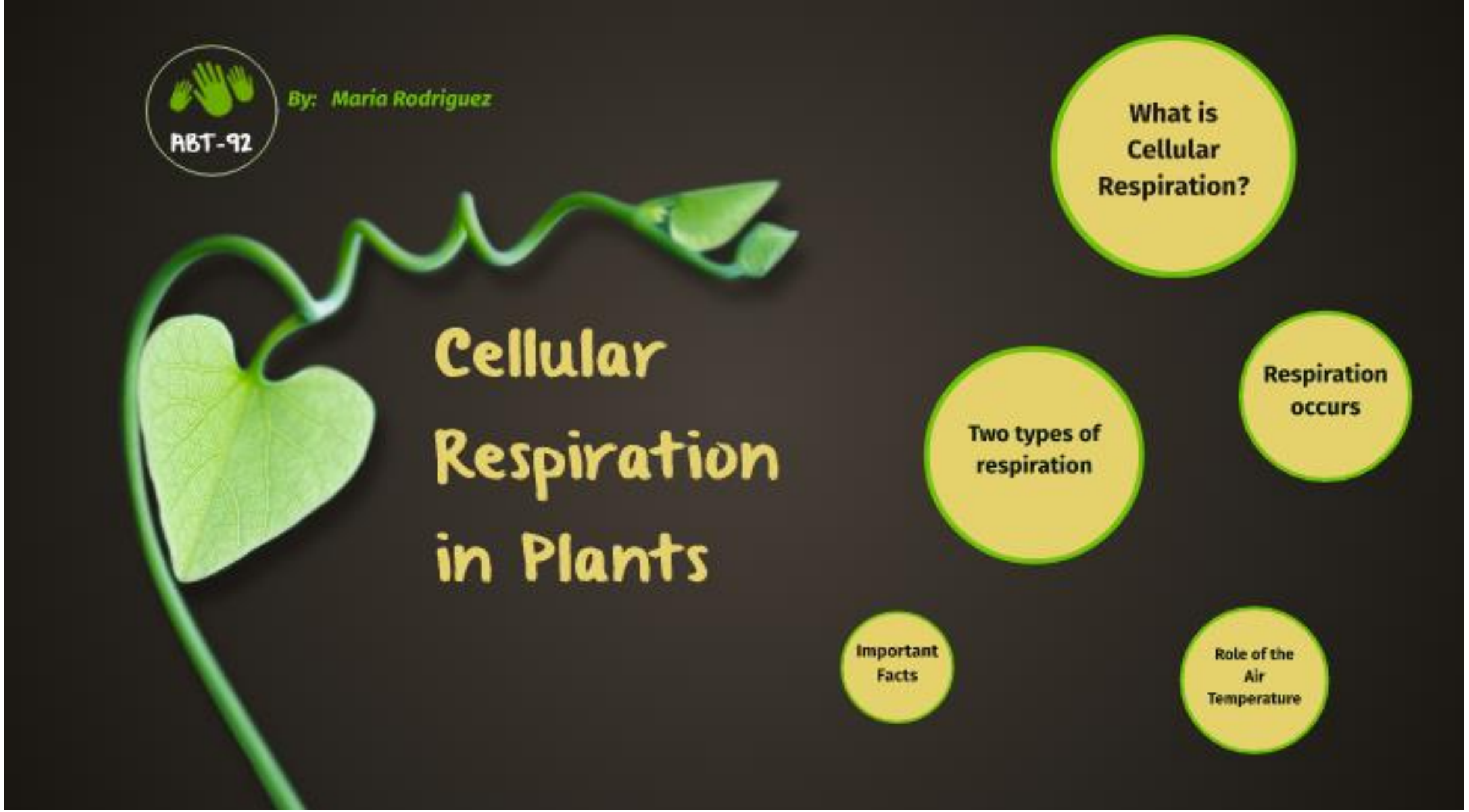
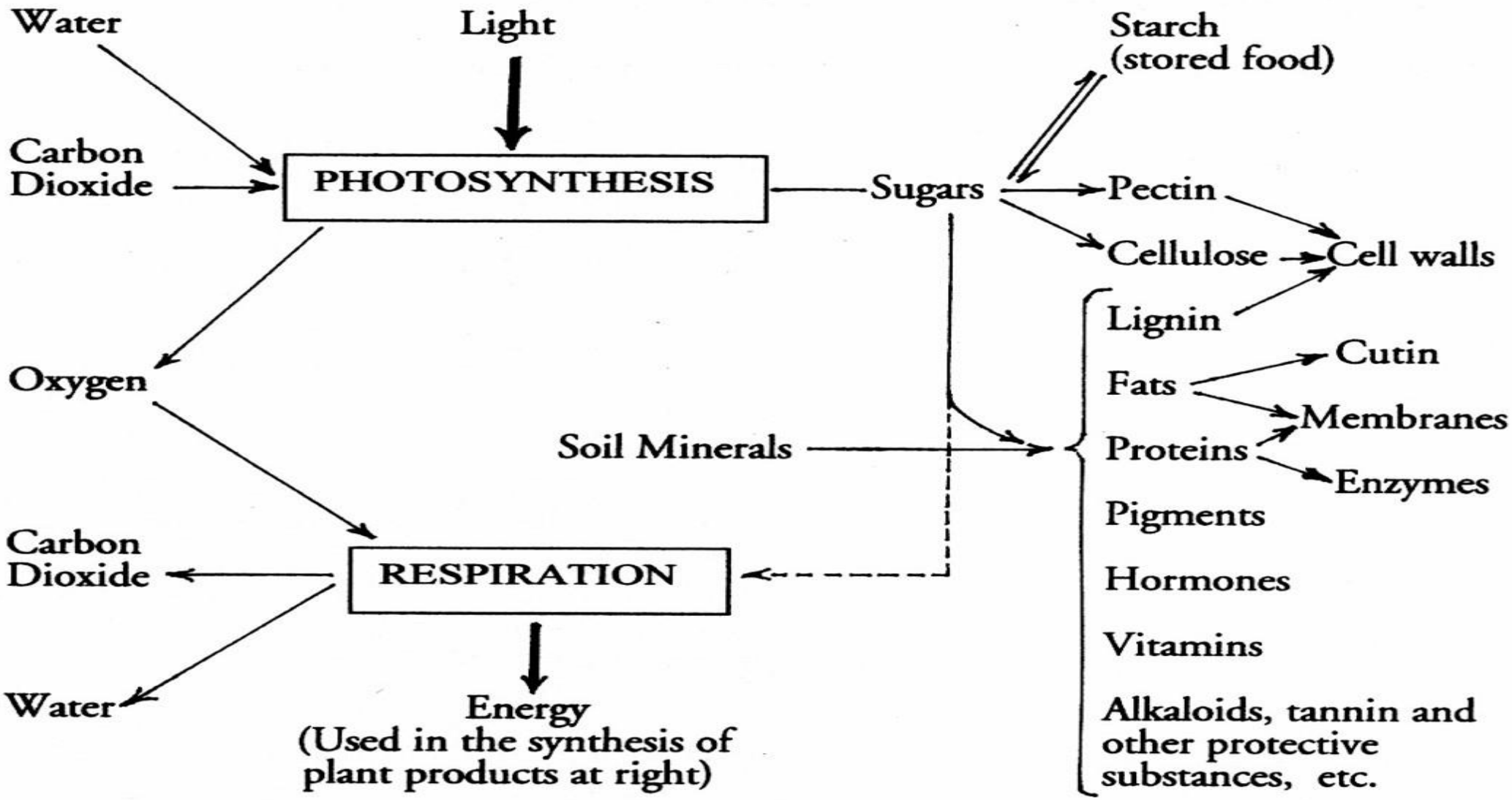
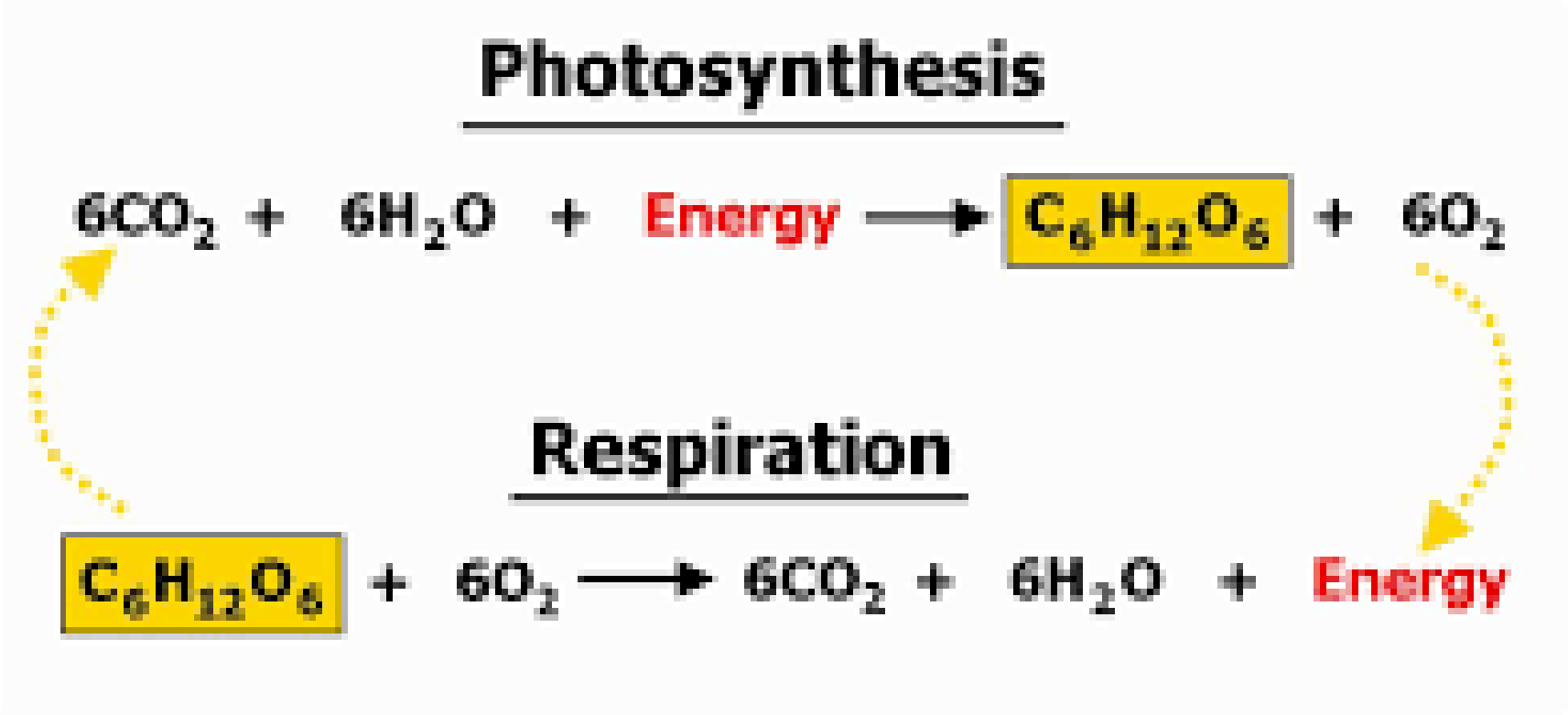
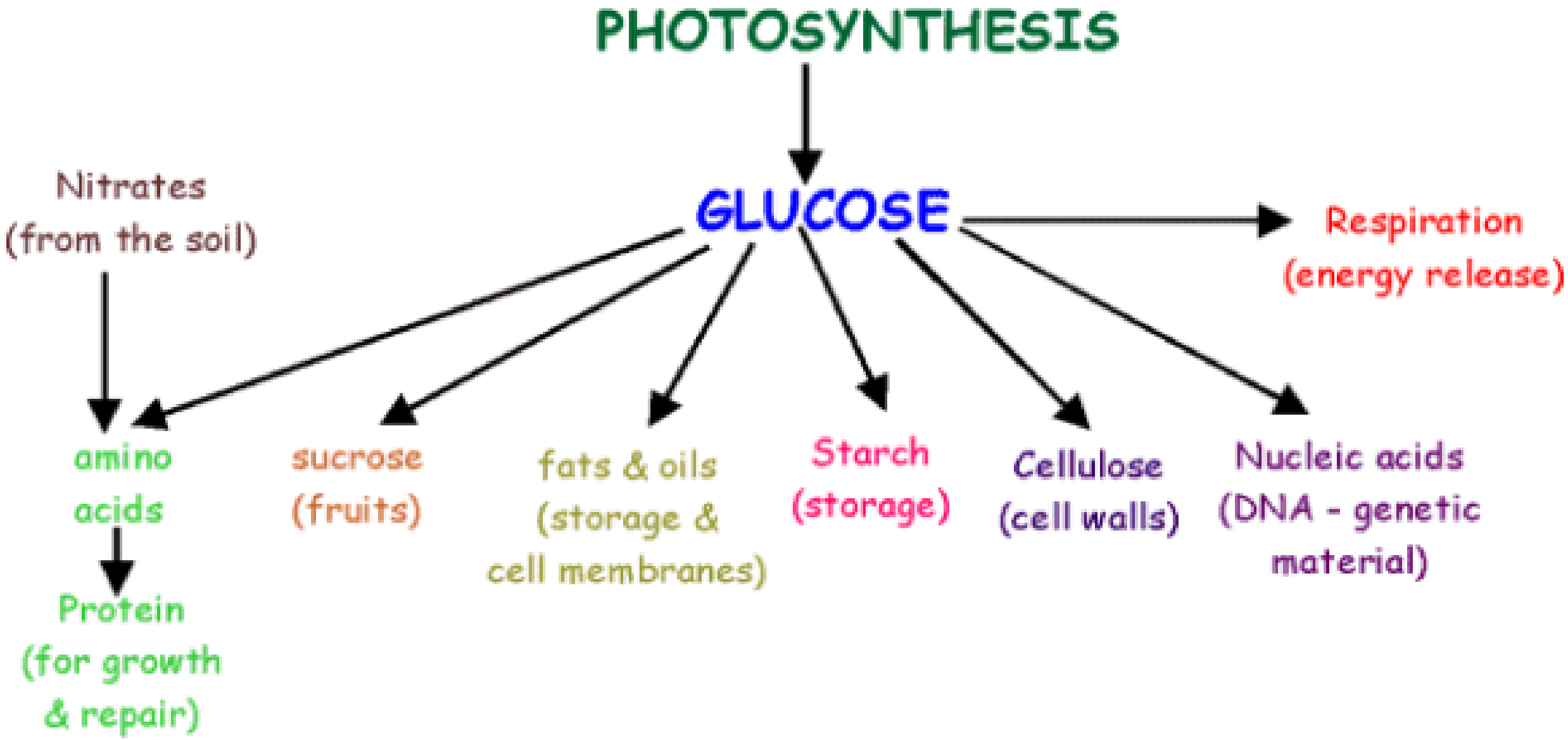

ABT-92
By: Maria Rodriguez
Cellular Respiration in Plants
What is Cellular Respiration?
Respiration occurs
Two types of respiration
Important Facts
Role of the Air Temperature



An outline of plant metabolism

Photosynthesis VS Cellular Respiration




PHOTOSYNTHESIS
GLUCOSE
Nitrates
(from the soil)
Respiration
(energy release)
amino
acids
Protein
(for growth
& repair)
sucrose
(fruits)
fats & oils
(storage &
cell membranes)
Starch
(storage)
Cellulose
(cell walls)
Nucleic acids
(DNA - genetic
material)

Importance of Respiration

- Energy in food is in a form that CANNOT be used by cells.
- During respiration, food energy is converted into a form that all cells can use
- Aerobic respiration returns CO_2 to the atmosphere where it can be used again by photosynthetic organisms

Anaerobic respiration in plants

- Just like animals, plants respire anaerobically when oxygen is in short supply.

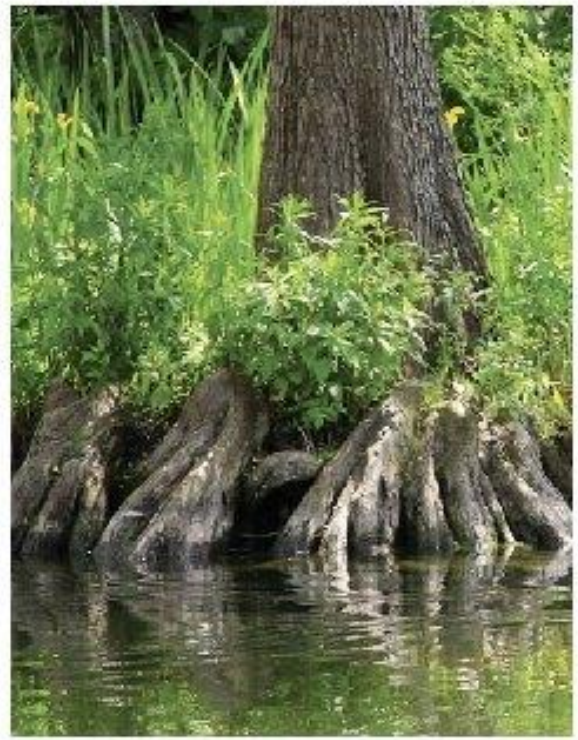
- However, the products of anaerobic respiration are different:

✓ **In animals** → lactic acid is produced

✓ **In plants** → ethanol and carbon dioxide are produced.

- The type of anaerobic respiration that produces ethanol and carbon dioxide is called **fermentation**.

- It can occur in the roots when a plant is growing in boggy or waterlogged soil.



AEROBIC AND ANEROBIC RESPIRATION

Aerobic Respiration

- Requires Oxygen
- Has three cycles
  - Glycolysis
  - Krebs's Cycle
  - Electron Transport Chain
- Produces up to 38 ATP
- Takes place: in Cytosol/cytoplasm and mitochondria
- Outputs: carbon dioxide, oxygen, ATP, water

Anaerobic Respiration

- Requires NO Oxygen
- Has ONE cycle
  - Glycolysis
    - Fermentation/lactic acid
- Produces up to 2 ATP
- Takes place: in Cytosol/cytoplasm
- Outputs: ATP

Anaerobic Respiration

(no oxygen)

↓

Glycolysis

(cytoplasm)

↓

Fermentation

1) alcoholic fermentation
2) lactic acid fermentation

(cytoplasm)

↓

2 ATP / Glucose

Aerobic Respiration

(requires oxygen)

↓

Glycolysis

(cytoplasm)

↓

Krebs cycle

(mitochondria)

↓

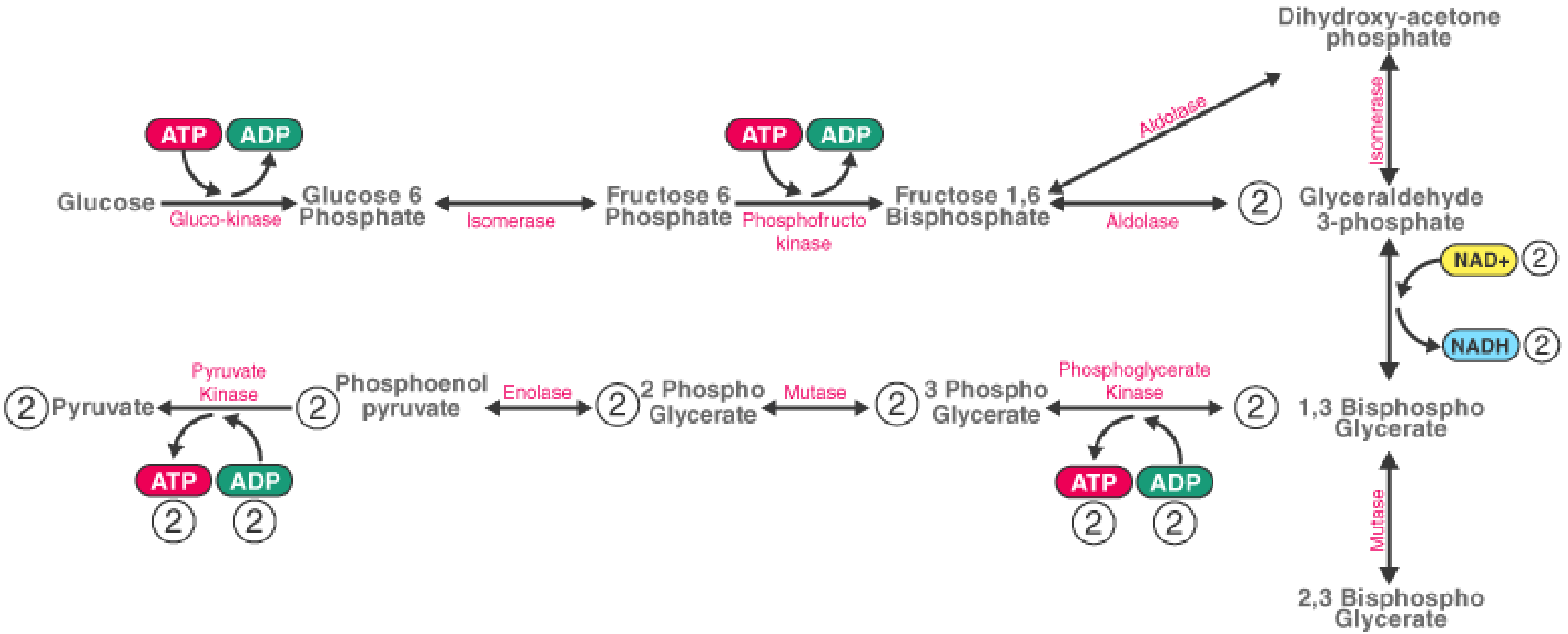
Electron Transport

(mitochondria)

↓

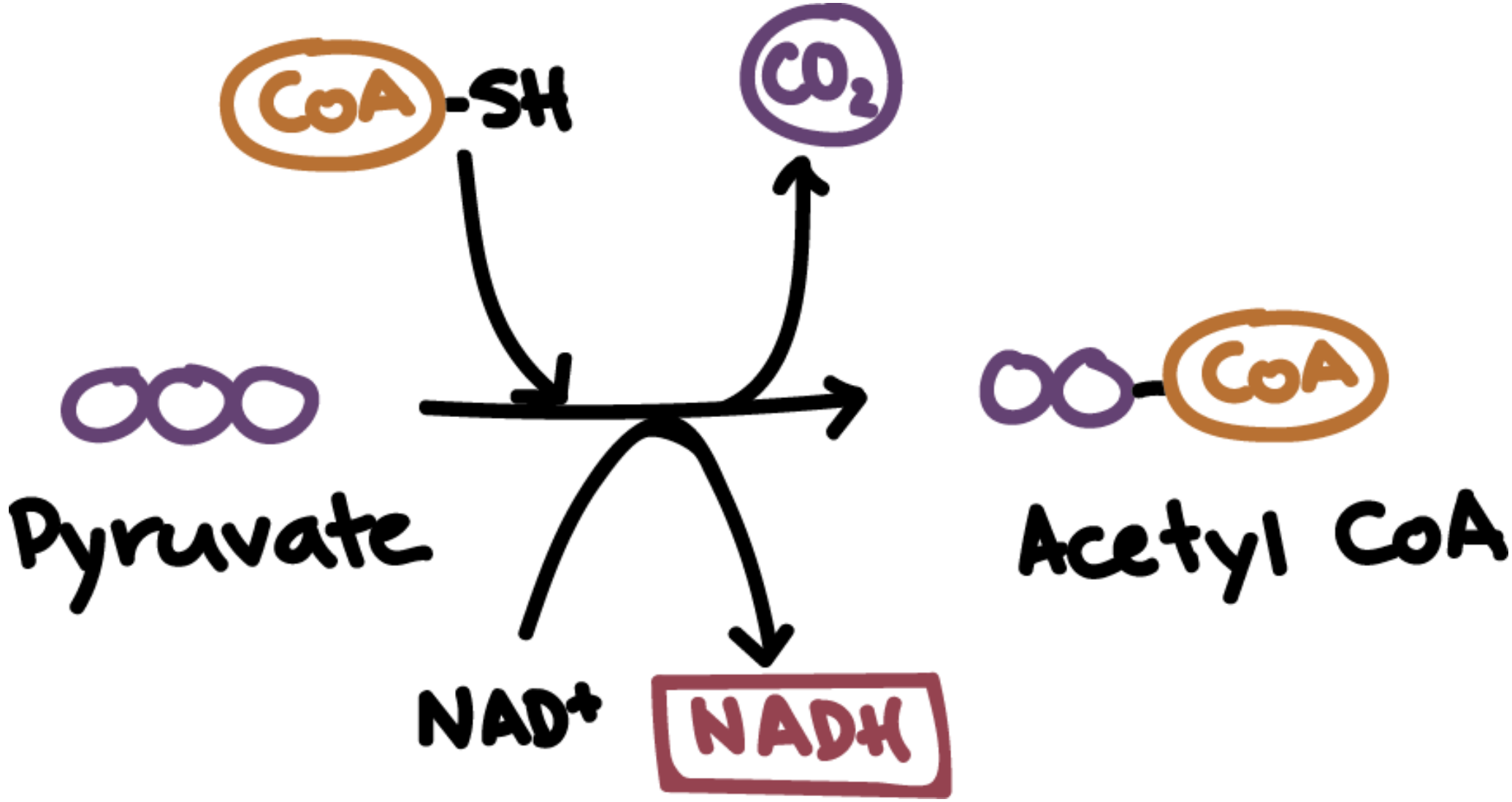
36 ATP / Glucose

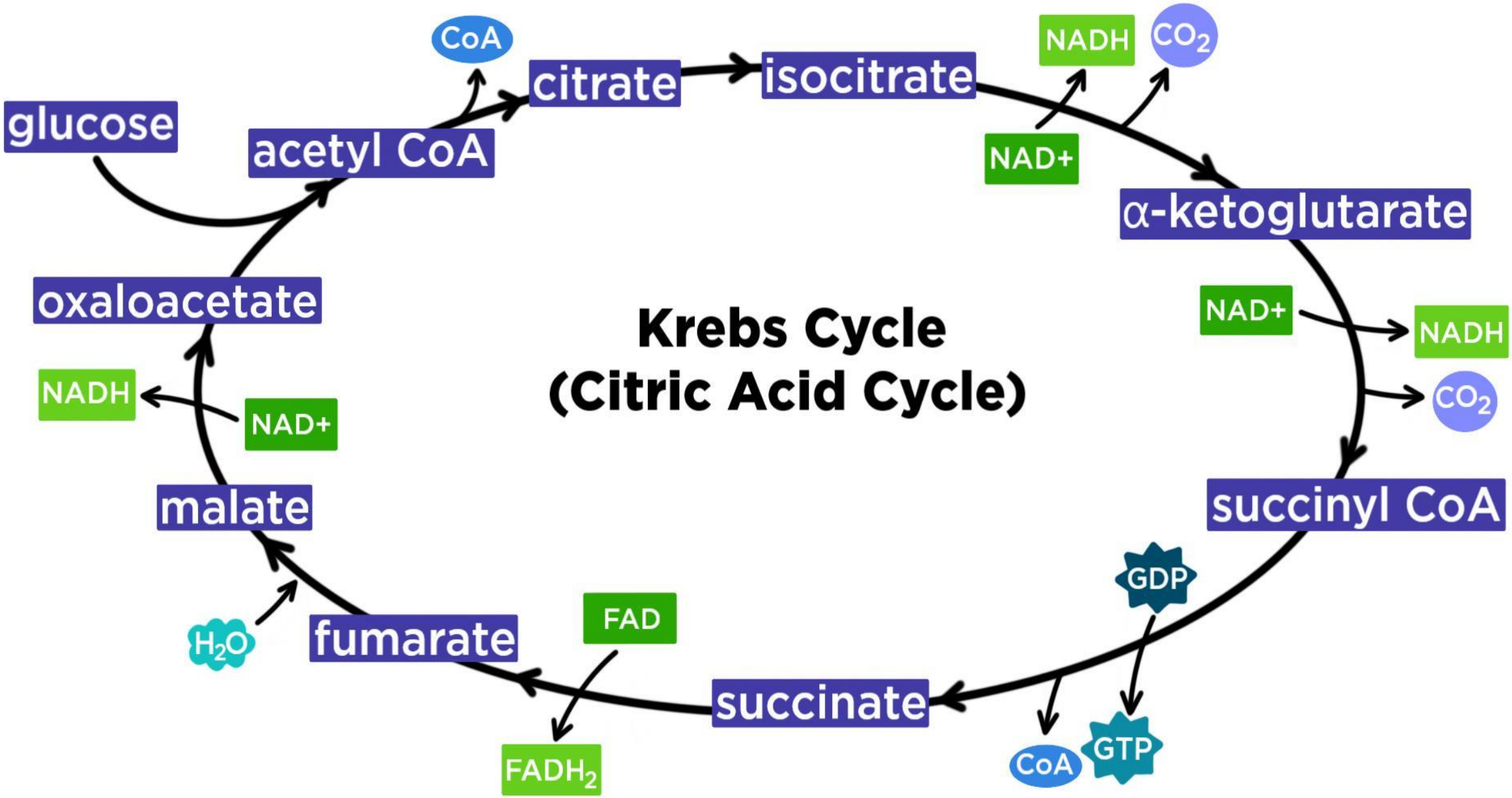
PATHWAY OF GLYCOLYSIS



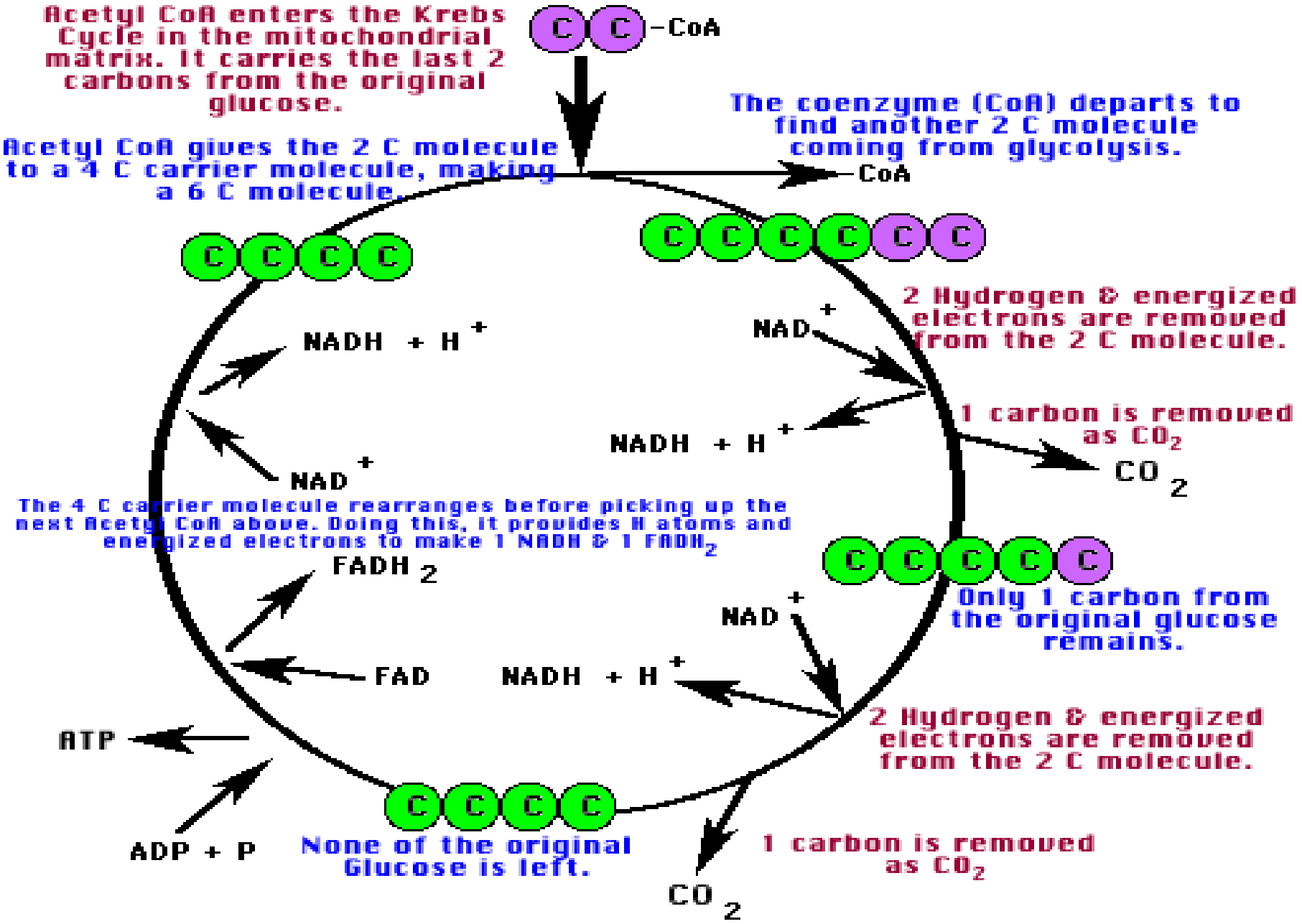
Glycolysis Enzymes

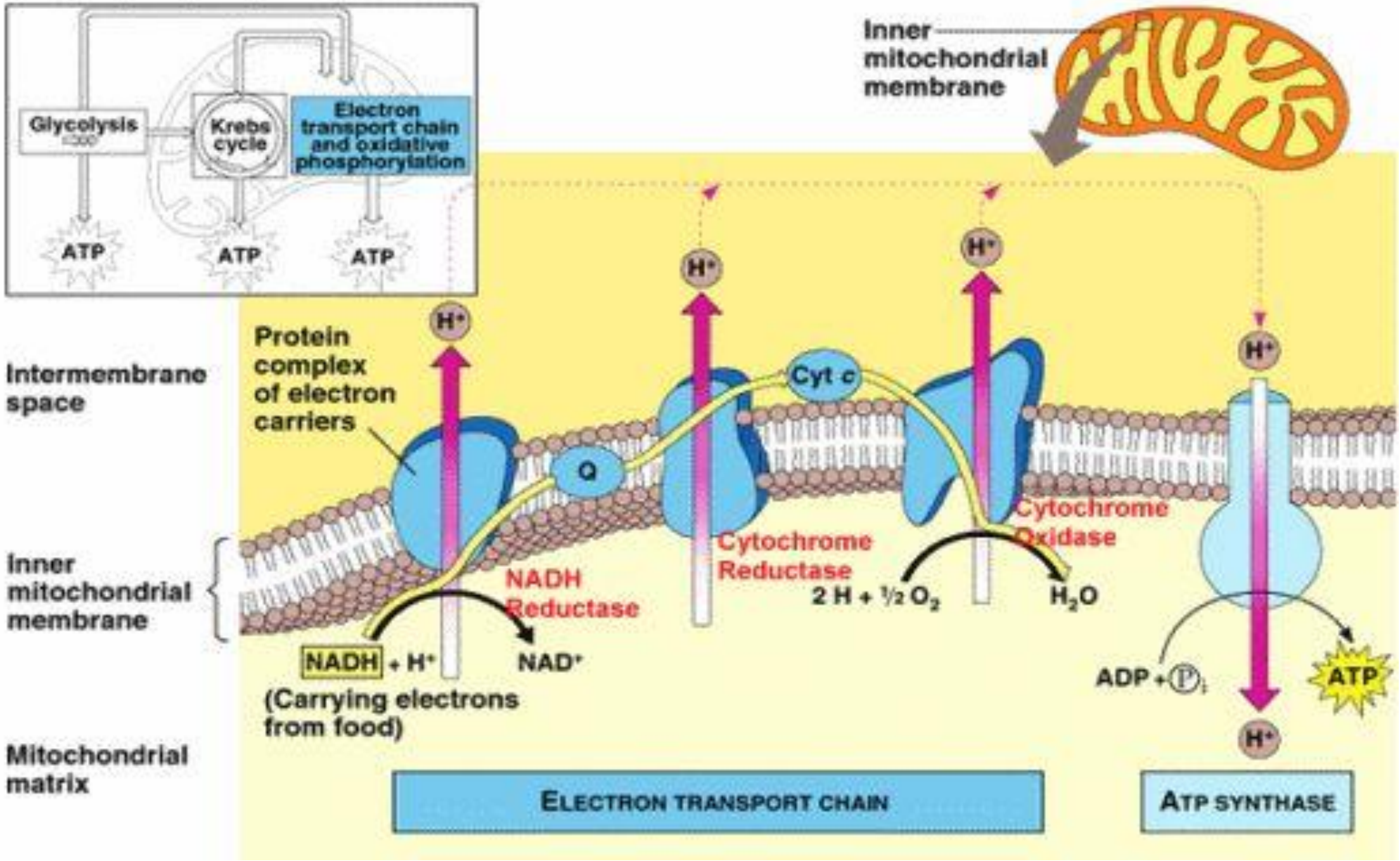
- Kinase (حذف او اضافة Phosphate)
- Isomerase (نفس التركيب ومختلف الصيغة)
- Aldolase (تكسير)
- Dehydrogenase (سحب Hydrogen)
- Mutase (من عائلة ال Isomerase)


CoA-SH
CO_2
Pyruvate
CoA
Acetyl CoA
NAD^+
NADH


Krebs Cycle
(Citric Acid Cycle)
glucose
acetyl CoA
CoA
citrate
isocitrate
NADH
CO_2
NAD+
α-ketoglutarate
NAD+
NADH
CO_2
succinyl CoA
GDP
GTP
CoA
succinate
FAD
$FADH_2$
fumarate
H_2O
malate
NADH
NAD+
oxaloacetate

The Krebs Cycle




Glycolysis
Krebs cycle
Electron transport chain and oxidative phosphorylation
ATP
ATP
ATP
Inner mitochondrial membrane
Intermembrane space
Protein complex of electron carriers
Inner mitochondrial membrane
Mitochondrial matrix
H+
H+
H+
H+
Q
Cyt c
NADH Reductase
Cytochrome Reductase
Cytochrome Oxidase
2 H + ½ O2
H2O
NADH + H+
NAD+
(Carrying electrons from food)
ADP + P
ATP
H+
ELECTRON TRANSPORT CHAIN
ATP SYNTHASE

The Totals

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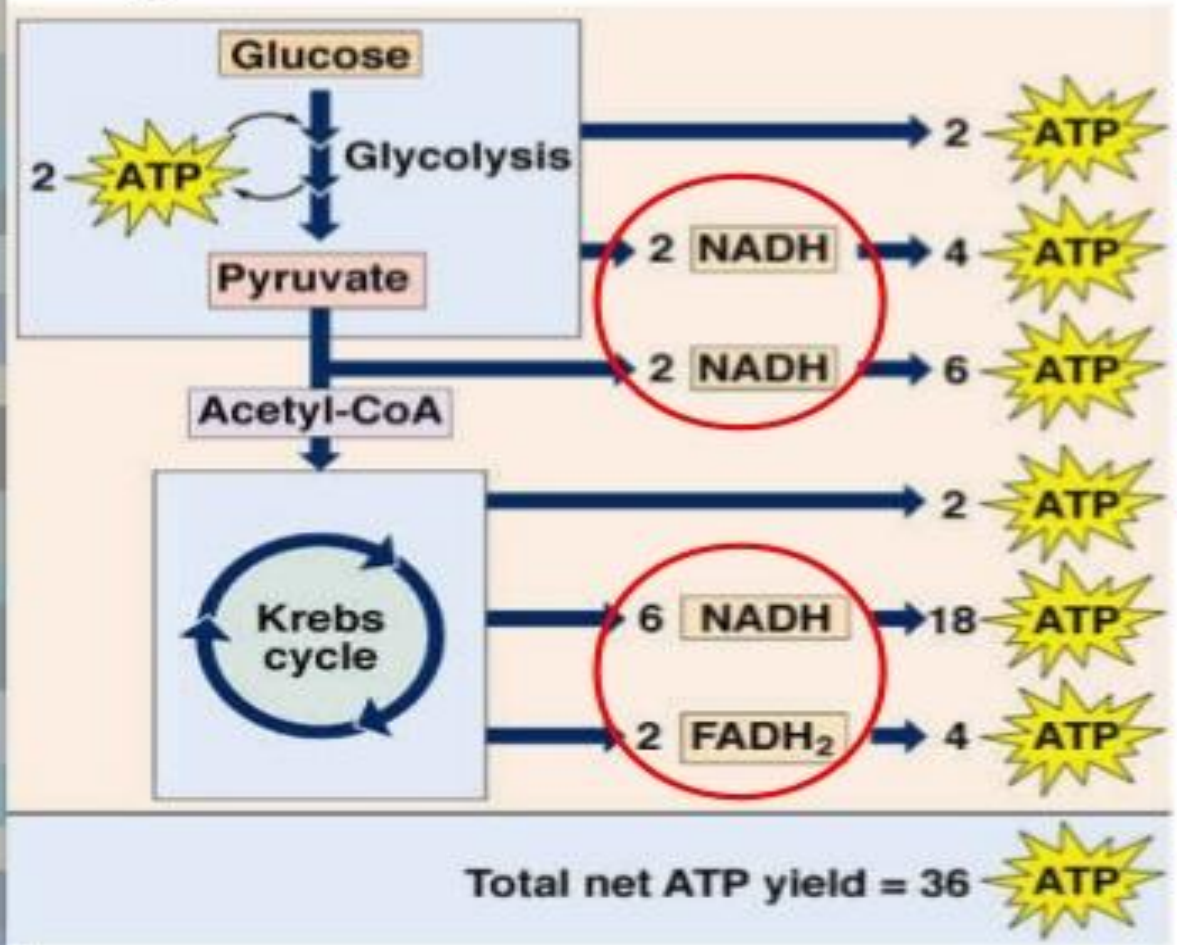

Electron carriers which go on the electron transport chain to generate ATP!

Oxidative phosphorylation	Photophosphorylation
degradation of carbohydrates, fats, and amino acids converge at this final stage of cellular respiration drives the synthesis of ATP	photosynthetic organisms capture the energy of sunlight and harness it to make ATP
occurs in mitochondria	occurs in chloroplasts
reduction of O_2 to H_2O with electrons donated by NADH and $FADH_2$	*oxidation* of H_2O to O_2, with $NADP^+$ as ultimate electron acceptor
occurs equally well in light or darkness	dependent on the energy of light

PHOTOSYNTHESIS	RESPIRATION
It is an anabolic process	It is Catabolic process
It occurs only in plants with green pigments	It occurs in all Plants and Animals
Light is essential	Light is not essential
The cell organelle necessary is chloroplast	The cell organelle necessary is Mitochondria
The glucose is end product	The glucose is Starting product
CO_2 and H_2O is starting product And O_2 given out	O_2 is taken in and CO_2 and H_2O are end product
Energy is trapped	Energy is released
It occurs mainly during the day	It continues day and night
Light energy is converted into Potential energy	Potential energy is converted into Kinetic energy
Takes place in the presence of a catalyst chlorophyll	No catalyst is needed for respiration
The day weight of the plant increases due to synthesis of food material.	The day weight of the plant decreases due to utilization of food materials.

Factors affecting Respiration