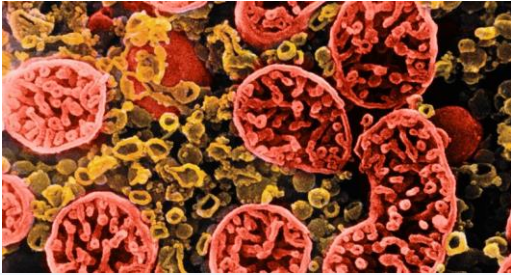


Cellular Respiration



Aerobic Cellular Respiration

Cellular respiration is a process of energy conversion that releases energy from food in the presence of oxygen.



Aerobic Cellular Respiration

The chemical summary of cellular respiration is:

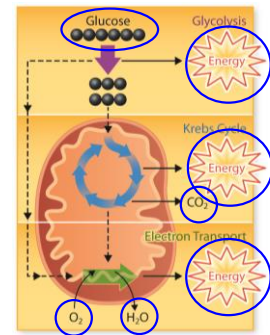
Oxygen + Glucose → Carbon Dioxide + Water + Energy

What does the equation look like expressed in symbols?



Stages of Aerobic Cellular Respiration

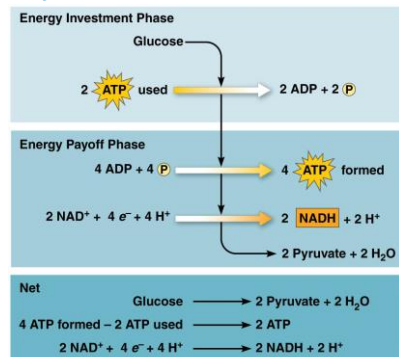
- Glycolysis
- Krebs cycle
- Electron transport



Stage 1: Glycolysis

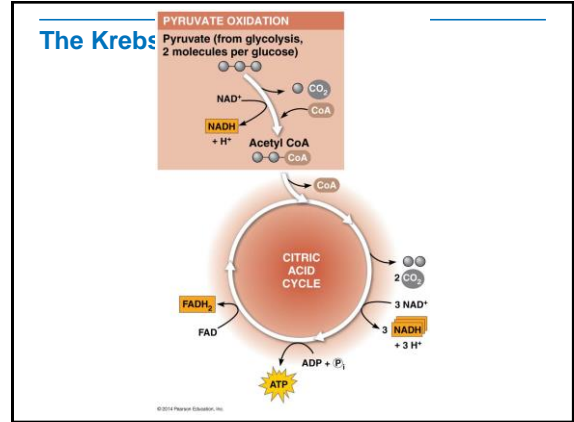
- Glucose first enters a chemical pathway known as glycolysis. A small amount of energy is captured to produce ATP.
- Glucose is split to form 2 pyruvic acid (pyruvate).

Glycolysis: ATP and NADH Production



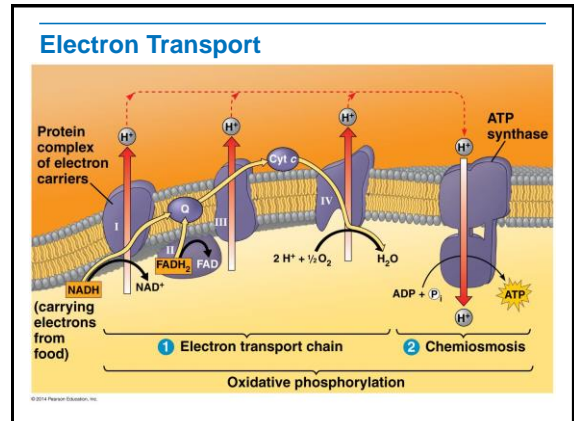
Stage 2: Krebs Cycle

- Pyruvic acid from glycolysis is broken down into carbon dioxide in a series of energy-extracting reactions.
- Pyruvic acid is used to make NADH, ATP, and FADH₂, with carbon dioxide as a by-product.



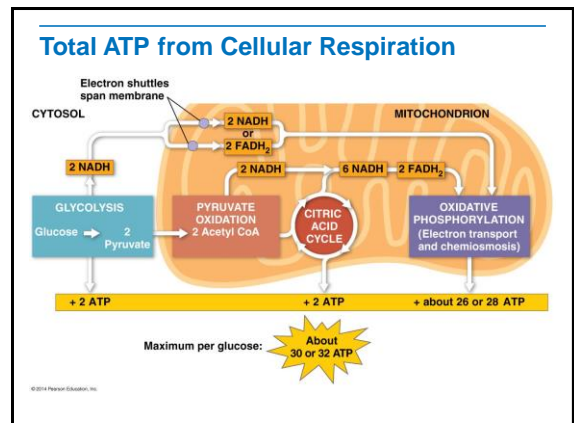
Stage 3: Electron Transport

- Electron transport uses the high-energy electrons from glycolysis and the Krebs cycle to synthesize ATP from ADP.
- Electron transport chain is composed of a series of electron carriers located in the inner membrane of the mitochondrion.



What about oxygen?

- Oxygen is the final electron acceptor
- Without oxygen to accept the electrons, the process stops



What if there is no oxygen?

- Aerobic = with oxygen
- Anaerobic = without oxygen
 - Glycolysis is an anaerobic process
 - But, the cell will eventually run out of NAD⁺ and the process will have to stop

UNLESS

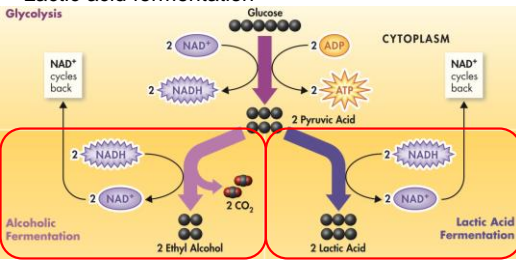
Fermentation

- Produces no ATP
- Allows glycolysis to continue (which produces 2 ATP)

Fermentation

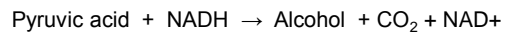
There are two slightly different forms of the process:

- Alcoholic fermentation
- Lactic acid fermentation



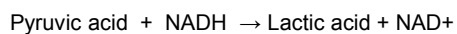
Alcoholic Fermentation

Yeasts and a few other microorganisms use alcoholic fermentation, which produces ethyl alcohol and carbon dioxide.



Lactic Acid Fermentation

Most organisms carry out fermentation using a chemical reaction that converts pyruvic acid to lactic acid.



Quick Energy

For short, quick bursts of energy, the body uses ATP already in muscles as well as ATP made by lactic acid fermentation.



Long-Term Energy

For exercise longer than about 90 seconds, cellular respiration is the only way to continue generating a supply of ATP.

