

Steps of Cellular Aerobic Respiration

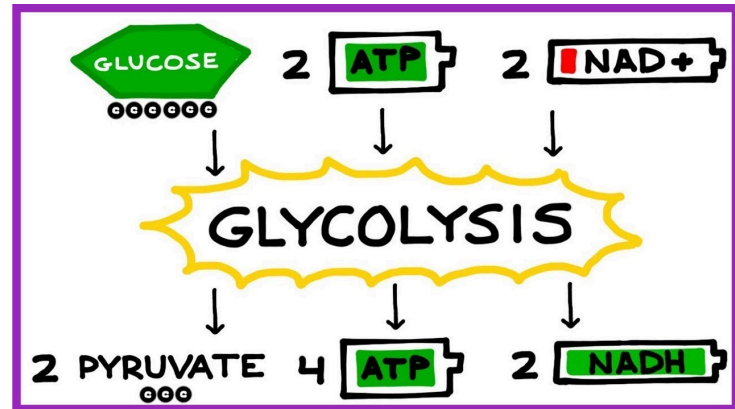
1. Glycolysis

- Happens in the cytoplasm
- Does not require O₂ (Oxygen Gas)

- ☐ Glycolysis begins when glucose enters the cell through diffusion or endocytosis
- ☐ Glucose is broken down into 2 pyruvic acids (3 carbon molecules)
- ☐ The energy needed to break glucose comes from 2 ATP molecules (YOU NEED TO SPEND IT TO MAKE IT!)

When 2 ATP molecules are spent to break glucose, the energy is released from the bond breaking is then used to create 4 ATP molecules.

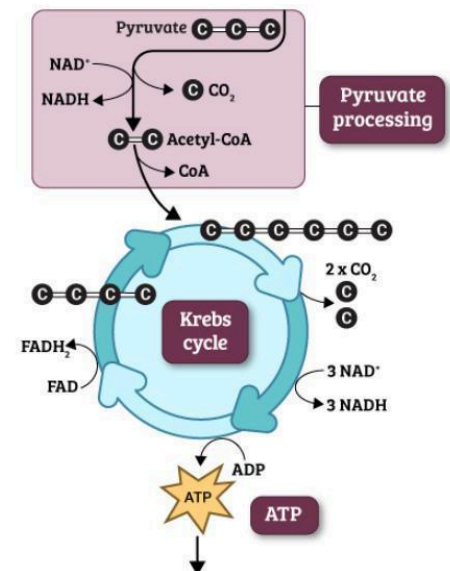
- ☐ The high energy electrons from this reaction are carried by NADH⁺ (NAD becomes NADH⁺ as it carries the electrons)
- The electron carrier NADH⁺ goes to the mitochondria where it will be used in the ETC (electron transport chain)



2. Kreb's Cycle

- Happens in the matrix of the mitochondria (the most central part)
- Require O₂ (Oxygen gas)

- ☐ Pyruvic acid dissolves into carbon dioxide and acetyl coA (a 2 carbon sugar) when entering the mitochondria
- ☐ Acetyl CoA (2 carbon sugar) is joined to a 4 carbon sugar (oxaloacetate)
- ☐ After the acetyl-coA joins the 4 carbon acceptor compound (oxaloacetate) it forms a 6 carbon compound. Citrate.
- ☐ Citrate has its carbons stripped from it until it is recycled into the oxaloacetate molecule from a previous step
- ☐ The energy released from stripping off the carbon is used to form ATP (*The Krebs Cycle turns twice during one Cycle of Respiration)
- ☐ As the Krebs Cycle turns, NAD becomes NADH and FAD becomes FADH₂



3. Electron Transport Chain

- Happens in the inner membrane of the mitochondria
 - ☐ NADH⁺ and FADH₂ are reduced and release the H⁺ ions
 - ☐ As they are reduced they release the high energy electrons they have been carrying
 - ☐ H⁺ ions are pushed into the inner membrane creating a high concentration
 - ☐ These electrons bounce between proteins in the inner membrane like hot potatoes.
 - ☐ H⁺ ions diffuse from high to low concentration by diffusion through ATP Synthase (The membrane is not permeable to ions so this is the only place ions can escape)
 - ☐ As the H⁺ ions diffuse through ATP Synthase, it spins turning ADP into ATP.
 - ☐ ATP Synthase creates ATP
 - ☐ Oxygen diffuses into the cell and into the mitochondria
 - ☐ Electrons are pulled to O₂ (oxygen) and join it to H⁺ ions
 - *Oxygen is an Electron Acceptor
 - ☐ Water is formed

