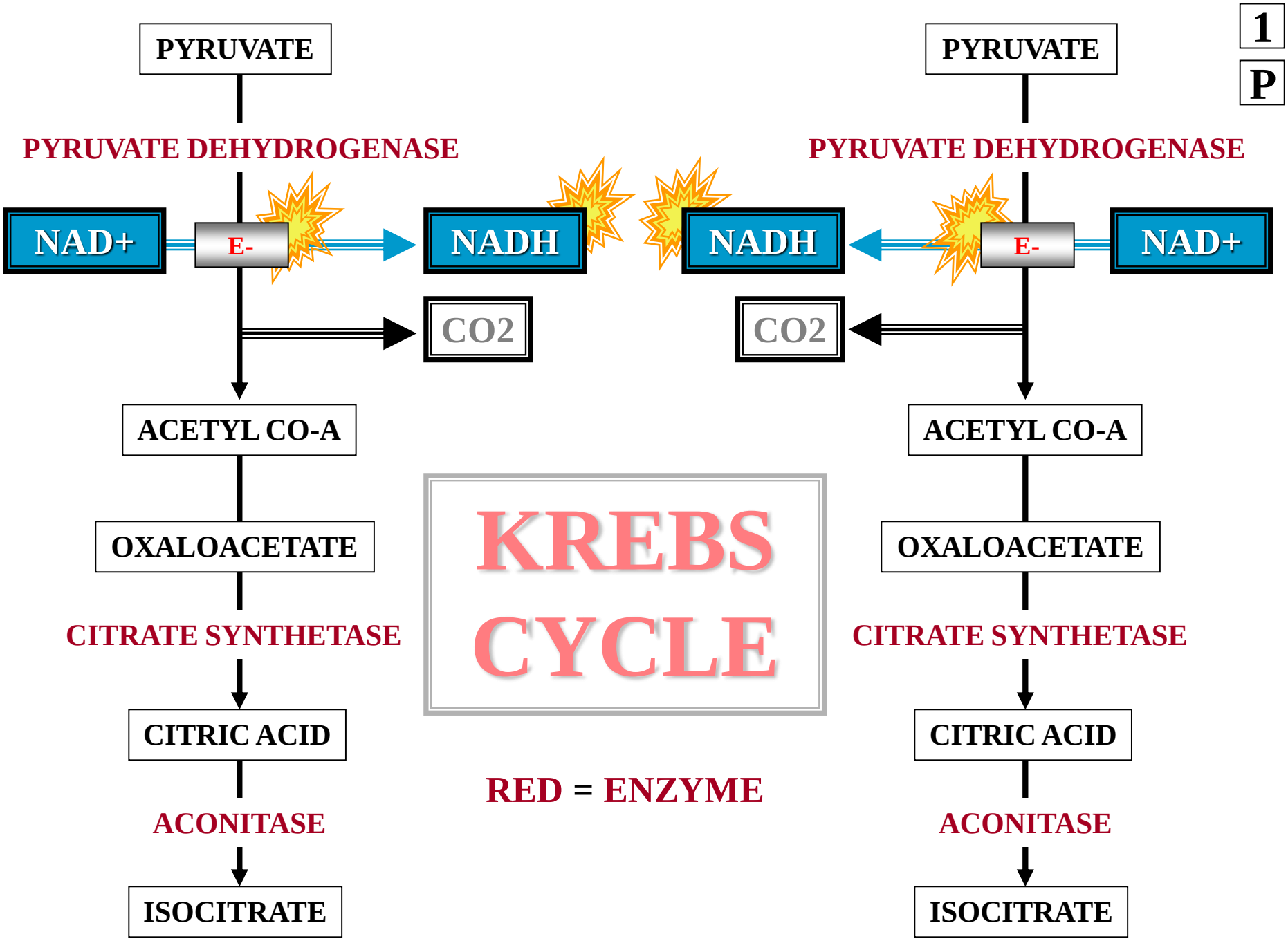
GLUCOSE → 2 PYRUVATE → KREBS CYCLE

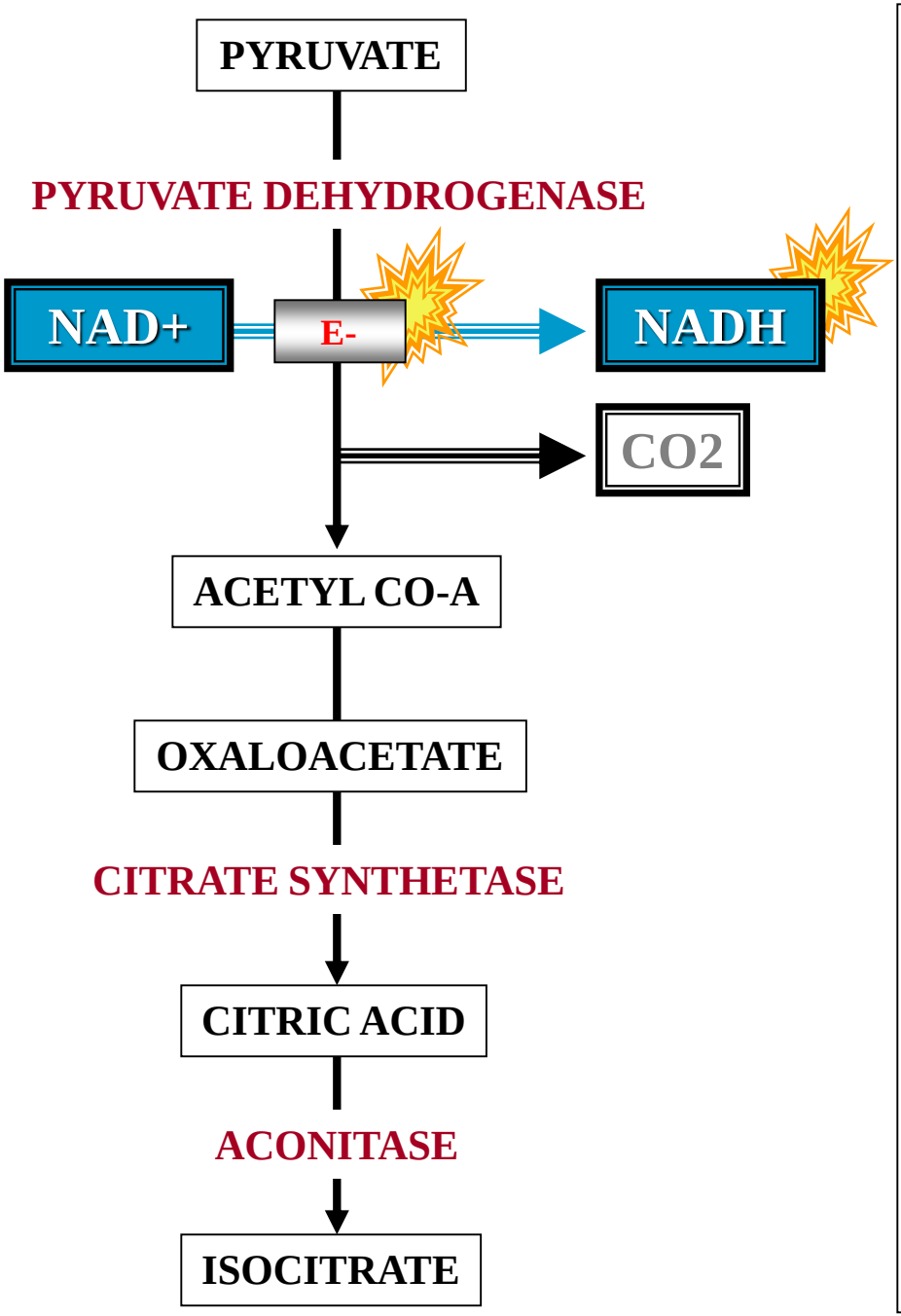
CYTOSOL

MITOCHONDRION

CELL

= CHEMICAL ENERGY


1
P
PYRUVATE
PYRUVATE DEHYDROGENASE
NAD+
E-
NADH
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE
KREBS CYCLE
RED = ENZYME
PYRUVATE
PYRUVATE DEHYDROGENASE
NADH
E-
NAD+
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE



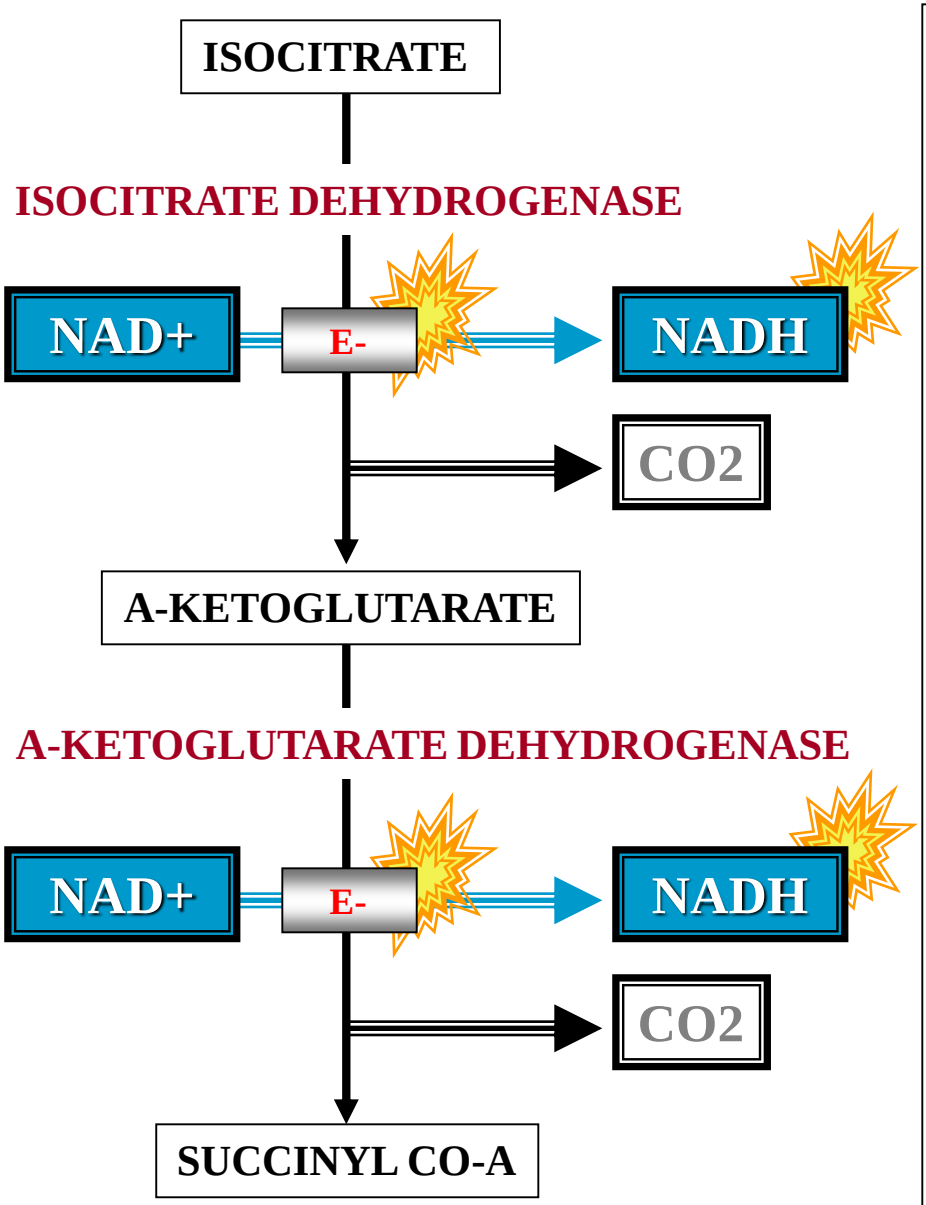
+

1

KREBS CYCLE

? CO2 / PYRUVATE

KREBS CYCLE



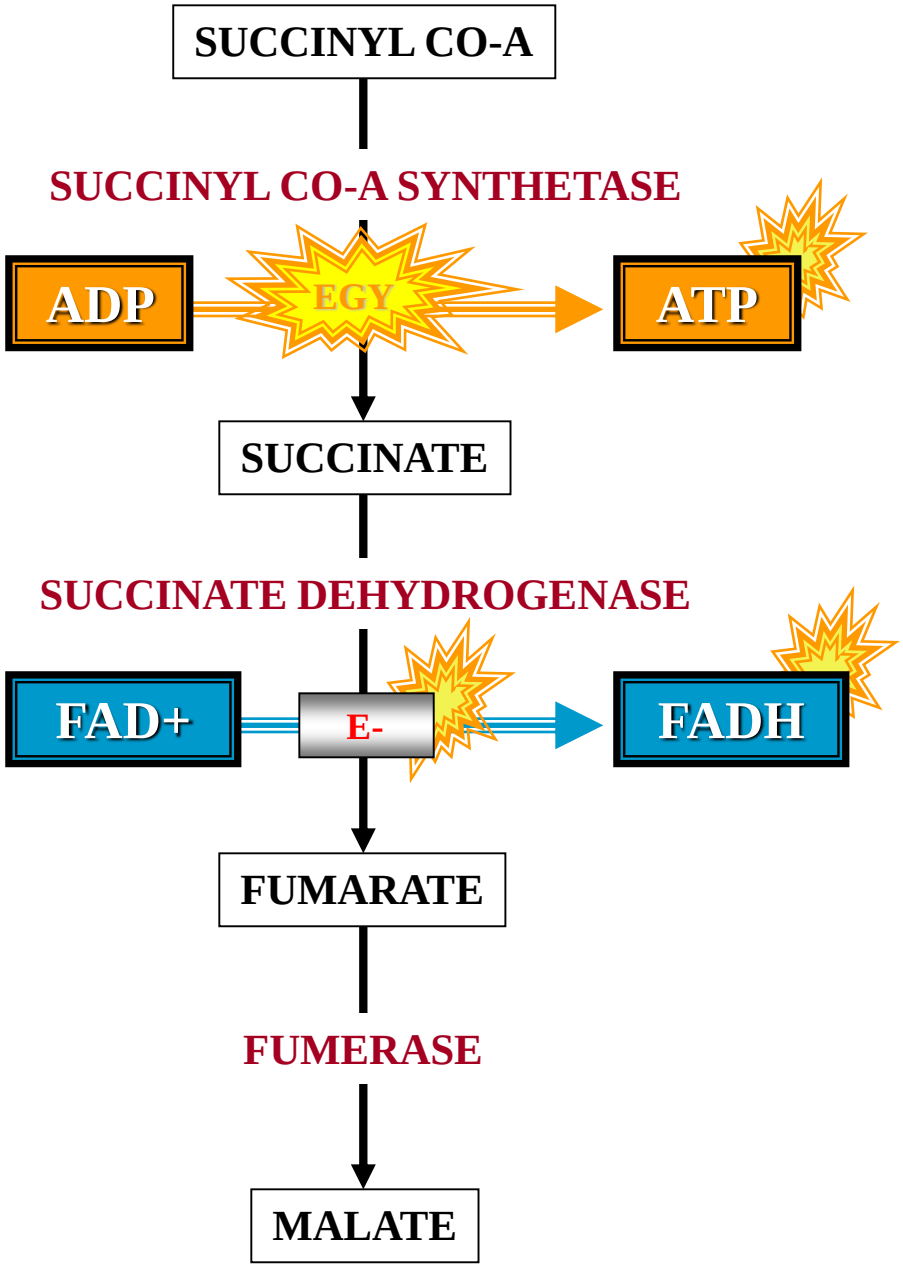
+

2

KREBS CYCLE

? CO2 / PYRUVATE

KREBS CYCLE



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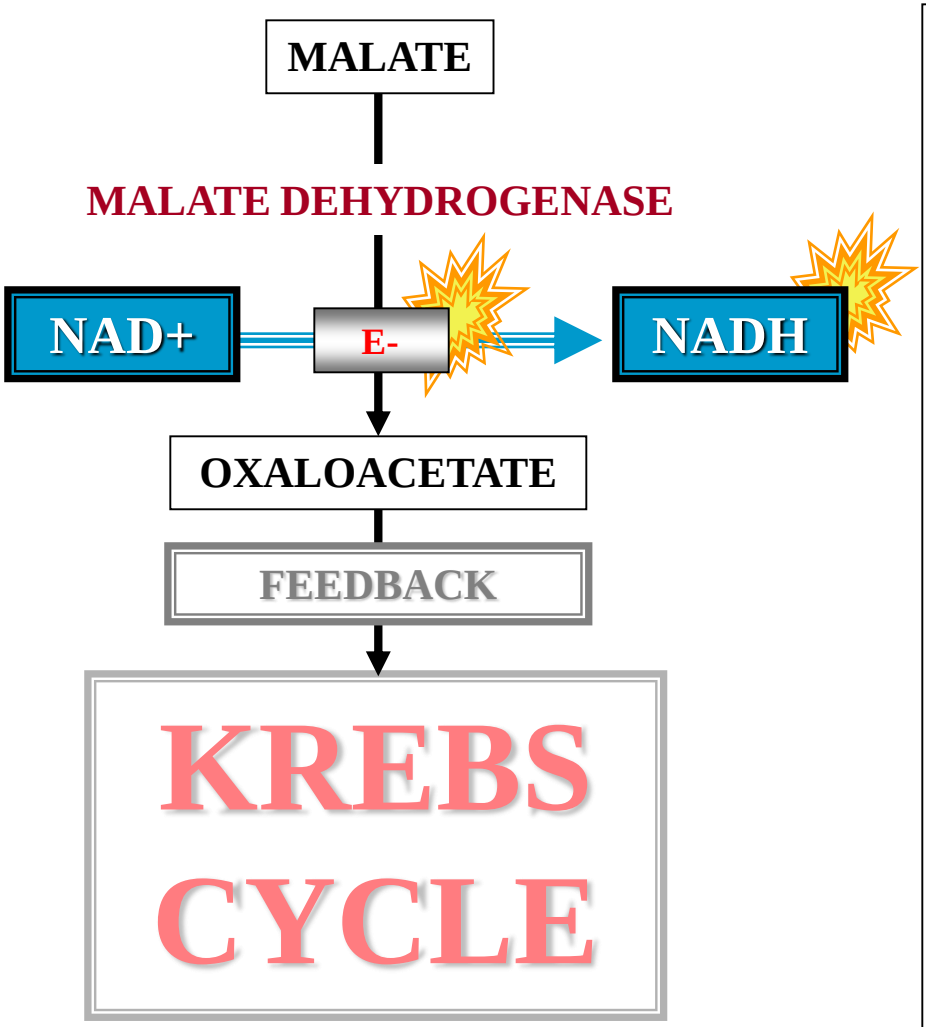
KREBS CYCLE

? CO2 / PYRUVATE

KREBS CYCLE



0

?

KREBS CYCLE

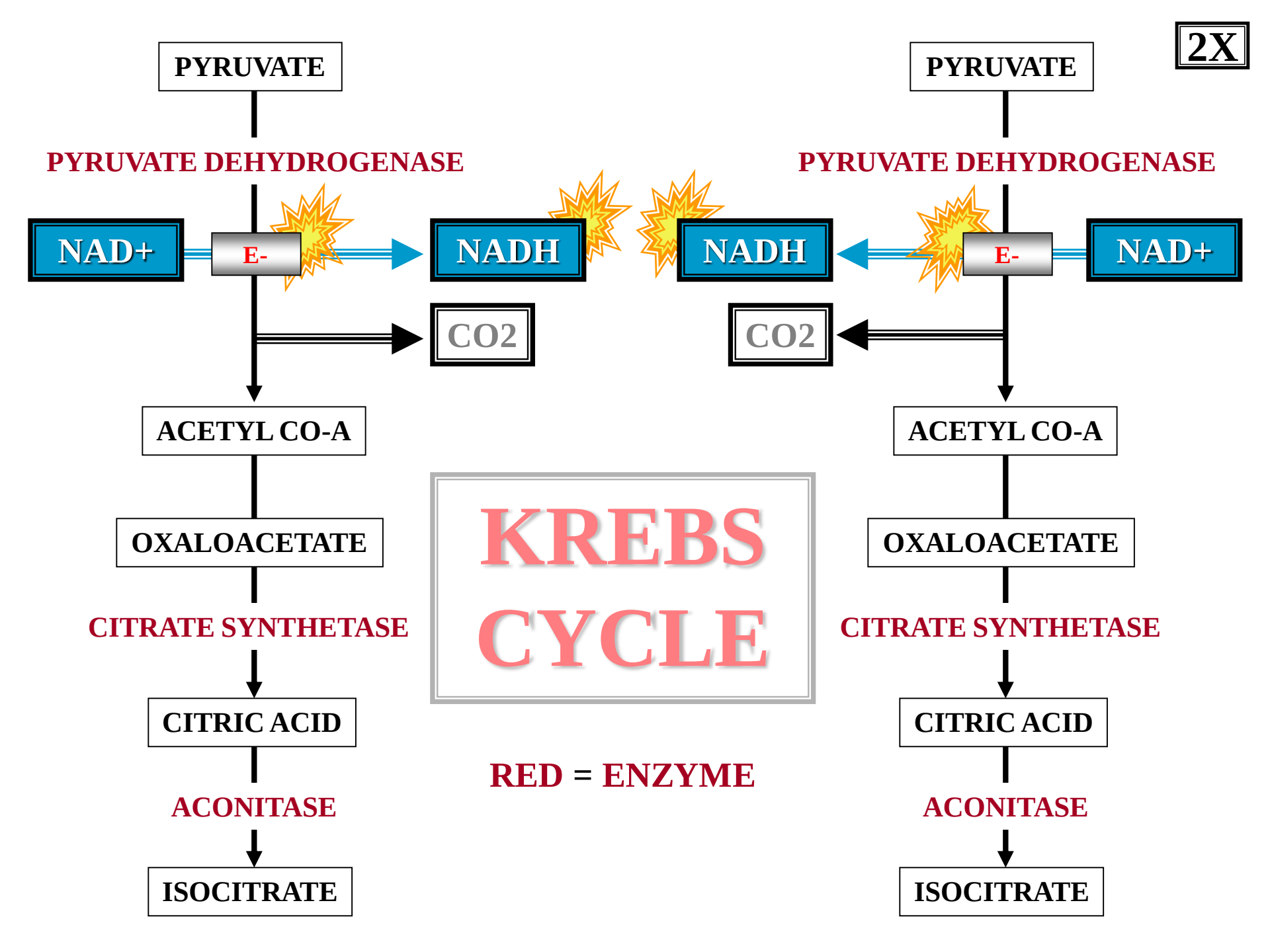
? CO2 / PYRUVATE

KREBS CYCLE

? CO2 / PYRUVATE

2
P

3 CO2 / PYRUVATE


2X
PYRUVATE
PYRUVATE DEHYDROGENASE
NAD+
E-
NADH
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE
KREBS CYCLE
RED = ENZYME
PYRUVATE
PYRUVATE DEHYDROGENASE
NADH
E-
NAD+
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE

?

3 CO_2 / PYRUVATE

2X

3 CO2 / PYRUVATE

2X

? CO2 / GLUCOSE

6 CO2 / GLUCOSE

A

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

6 CO2: ➔

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

6 CO2: ➔ ATMOSPHERE

PHOTOSYNTHESIS

N

WATER

6CO2

LIGHT EGY

PHOTO

ATMOSPHERE

E-

PHOTOLYSIS

LT RXT

THYLAKOID GRANUM

ATP NADPH

DK RXT

STROMA

SYNTHESIS

CHEM EGY INPUT

CHLOROPLAST

ATMOSPHERE

OXYGEN

GLUCOSE

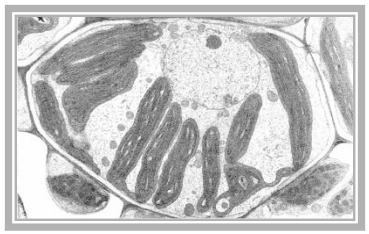
?

NADH

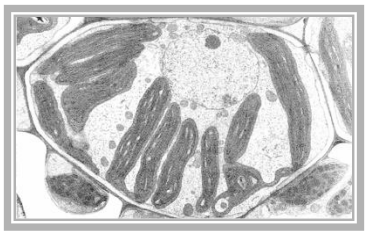
2

P

? NADH / PYRUVATE



AEROBIC RESPIRATION



GLYCOLYSIS

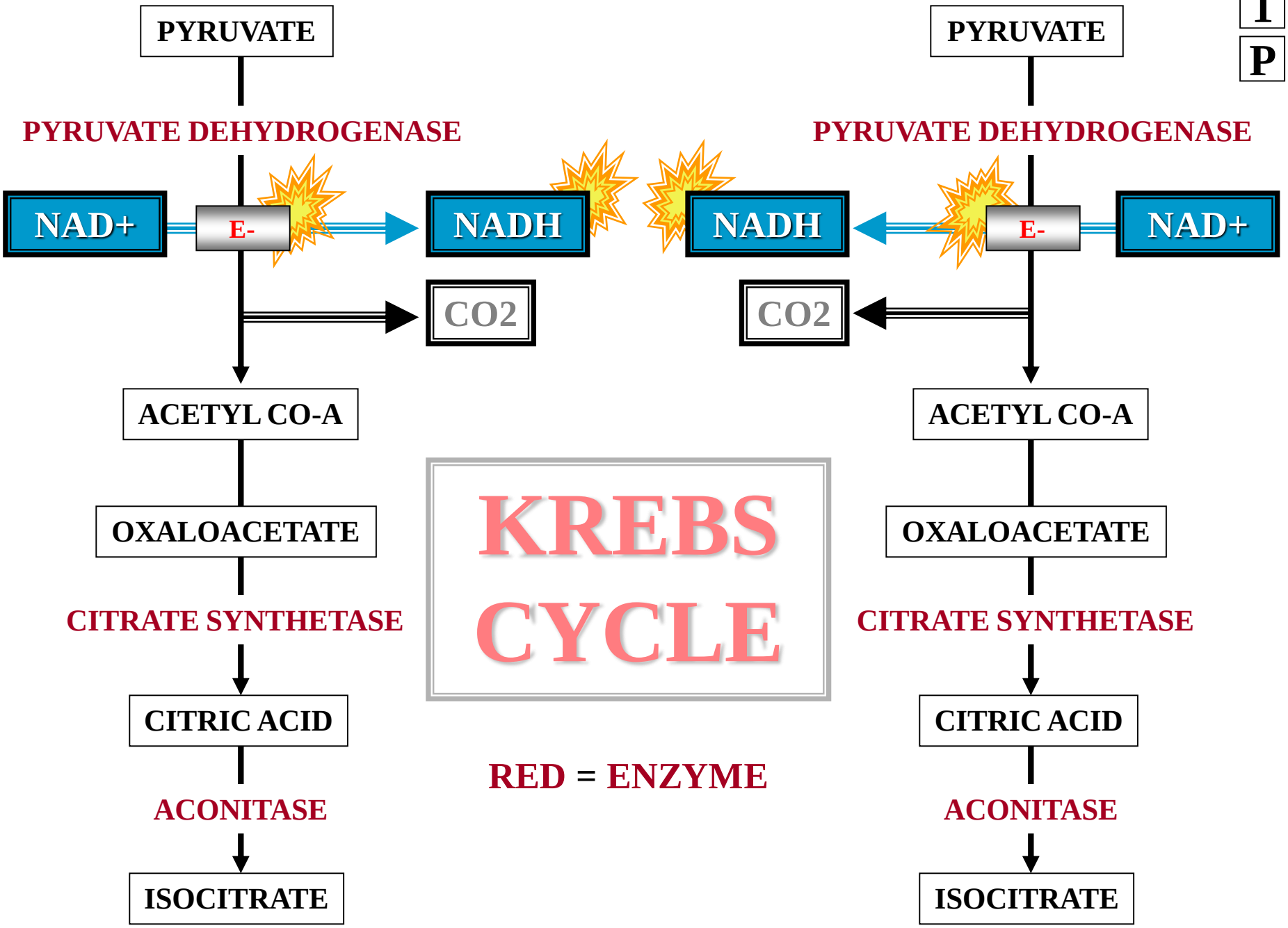
GLUCOSE → 2 PYRUVATE → KREBS CYCLE

CYTOSOL

MITOCHONDRION

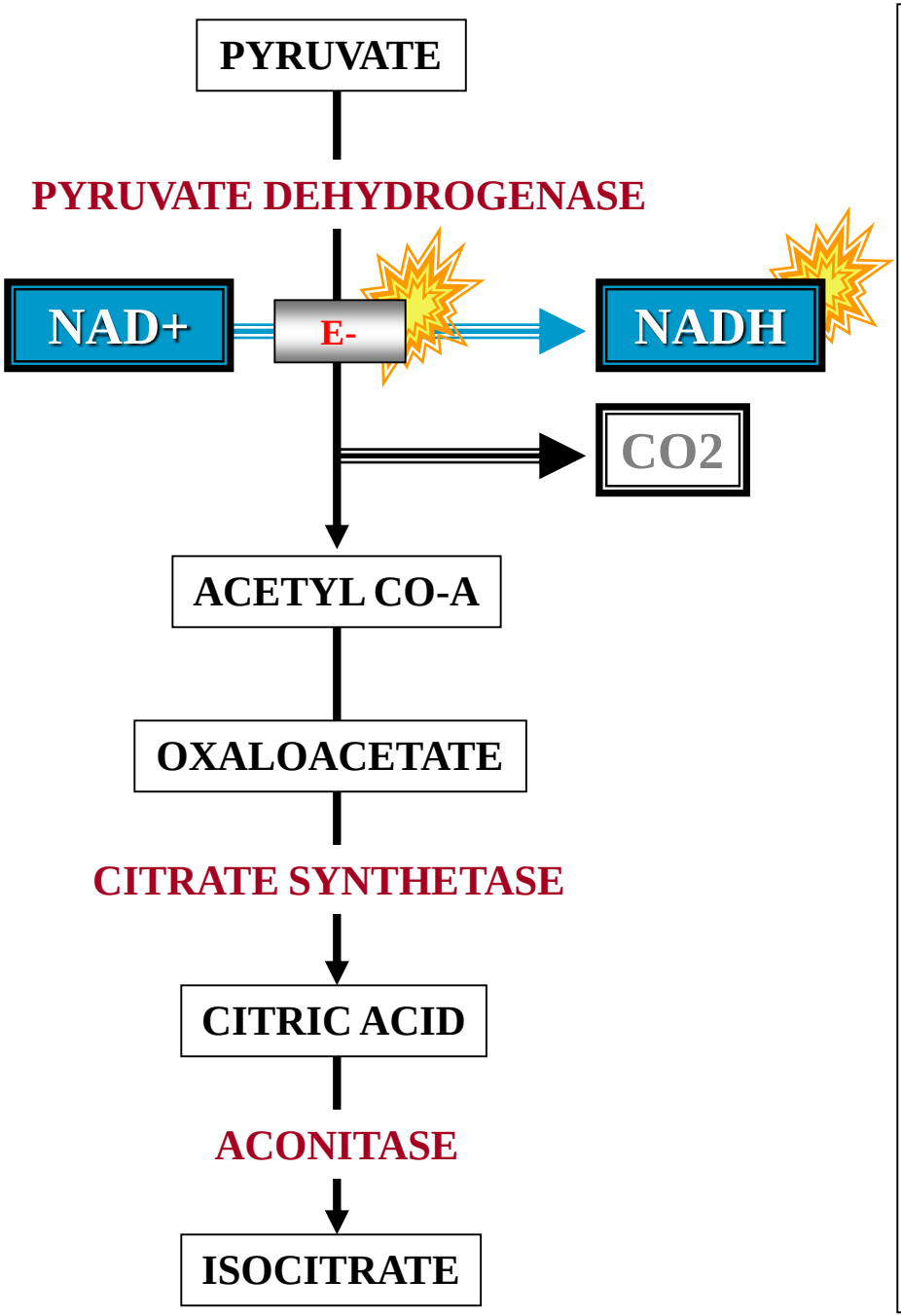
CELL

= CHEMICAL ENERGY



KREBS CYCLE

RED = ENZYME



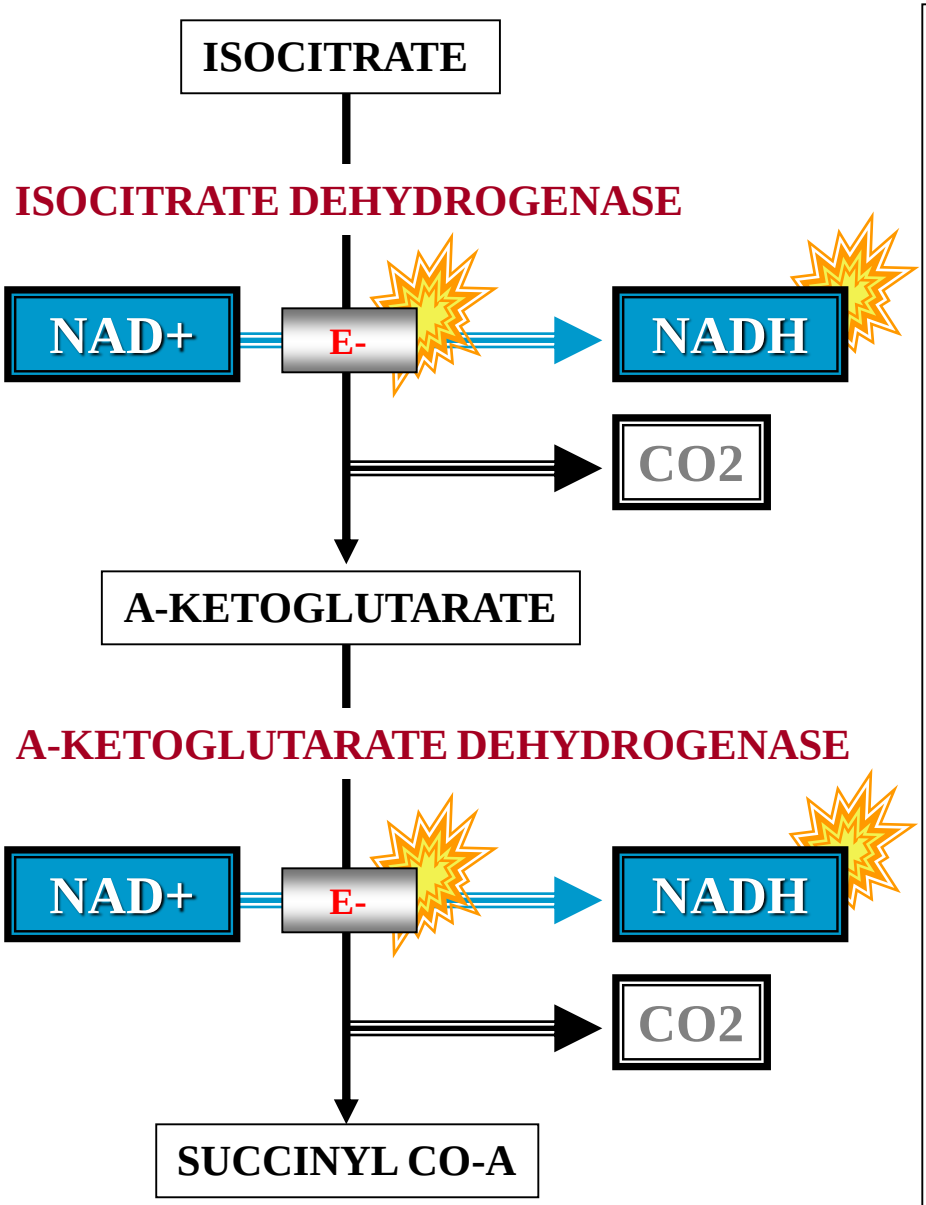
+

1

KREBS CYCLE

? NADH / PYRUVATE

KREBS CYCLE



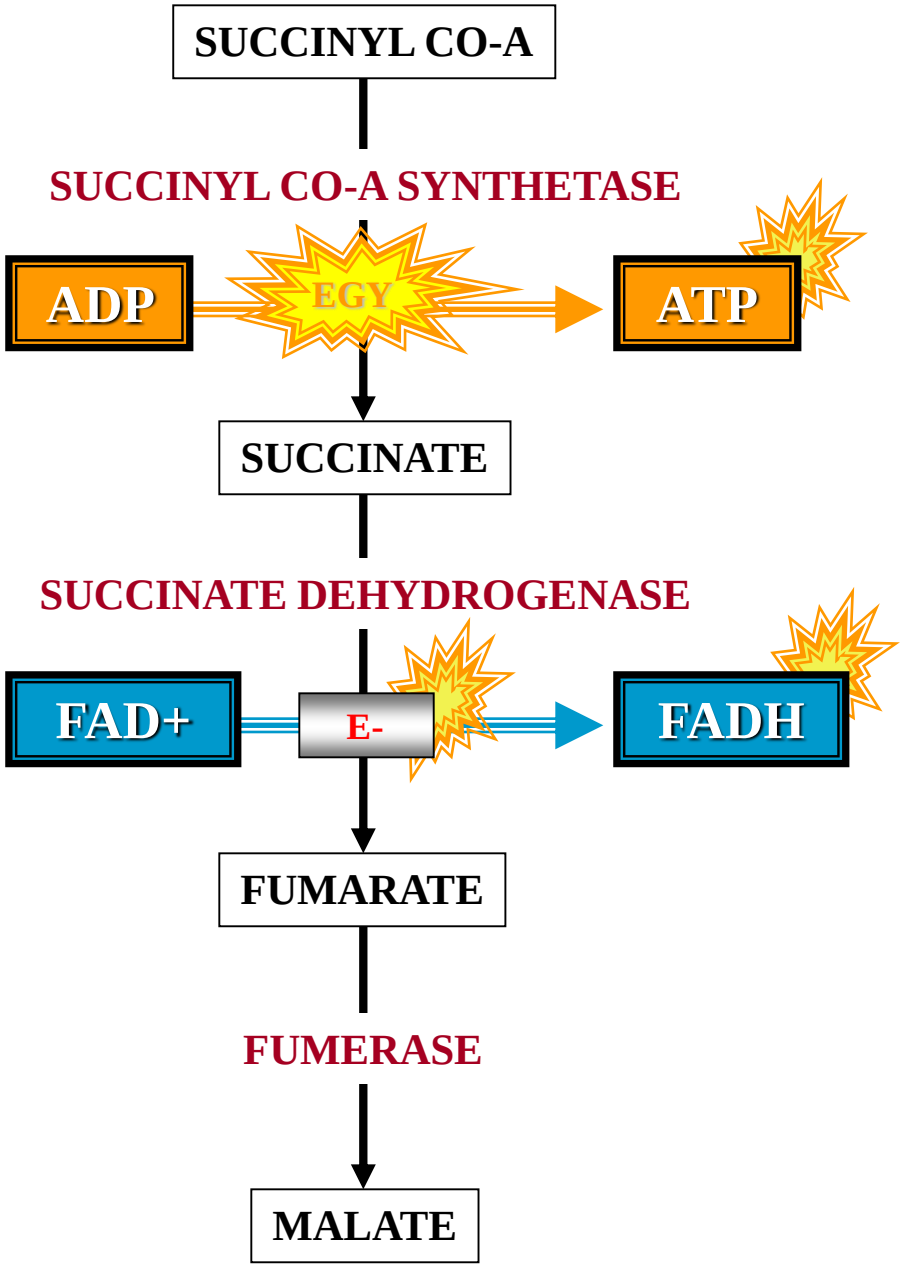
+

2

KREBS CYCLE

? NADH / PYRUVATE

KREBS CYCLE



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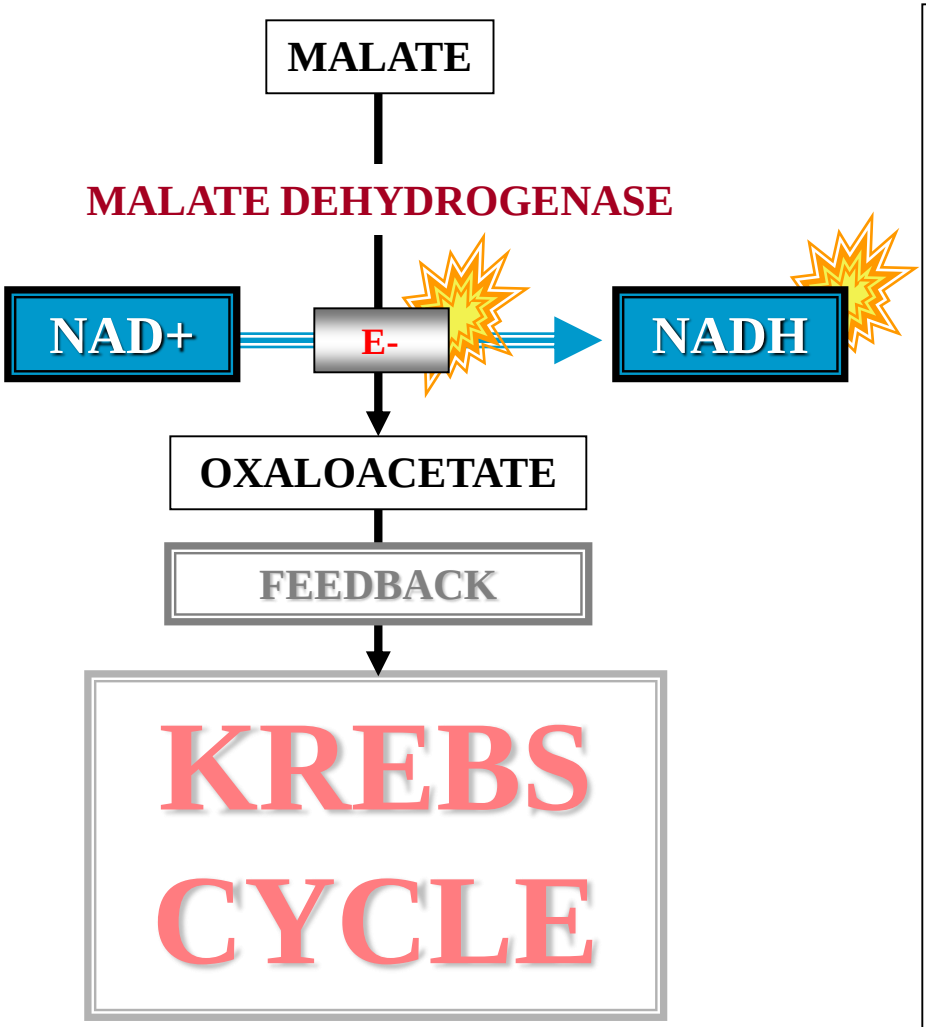
0

KREBS CYCLE

? NADH / PYRUVATE

KREBS CYCLE



1

?

KREBS CYCLE

? NADH / PYRUVATE

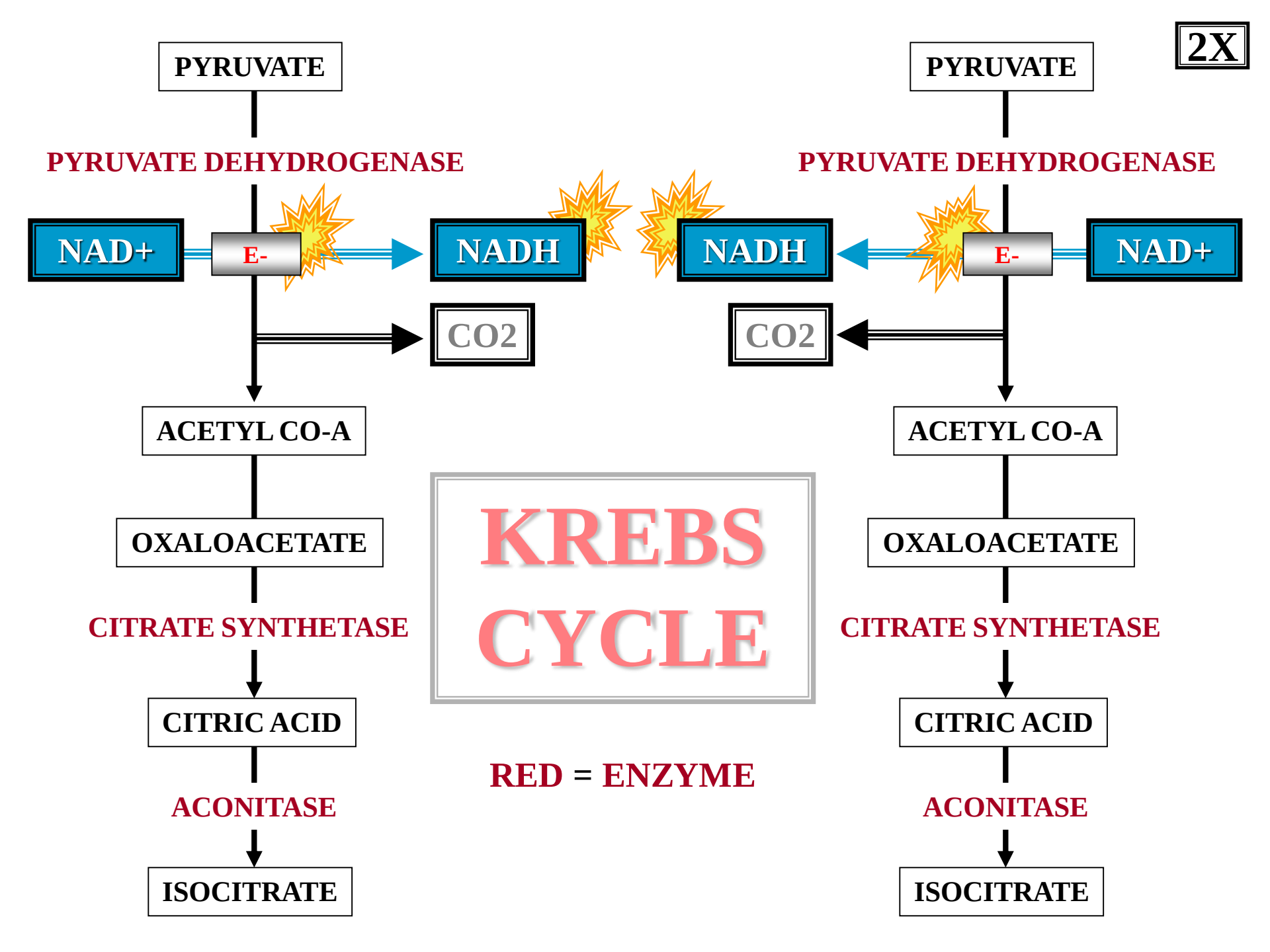
KREBS CYCLE

? NADH / PYRUVATE

2

P

4 NADH / PYRUVATE


2X
PYRUVATE
PYRUVATE DEHYDROGENASE
NAD+
E-
NADH
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE
KREBS CYCLE
RED = ENZYME
PYRUVATE
PYRUVATE DEHYDROGENASE
NADH
E-
NAD+
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE

?

4 NADH / PYRUVATE

2X

4 NADH / PYRUVATE

2X

? NADH / GLUCOSE

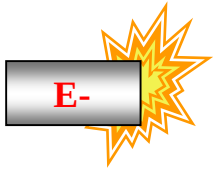
8 NADH / GLUCOSE

E

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

6 CO2: ➔ ATMOSPHERE

8 NADH: ➔ 

= **CHEM ENERGY**

^
F

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

6 CO_2: ➔ ATMOSPHERE

8 NADH: ➔ ETC

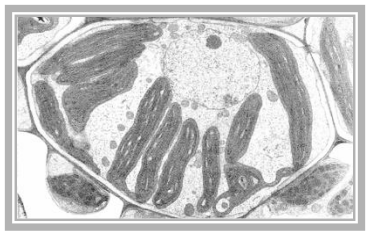
?

FADH

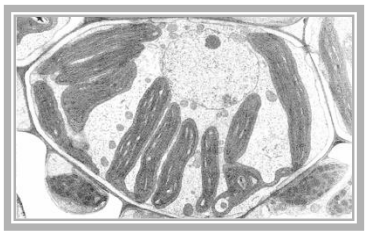
2

P

? FADH / PYRUVATE



AEROBIC RESPIRATION



GLYCOLYSIS

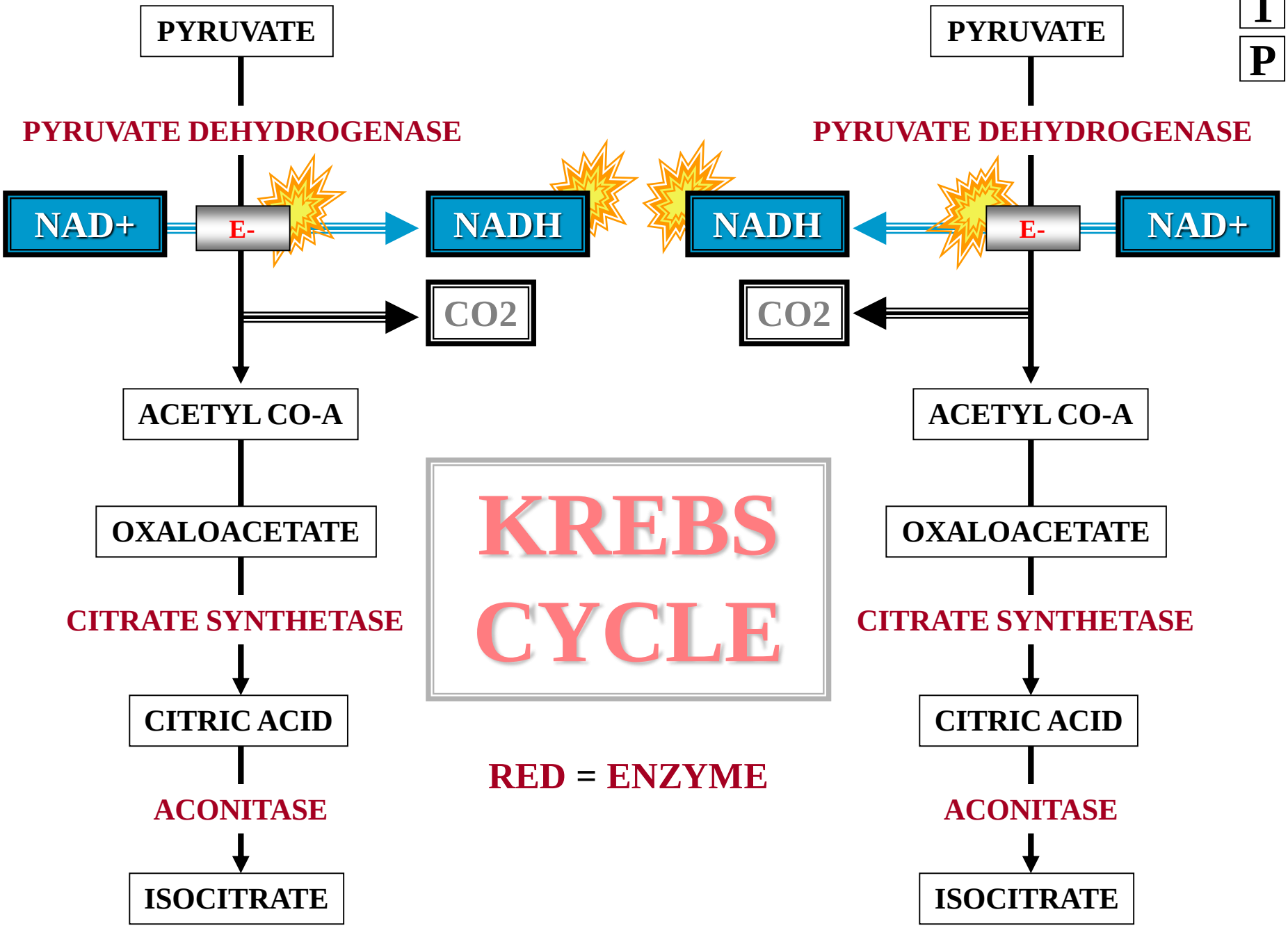
GLUCOSE → 2 PYRUVATE → KREBS CYCLE

CYTOSOL

MITOCHONDRION

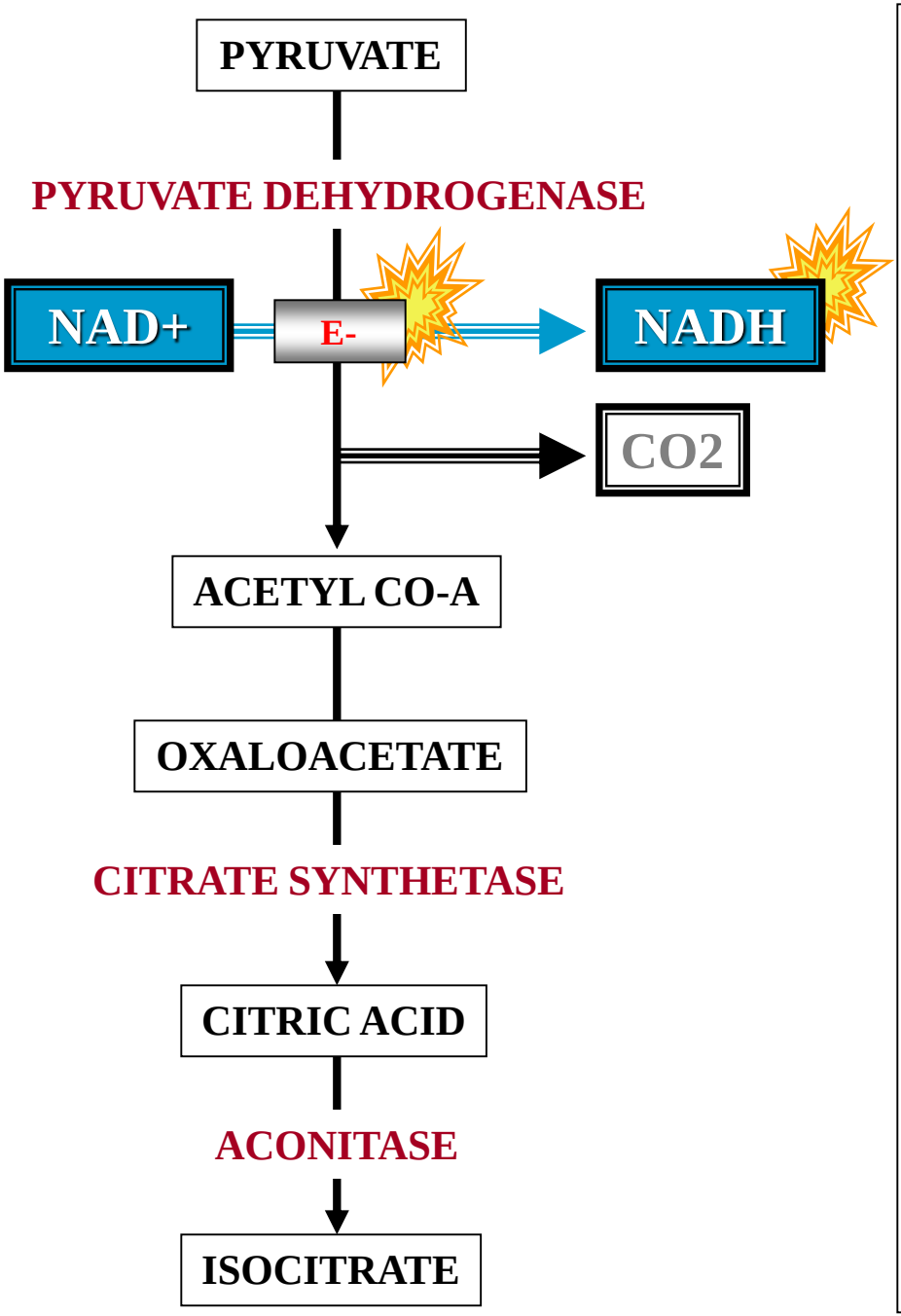
CELL

= CHEMICAL ENERGY



KREBS CYCLE

RED = ENZYME



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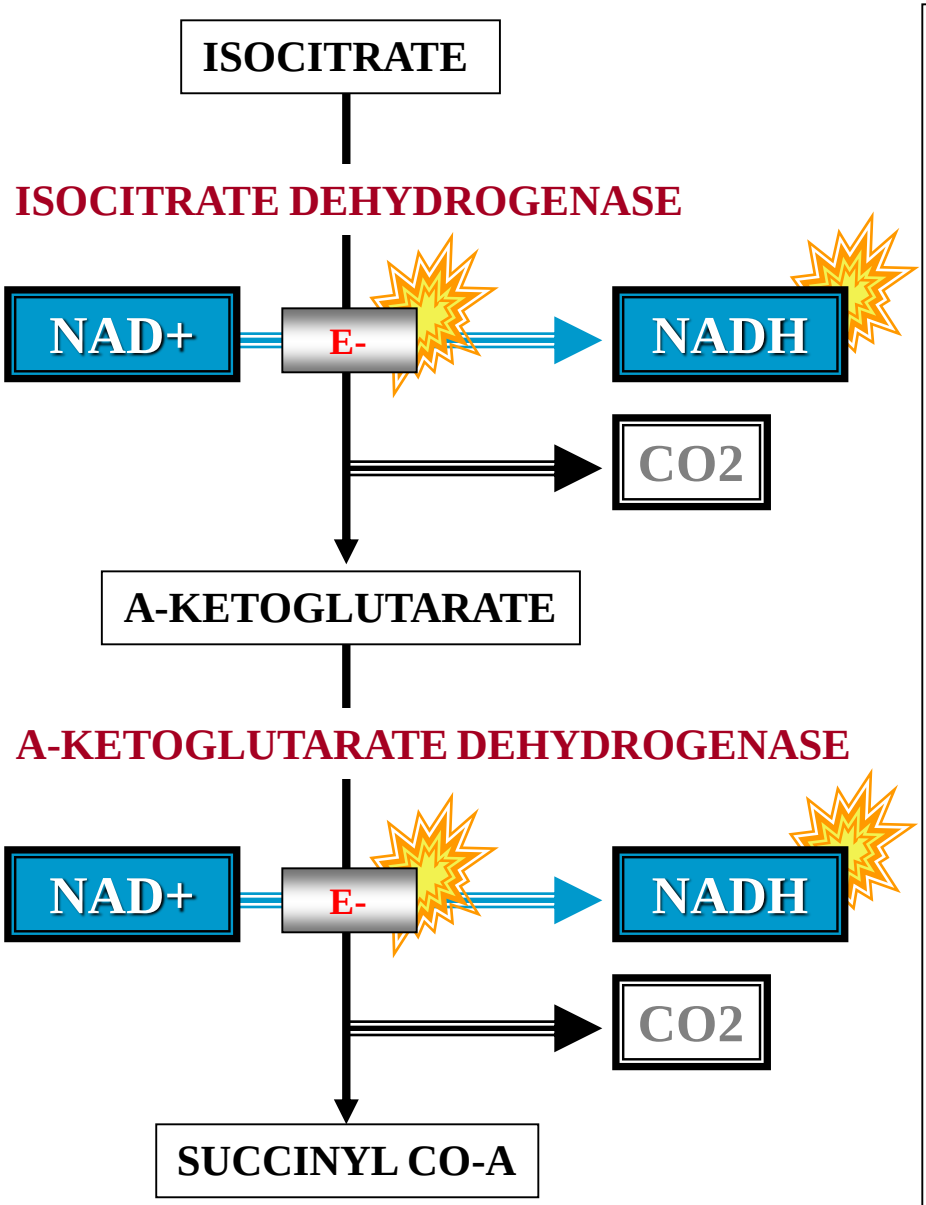
KREBS CYCLE

? FADH / PYRUVATE

KREBS CYCLE



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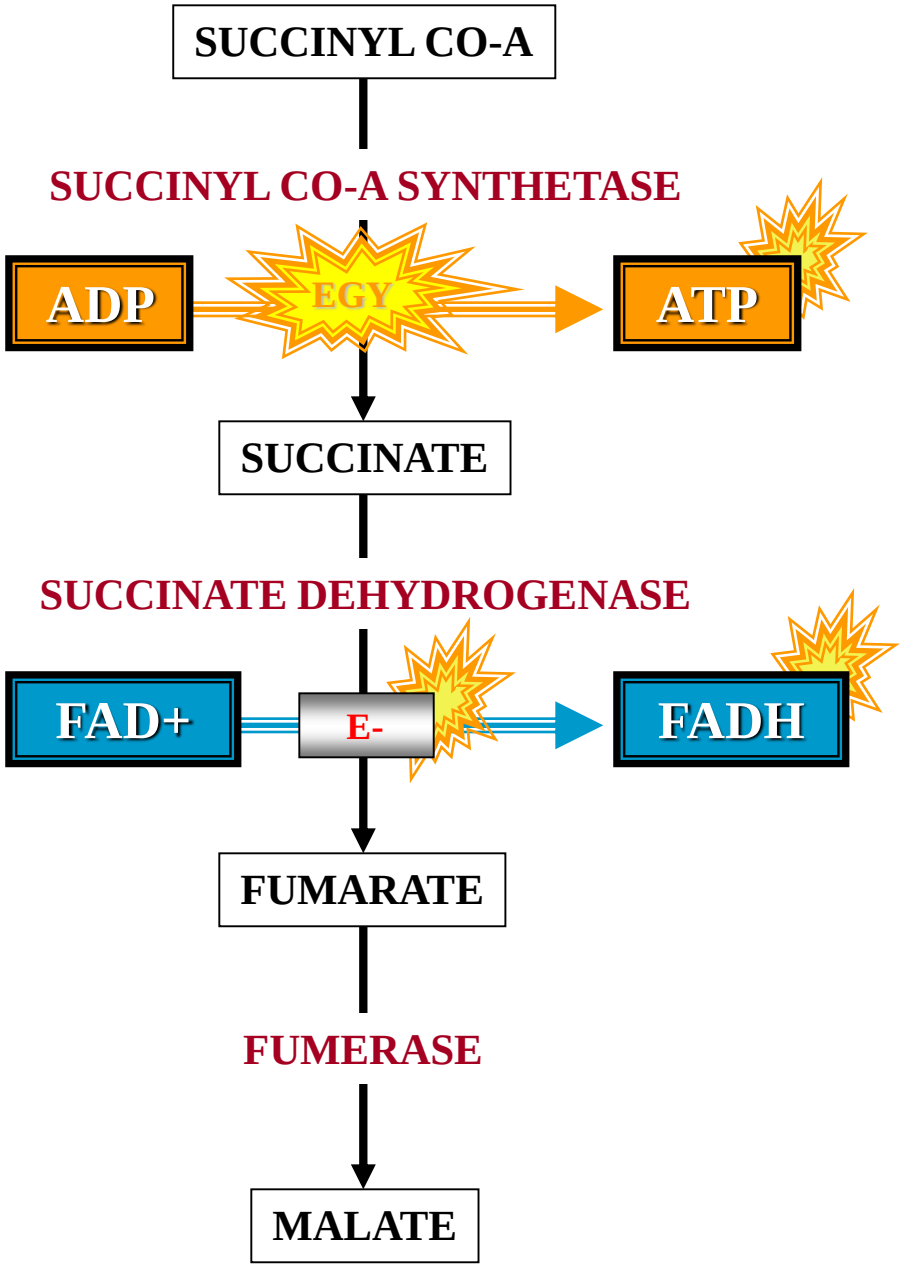
KREBS CYCLE

? FADH / PYRUVATE

KREBS CYCLE



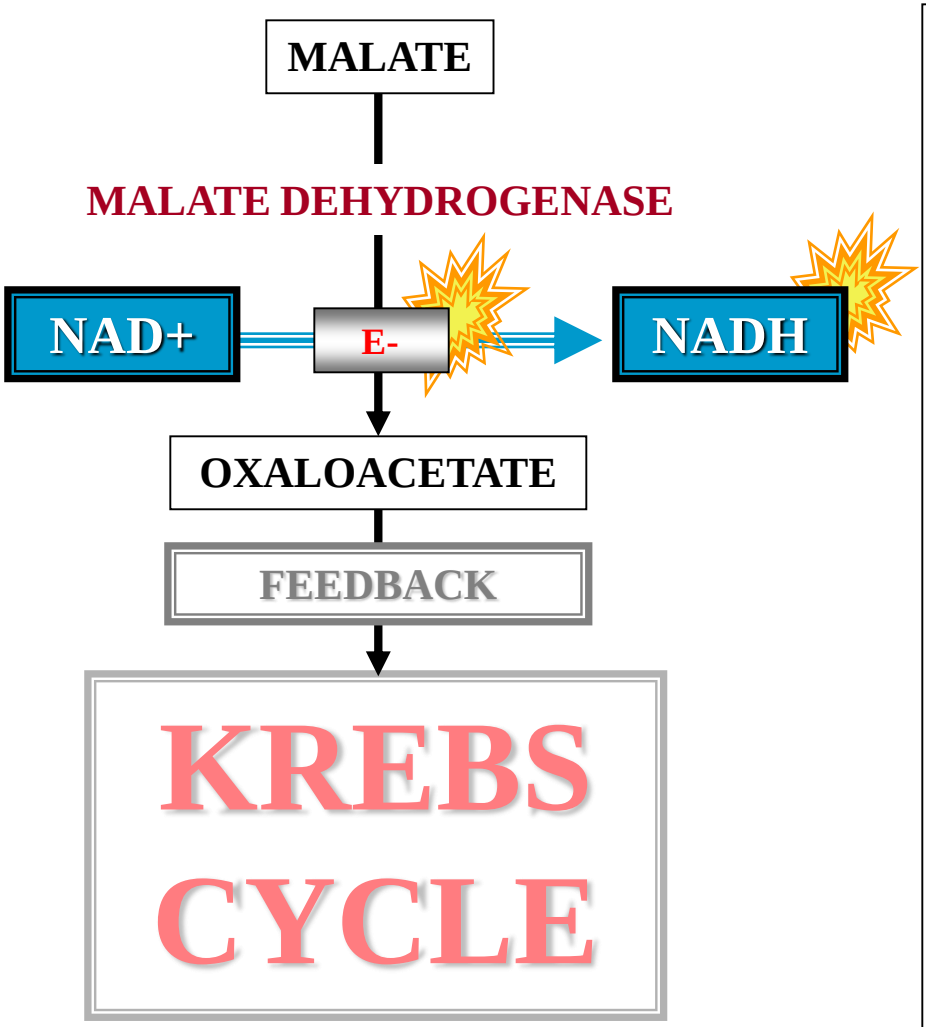
+

1

KREBS CYCLE

? FADH / PYRUVATE

KREBS CYCLE



0

?

KREBS CYCLE

? FADH / PYRUVATE

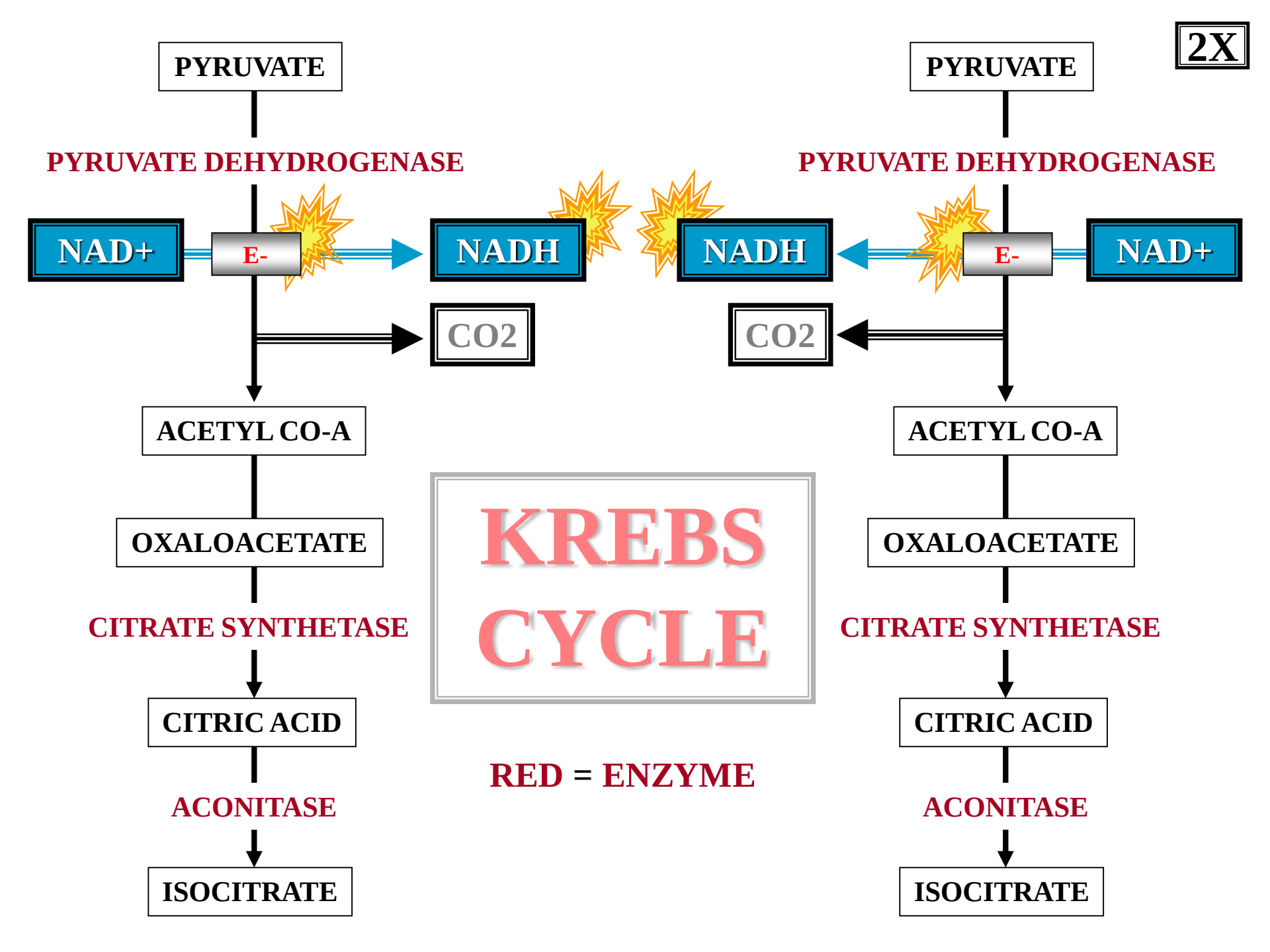
KREBS CYCLE

? FADH / PYRUVATE

2

P

1 FADH / PYRUVATE


2X
PYRUVATE
PYRUVATE DEHYDROGENASE
NAD+
E-
NADH
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE
KREBS CYCLE
RED = ENZYME
PYRUVATE
PYRUVATE DEHYDROGENASE
NADH
E-
NAD+
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE

?

1 FADH / PYRUVATE 2X

1 FADH / PYRUVATE

2X

? FADH / GLUCOSE

2 FADH / GLUCOSE

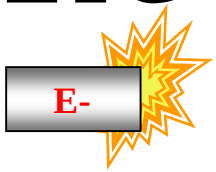
E

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

6 CO2: ➔ ATMOSPHERE

8 NADH: ➔ ETC

2 FADH: ➔ 

 = CHEM ENERGY

^

A

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

6 CO_2: ➔ ATMOSPHERE

8 NADH: ➔ ETC

2 FADH: ➔ ETC

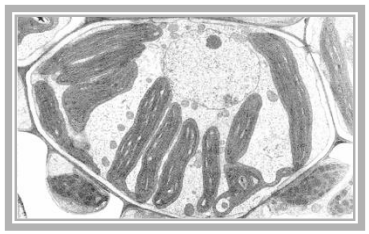
?

ATP

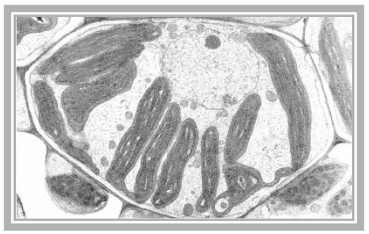
2

P

? ATP / PYRUVATE



AEROBIC RESPIRATION



GLYCOLYSIS

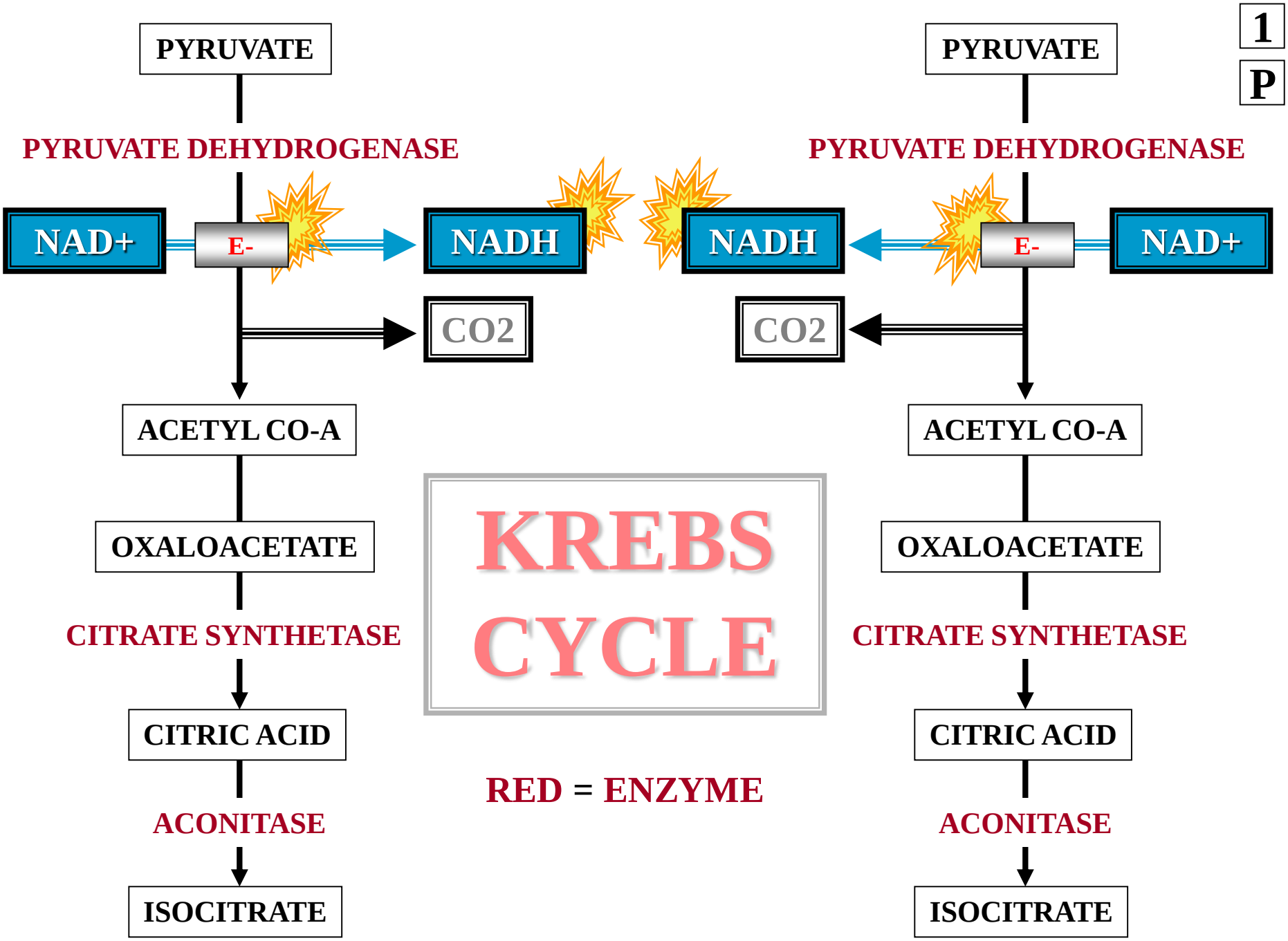
GLUCOSE → 2 PYRUVATE → KREBS CYCLE

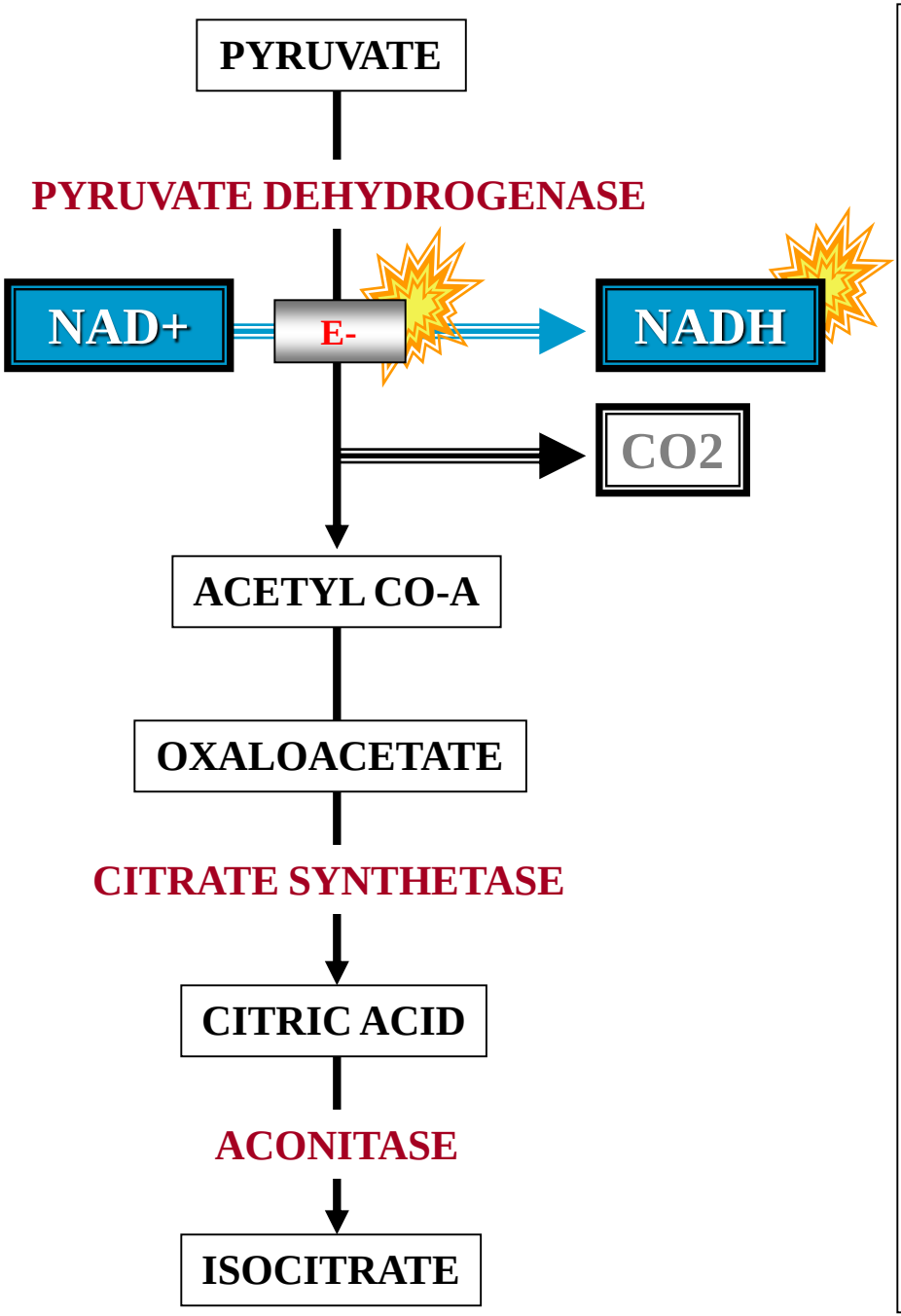
CYTOSOL

MITOCHONDRION

CELL

= CHEMICAL ENERGY


1
P
PYRUVATE
PYRUVATE DEHYDROGENASE
NAD+
E-
NADH
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE
KREBS CYCLE
RED = ENZYME
PYRUVATE
PYRUVATE DEHYDROGENASE
NADH
E-
NAD+
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE



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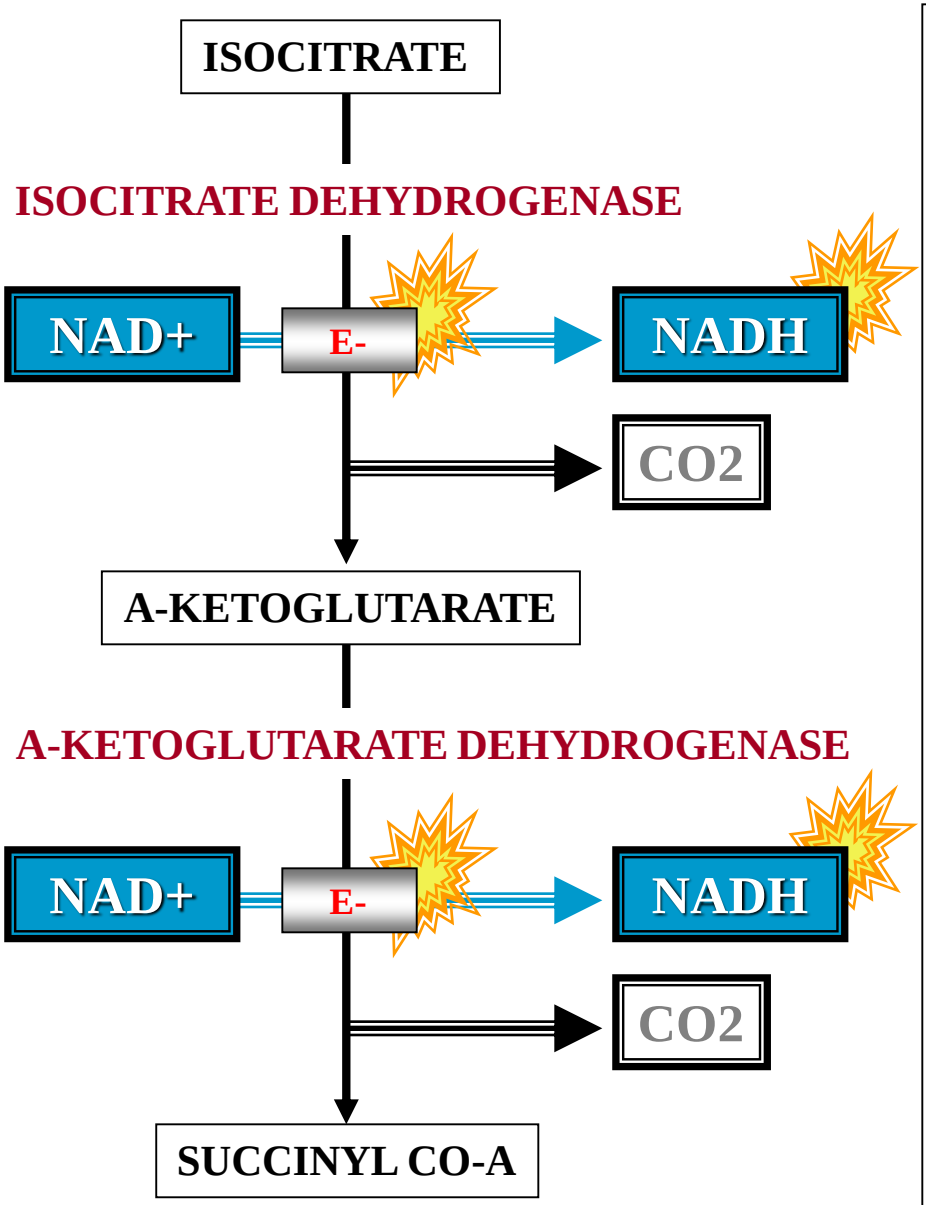
0

KREBS CYCLE

? ATP / PYRUVATE

KREBS CYCLE



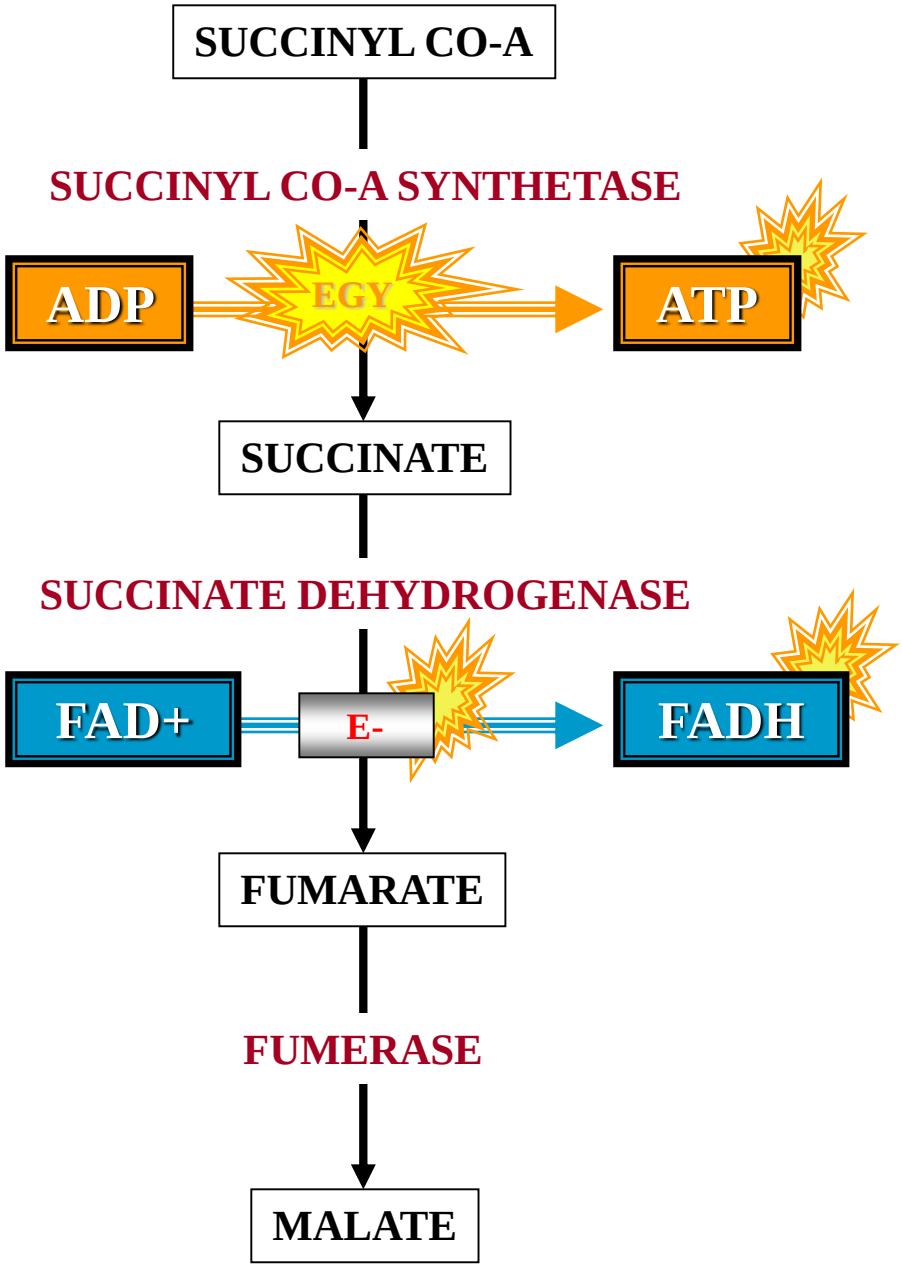
+

0

KREBS CYCLE

? ATP / PYRUVATE

KREBS CYCLE



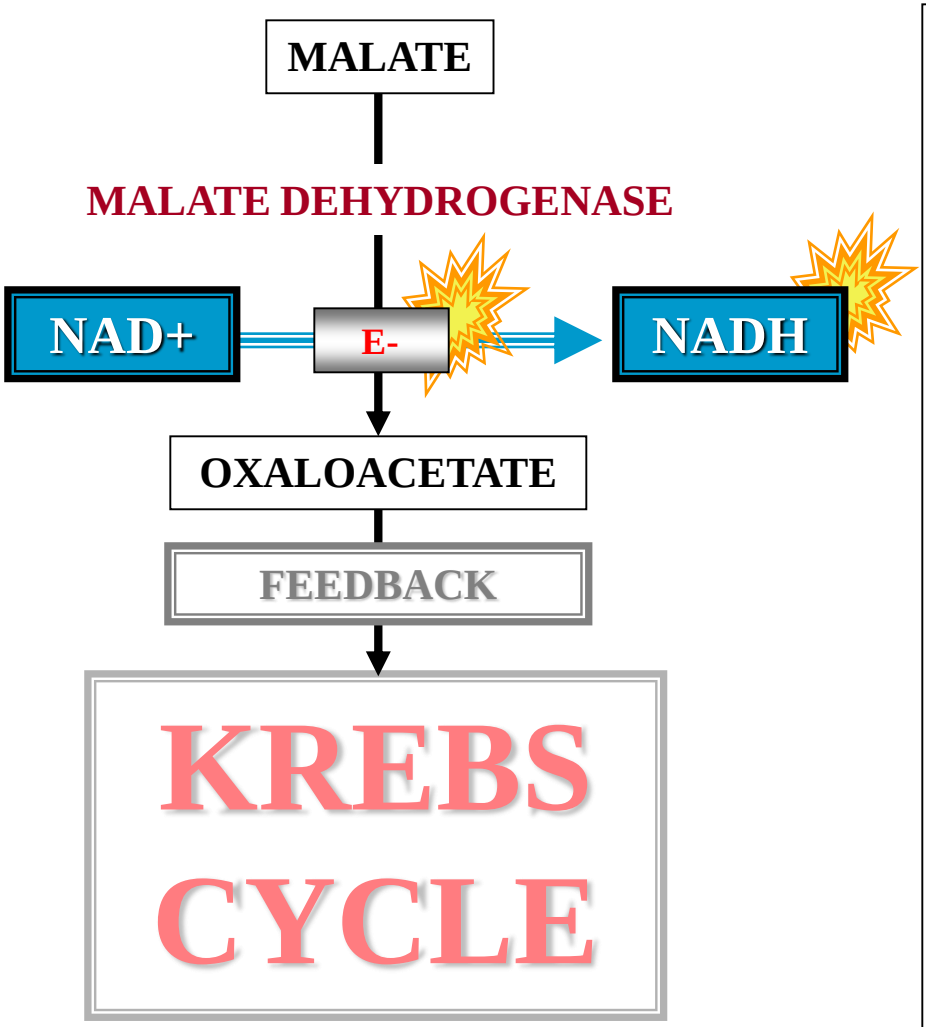
+

1

KREBS CYCLE

? ATP / PYRUVATE

KREBS CYCLE



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?

KREBS CYCLE

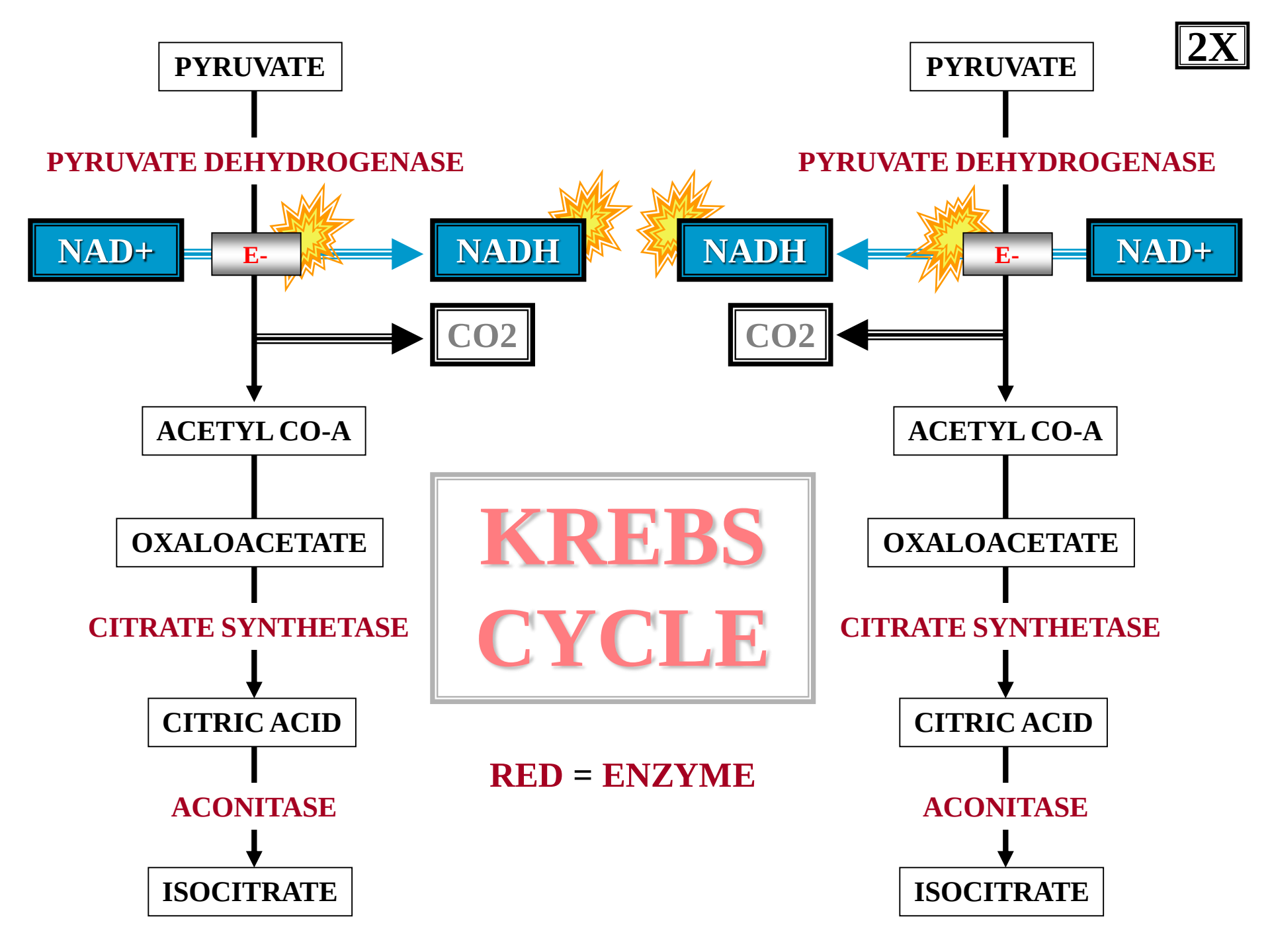
? ATP / PYRUVATE

KREBS CYCLE

? ATP / PYRUVATE

2
P

1 ATP / PYRUVATE


2X
PYRUVATE
PYRUVATE DEHYDROGENASE
NAD+
E-
NADH
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE
KREBS CYCLE
RED = ENZYME
PYRUVATE
PYRUVATE DEHYDROGENASE
NADH
E-
NAD+
CO2
ACETYL CO-A
OXALOACETATE
CITRATE SYNTHETASE
CITRIC ACID
ACONITASE
ISOCITRATE

?

1 ATP / PYRUVATE
2X

1 ATP / PYRUVATE

2X

? ATP / GLUCOSE

2 ATP / GLUCOSE

M

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

6 CO_2: ➔ ATMOSPHERE

8 NADH: ➔ ETC

2 FADH: ➔ ETC

2 ATP: ➔

KREBS CYCLE OUTCOME

OUTCOME / GLUCOSE:

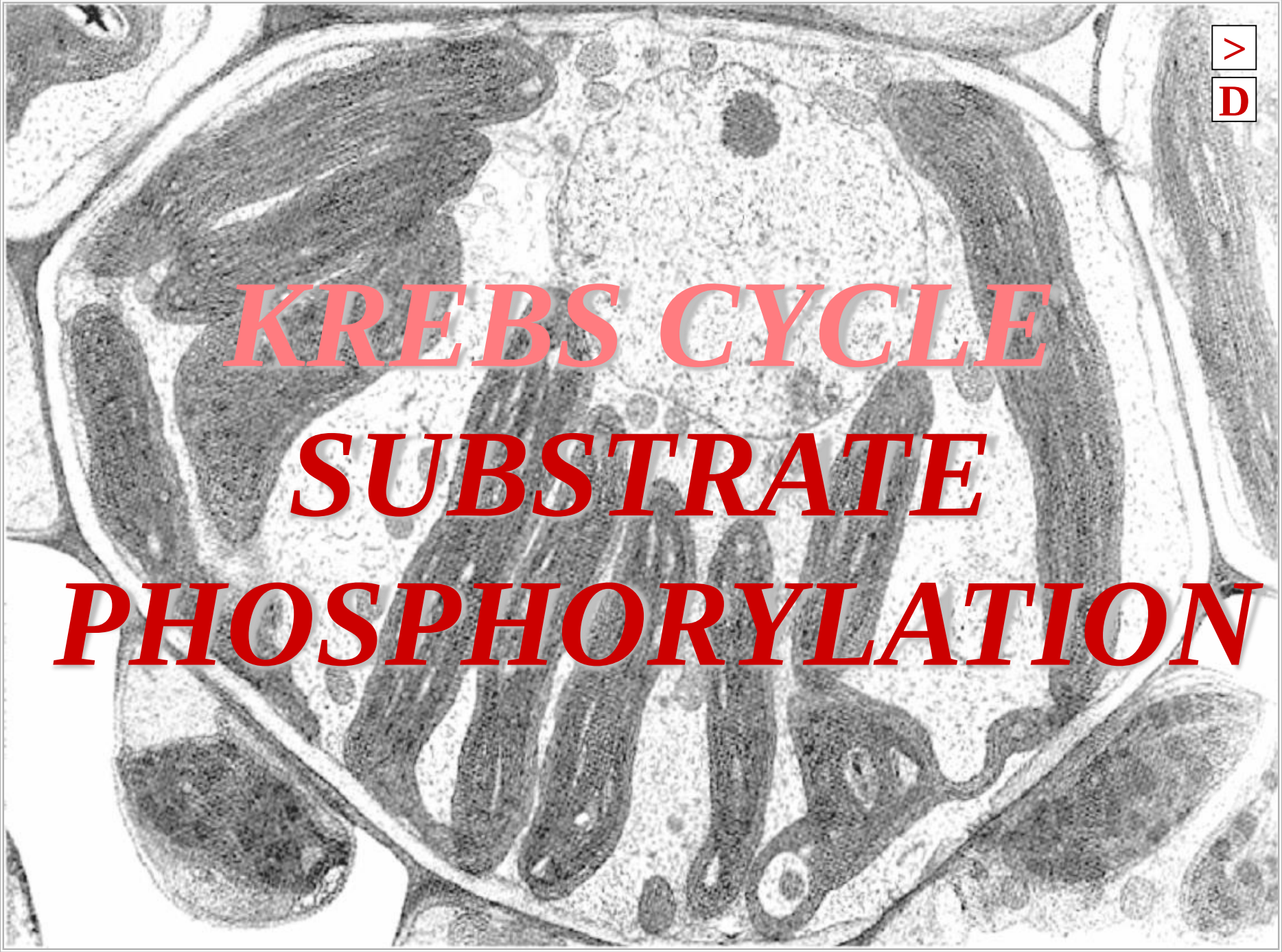
6 CO_2: ➔ ATMOSPHERE

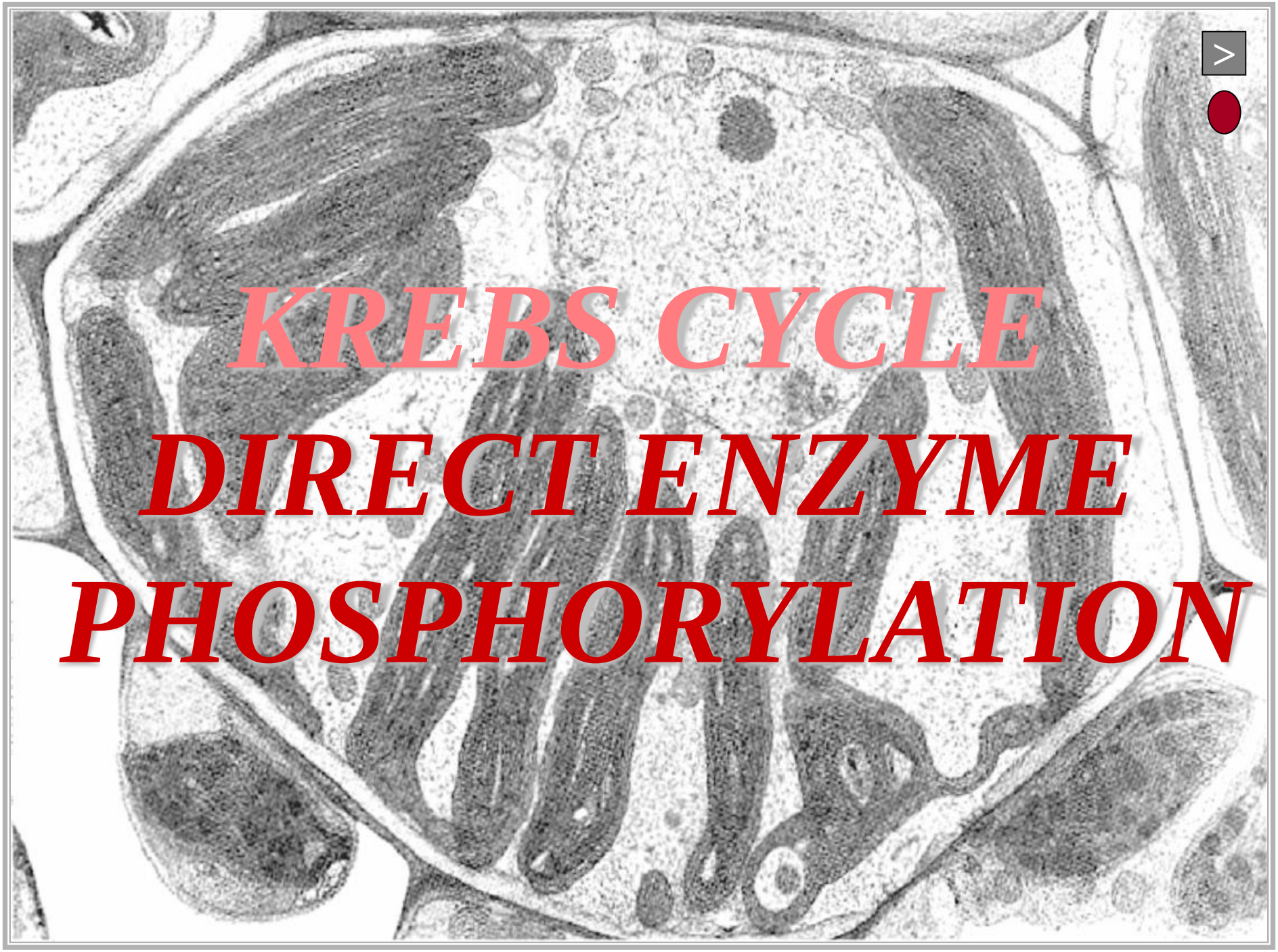
8 NADH: ➔ ETC

2 FADH: ➔ ETC

2 ATP: ➔ METABOLISM

KREBS CYCLE
PHOSPHORYLATION

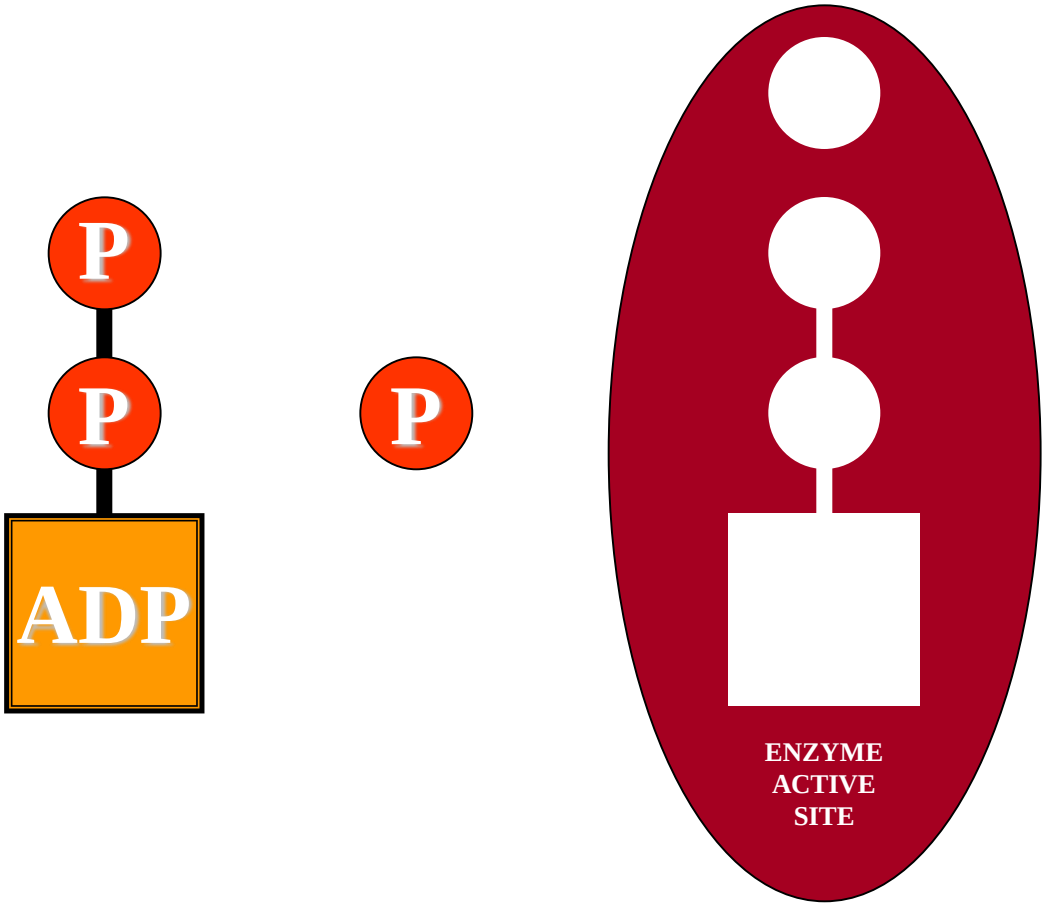

KREBS CYCLE
SUBSTRATE
PHOSPHORYLATION



KREBS CYCLE

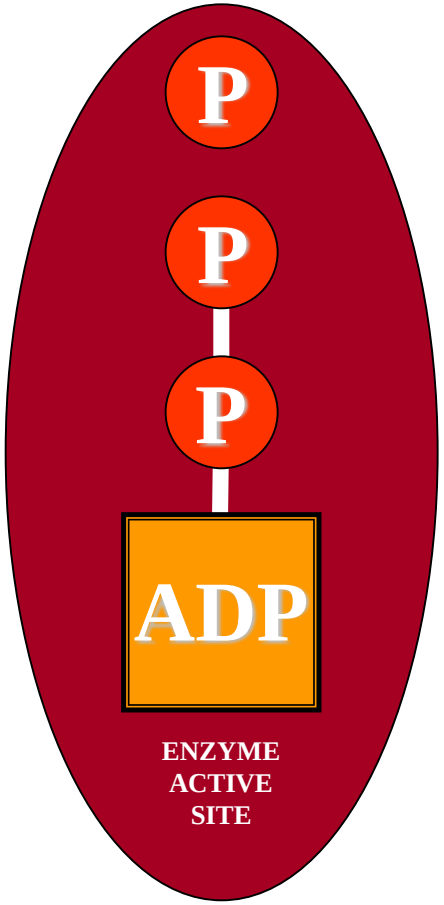
DIRECT ENZYME PHOSPHORYLATION

KREBS
SUBSTRATE PHOSPHORYLATION



SUCCINYL CO-A SYNTHETASE

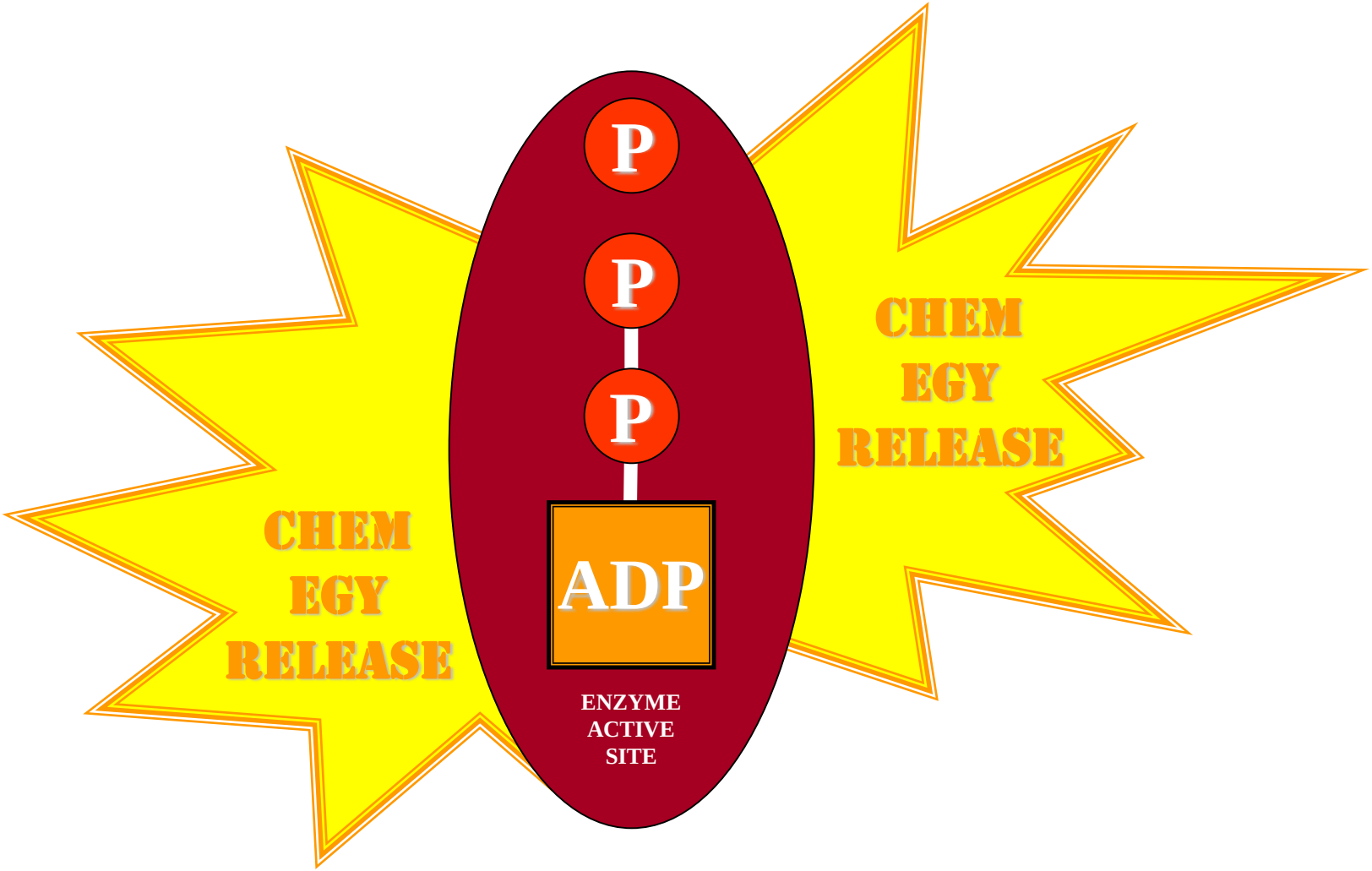
KREBS
SUBSTRATE PHOSPHORYLATION



SUCCINYL CO-A SYNTHETASE

KREBS

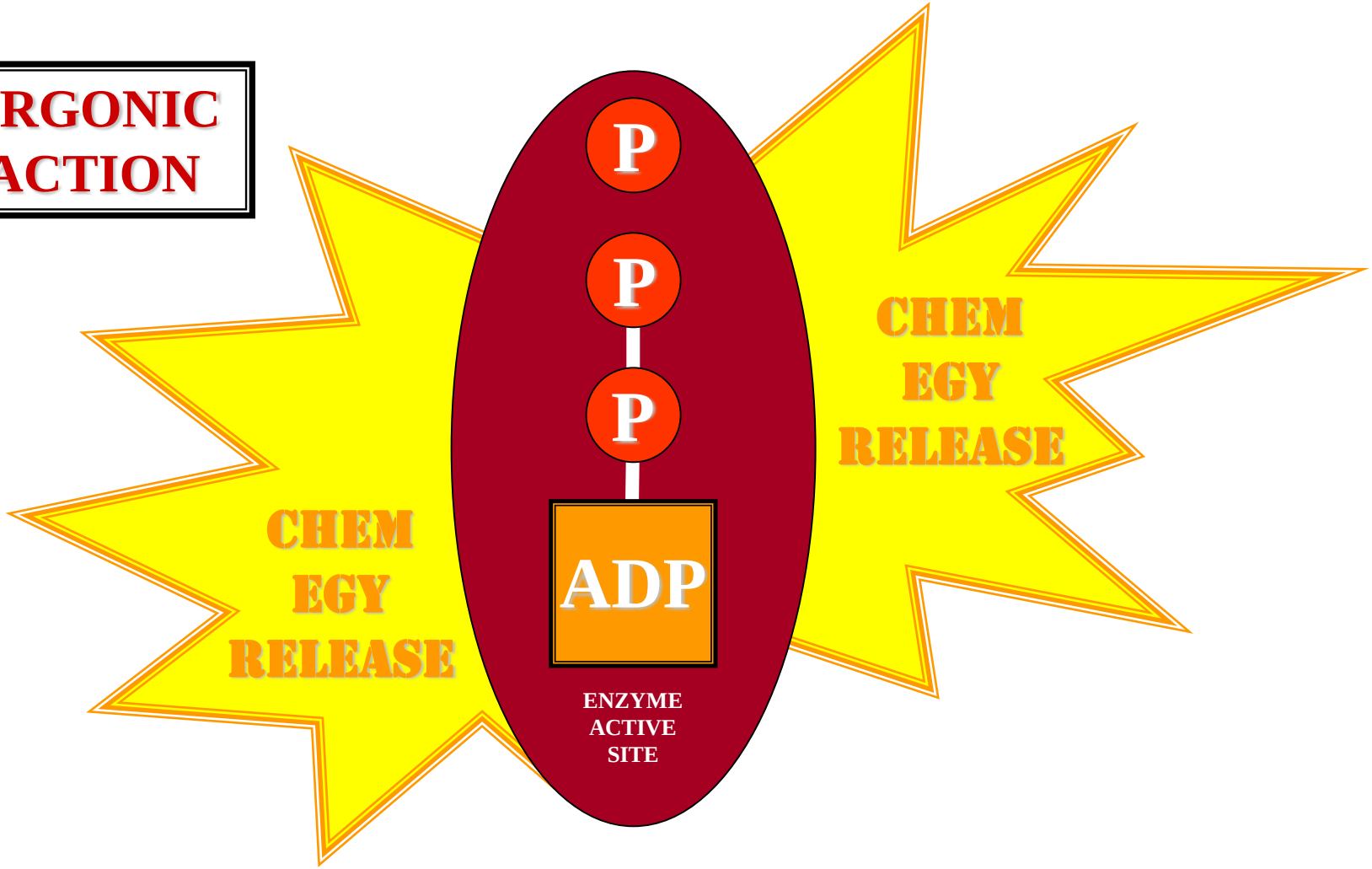
SUBSTRATE PHOSPHORYLATION



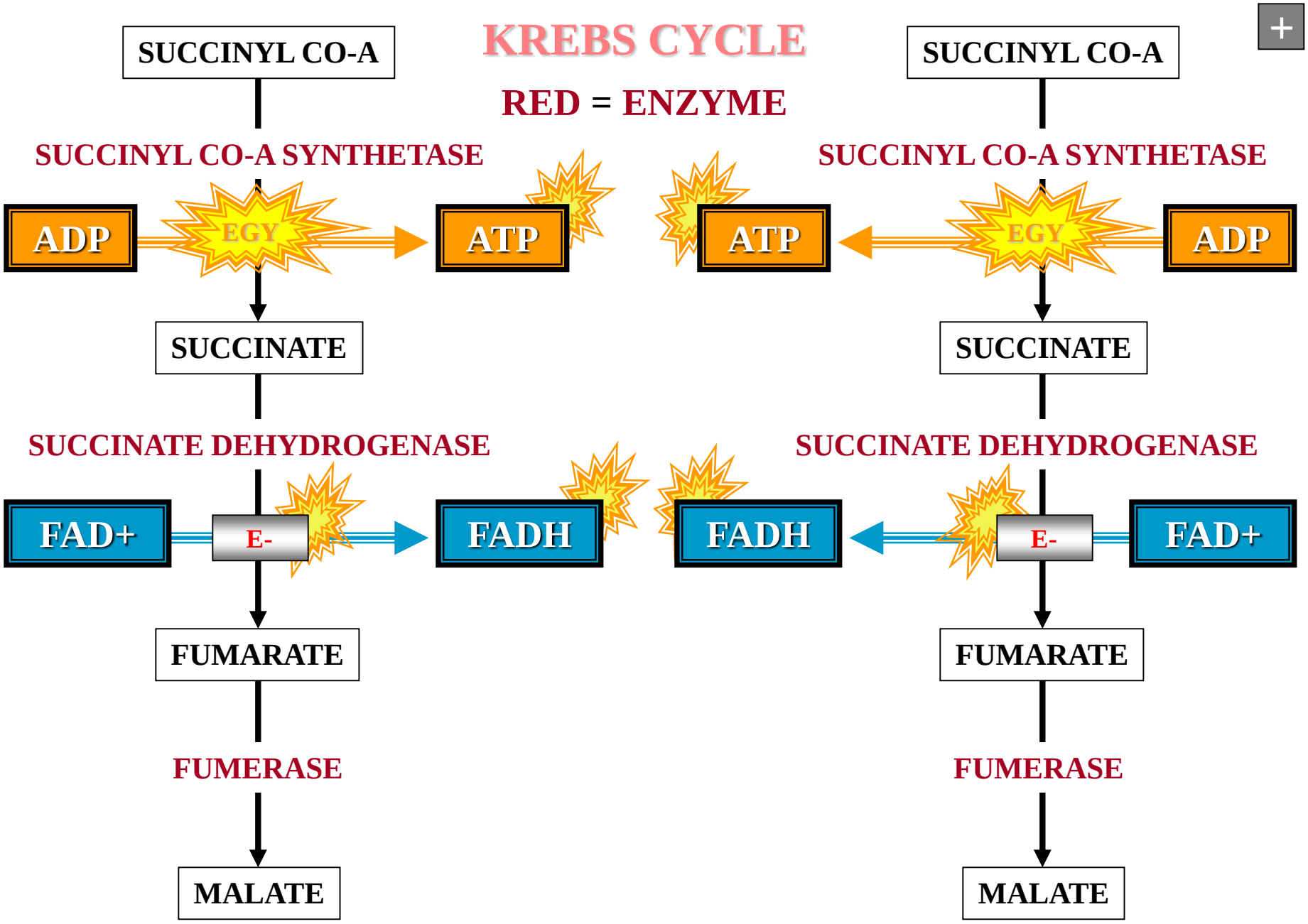
SUCCINYL CO-A SYNTHETASE

KREBS
SUBSTRATE PHOSPHORYLATION

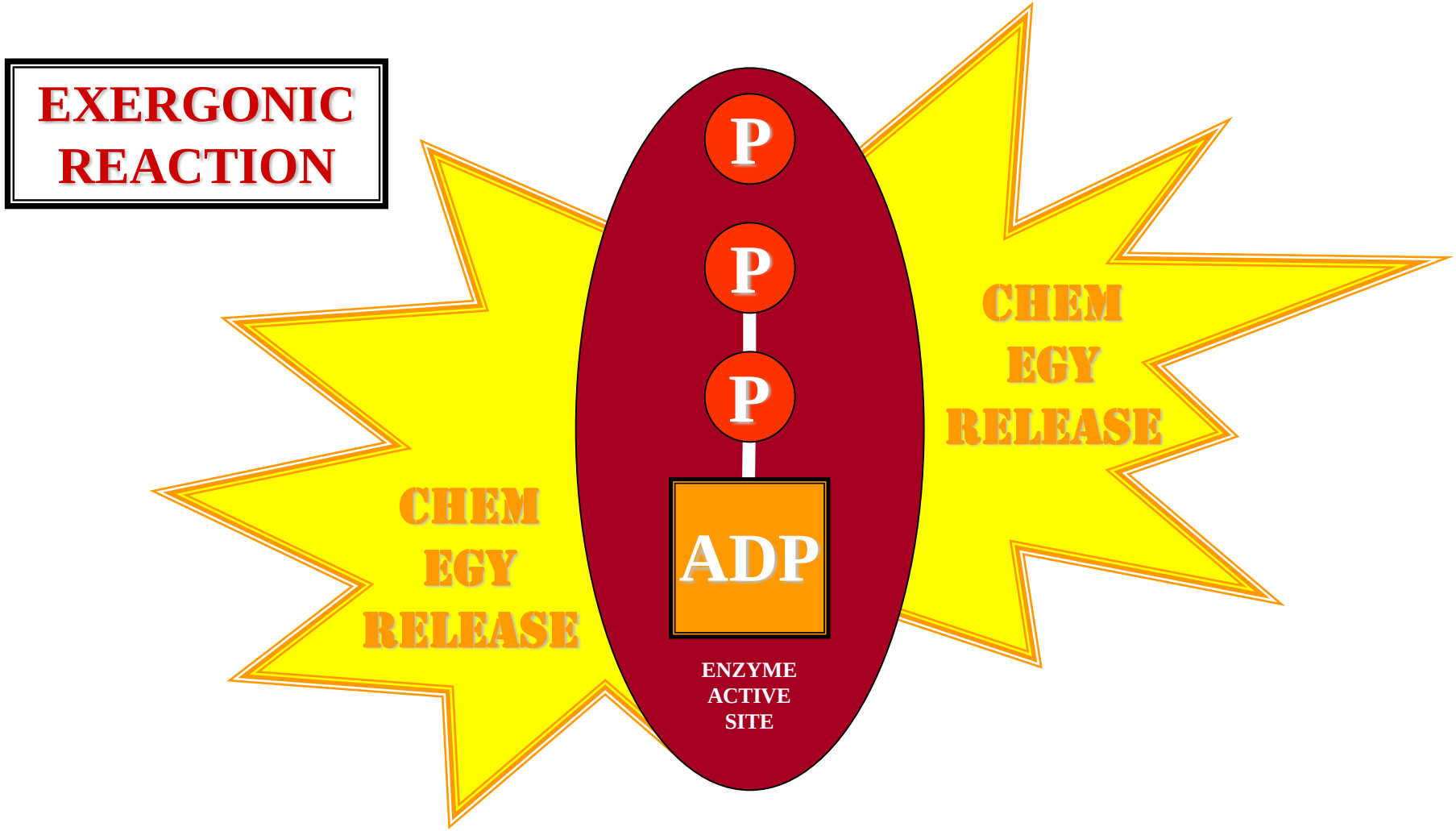
EXERGONIC REACTION



SUCCINYL CO-A SYNTHETASE


KREBS CYCLE
RED = ENZYME
SUCCINYL CO-A
SUCCINYL CO-A SYNTHETASE
ADP
EGY
ATP
SUCCINATE
SUCCINATE DEHYDROGENASE
FAD+
E-
FADH
FUMARATE
FUMERASE
MALATE
SUCCINYL CO-A
SUCCINYL CO-A SYNTHETASE
ATP
EGY
ADP
SUCCINATE
SUCCINATE DEHYDROGENASE
FADH
E-
FAD+
FUMARATE
FUMERASE
MALATE

KREBS
SUBSTRATE PHOSPHORYLATION

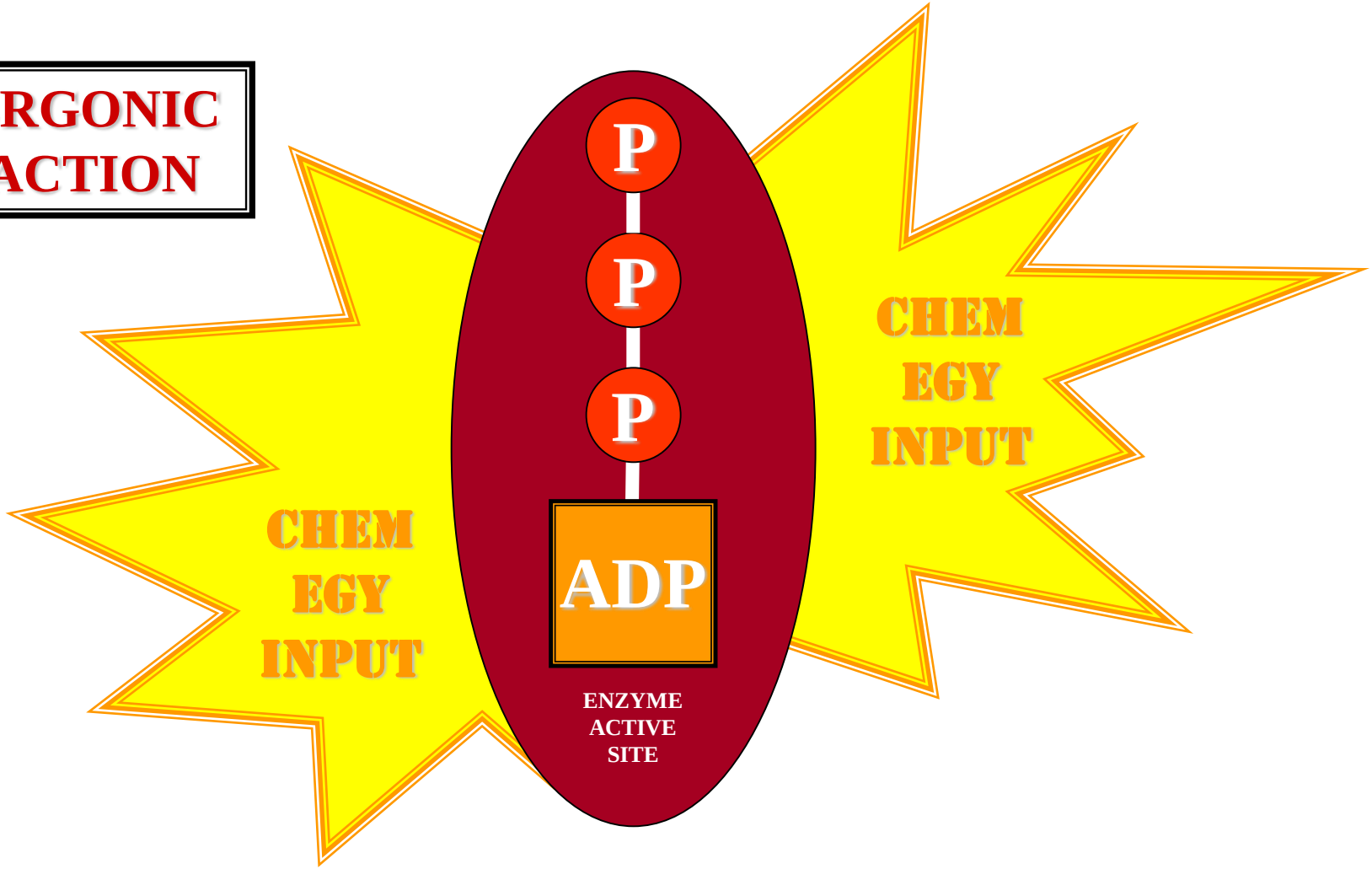


SUCCINYL CO-A SYNTHETASE

KREBS
SUBSTRATE PHOSPHORYLATION

EN

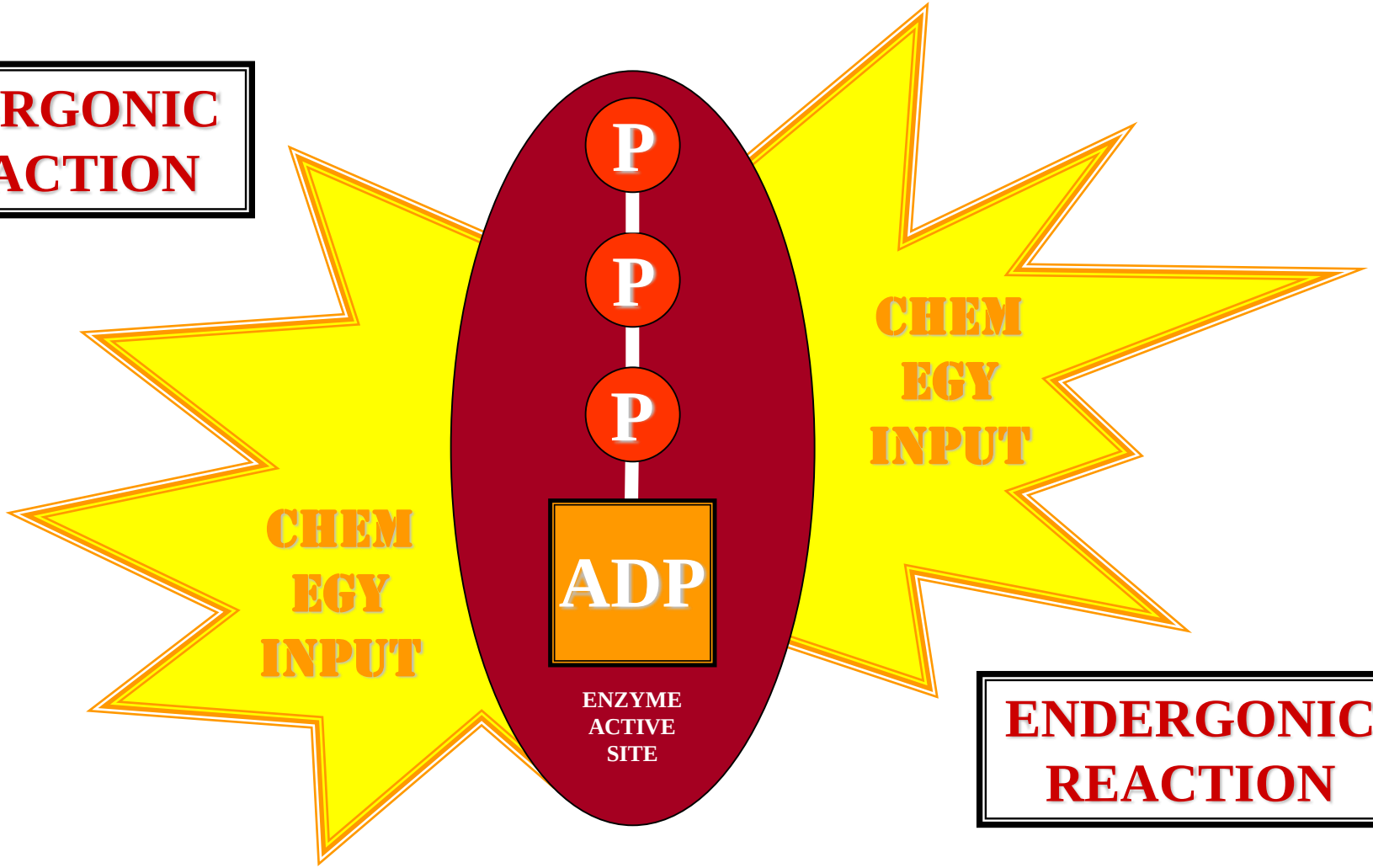
EXERGONIC REACTION



SUCCINYL CO-A SYNTHETASE

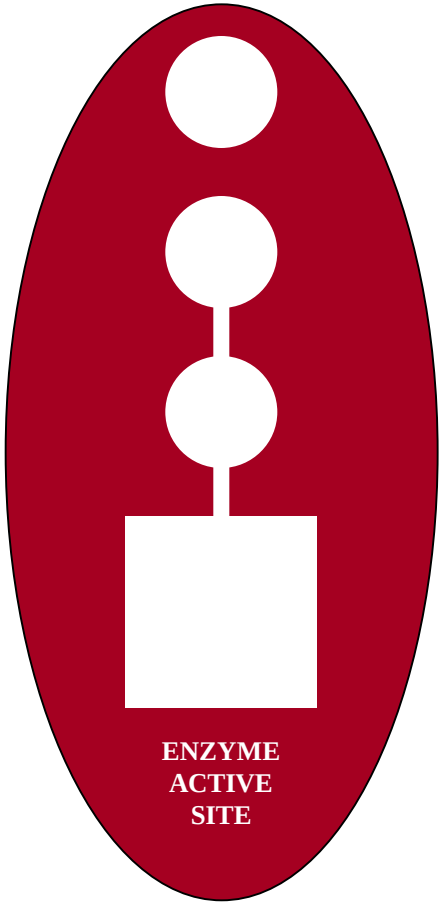
KREBS

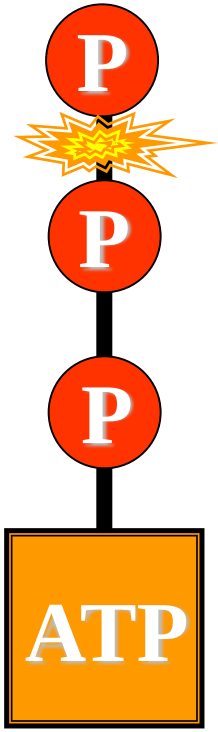
SUBSTRATE PHOSPHORYLATION



SUCCINYL CO-A SYNTHETASE

KREBS
SUBSTRATE PHOSPHORYLATION





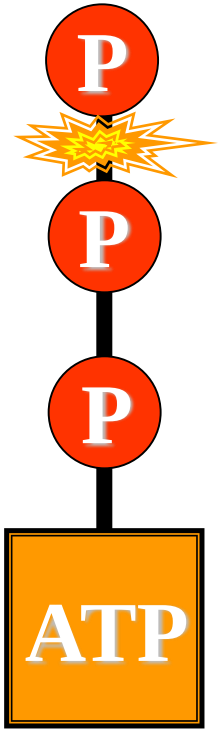
= CHEM ENERGY

SUCCINYL CO-A SYNTHETASE

KREBS
SUBSTRATE PHOSPHORYLATION

¿ ETC

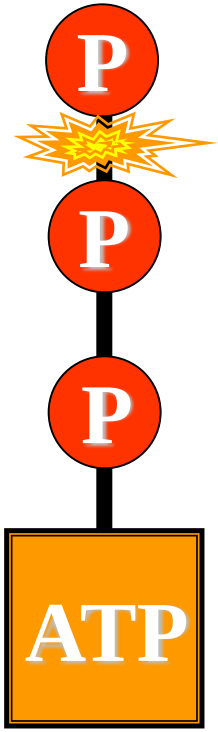
DIRECT ENZYME SUBSTRATE PHOSPHORYLATION



= CHEM ENERGY

KREBS
SUBSTRATE PHOSPHORYLATION

DIRECT ENZYME SUBSTRATE PHOSPHORYLATION



!!!ETC: ABSENT!!!

= CHEM ENERGY

KREBS CYCLE
ATP NET

KREBS CYCLE

ATP NET

?

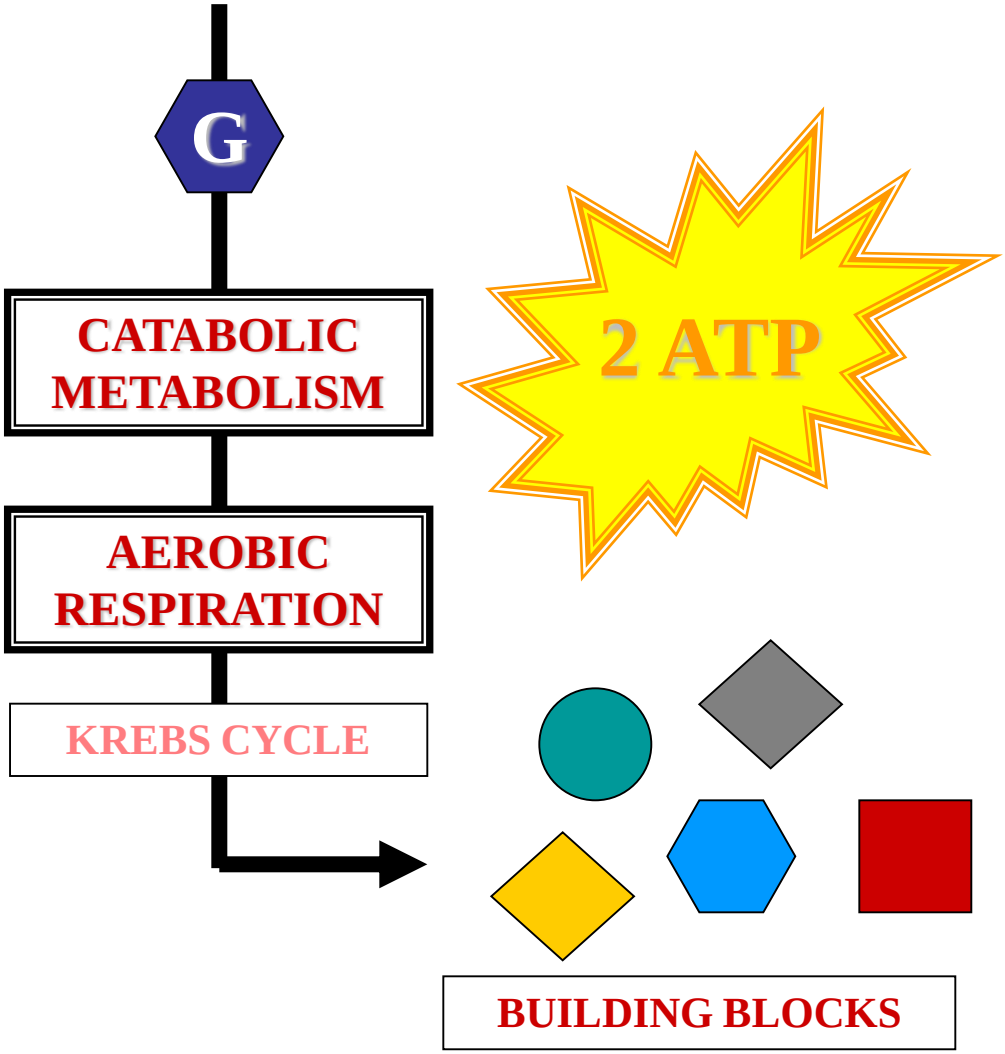
KREBS CYCLE

ATP NET

2 ATP

METABOLISM

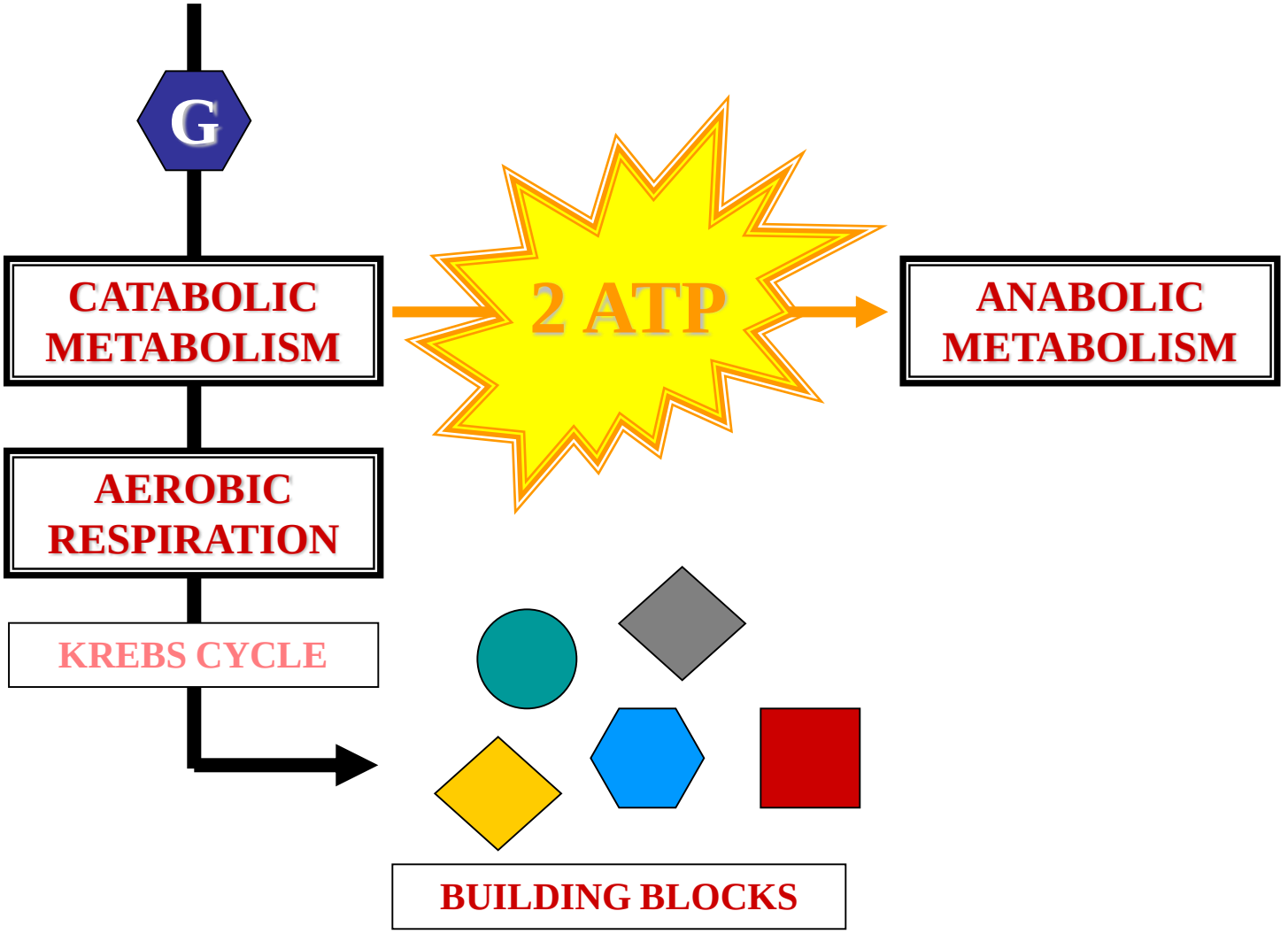
GLUCOSE



METABOLISM

C

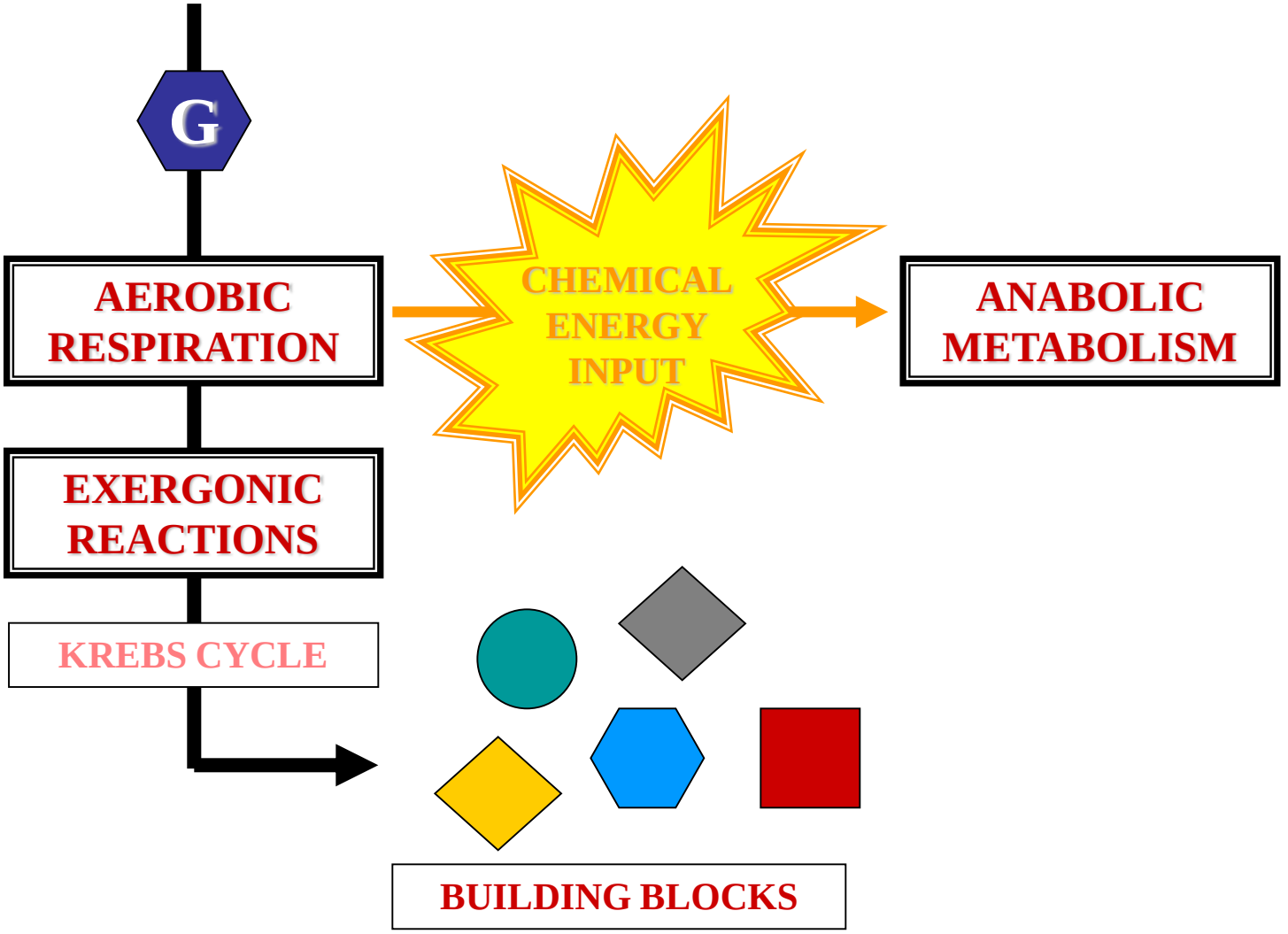
GLUCOSE



METABOLISM

EN

GLUCOSE



METABOLISM

GLUCOSE

G

AEROBIC RESPIRATION

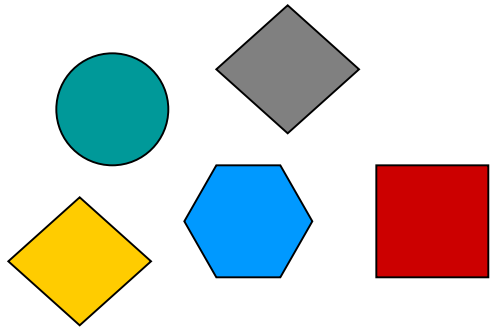
EXERGONIC REACTIONS

KREBS CYCLE

CHEMICAL ENERGY INPUT

ENDERGONIC REACTIONS

ANABOLIC METABOLISM



BUILDING BLOCKS

!

B