

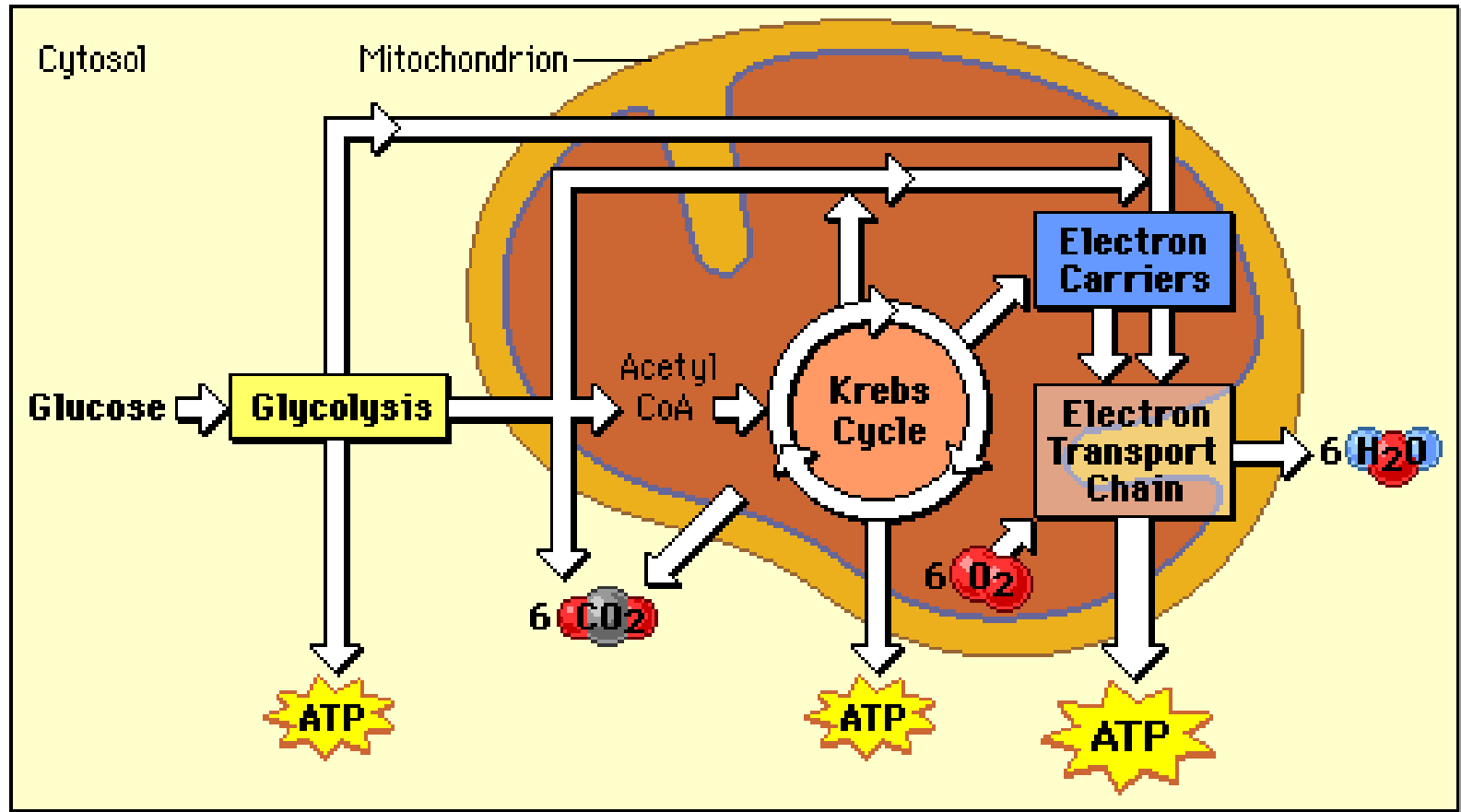
# Cellular Respiration

## Chapter 9

# 9.1 Chemical Pathways

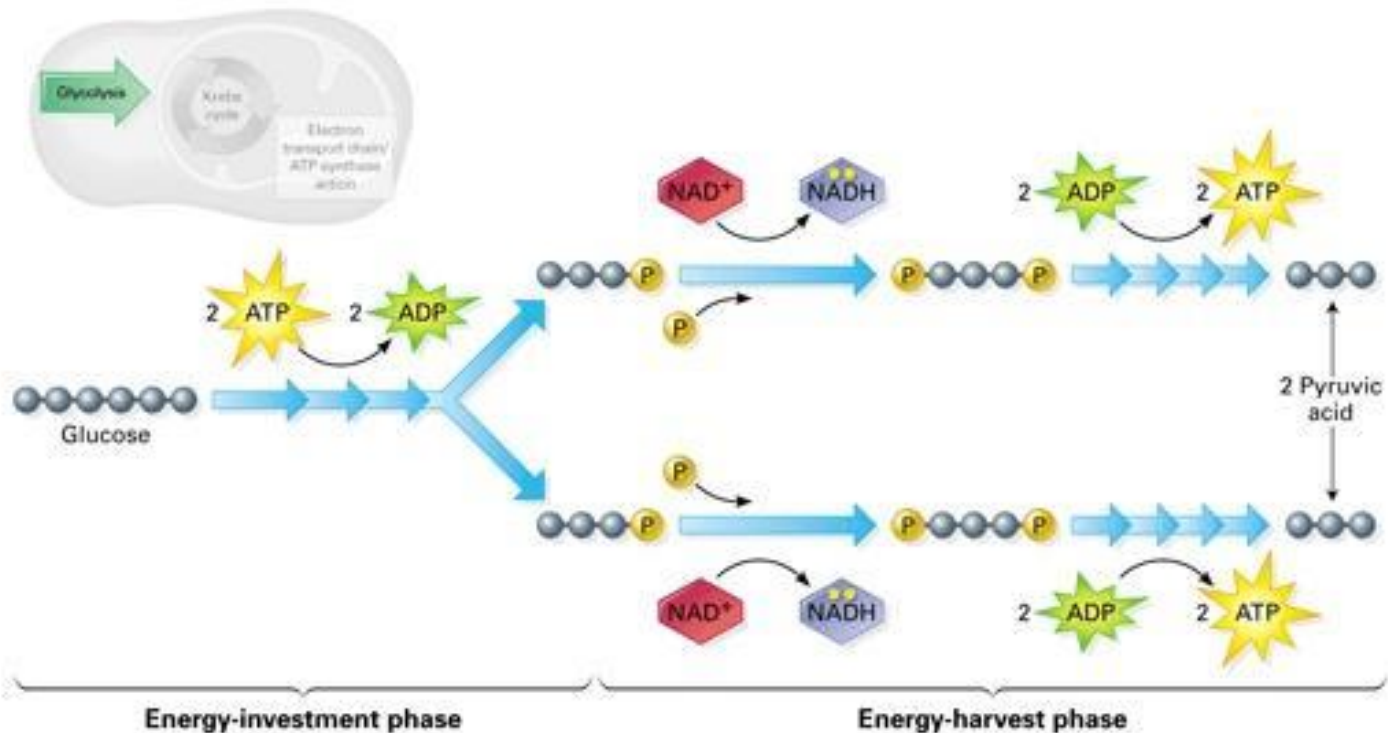
- 1 g sugar stores 3811 calories
- 1 cal is the amount of heat required to raise 1 gram of H<sub>2</sub>O 1 degree celsius
- 1 Cal=1000 cal or 1 kcal
- Energy is released from glucose in 3 stages-glycolysis, Krebs cycle and Electron Transport Chain (ETC). Each stage releases some ATP
- $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

# 9.1 Chemical Pathways



# 9.1 Chemical Pathways

- Glycolysis
- 1 glucose makes 2 pyruvates



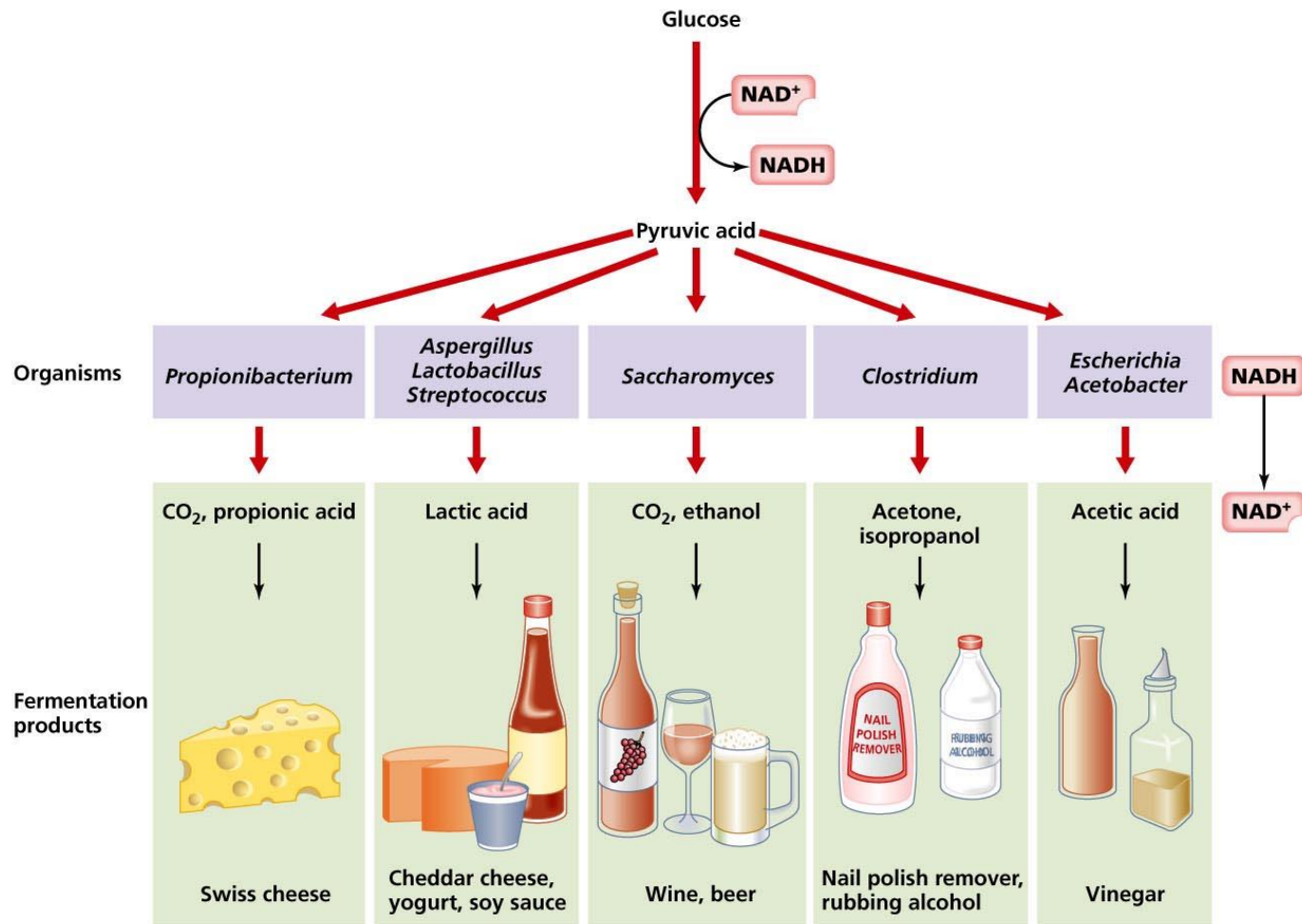
# 9.1 Chemical Pathways

- When oxygen is not available, after glycolysis, instead of the Krebs cycle occurring, another pathway occurs
- Glycolysis and this alternative pathway together are called fermentation
- 2 types of fermentation-alcoholic and lactic acid fermentation

# 9.1 Chemical Pathways

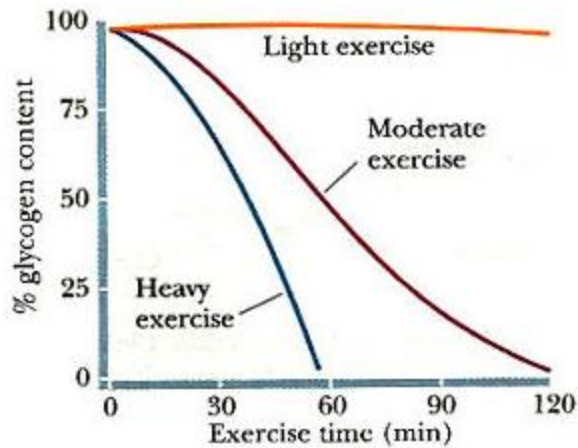
- Alcoholic fermentation
- Pyruvic acid + NADH → alcohol + CO<sub>2</sub> + NAD<sup>+</sup>
- Also causes bread to rise
- Lactic acid fermentation
- Pyruvic acid + NADH → lactic acid + NAD<sup>+</sup>

# 9.1 Chemical Pathways-Alcoholic Fermentation

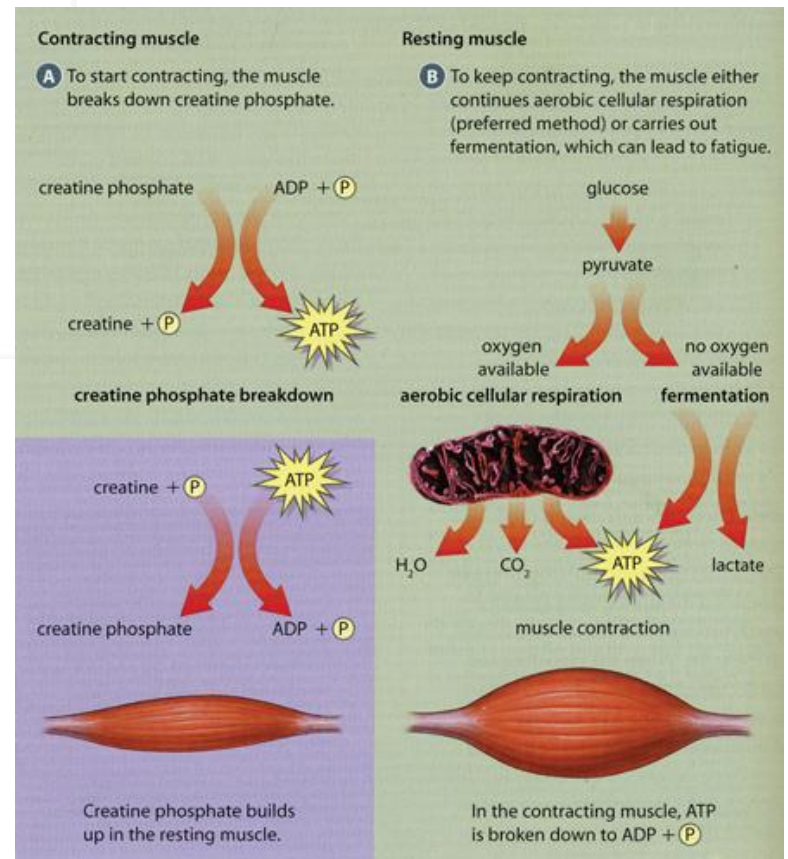


# 9.1 Chemical Pathways-Lactic Acid

## Glycogen Utilization in Working Muscle



Rowland and Crickson, 2004, p. 772



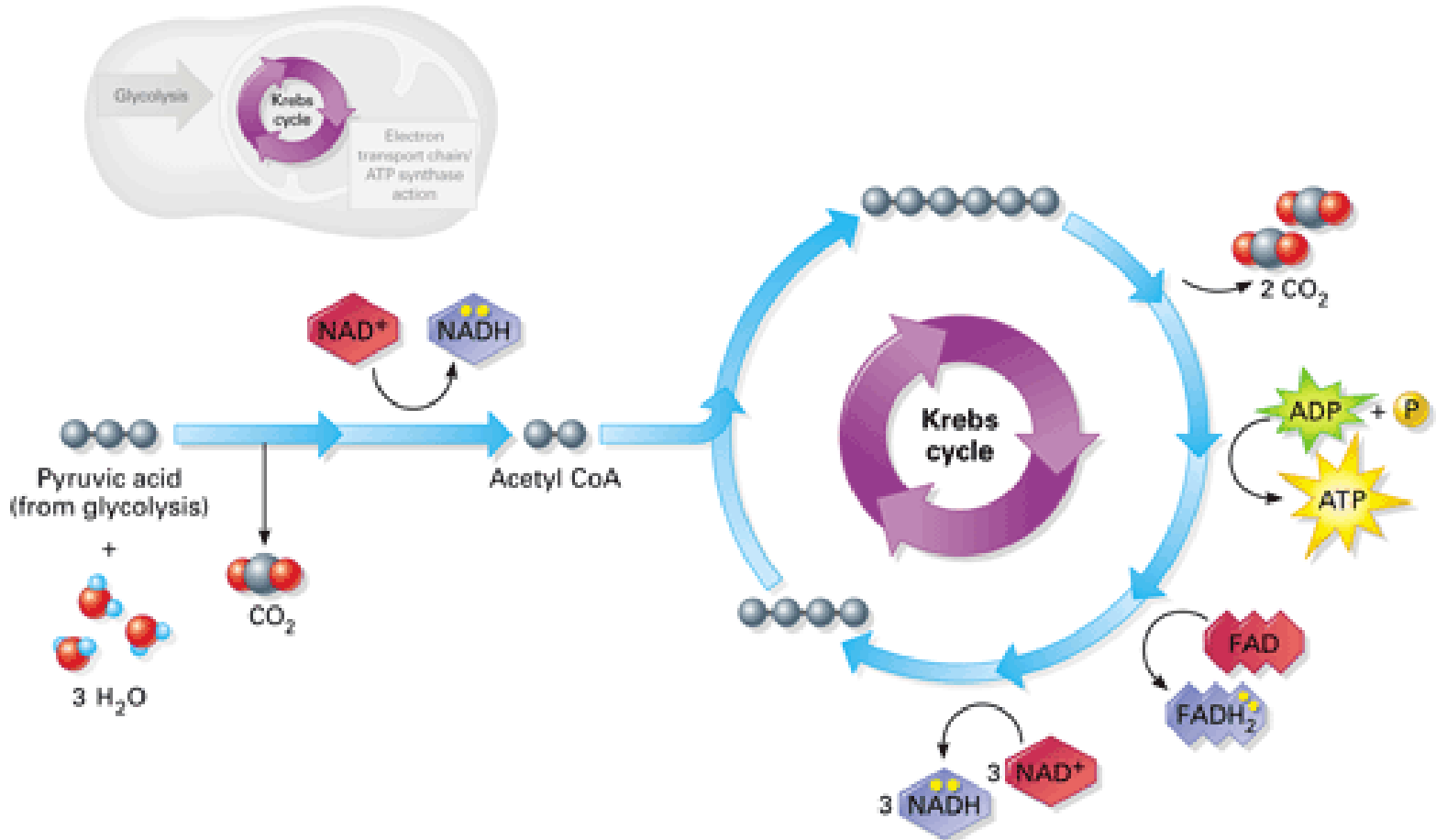


## 9.2 Krebs Cycle and ETC

- After glycolysis, 90% of the energy stored in glucose is still available
- Cellular respiration is the process of releasing all the energy from glucose
- Requires oxygen
- Respiration and cellular respiration are connected in that we need to breathe (respire) so that our cells can do cellular respiration

# 9.2 Krebs Cycle

- Pyruvic acid is converted to  $\text{CO}_2$  in the mitochondria; every step is catalyzed by enzymes that require cofactors which are our “vitamins”

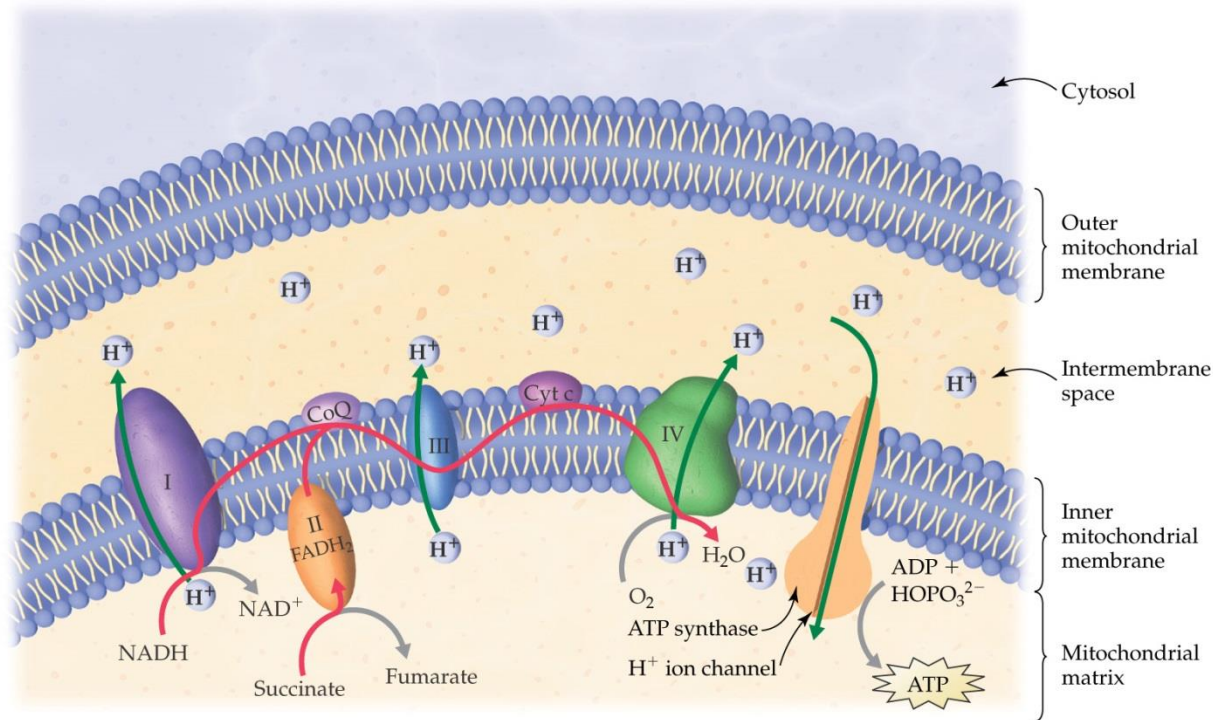


## 9.2 Krebs Cycle

- <https://www.youtube.com/watch?v=jsMNYGbKxqk>

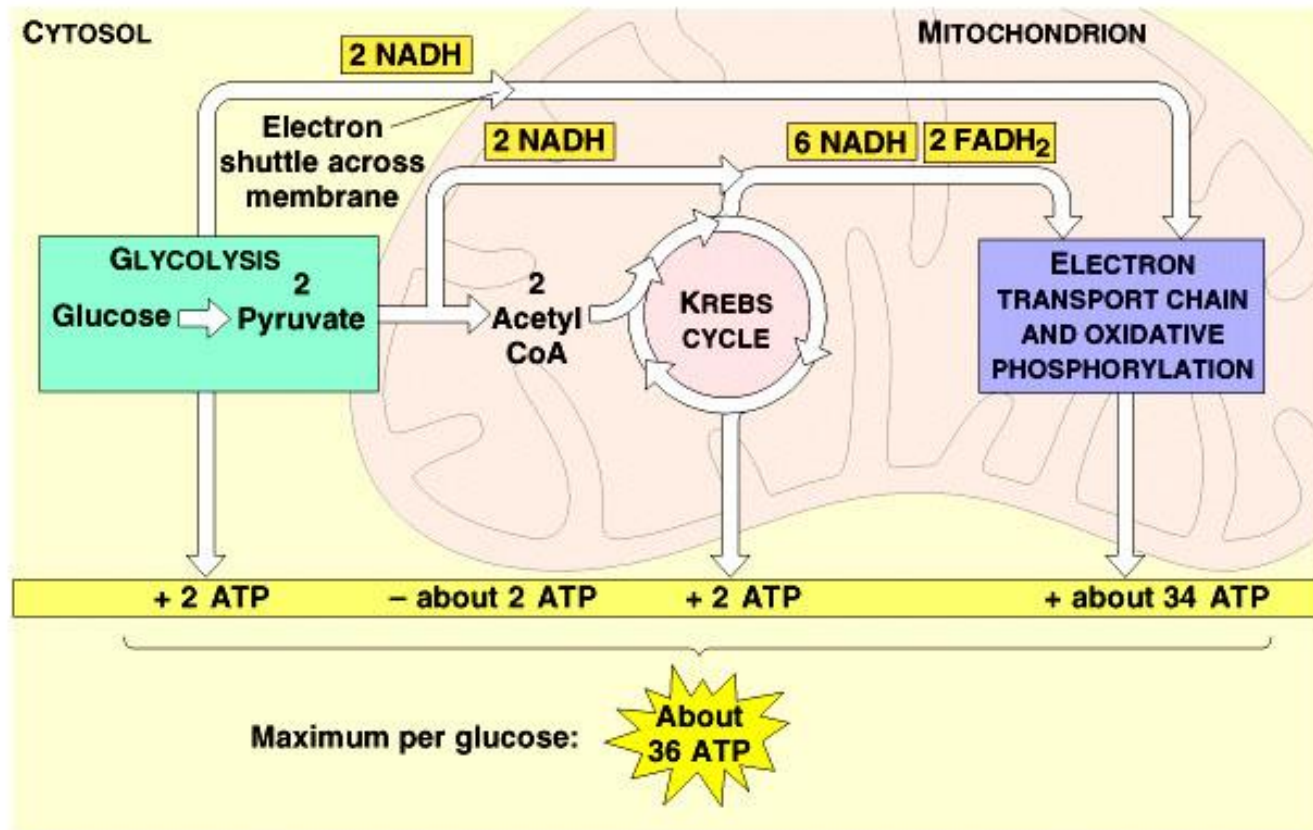
# 9.2 ETC

- After Krebs cycle the high energy  $e^-$  in NADH and FADH are passed to other molecules in the electron transport chain (ETC) and used to convert ADP to ATP



# 9.2 Total ATP Produced

Figure 9.15 Review: each molecule of glucose yields many ATP during cellular respiration



## 9.2 Cellular Respiration review

- <http://www.discovery.com/tv-shows/other-shows/videos/assignment-discovery-shorts-06-07-07-08-cellular-respiration.htm>

## 9.2 Energy and Exercise

- When you exercise, the energy stored in ATP, blood glucose and lactic acid is used very quickly. After that you use glycogen, a storage form of energy in the liver
- [https://www.youtube.com/watch?v=K\\_JFBxRBe9Q](https://www.youtube.com/watch?v=K_JFBxRBe9Q)
- <https://www.youtube.com/watch?v=oBL0OC3IavI>

## 9.2 How Cells Obtain Energy-An overview

- <https://www.youtube.com/watch?v=i8c5JcnFaJ0>



# 9.2 Comparing Cellular Respiration and Photosynthesis

	Photosynthesis	Cellular Respiration
Function	Energy storage	Energy Release
Location	Chloroplasts	Mitochondria
Reactants	$\text{CO}_2$ & $\text{H}_2\text{O}$	$\text{C}_6\text{H}_{12}\text{O}_6$ & $\text{O}_2$
Products	$\text{C}_6\text{H}_{12}\text{O}_6$ & $\text{O}_2$	$\text{CO}_2$ & $\text{H}_2\text{O}$
Equation	$\text{CO}_2 \text{ \& \; } \text{H}_2\text{O}$ $\rightarrow \text{C}_6\text{H}_{12}\text{O}_6 \text{ \& \; } \text{O}_2$	$\text{C}_6\text{H}_{12}\text{O}_6 \text{ \& \; } \text{O}_2$ $\rightarrow \text{CO}_2 \text{ \& \; } \text{H}_2\text{O}$

