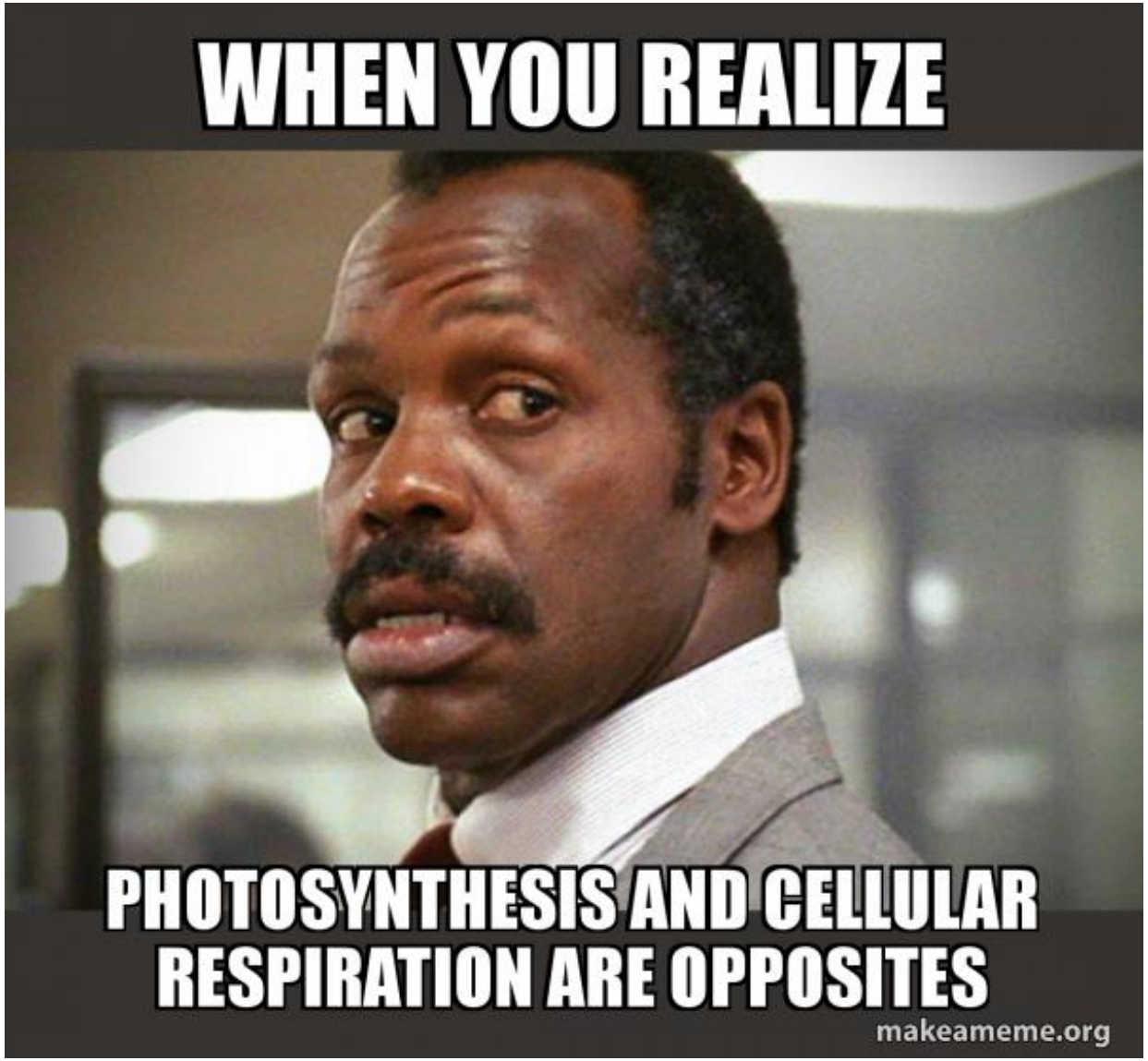
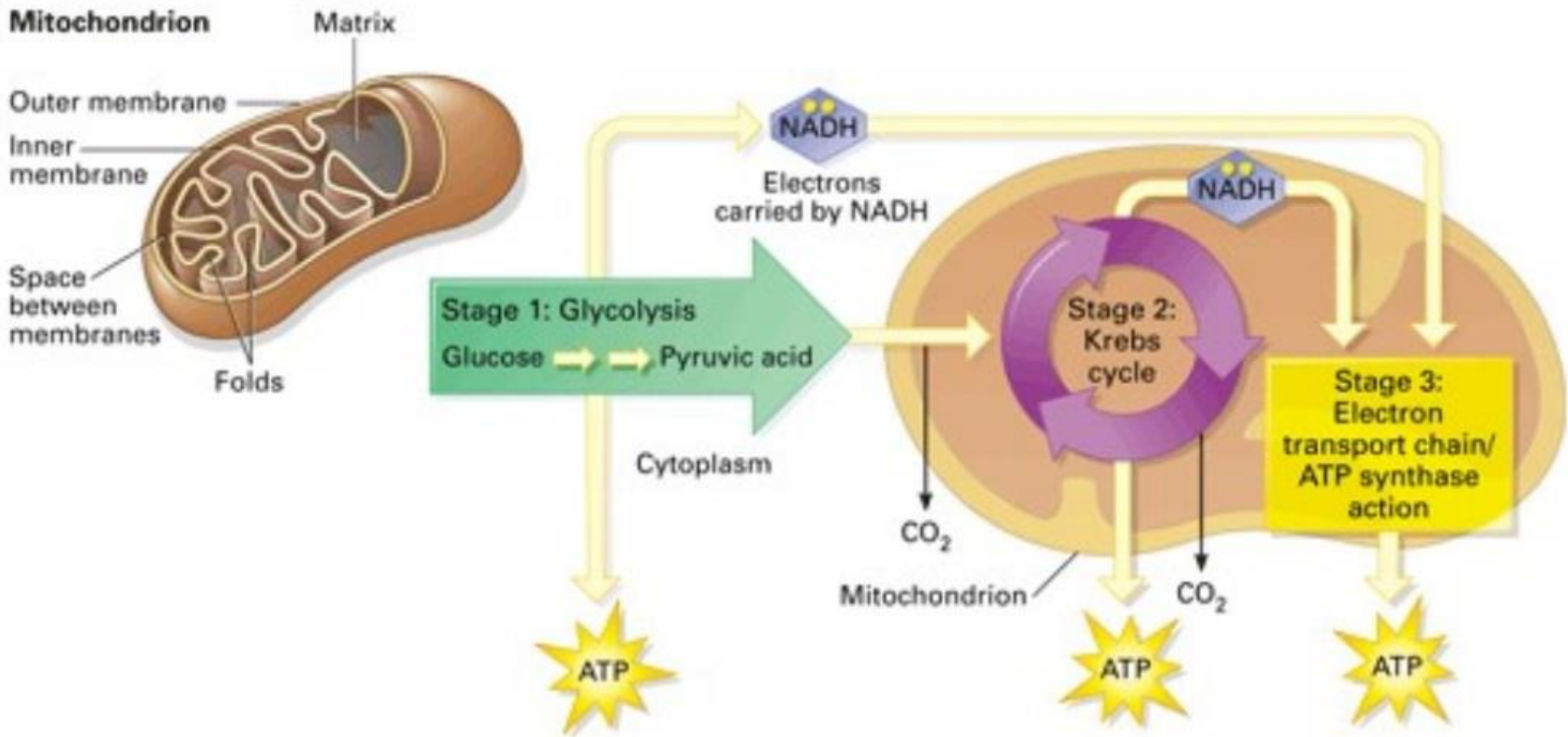
CELLULAR RESPIRATION
memegenerator.net


WHEN YOU REALIZE
PHOTOSYNTHESIS AND CELLULAR RESPIRATION ARE OPPOSITES
makeameme.org

Cellular respiration uses the oxygen produced by photosynthesis!!

Cellular Respiration: Energy for Life

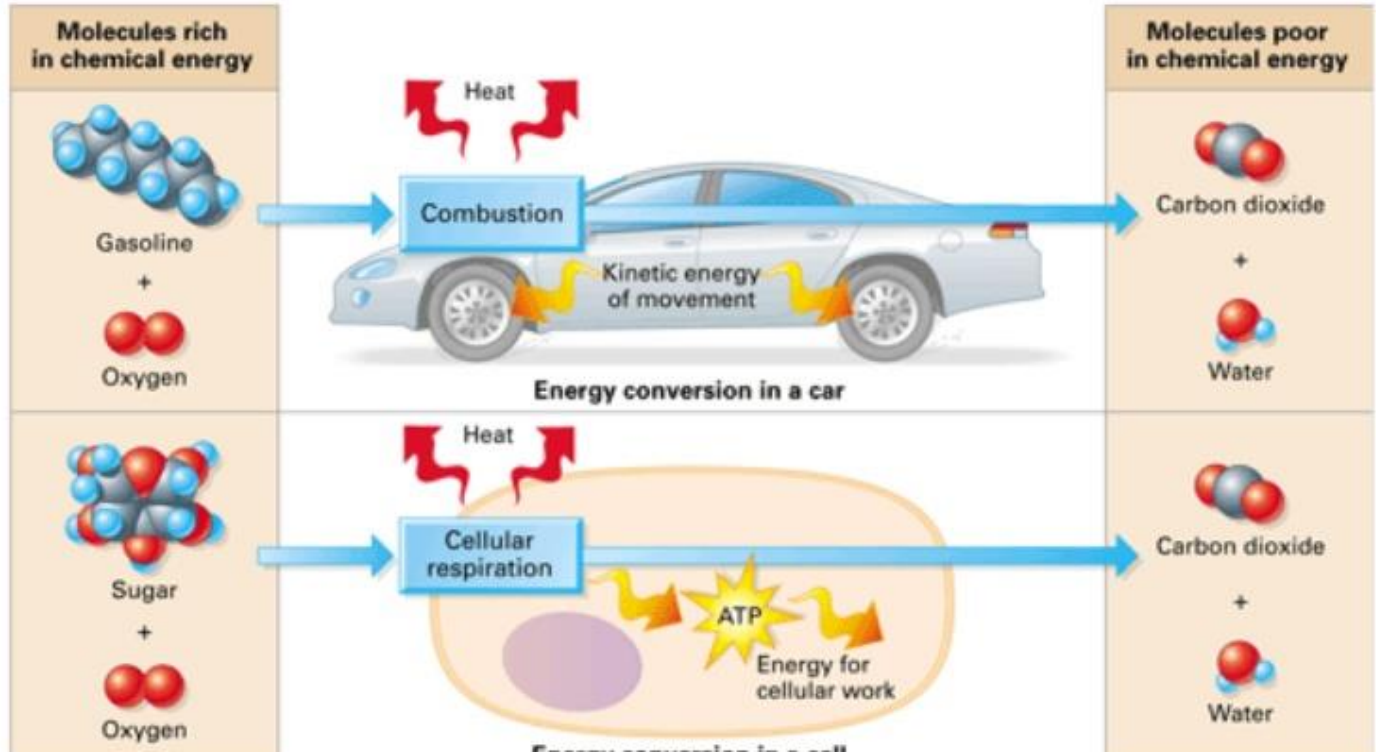


https://www.youtube.com/watch?v=V_xZuCPIHvk

What is Energy?

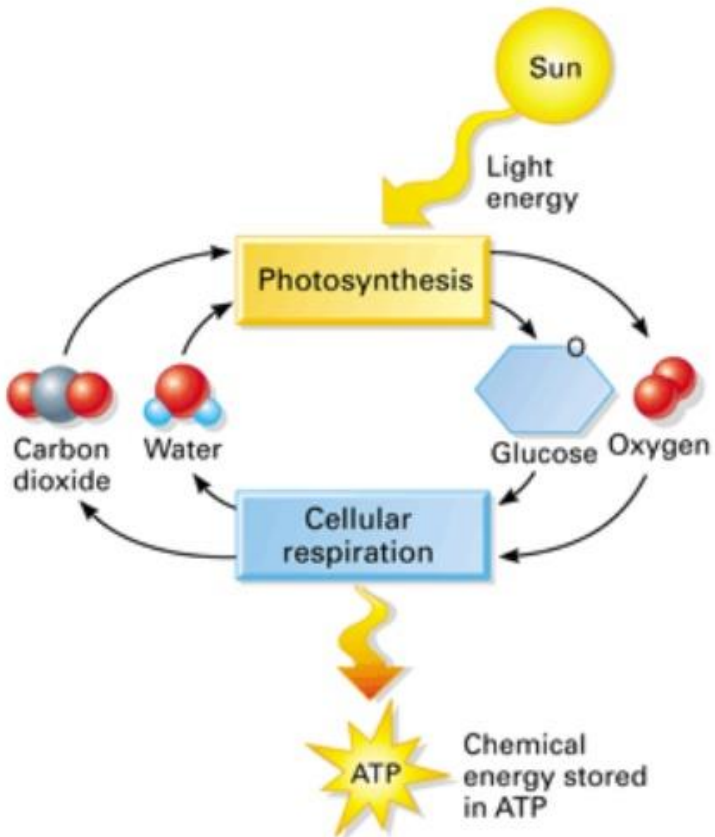
Types of Energy:

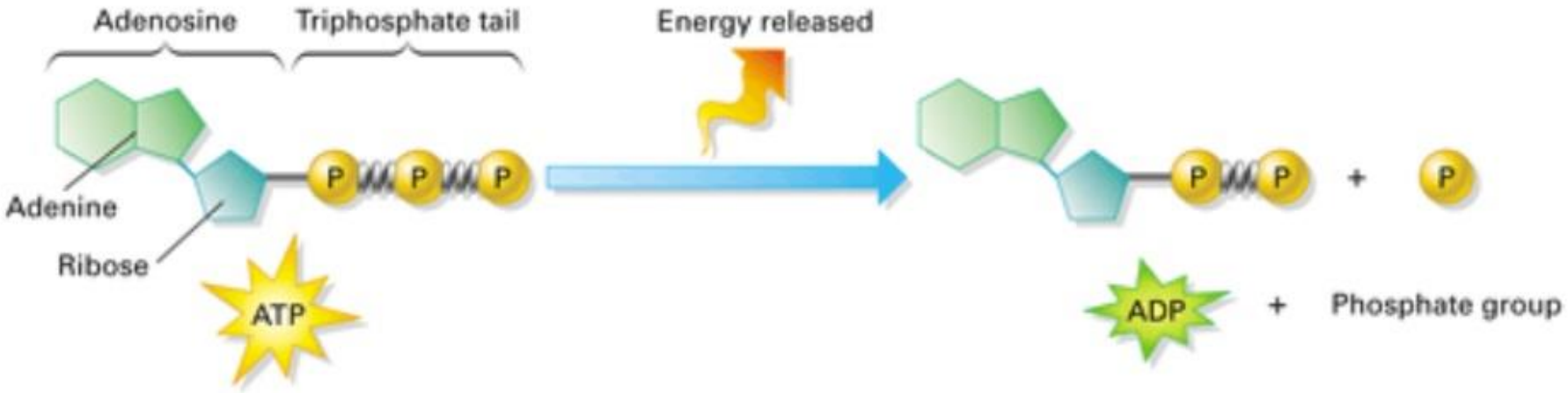
- Light
- Heat
- Potential
- Chemical



Where Does Cellular Energy Come From?

Sunlight → Autotrophs → Food → ATP

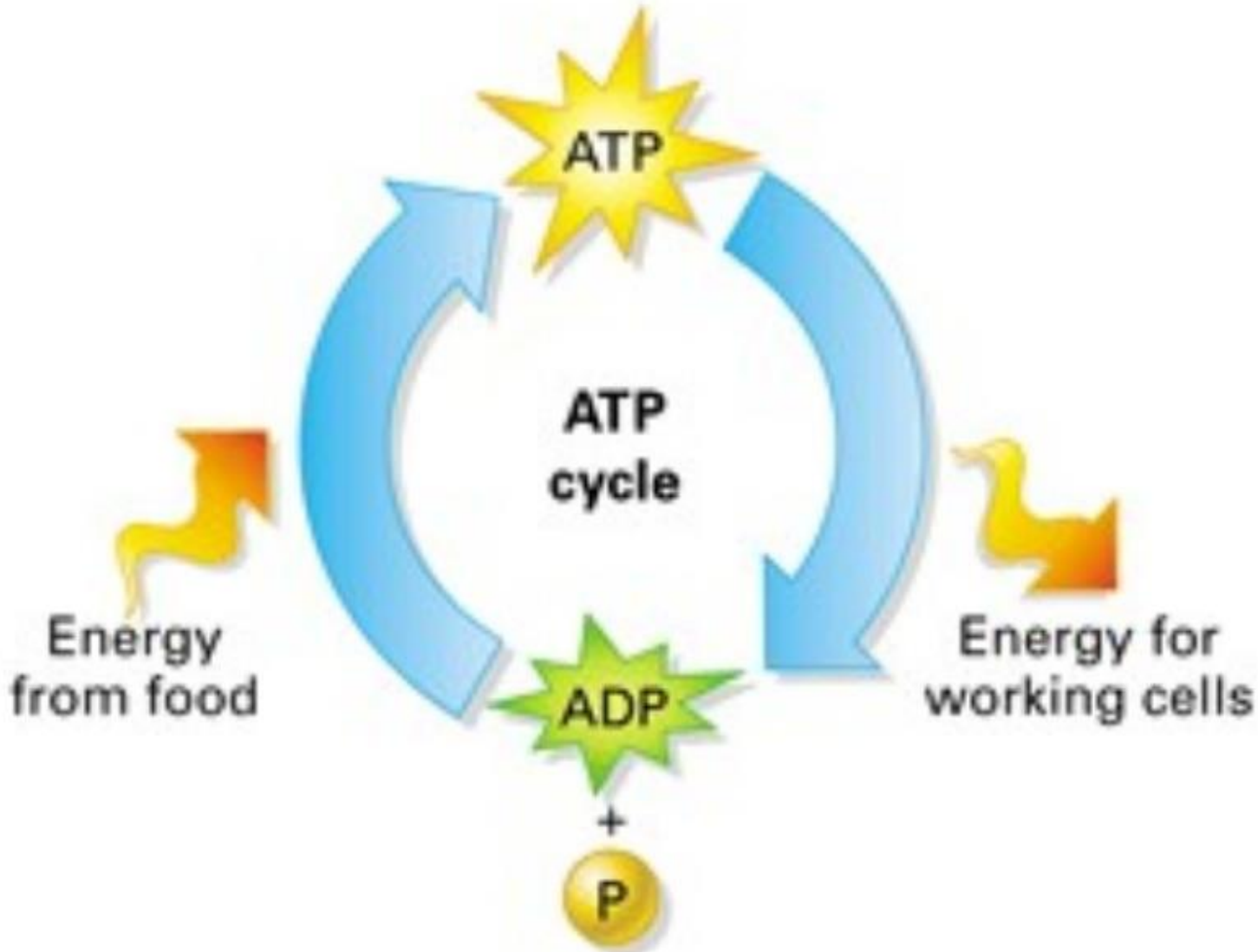




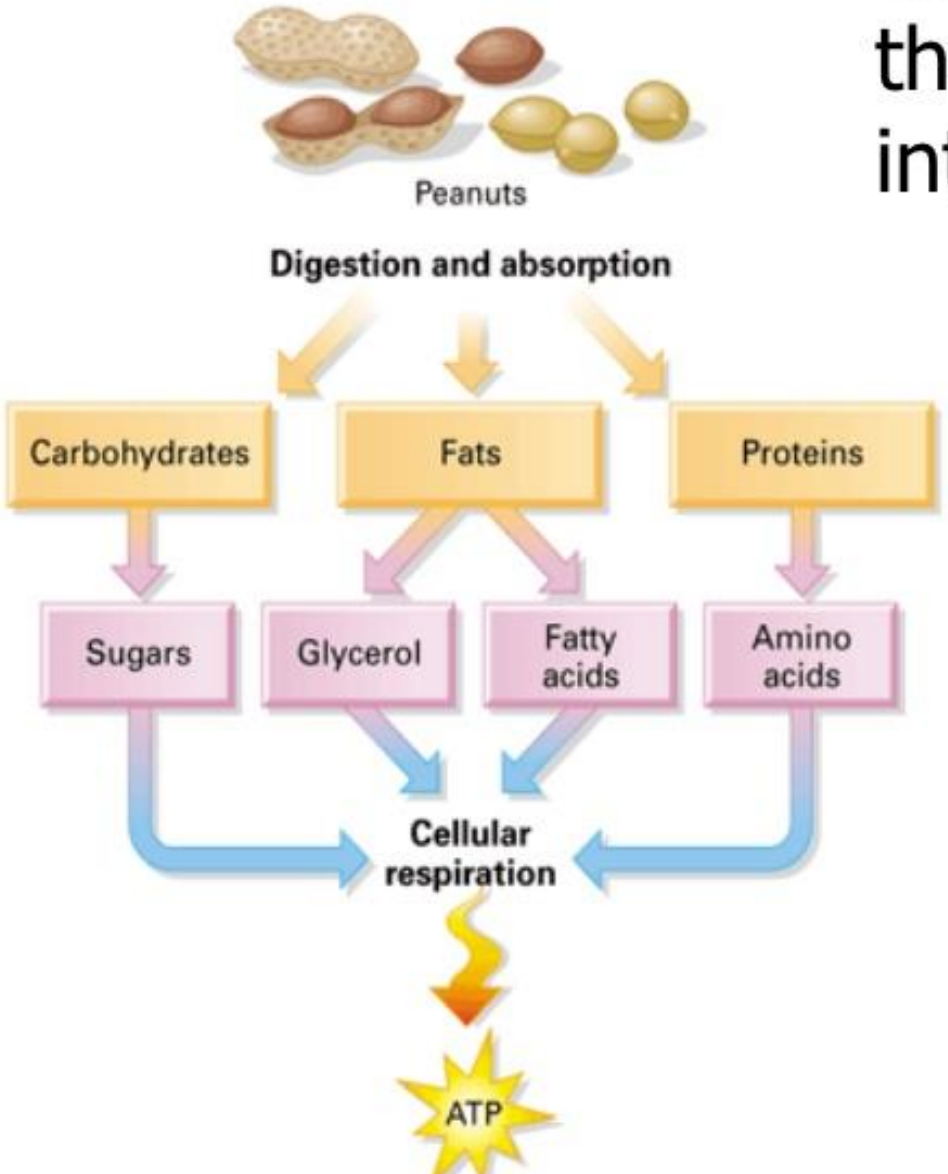
ATP is <u>adenosine triphosphate</u> and is like a charged battery

ADP is called <u>adenosine diphosphate</u> and is like an uncharged battery

Energy is released when ATP is converted to ADP


ATP
ATP
cycle
Energy
from food
ADP
+
P
Energy for
working cells

Cellular Respiration Converts the Chemical Energy in Food into ATP

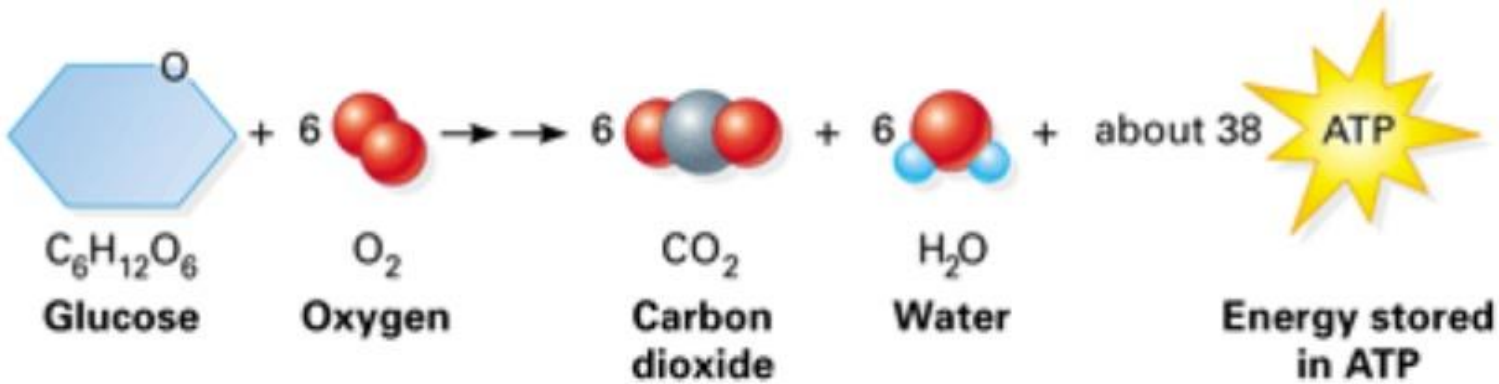


The Reactions of Cellular Respiration

All living things require energy from food

The primary energy molecule is glucose

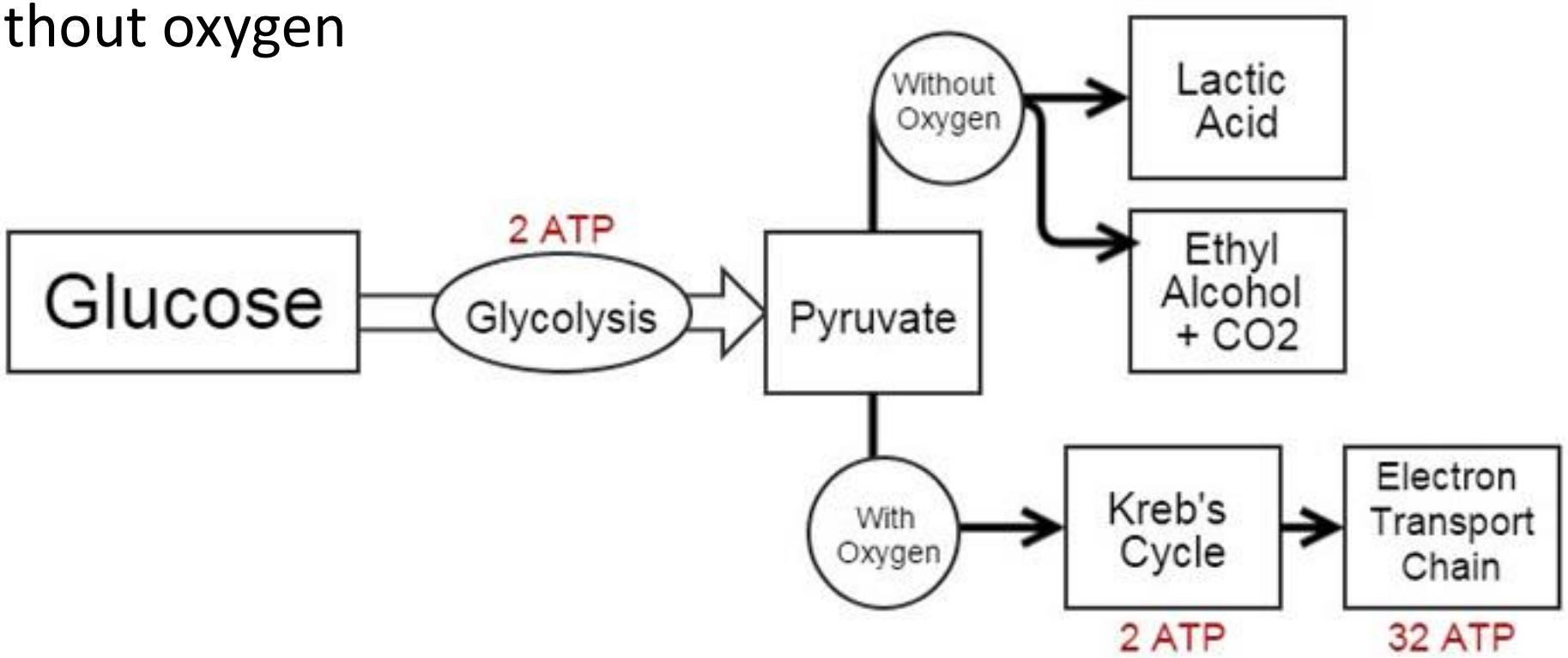
The Process of Cellular Respiration converts the energy in glucose into ATP for use by the cell



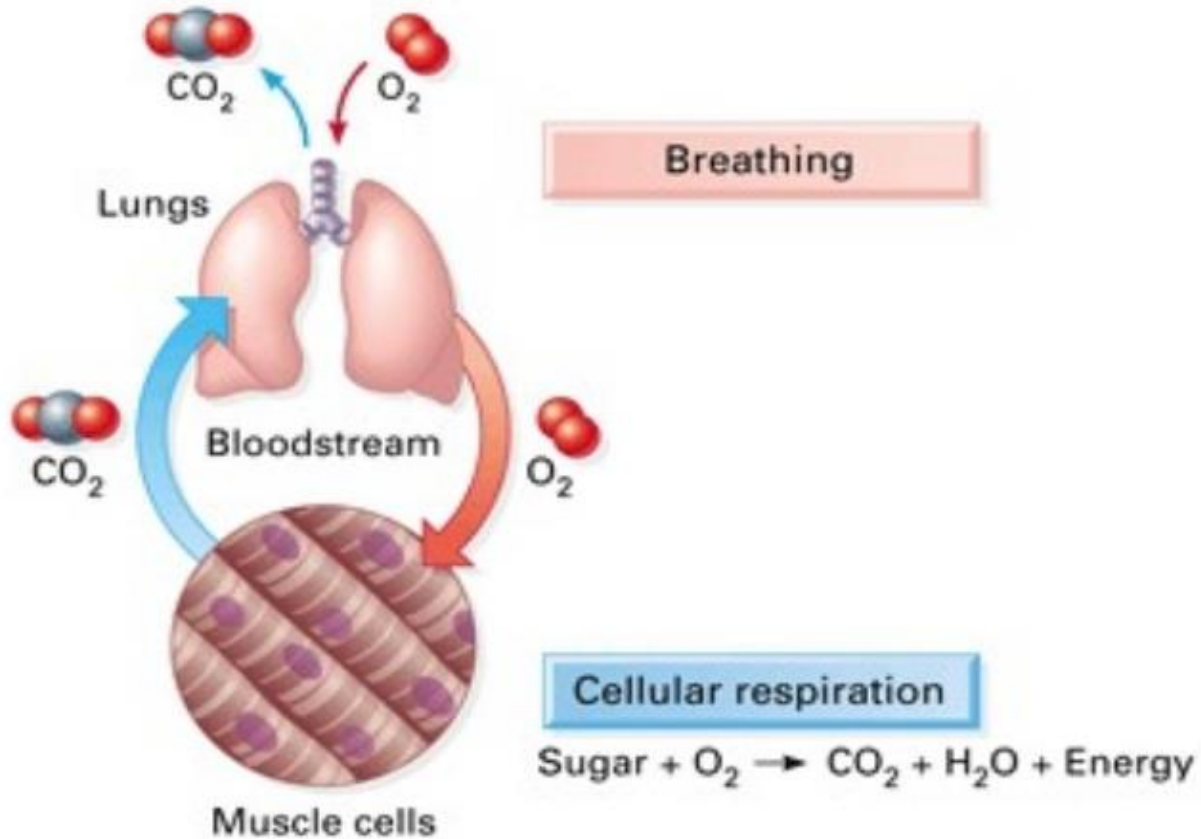
Cellular Respiration can occur with or without oxygen

1) Aerobic- with oxygen

2) Anaerobic- without oxygen

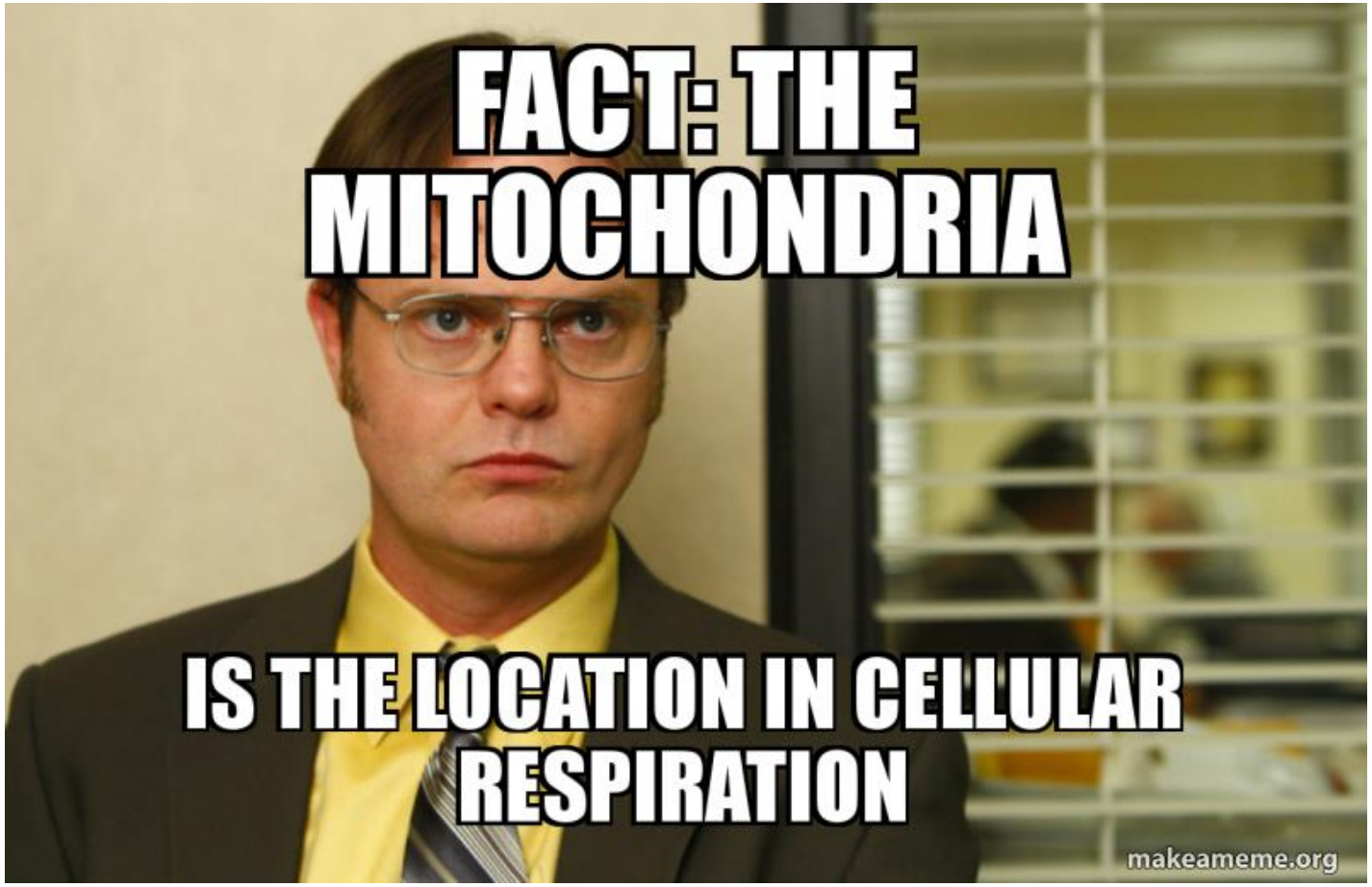


Complete Breakdown of Glucose is Aerobic

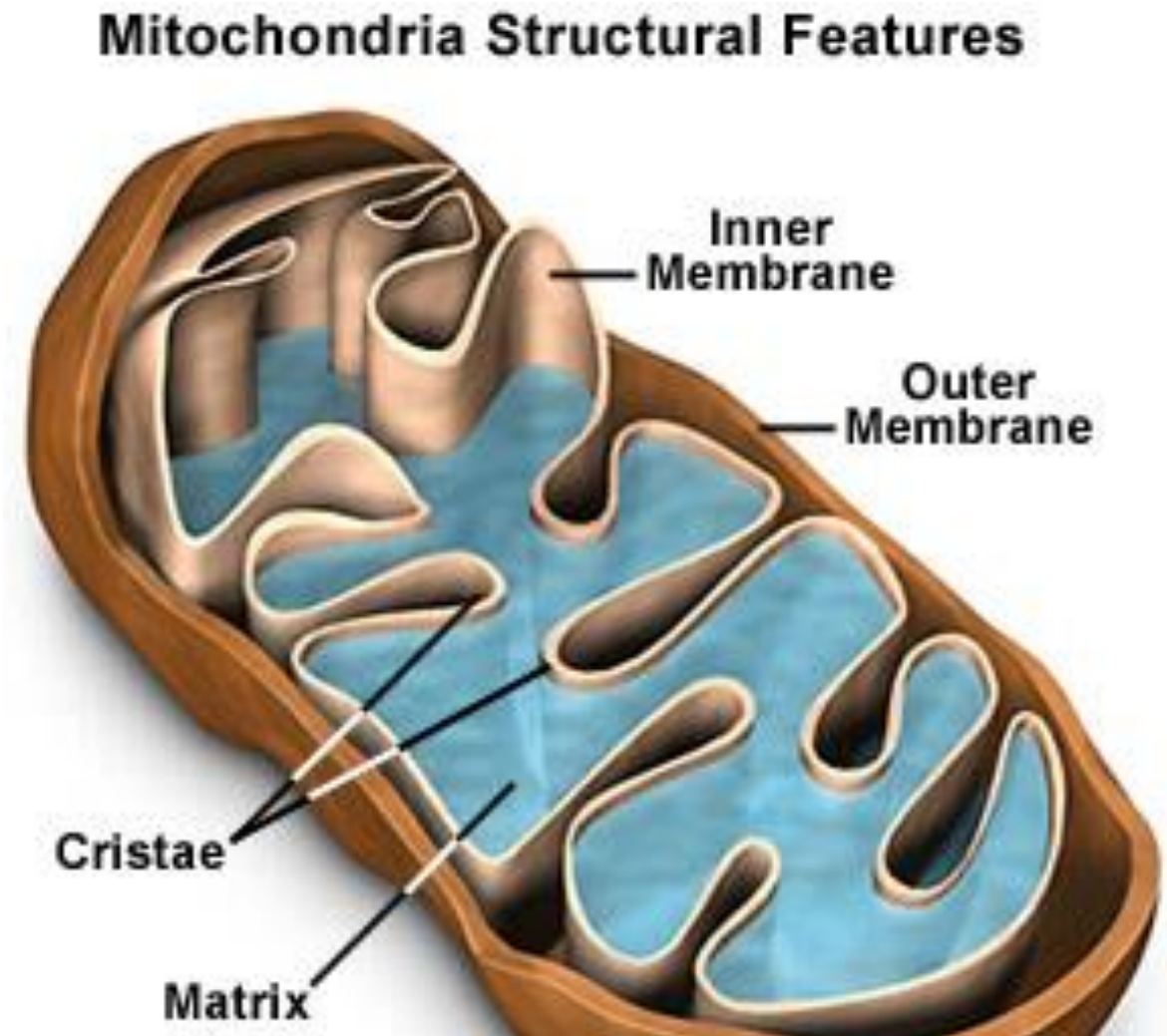


Produces 36-38 ATP per Glucose

Aerobic Cellular Respiration Occurs in the Mitochondria



Aerobic Cellular Respiration Occurs in the Mitochondria

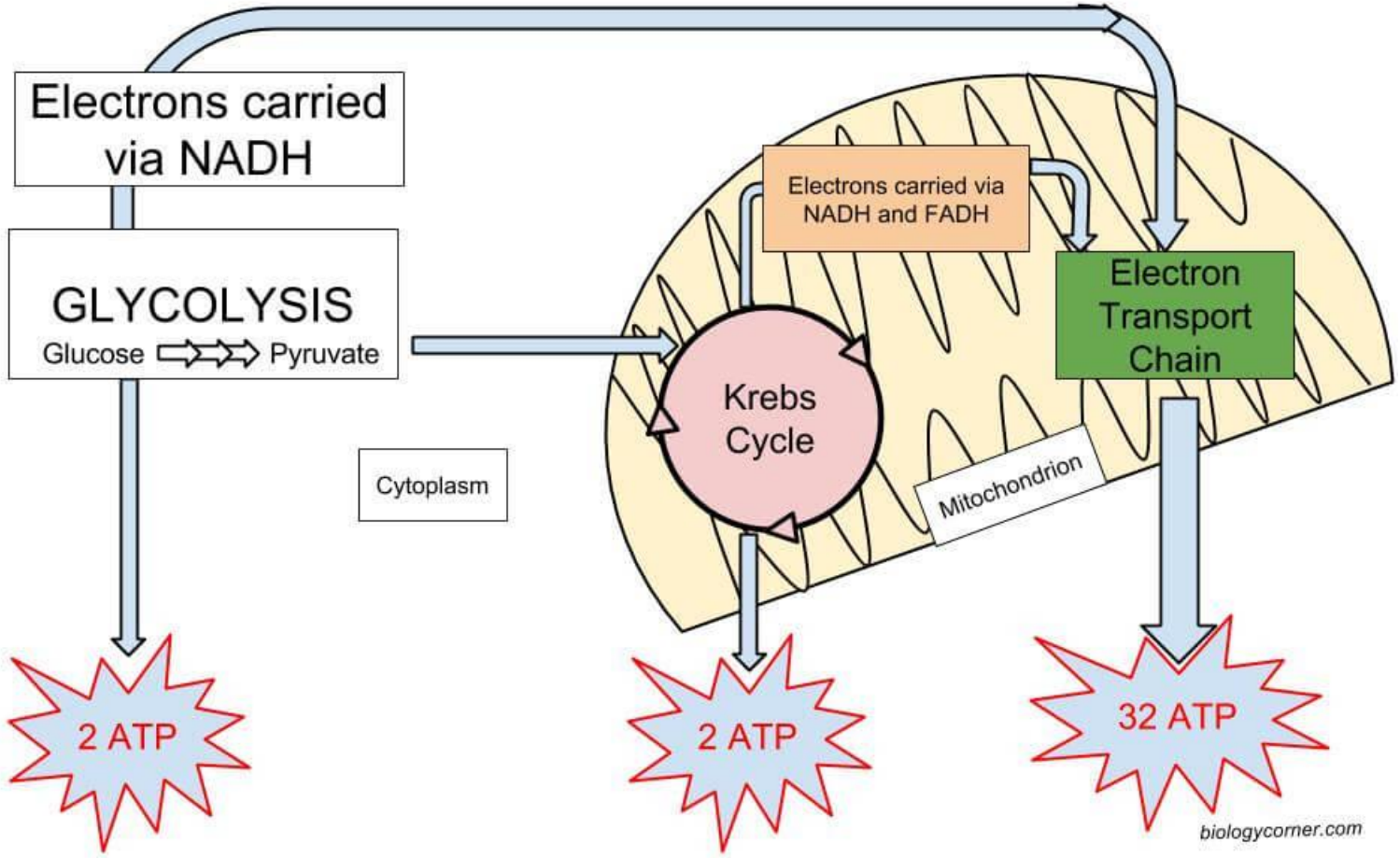


The 3 Main Stages of Aerobic Cellular Respiration

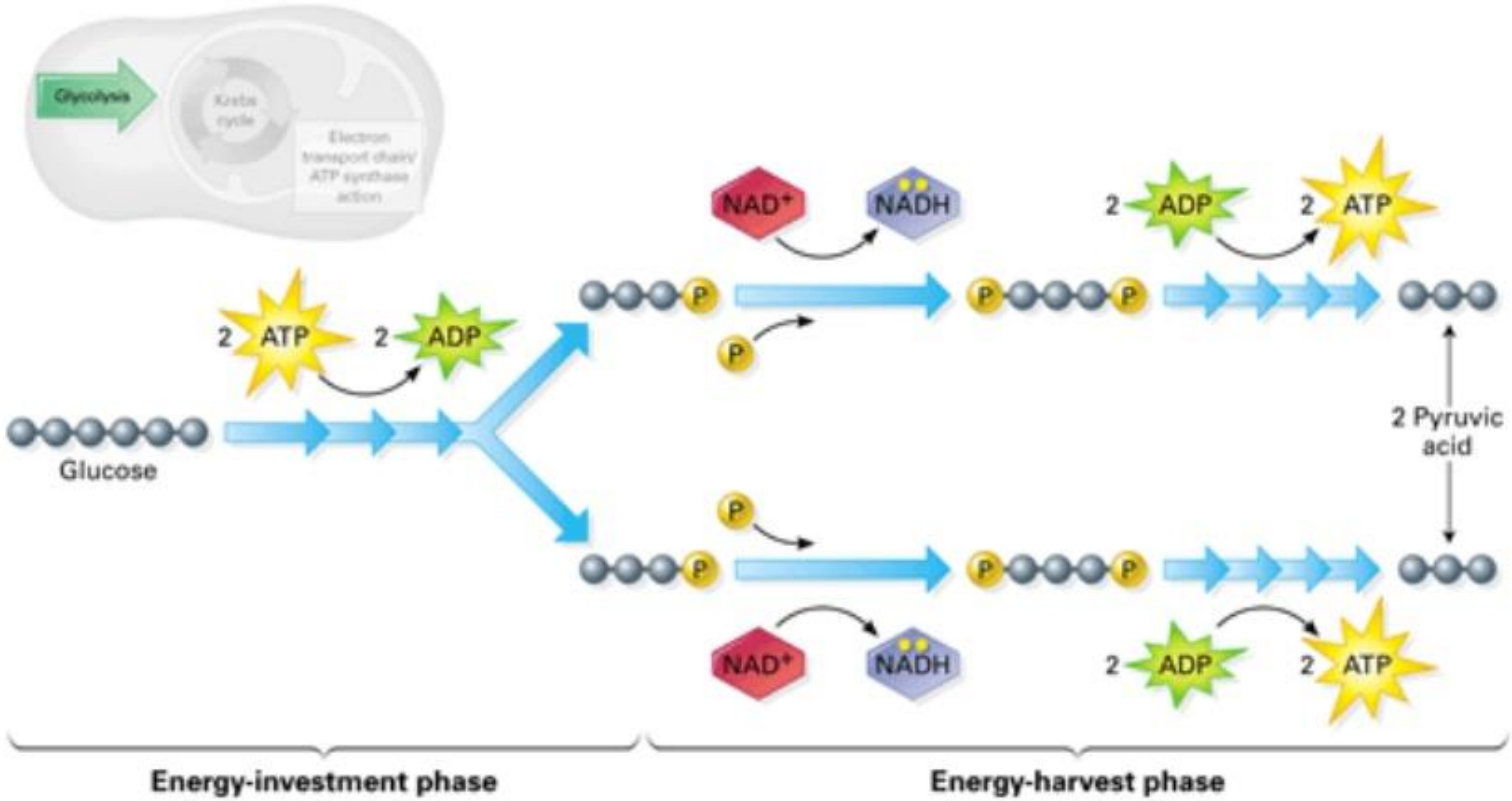
1) Glycolysis

2) Kreb's Cycle

3) Electron Transport Chain



Glycolysis



The "Glucose Splitting" reaction

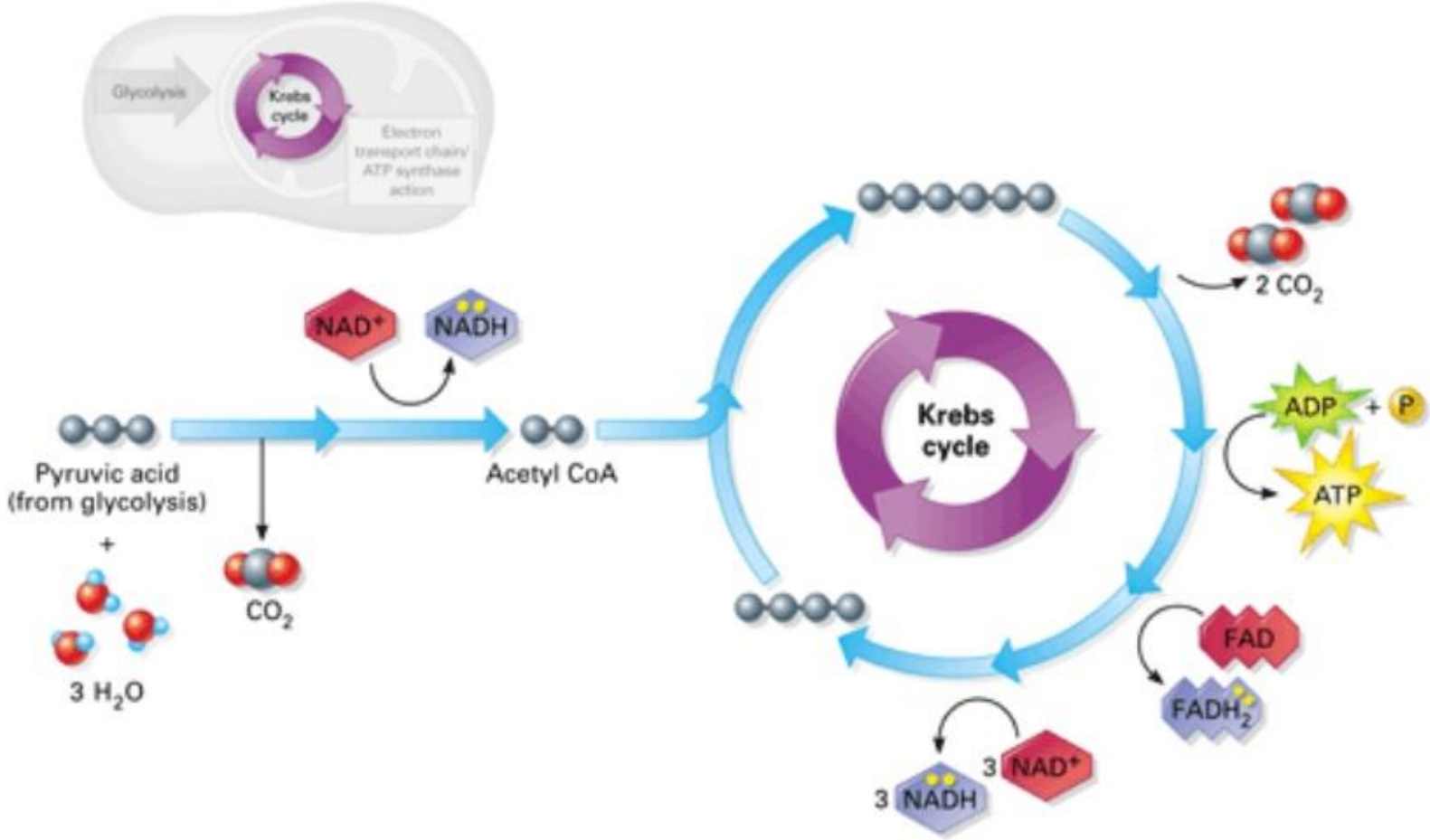
Glycolysis “Glucose Splitting”

https://www.youtube.com/watch?v=EfGlznwfu9U

- Main objective: splits glucose into pyruvic acid and makes ATP
- Location: cytoplasm
- Reactants: glucose, ADP
- Products: ATP and NADH

**Uses 2 ATPs but produces 4 ATP---- 2 net ATPs produced!!!

Intermediate Reactions

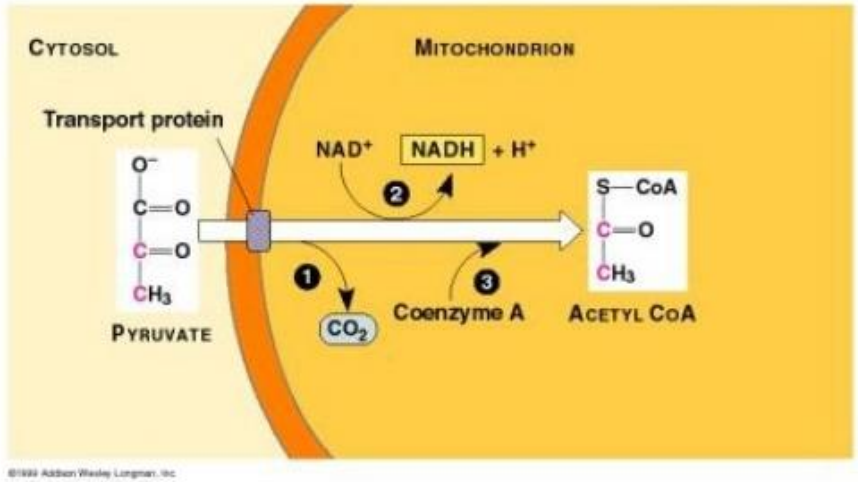


The Krebs Cycle

Intermediate Reaction

Converts pyruvate to Acetyl CoA

*** requires oxygen!



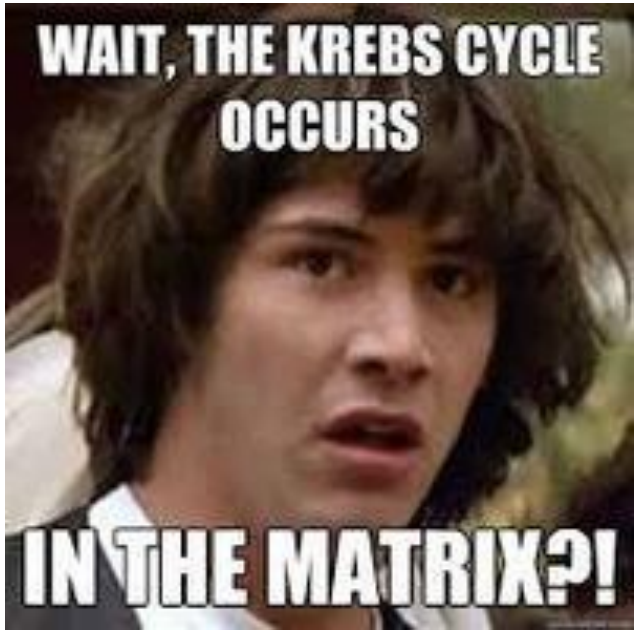
Pyruvate converted to Acetyl CoA (enters Krebs Cycle)

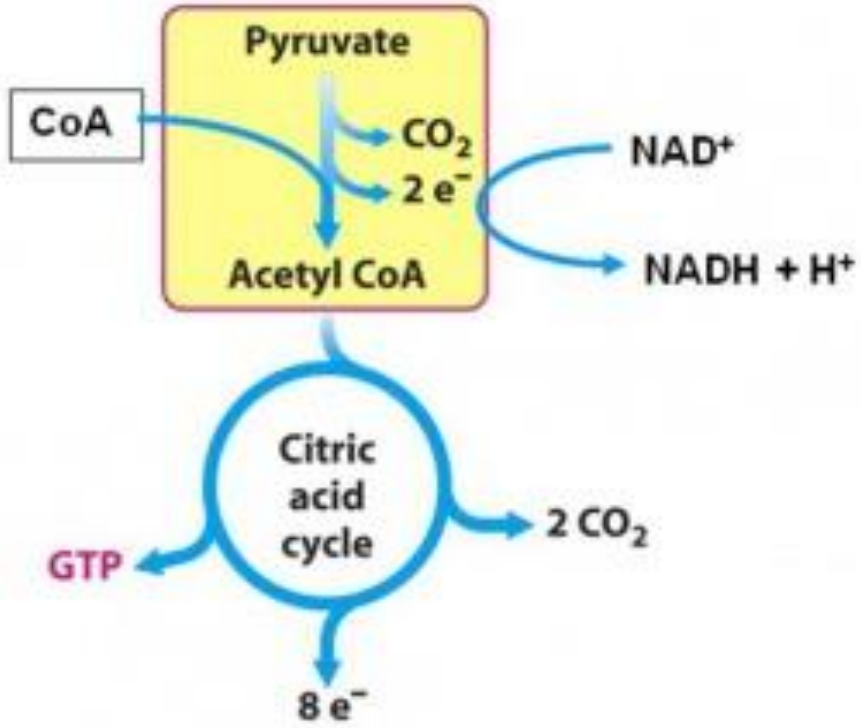
CO_2 is released

NAD^+ is reduced to NADH

Kreb's Cycle (AKA Citric Acid Cycle)

- Requires oxygen!
- Occurs in the matrix of the mitochondria
- Main objective: To make high energy molecules to send to the Electron Transport Chain





Kreb's Cycle

https://www.youtube.com/watch?v=0NdYYAE3Wd0

Location: mitochondria

Reactants:

Acetyl CoA

ADP+ P

NAD

FAD

Oxygen

Products:

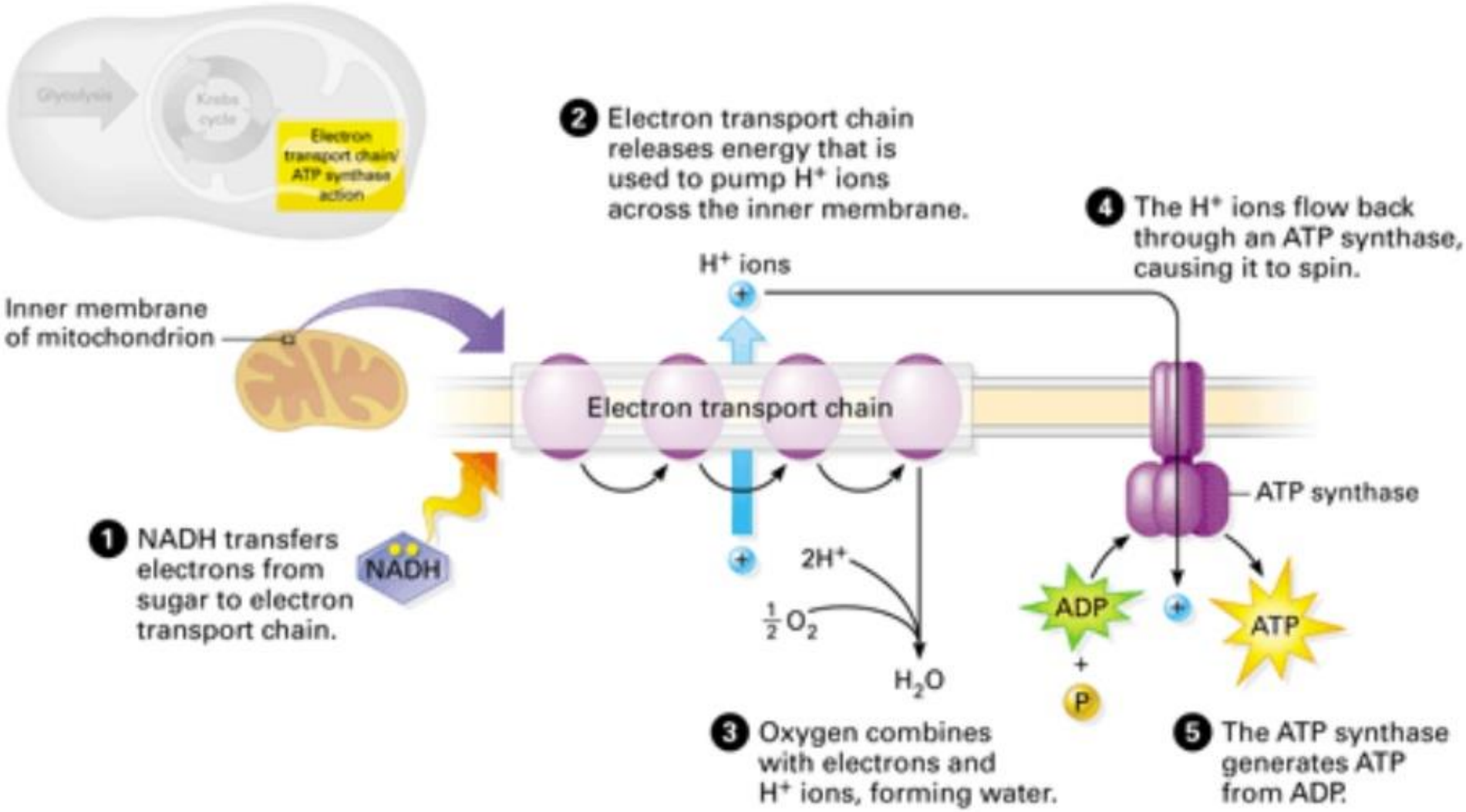
ATP

NADH- goes to ETC

FADH2-goes to ETC

**CO2- breathed out

The Electron Transport System



Electron Transport Chain (ETC)

Location: mitochondria

Main objective: To make lots of ATP

Reactants:

ADP+ P

NADH

FADH2

Oxygen

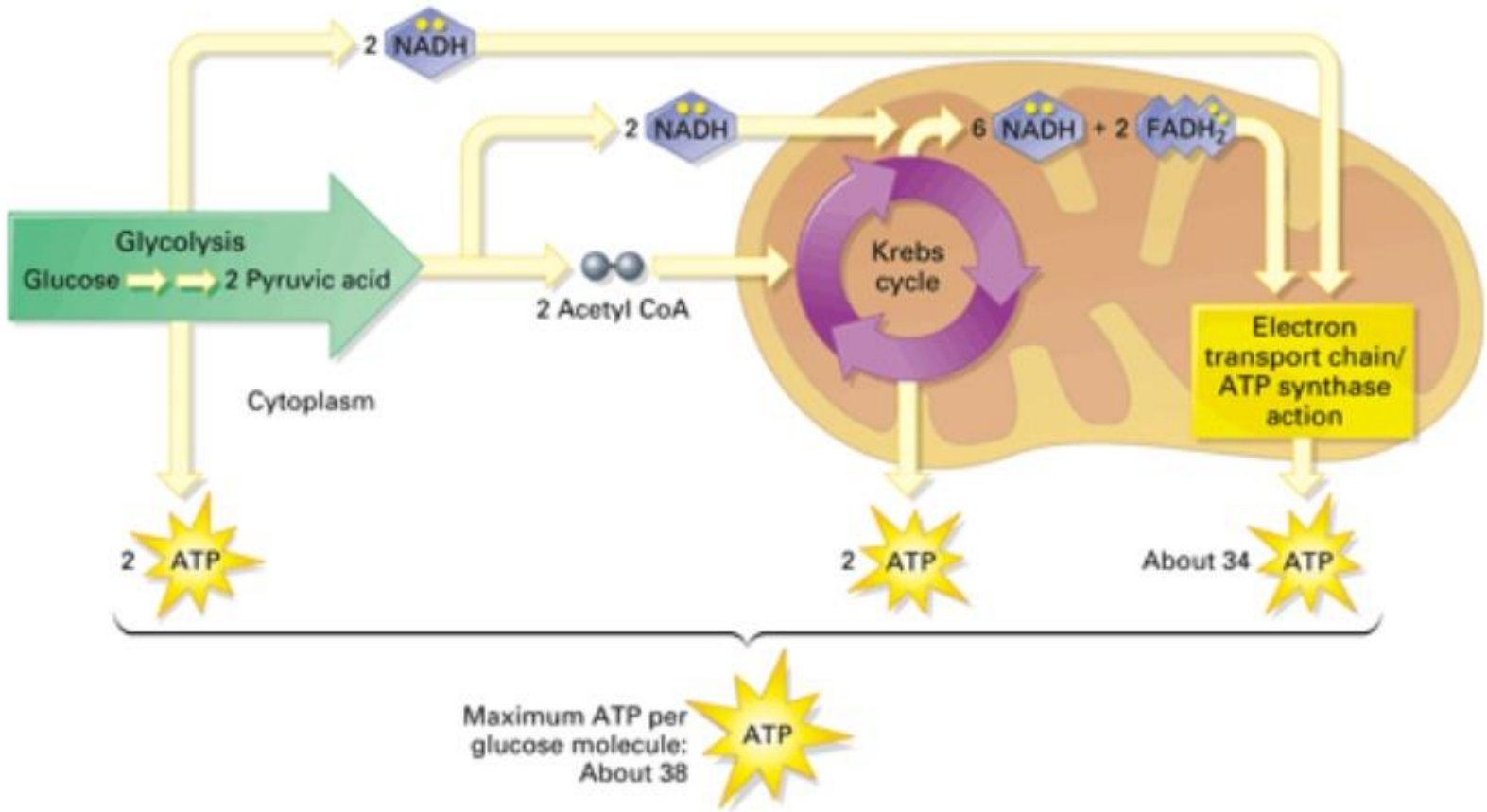
Products:

34 ATP!!!

NAD

FADH

Total ATP Production



ATP Totals

Stage	ATP Produced
Glycolysis	2
Kreb's Cycle	2
Electron Transport Chain	34

Review Videos

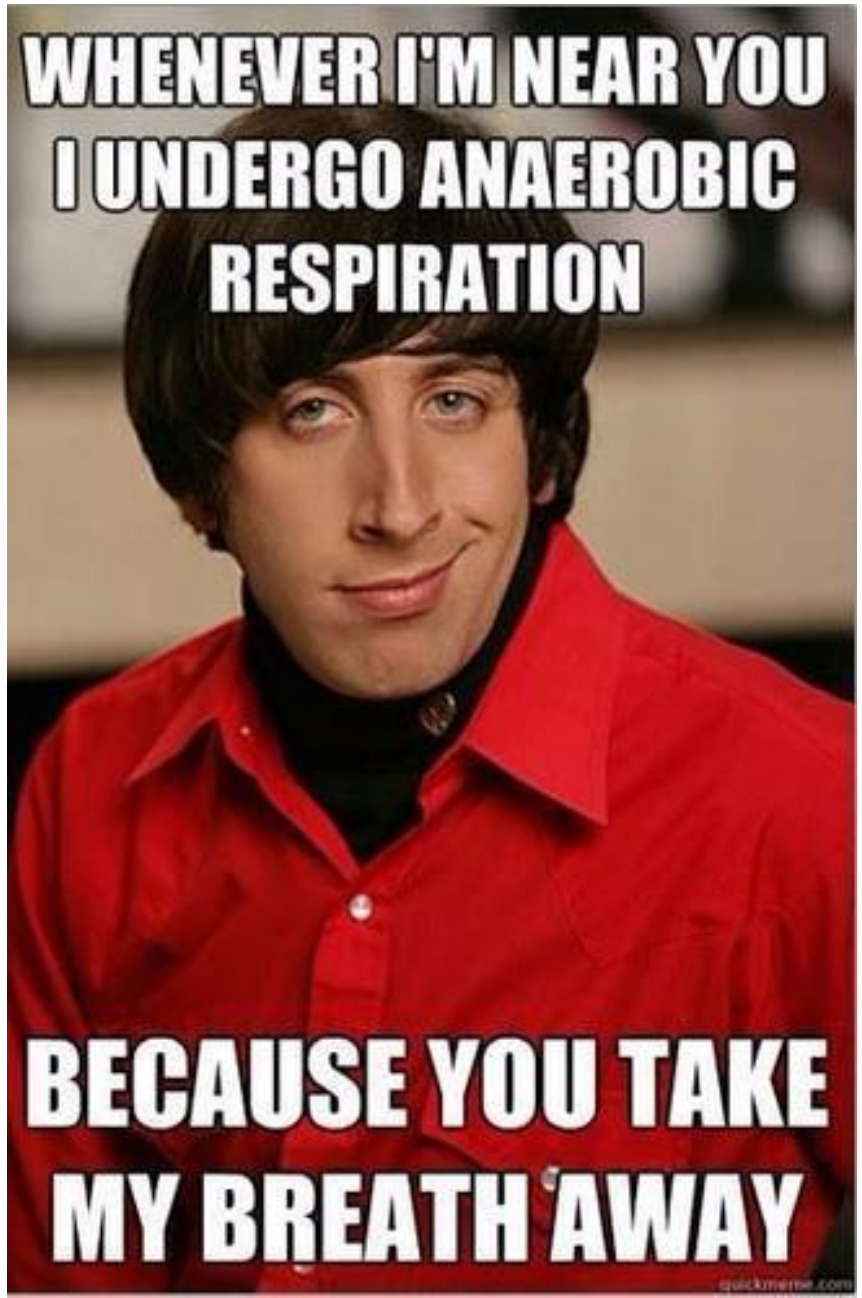
- https://www.youtube.com/watch?v=4Eo7JtRA7lg
- https://www.youtube.com/watch?v=7J4LXs-oDCU
-

Anaerobic Respiration

- Does not require oxygen
- Starts with Glycolysis!

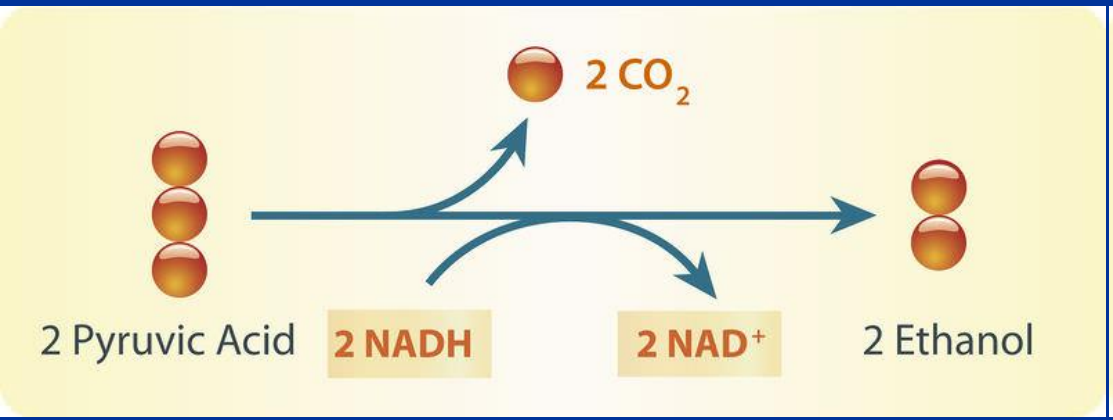
https://www.youtube.com/watch?v=YbdkbCU20_M

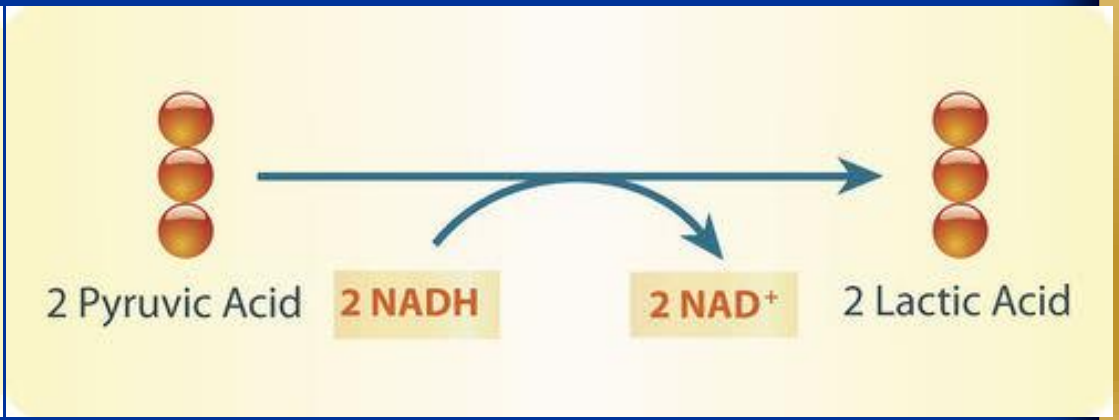
- After glycolysis, fermentation occurs to regenerate NAD+
  - Two Types
    - Lactic Acid Fermentation
    - Alcoholic Fermentation


WHENEVER I'M NEAR YOU
I UNDERGO ANAEROBIC
RESPIRATION
BECAUSE YOU TAKE
MY BREATH AWAY
quickmeme.com

Fermentation

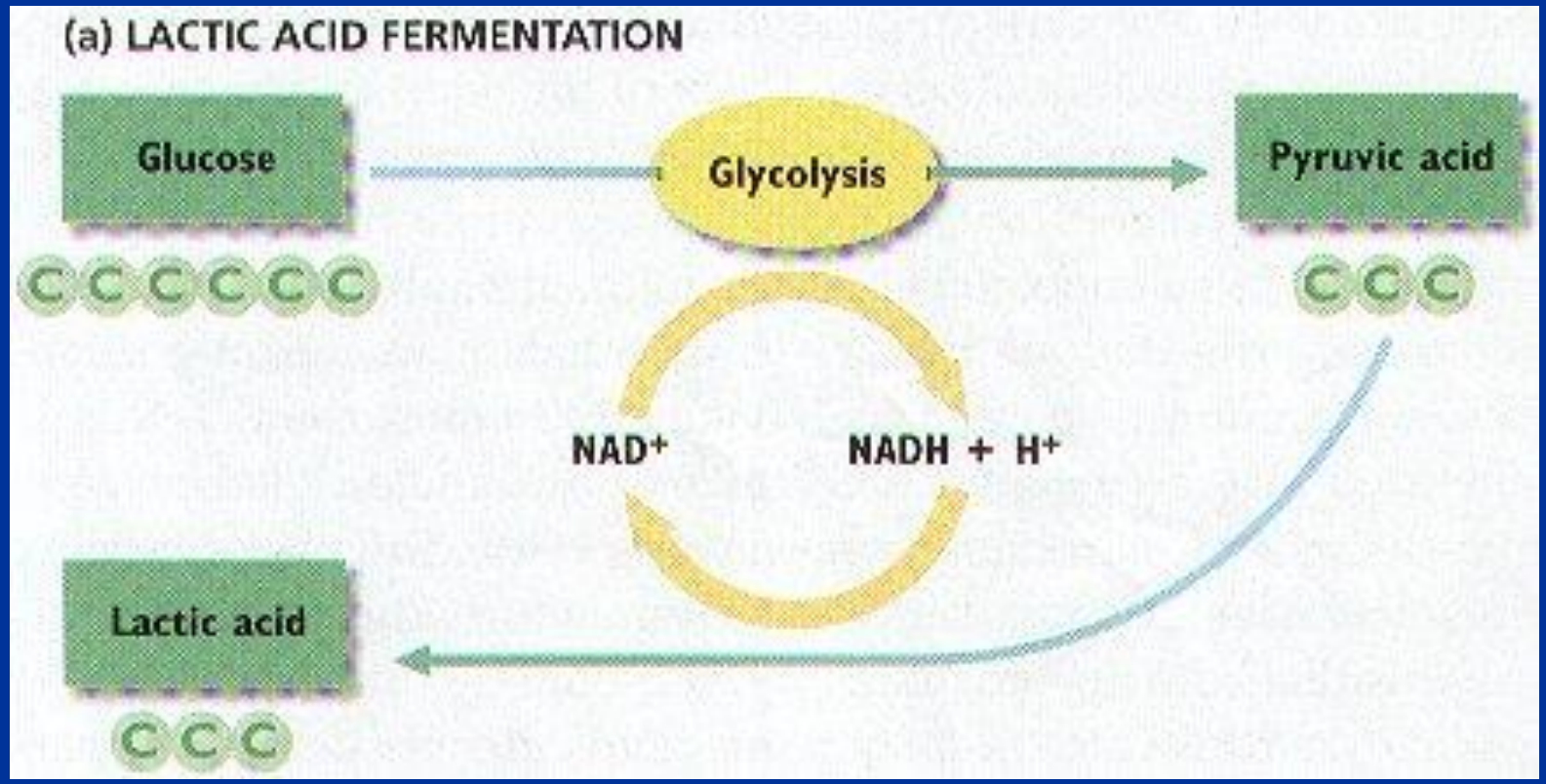
- After glycolysis, fermentation regenerates NAD+ to be used in another glycolysis cycle.





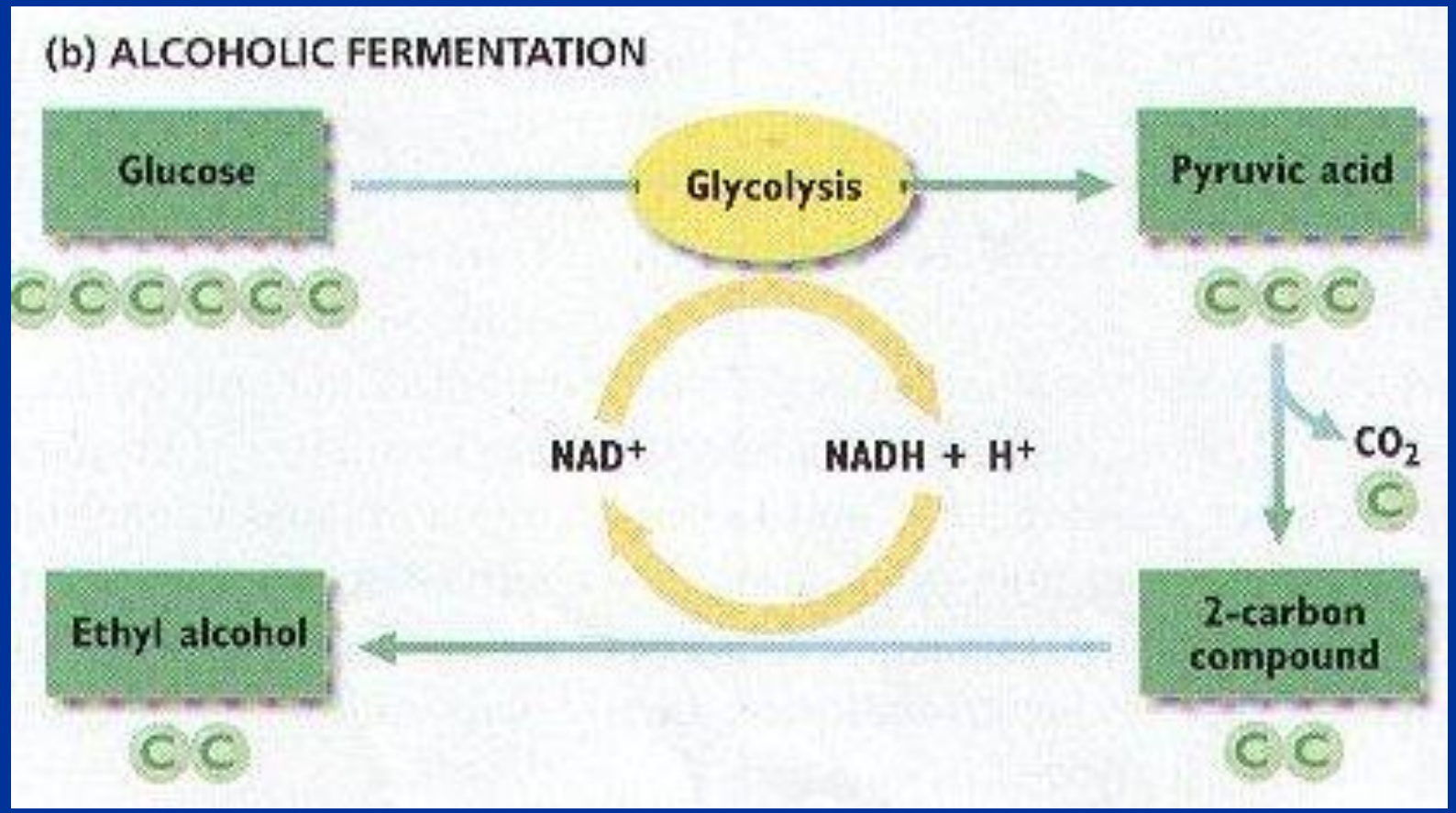
Lactic Acid Fermentation

- bacteria, plants and most animals
- Steps:
  - 1) Glycolysis
  - 2) Fermentation: pyruvate is broken down into lactic acid and NAD is produced
- Sometimes happens in your muscles, cramps----- Exercise


(a) LACTIC ACID FERMENTATION
Glucose
Glycolysis
Pyruvic acid
C C C C C C
C C C
NAD+
NADH + H+
Lactic acid
C C C

Alcoholic Fermentation

- Bacteria and fungi (yeast)
- Steps:
  - 1) Glycolysis
  - 2) Fermentation: pyruvate is broken down into ethyl alcohol and CO_2 and NAD is produced
- Main byproduct: Alcohol
  - Process used to form beer, wine, and other alcoholic beverages
- Also used to raise dough, bread


(b) ALCOHOLIC FERMENTATION
Glucose
Glycolysis
Pyruvic acid
NAD+
NADH + H+
CO2
Ethyl alcohol
2-carbon compound