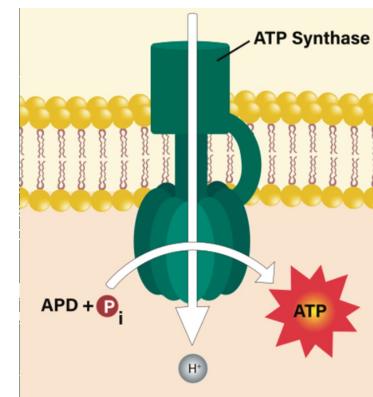
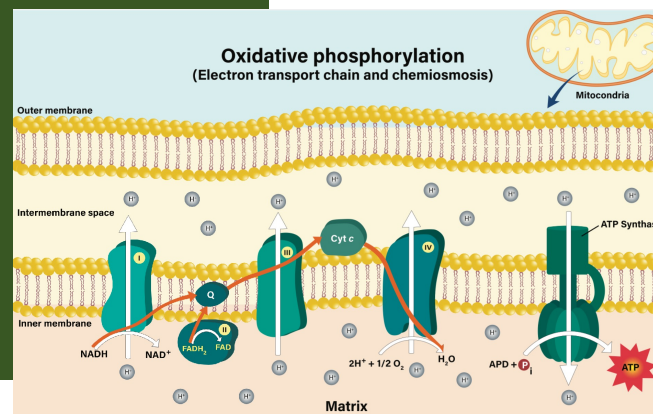
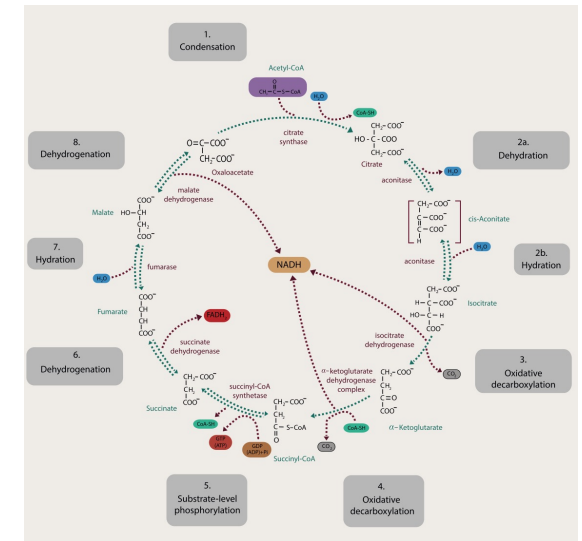


Aerobic Respiration

Krebs Cycle and the ETC

- Review of Glycolysis & Pyruvate Oxidation
- Krebs/Citric Acid Cycle
- The Electron Transport Chain
- The Role of O_2
- Proton Gradient and Chemiosmosis
- ATP Synthase
- Uncoupling the ETC



Preview File

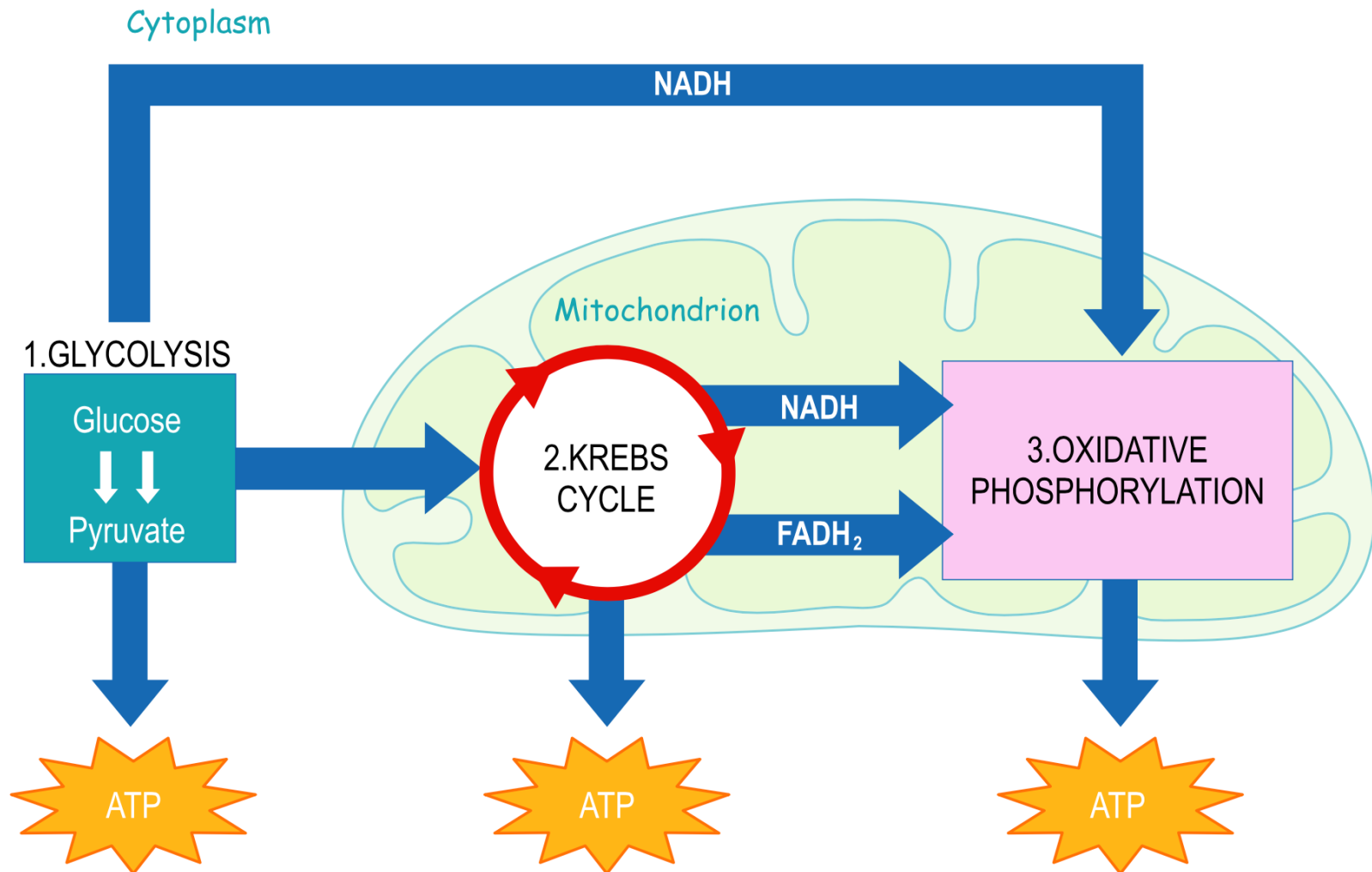
Please enjoy this preview of your Student Version of the presentation. Please note within this sample file:

- Some slides appear blank because they have been removed
- Student versions have portions of the text removed which is given in the teacher version and appear as _____ which the students are to fill in
- Other slides may have on them, this represents writing that has been removed on this sample

**The paid full version of your resource includes
both Google Slides and PowerPoint and is
Google Classroom Ready**



Aerobic Respiration – With O_2



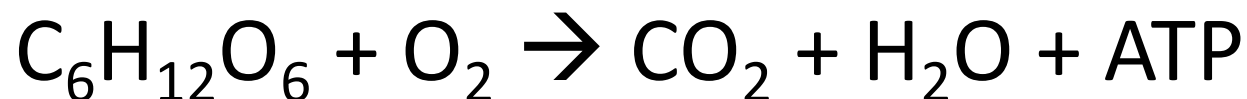
Recall: What's the goal of cellular respiration?

The goal of cellular respiration is to make as much ATP as possible to power the chemical reactions inside the body.

Goal is to make

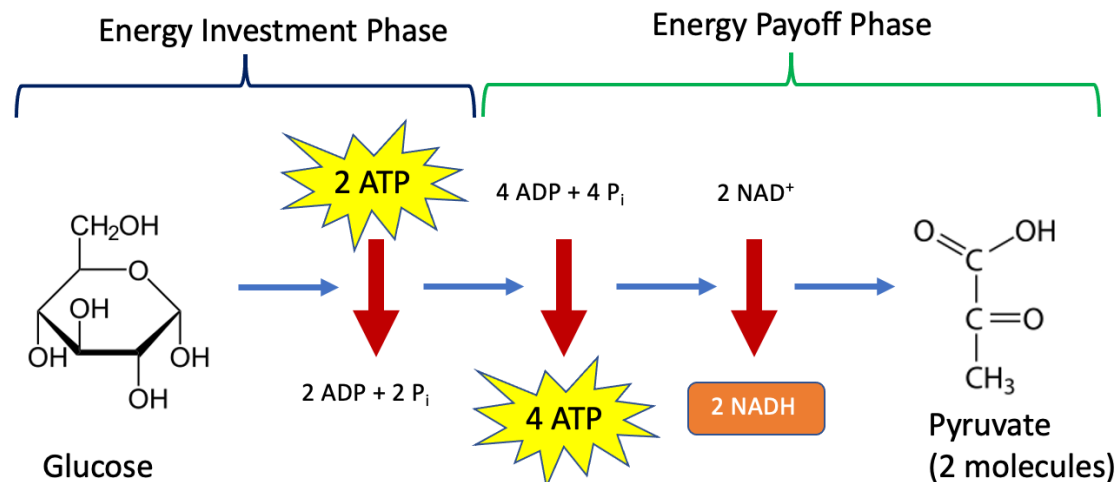


→ Energy (ATP)

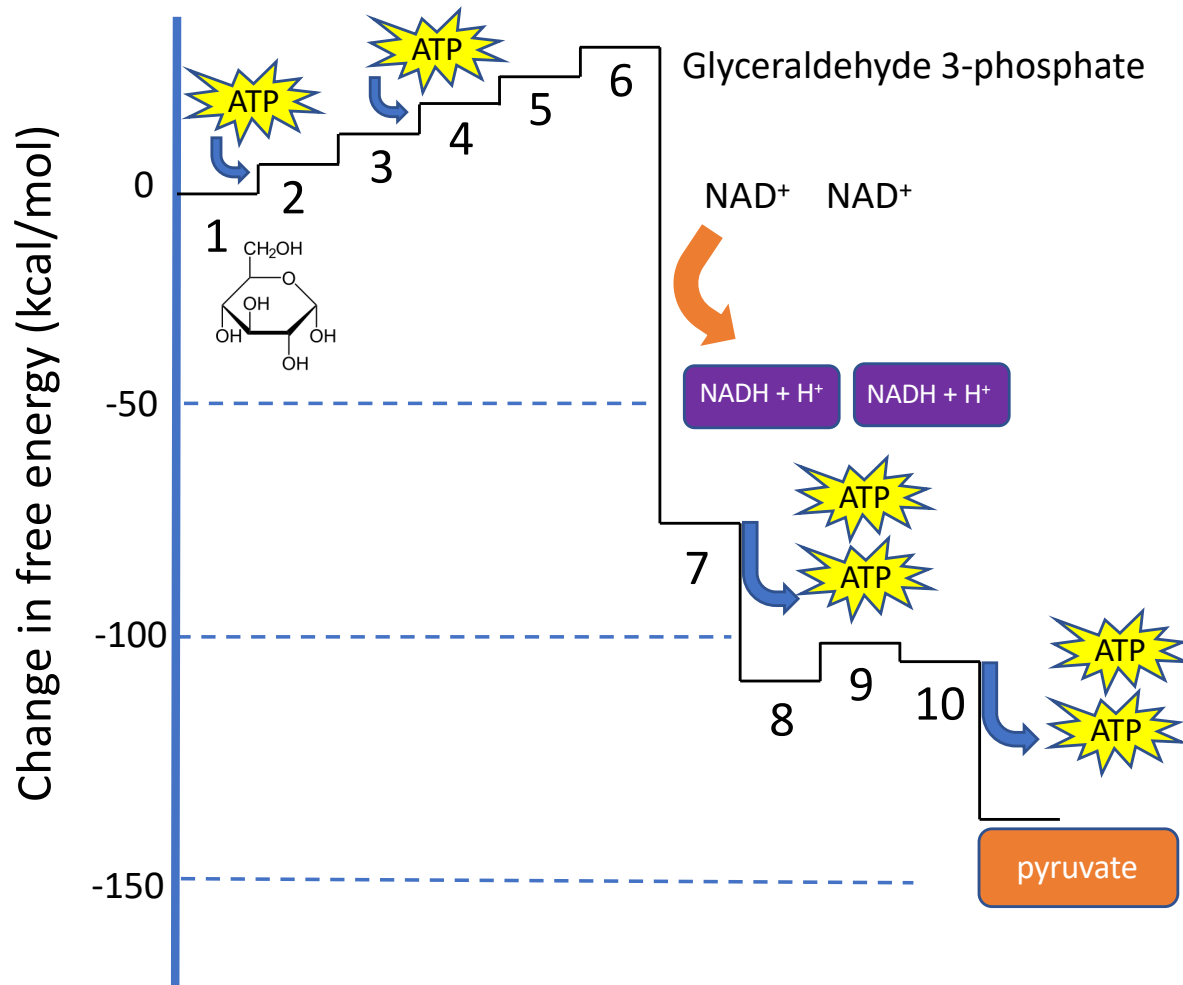
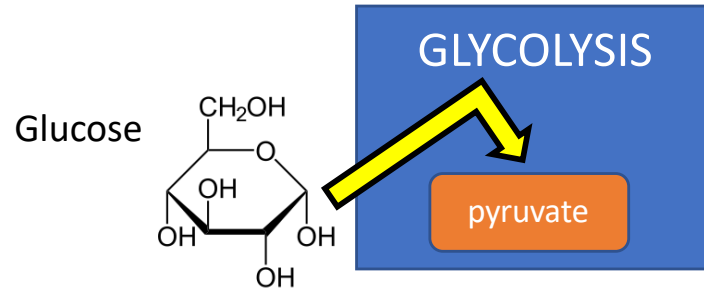


Cellular Respiration Stage 1: Glycolysis

- Glycolysis consists of 10 reactions which changes the 6-carbon glucose into two 3-carbon pyruvate molecules
- _____
- Has two phases:
 - 1) Energy Investment Phase
 - 2) Energy Payoff Phase



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For each glucose

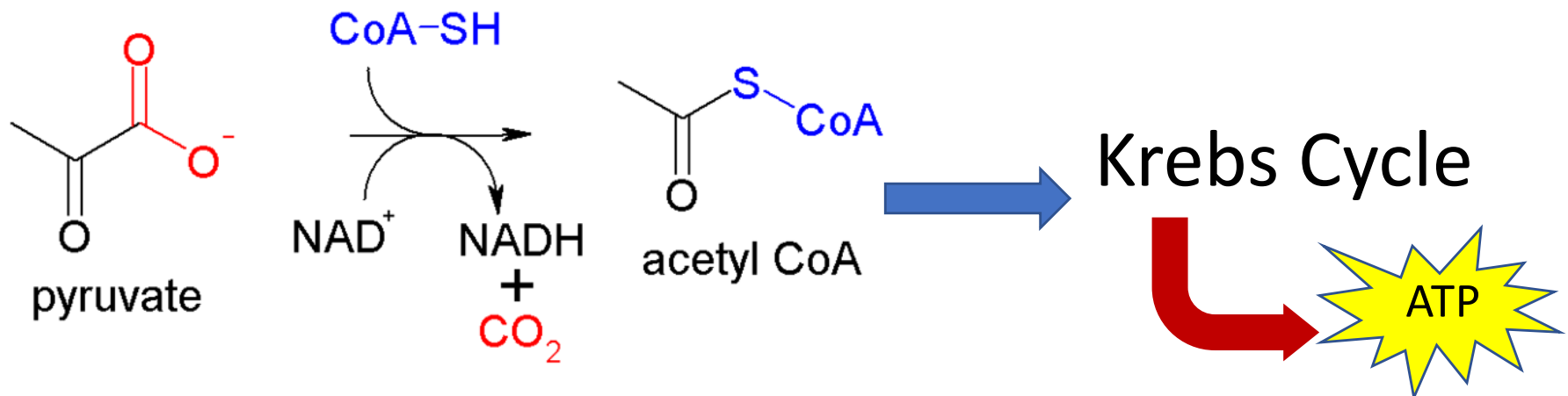
- 2 Pyruvate
- 2 NADH + 2 H⁺
- 2 ATP are produced

Cellular Respiration Stage 2: Pyruvate Oxidation

- Two pyruvate molecules are transported through the two membranes and into the mitochondrial matrix

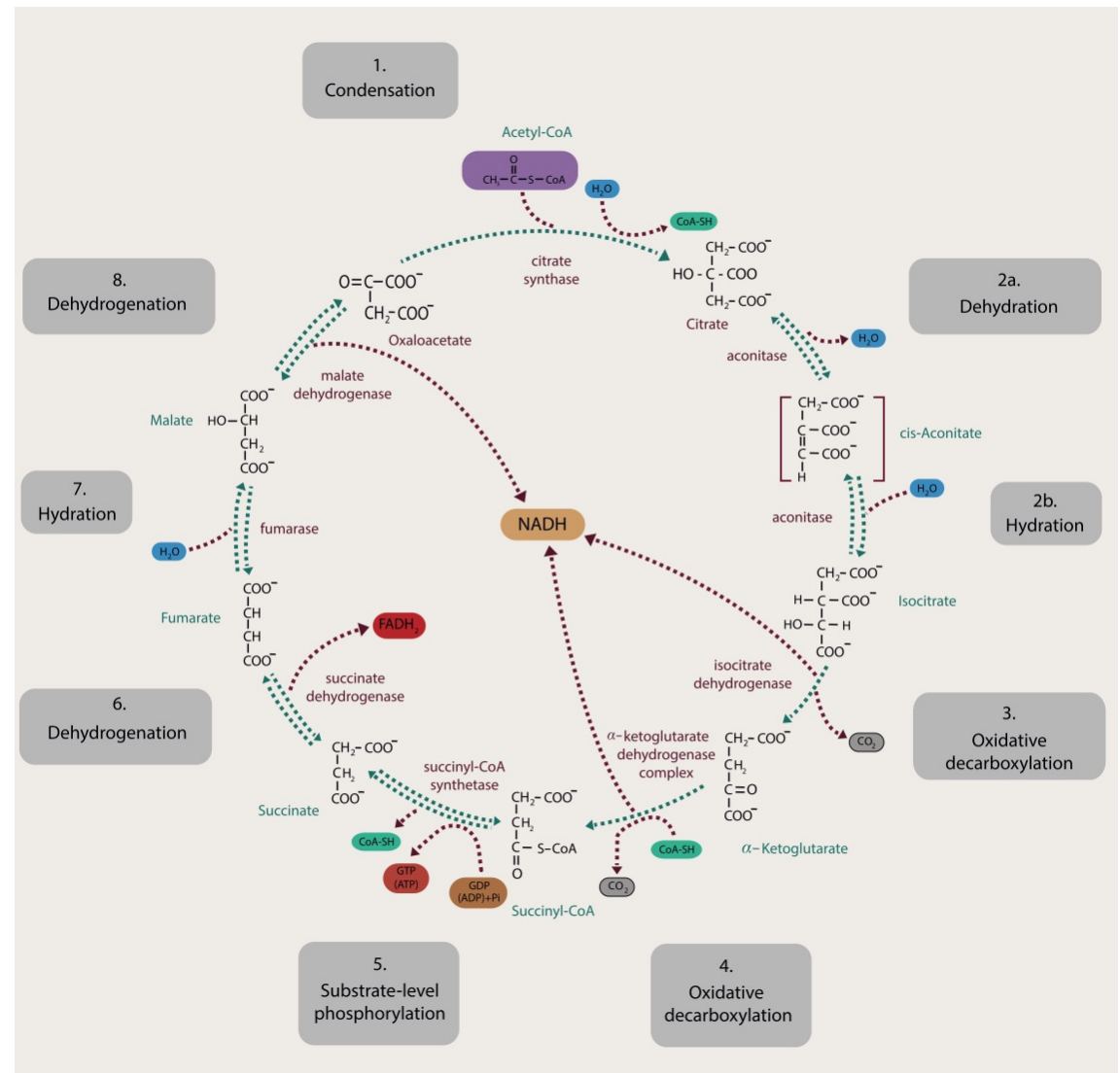
- _____

- _____



Cellular Respiration Stage 3: Krebs Cycle

Also known as the
Citric Acid Cycle
and Tricarboxylic
Acid Cycle.



Krebs Cycle

- 8 Step process
 - Each step has a specific enzyme
 - It is cyclic (oxaloacetate, the product of step 8, is the reactant in step 1)
 - Overall chemical equation:
-

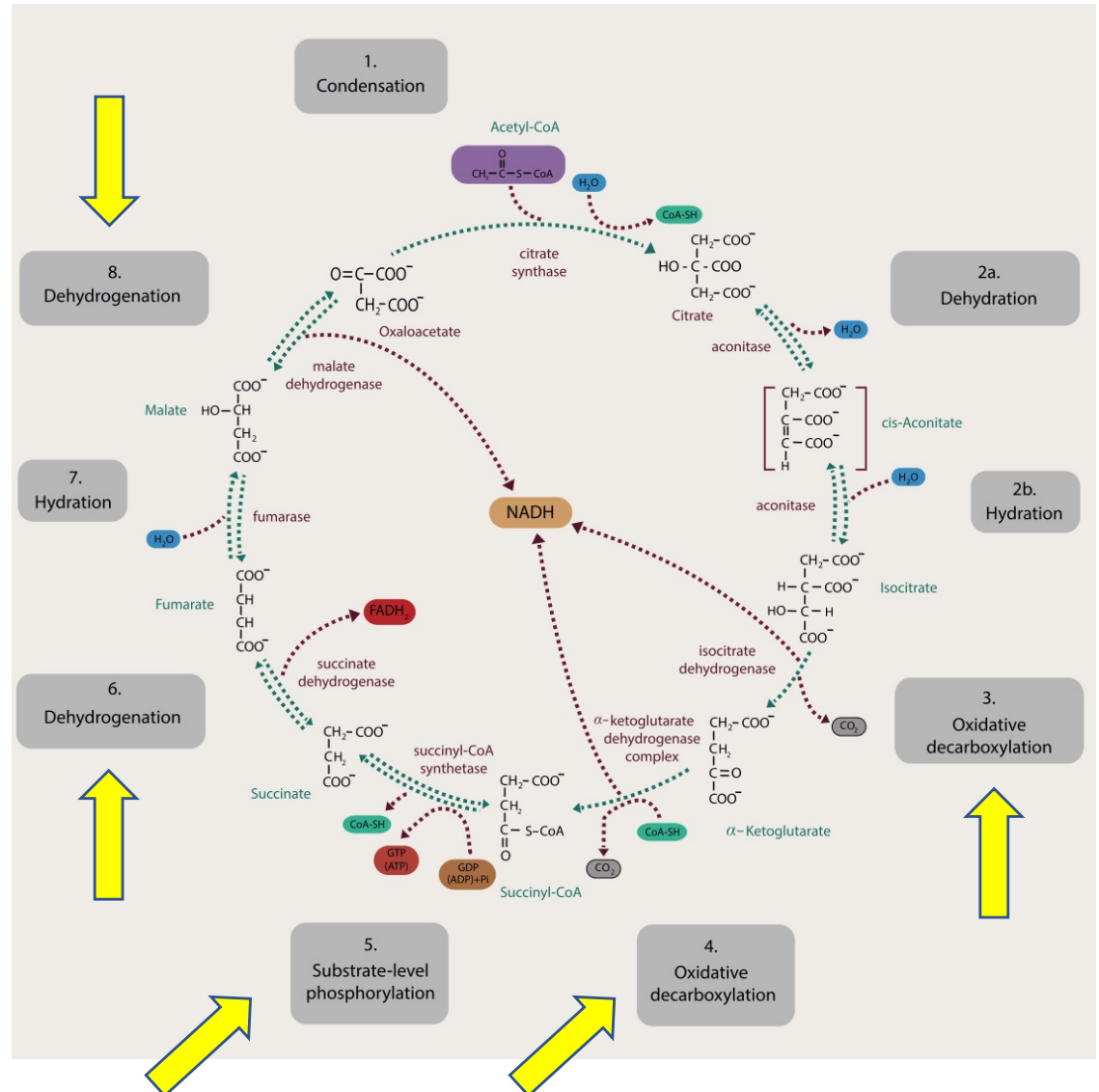
1 - Krebs Cycle Quiz – Flash Required

**CLICK THE LINK AND
IMAGE IN SLIDESHOW
MODE TO ACCESS THE
QUIZ/VIDEO**



Krebs Cycle

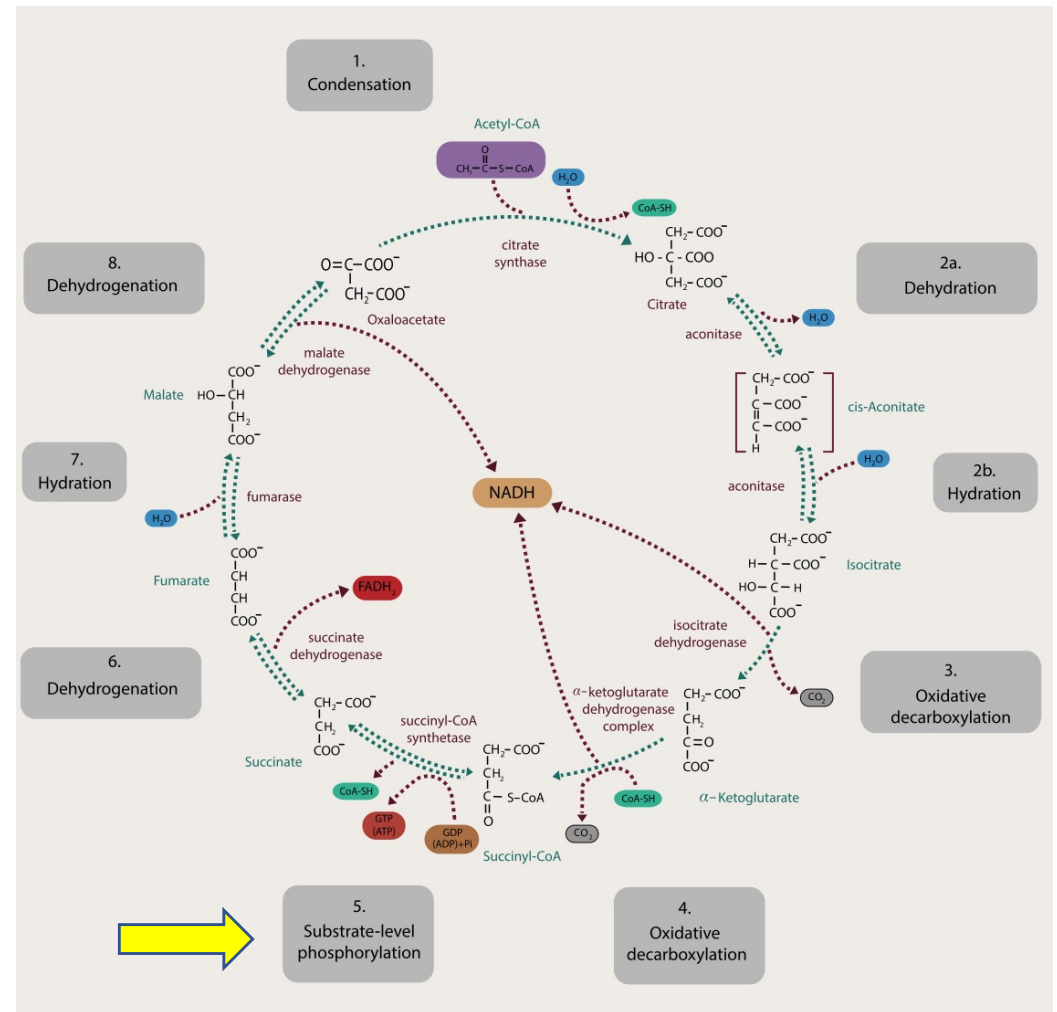
- The Krebs Cycle occurs twice for each molecule of glucose processed
- Energy is harvested at steps; 3, 4, 5, 6, and 8



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Krebs Cycle

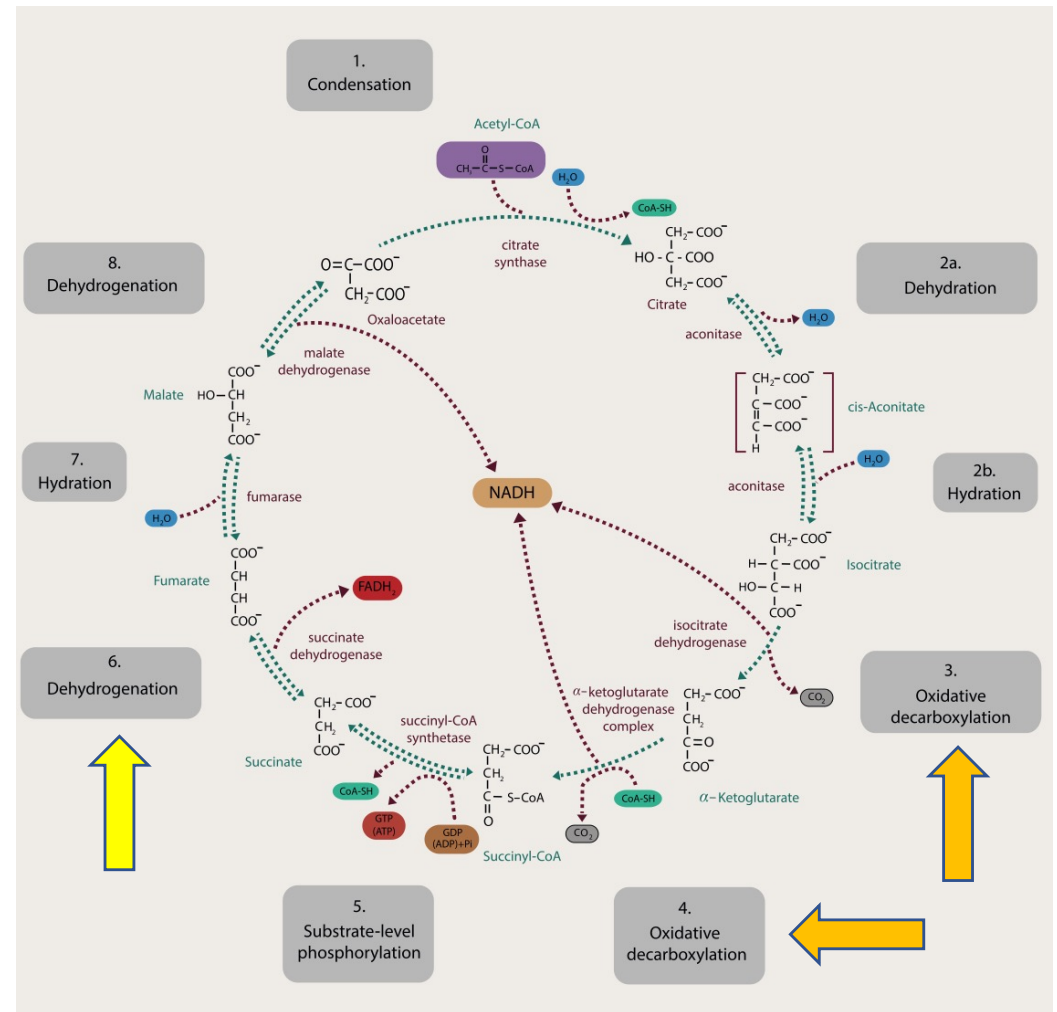
Step 5 – substrate-level phosphorylation



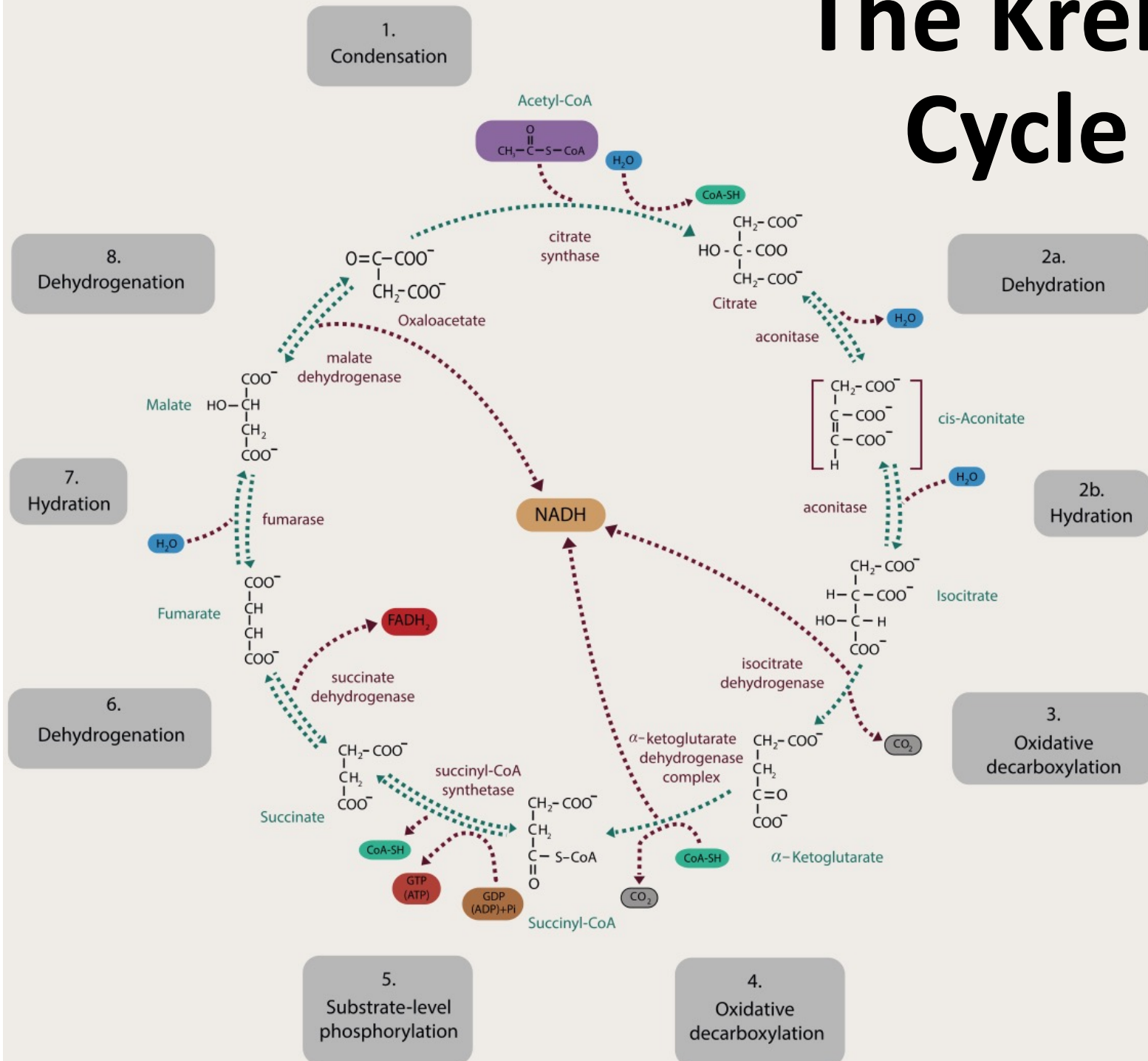
Krebs Cycle

- Step 6 – not enough energy to reduce NAD⁺ instead, FAD → FADH₂
- Step 3, and 4 -

.....



The Krebs Cycle



What have we made so far from our single molecule of Glucose?

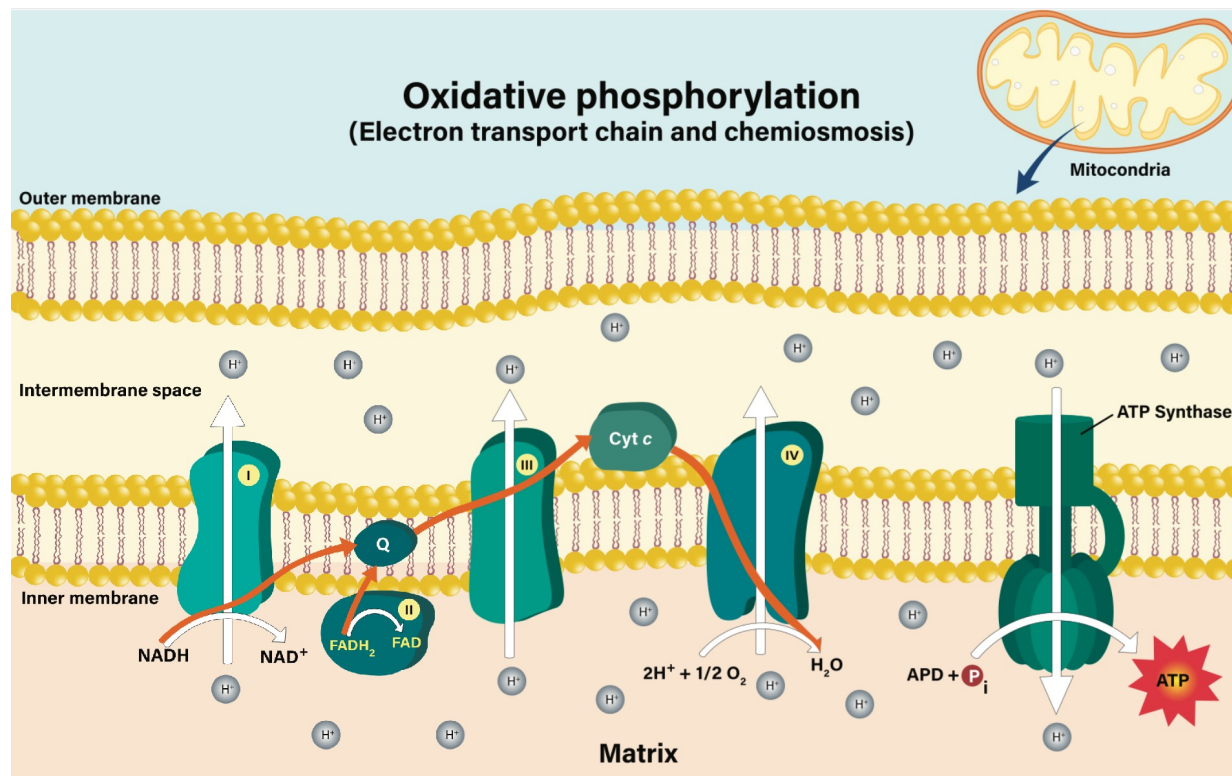
Process	Energy Carrier Created			
	ATP	NADH	FADH ₂	H ⁺
Glycolysis	2	2	0	2
Pyruvate Oxidation	0	1 X 2 = 2	0	1 X 2 = 2
Krebs Cycle	1 X 2 = 2	3 X 2 = 6	1 X 2 = 2	3 X 2 = 6
Total	4	10	2	10

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The Electron Transport Chain (ETC)

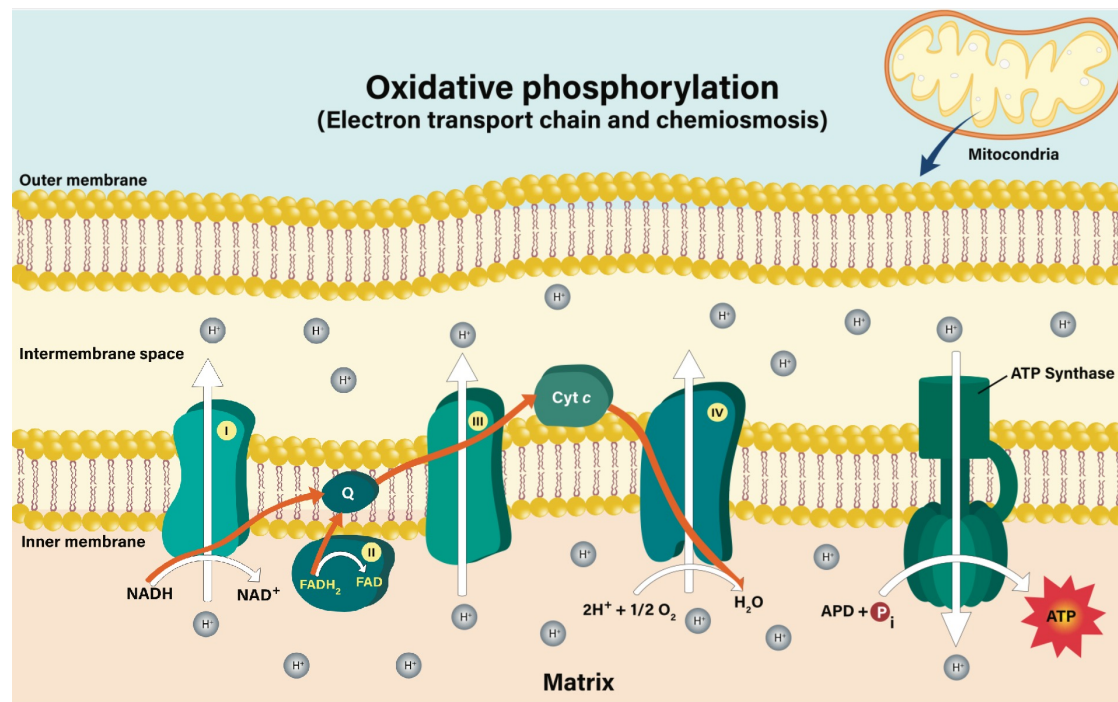
- We now need to extract the energy from our electron carriers (NADH and FADH_2)

- _____



The ETC

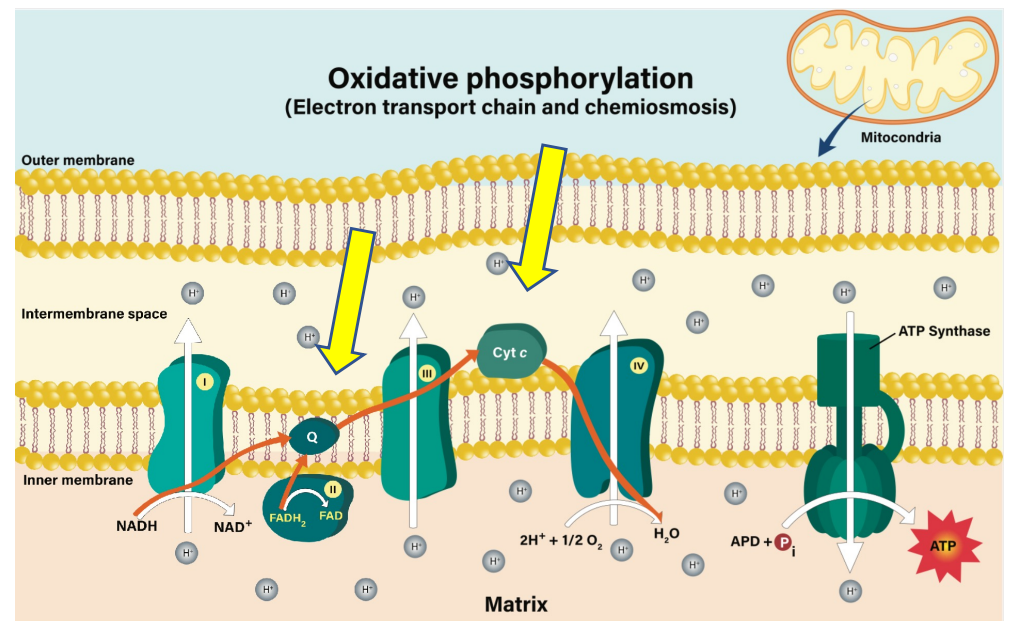
- The electron transport chain is comprised of a system of components on the inner mitochondrial membrane
- _____
- It consists of four protein complexes → complex I-IV



The ETC

The flow of electrons from one complex to another is facilitated by two mobile electron shuttles

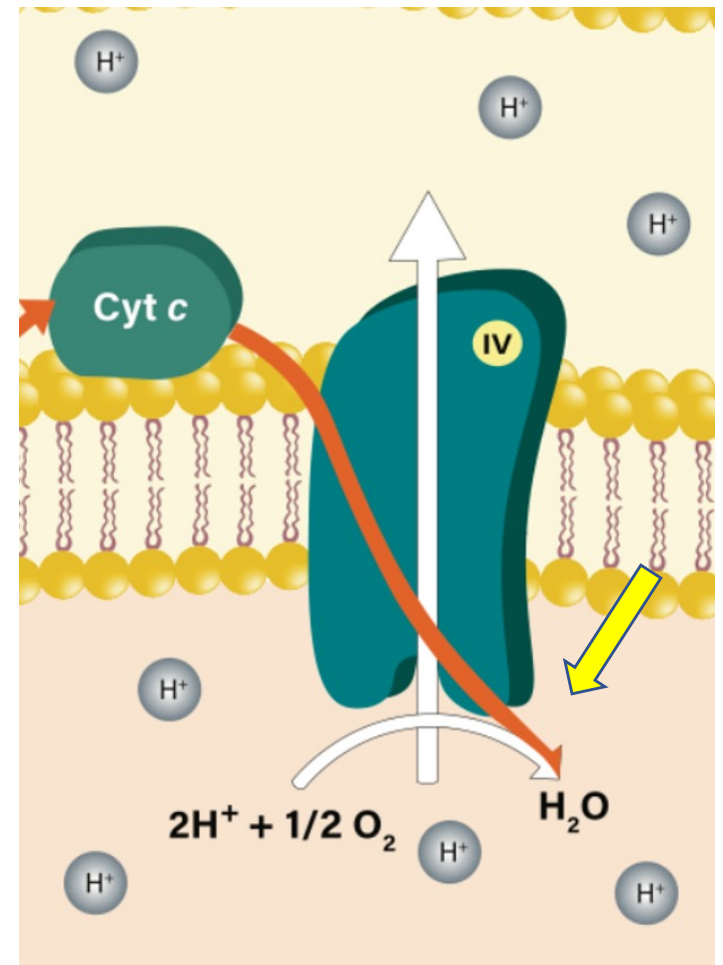
2) Cytochrome c (cyt c), ...



The Role of Oxygen

- The electron transport chain is the final destination for ALL the oxygen we breathe, which is transported around the body
- Oxygen goes to the mitochondria to perform the single vital task of pulling electrons away from complex IV

- _____

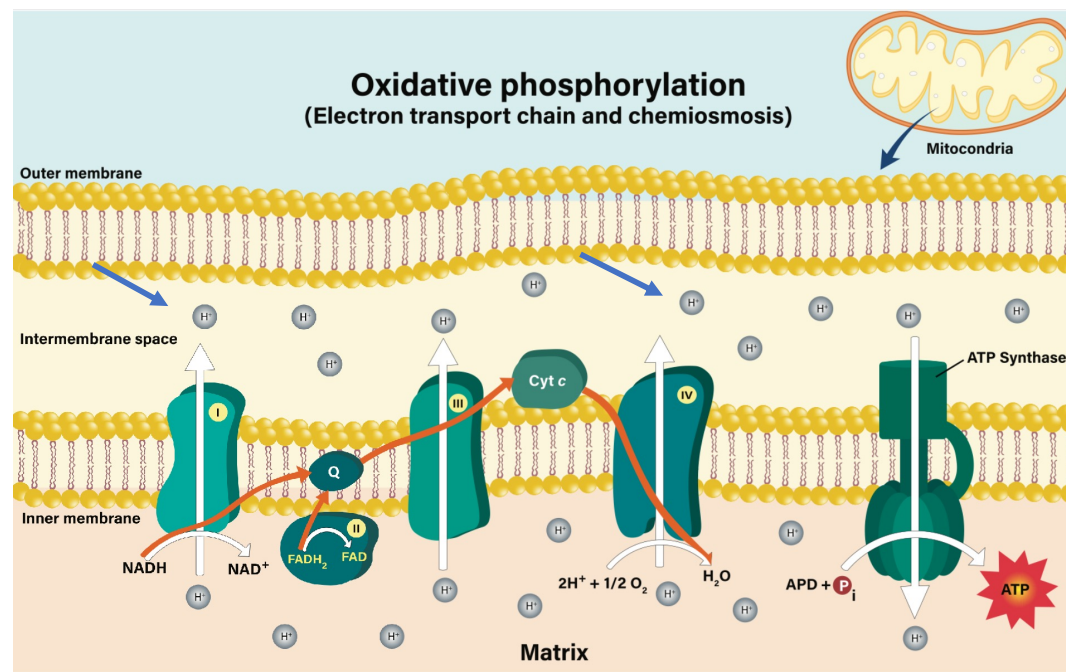


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Proton Gradient

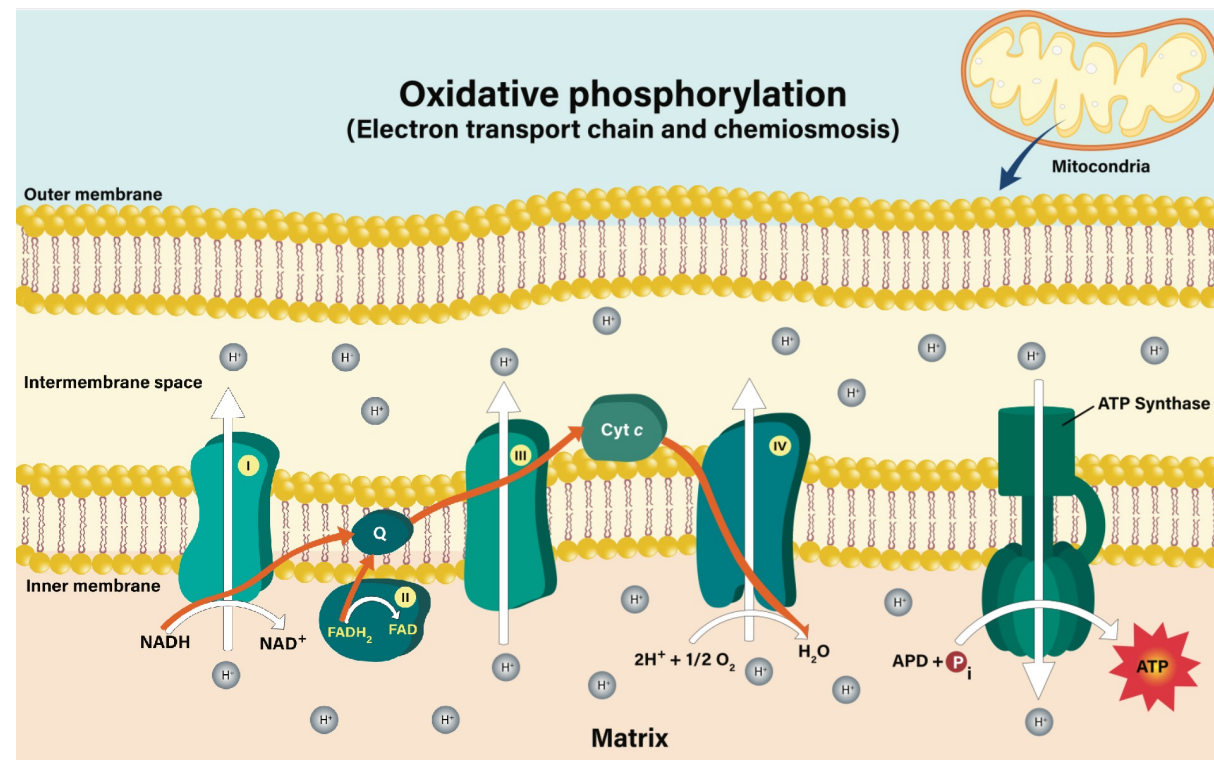
- During electron transport, the energy from the electrons being transported is used to do work, specifically the work of transporting protons (H^+) across the inner mitochondrial membrane, from the matrix into the intermembrane space

• _____



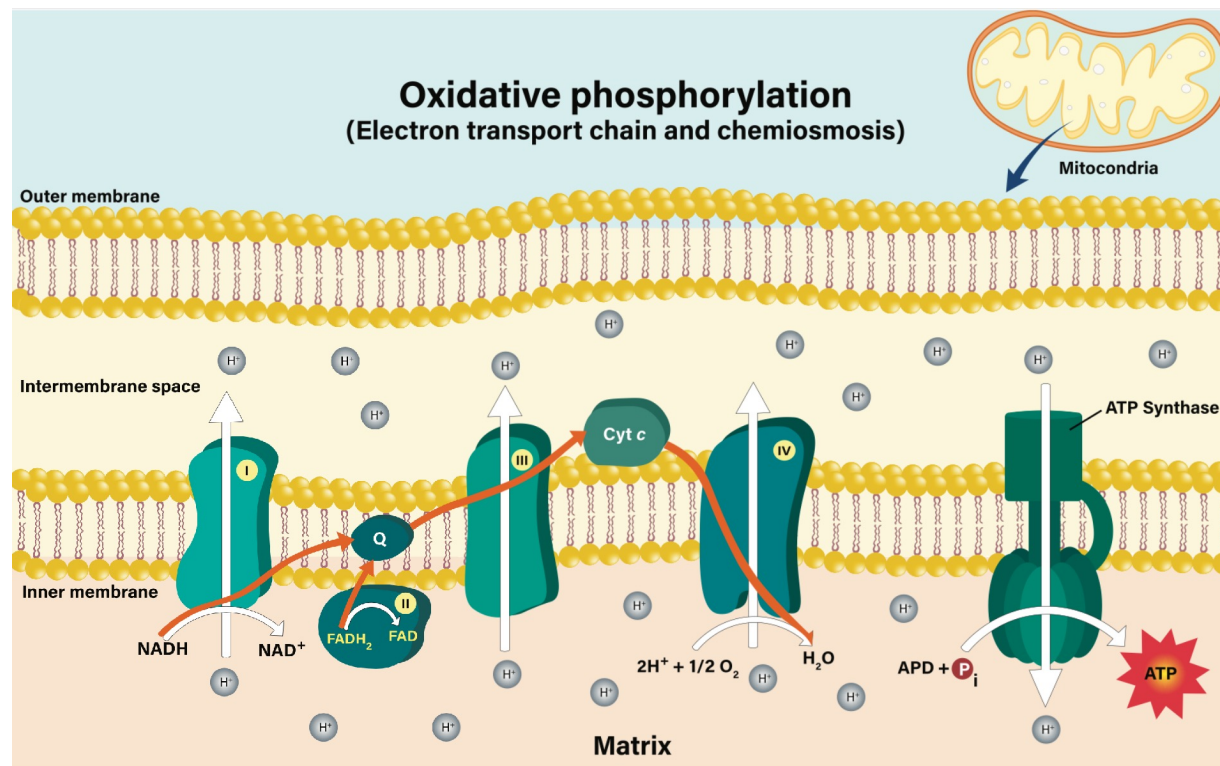
- As a result of this proton pumping across the inner membrane, the H^+

- This difference in H^+ concentration is called a
-



Proton Gradient

When one side of the inner mitochondrial membrane has more protons than the other side, the difference represents a source of energy that can be harnessed to do work.



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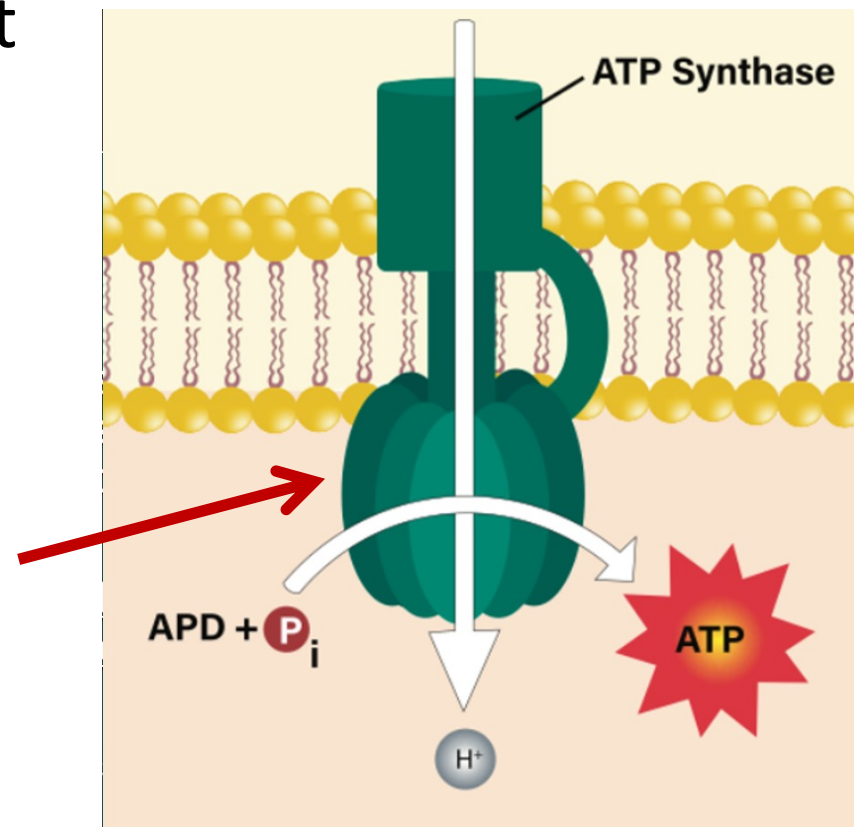
Chemiosmosis

- _____
- _____
- H^+ move across the inner mitochondrial membrane and into the mitochondrial matrix via ATP synthase (an enzyme which synthesis ATP)
- _____

ATP Synthase: A Molecular Motor

- ATP synthase is a structure that spans the inner mitochondrial membrane

- _____



- ATP is created from $\text{ADP} + \text{P}_i$

Uncoupling Electron Transport and Chemiosmosis

- _____
- When electron transport and ATP synthesis are uncoupled, the energy that is released during electron transport is not converted to ATP energy
- Instead, it is

CLICK THE IMAGE IN
SLIDESHOW MODE TO
ACCESS THE VIDEO



Why would we want to do this?

We have just spent all this time getting those pesky H^+ into the intermembrane space and creating our gradient, why would we want to release their potential energy as heat instead of generating ATP?



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Review – Krebs Cycle and ETC

4) ETC



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FROM THE PREVIEW**

5) Oxidate it - Recap

