Cell Respiration Cheat Sheet

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Cell Respiration

Cell respiration is the controlled release of energy from glucose to produce ATP

ATP is composed of a ribose sugar and a adenine base, connected to 3 phosphate groups

When 1 phosphate group is removed via hydrolysis, the energy stored in the bond is released

Anaerobic vs Aerobic Respiration

Anaerobic	Aerobic
NO oxygen required	Oxygen IS required
Only glucose used	Carbohydrates + Lipids used
2 ATP produced	36 (ish) ATP produced
ANIMAL: Lactic Acid PLANTS: ethanol + CO2	CO2 + H20 Waste product
in Mitochondria	in Cytoplasm + Mitochondria

Hydrogen Carriers

NAD and FAD

The Main role of hydrogen carriers is to transport hydrogen atoms to electron transport chain

This can chane ADP to ATP by adding 1 phosphate during metabolic processes (eg. respiration)

They happen during chemcial processes such as oxidation (loss electrons) and reduction (gain electrons)

Anaerobic Respiration

After Glycolysis

CO2 removed from pyruvate via decarboxy-lation (producing ethanal)

2H transferred from reduced NAD to ethanal, creating ethanol

NAD's then regenerated to do anaerobic respiration again (Glycolysis)

Glycolysis

Phosphory-lation	Oxidation	ATP Formation
The addition of a phosphate to a molecule (2x ATP -> ADP)	Each Triose phosphate oxidised (remove H atoms)	ADP is phosphory-lated by phosphate groups on 3C compound
Requires energy	Hydrogen is accepted by NAD, becoming reduced NAD	Forming 2x ATP per 3C compound
Makes molecule more unstable	Energy released by ox. causes 2nd phosphate group to attach	Glycerate converted to other organic acid
Glucose now split to form 2 triose phosphate	Forming a 2x 3C compound with 2 phosphate groups	Pyruvate is formed

SUMMARY

1. 1 glucose (6C) form 2x Pyruvate (3C)
2. 2 NAD molecules converted to reduced-NAD
3. Net gain of 2x ATP, so 2 ATP per glucose
4. In Cytoplasm

Link Reaction

Pyruvate transfered from cytosol to mitoch-ondrial matrix via carrier proteins in mito-m-embrane

Pyruvate decarboxylated forming CO2

2C compound loses H forming reduced NAD

2C Compound now forms an acetyl group

Acetyl compound combines with coenzyme A

Forming acetyl coenzyme A (acetyl CoA)

SUMMARY

1. Glycolysis forms 2 pyruvate, so link

Electron Transport Chain (ETC)

Proton Motive Force	ATP Synthesis	Oxygen Reduction
H carriers are oxidised, relasing high energy electrons + protons	High H^+ conc creates gradient	De-energise electrons need to be removed from chain to prevent blockage
e^- transf-erred to ETC	H^+ ions diffuse back to matrix	O binds with H^+ in matrix & e^- to form H2O
e^- pass through chain, loosing energy	Diffusion is called chemio-smosis	Removal of H^+ maintains gradient
energy sed to pump H^+ ions from out of matrix	Facilitated by ATP synthase	No O = H carriers cannot transfer e^-
accumu-lation of H^+ ions in interm-embrane space creates high conc.	Movement triggers rotation of enzyme, phosphory-lating ADP, creating ATP	So ATP production would be halted

Location of Each Step

GLYCOLYSIS: Cytoplasm of the cell

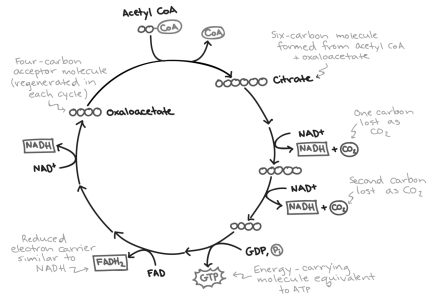
LINK REACTION: Mitochondrial Matrix

KREBS CYCLE: Mitochondrial Matrix

ETC: Matrix + Inter membrane Space

reaction occurs 2x per glucose molecule
2. Per glucose molecule = 2x acetyl CoA, 2x NADH, 2x CO2

Krebs Cycle



SUMMARY

Per glucose molecule = 4x CO2, 2X ATP, 2x FADH, 6x NADH

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