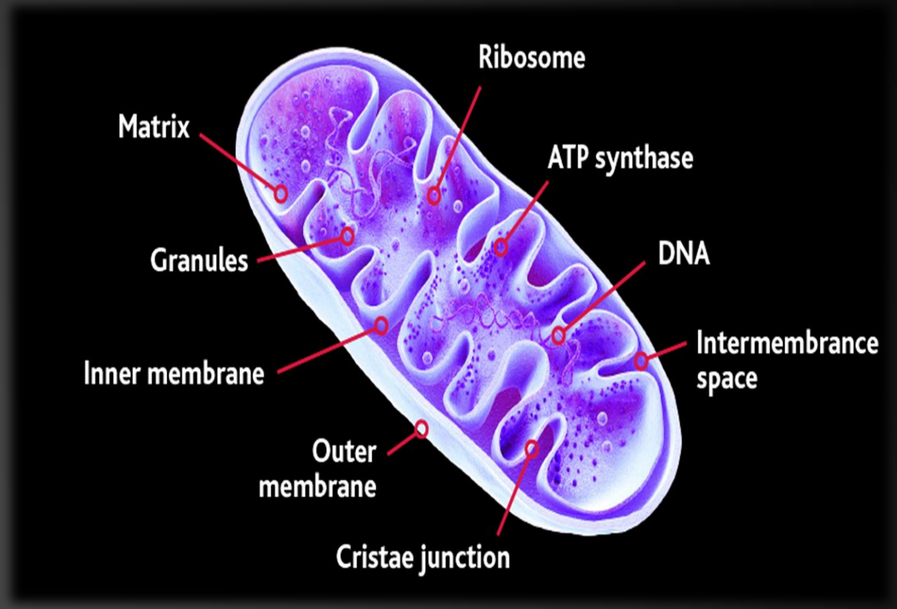
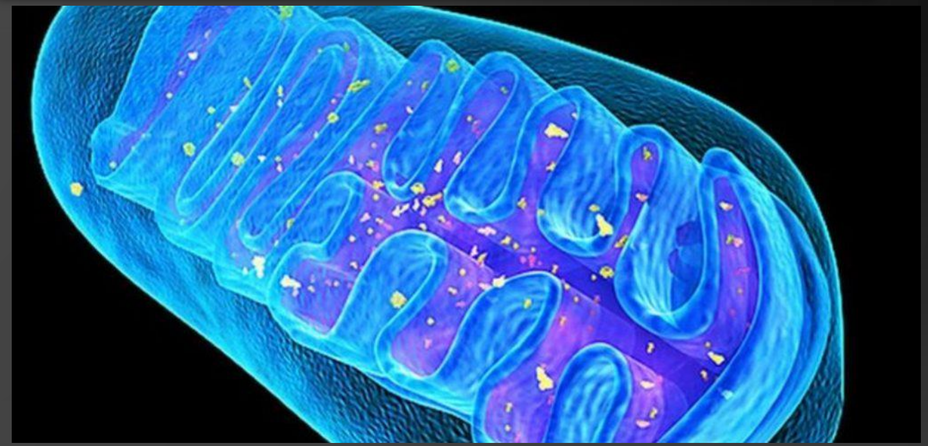




MITOCHONDRIA

DR ZAID O IBRAHEEM, BAGHDAD, IRAQ



MITOCHONDRIA

- Mitochondria (power house) is A double membrane bounded small organelles measure about 0.75-3 μm in diameter.

Mitochondrial content

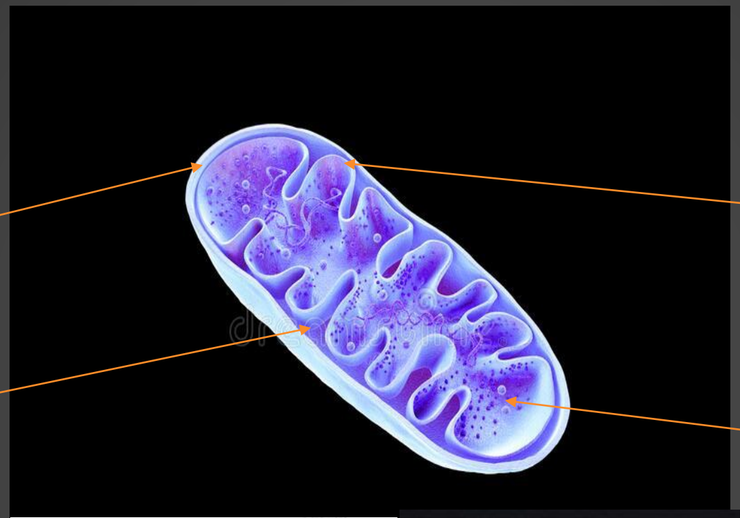
- Mitochondrial outer membrane

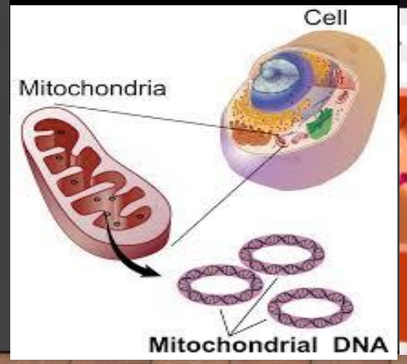
Intermembrane space

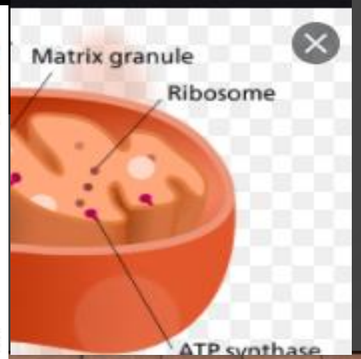
the sapece between the inner and outer mitochondrial membranes.

- Mitochnodrial DNA

Mitochondrial DNA is a circular thread of DNA. Similar to the protozoal DNA. It codes for proteins that mitochondria require to perfrm its function.







Mitochondrial content

Mitochondrial inner membrane

Forms a number of inward folds called cristea

- Mitochnodrial matrix

A semifluid structure fill the inner space of the mitochondria and is rich in the enzymes that perform the mitochondrial functions

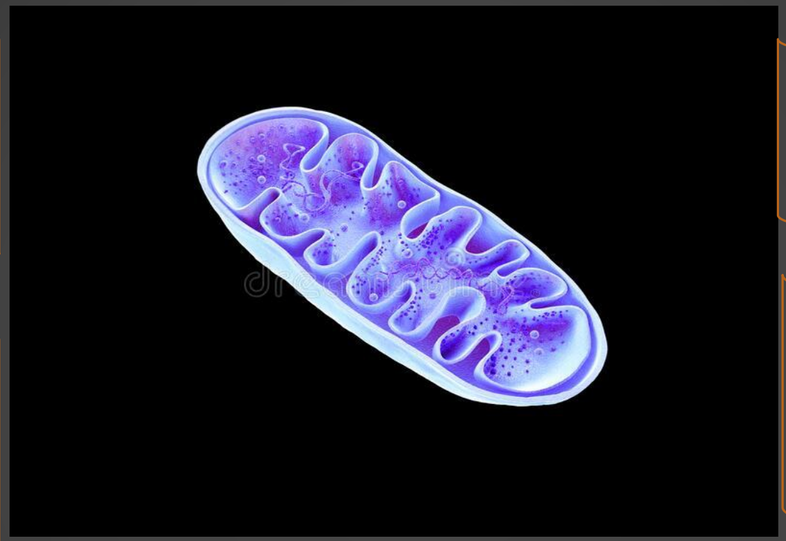
- Mitochnodrial ribosomes :-

Factories of mitochondrial proteins and enzymes

MITOCHONDRIA FUNCTION

THERMOGENESIS

- SYNTHESIS OF AMINO ACIDS (NON ESSENTIAL)



BREAK DOWN OF FATS (OXIDATION OF FATTY ACIDS)

- EAROBIC OXIDATION AND ATP PRODUCTION

SYNTHESIS OF MITOCHONDRIAL PROTEINS

GLUCOSE CATABOLISM PATHWAY

Glycolysis (break down of one glucose to 2 pyruvic acid molecules) occurs in the cytoplasm.

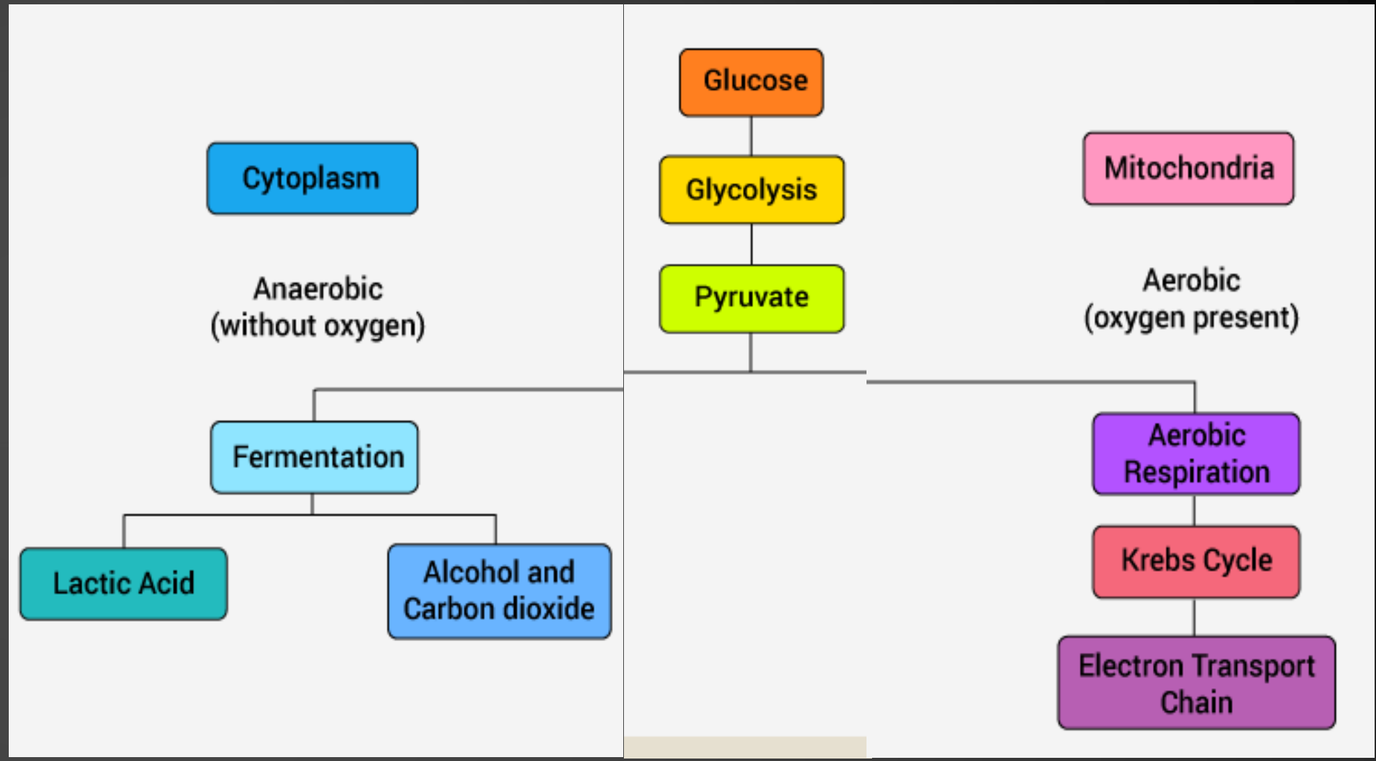
Pyruvic acid either goes to the

anaerobic pathway (inside the cytosol)

Aerobic (mitochondrial)

The aerobic pathway involves Kerb's cycle and the electron transport chain

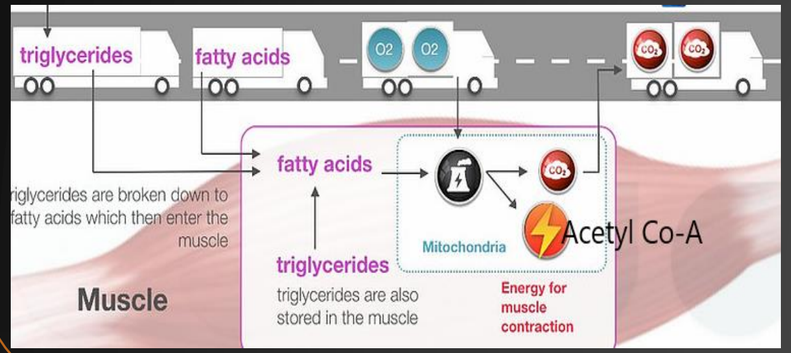
Vitamin B1 is required for pyruvic acid entry into the citiric acid cycle.



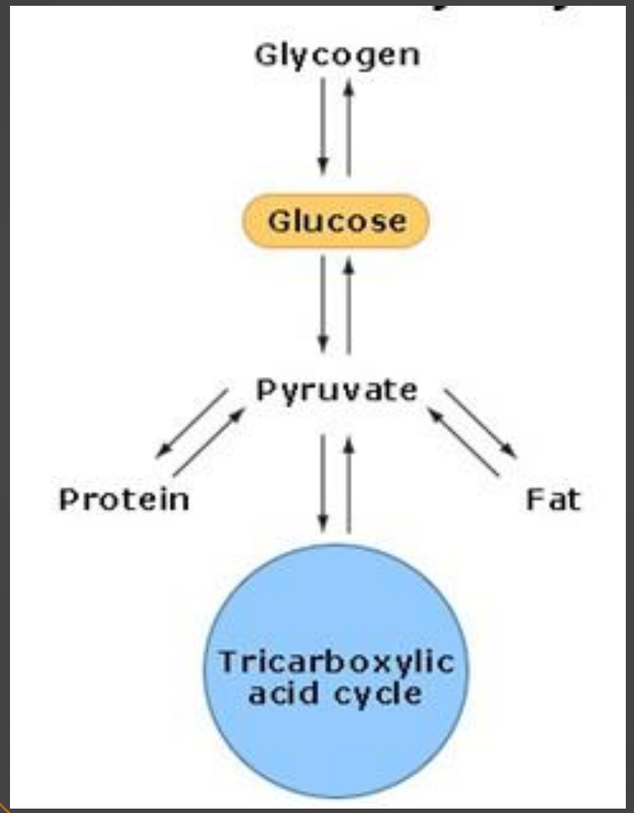
Earobic oxidation

Food procession in the presence of oxygen

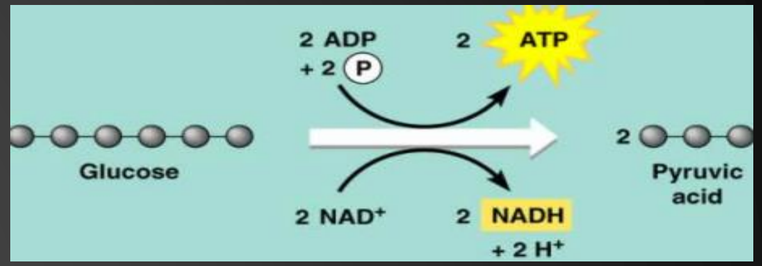
- Triglycerides release fatty acids outside the mitochondria
- Inside the mitochondria, fatty acids are broken down to pyrovate and acetyl coA



Some amino acids are consumed to produce intermediates of the cycle and others are produced.



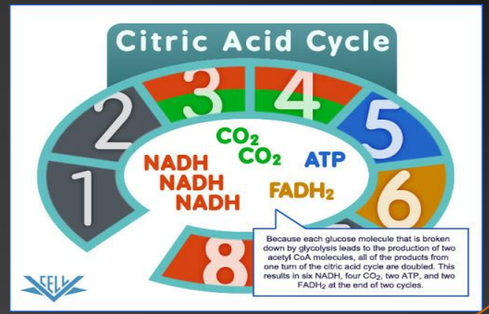
Glycolysis breaks down the endogenous or exogenous glucose into pyrovic acid



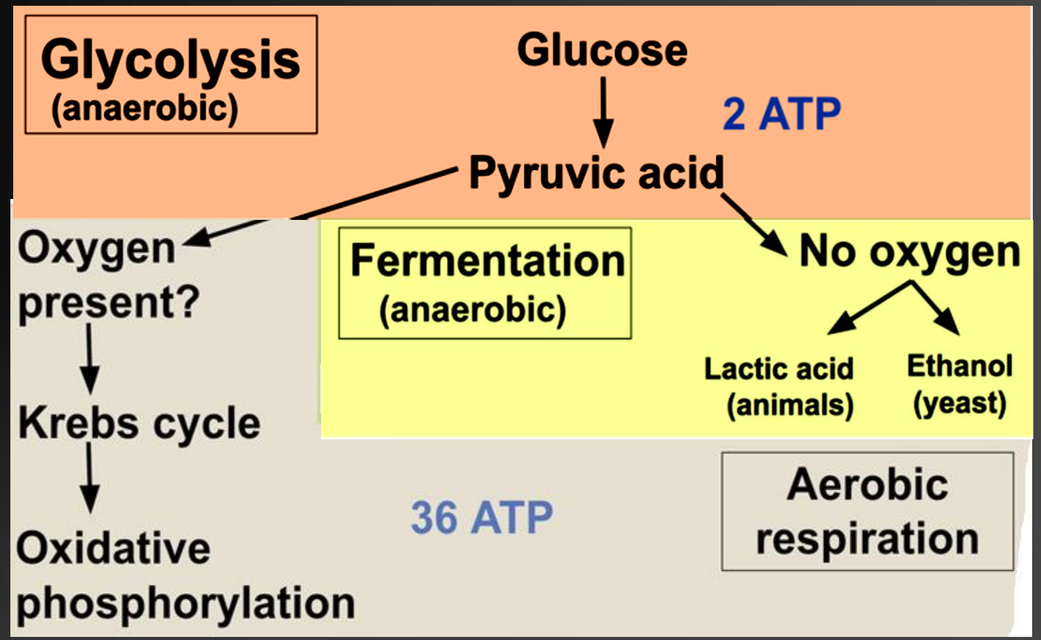
First the body consumes glucose till its level decline to normal value. Then it starts fats burning

Citric acid cycle is a sequence of dehydrogenation and oxidation processes that ends up with ATP production

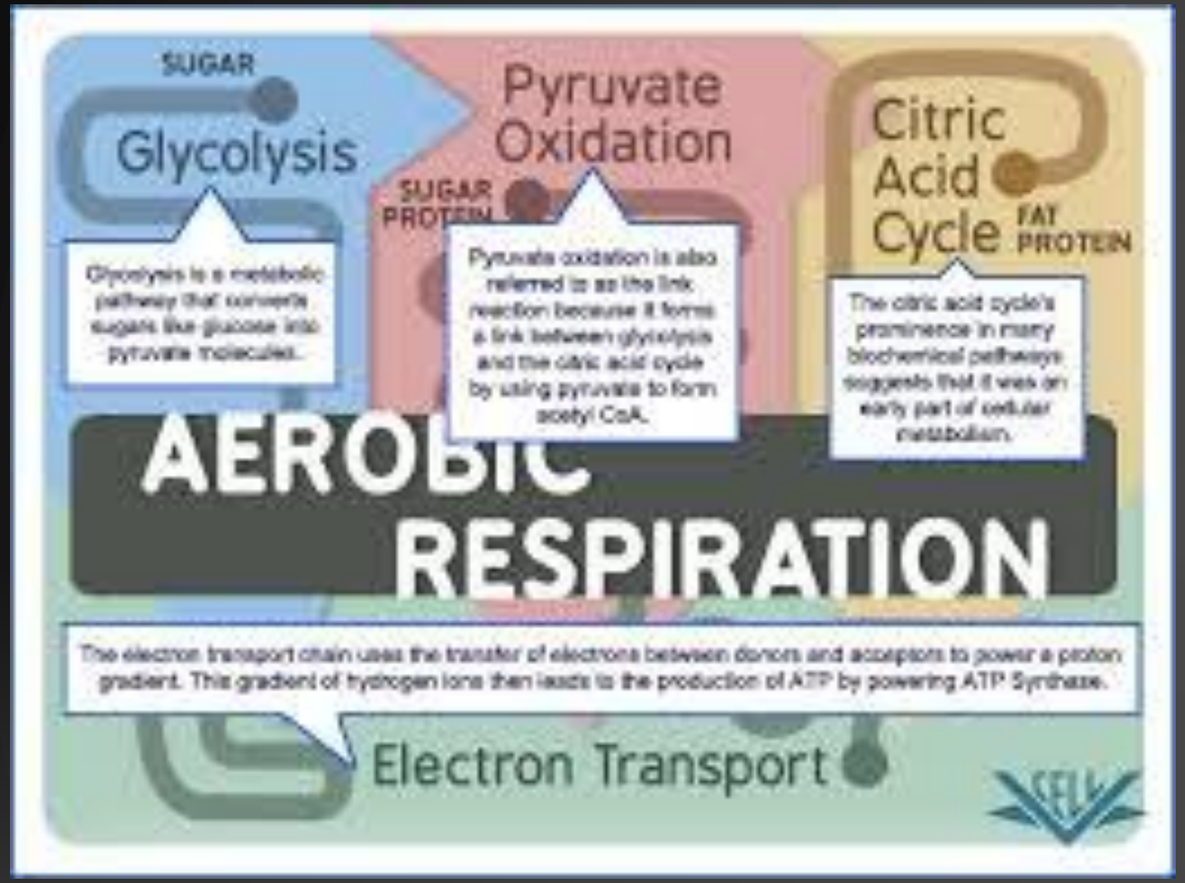
and shuffling of electrons to oxygen to produce water

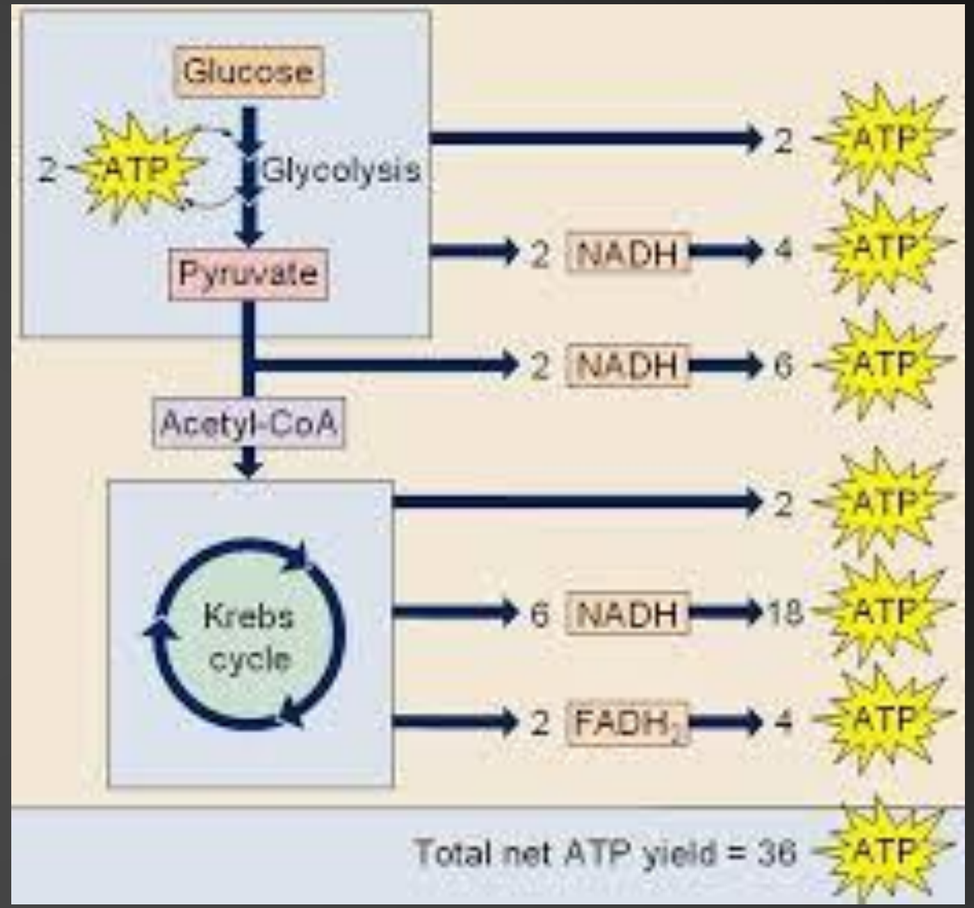


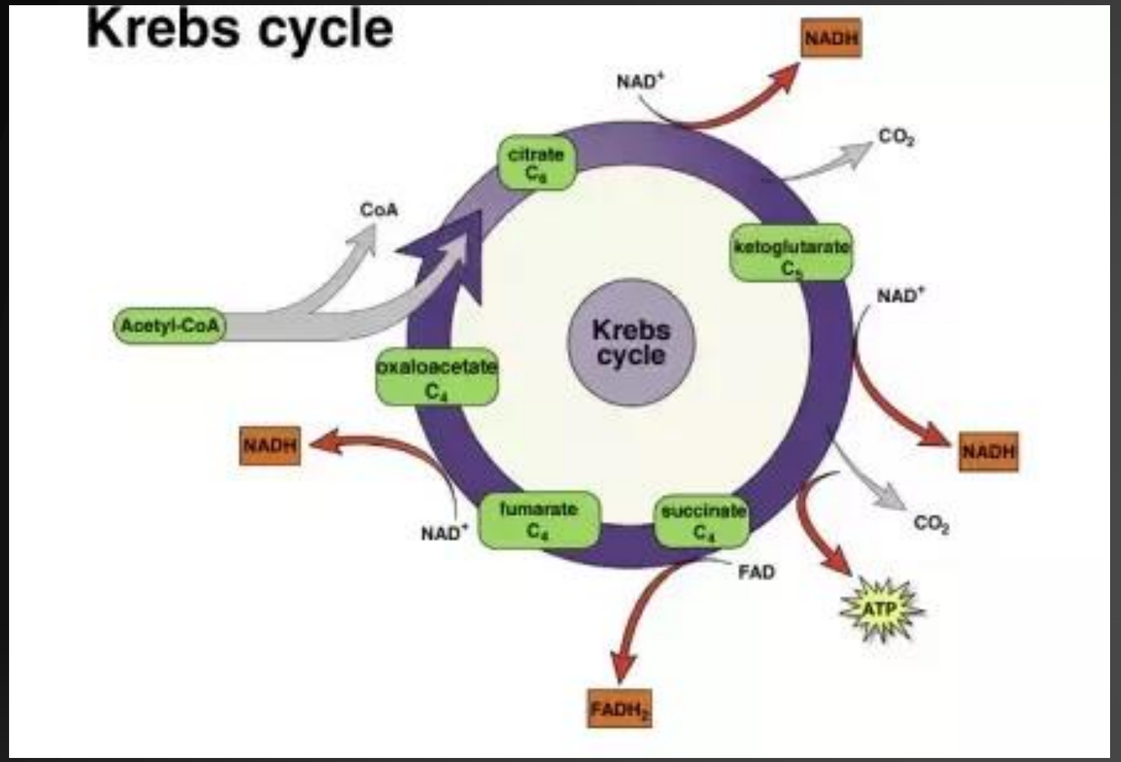
AEROBIC AND ANAEROBIC FERMENTATION



	AEROBIC FERMENTATION	-ANEAROBIC FERMENTATION
Site	**_ Takes place inside the mitochondria**	**-Occurs in the cytosol outside the mitochondria**
Oxygen requirement	Requires oxygen and good mitochondrial function to proceed	-Occurs in case of oxygen deficiency or mitochondrial dysfunction
Pyrovic acid	Pyrovic acid transforms into acety CoA to enter the citric acid cycle	-Pyrivic acid transforms into ethanol in yests and bacteria or lactic acid in mammals
ATP	36 ATP molecule is produced by each glucose	-2 ATP molecules are produced by one glucose


SUGAR
Glycolysis
Glycolysis is a metabolic pathway that converts sugars like glucose into pyruvate molecules.
Pyruvate Oxidation
SUGAR
PROTEIN
Pyruvate oxidation is also referred to as the link reaction because it forms a link between glycolysis and the citric acid cycle by using pyruvate to form acetyl CoA.
Citric Acid Cycle
FAT
PROTEIN
The citric acid cycle's prominence in many biochemical pathways suggests that it was an early part of cellular metabolism.
AEROBIC RESPIRATION
The electron transport chain uses the transfer of electrons between donors and acceptors to power a proton gradient. This gradient of hydrogen ions then leads to the production of ATP by powering ATP Synthase.
Electron Transport


Glucose
2 ATP
Glycolysis
Pyruvate
2 ATP
2 NADH 4 ATP
2 NADH 6 ATP
Acetyl-CoA
Krebs cycle
2 ATP
6 NADH 18 ATP
2 FADH2 4 ATP
Total net ATP yield = 36 ATP



Kerb's cycle involves a sequence of oxidative dehydrogenation steps which are accompanied by

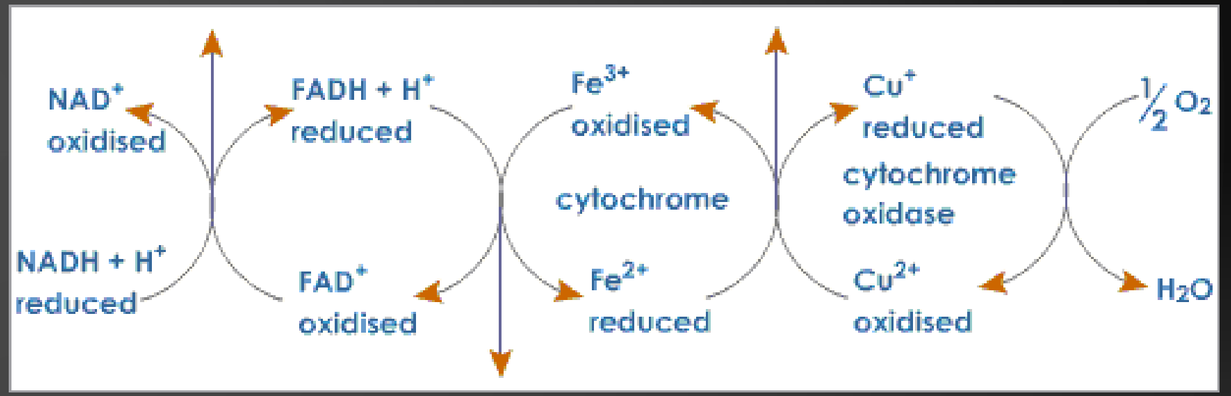
Removal of electrons

Release Co2 as a waste product

Electron transport chain

Electron transfer involves uptake of electrons released by dehydrogenation and carry them to oxygen to produce water

Electron transfer is accompanied with ATP synthesis complex which triggers phosphorylation of of ADP (adensin diphosphate) to produce ATP.



Electron transport chain requires NADH (Nicotinamide adenine dinucleotide) and FAD (Flavon adenine dinucleotide) which are Vit B3 and B2 respectively.

MUSCLE EXERCISE AND FATIGUE

Along with strenuous exercises, muscles starts building up more mitochondria to increase its endurance

Muscles of asthenic individuals lack the sufficient amount of mitochondria so they experience the anaerobic fermentation



Anaerobic fermentation ➔ lactic acid accumulation ➔ muscle degeneration and stiffness.


THANK
YOU