

Due in Lab Tomorrow

- Cyanobacteria
- Due next week lab
-
-

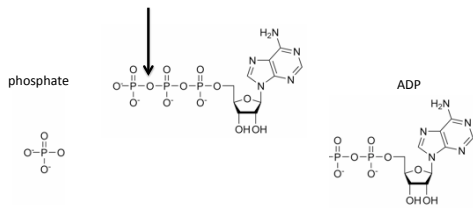
Cellular Respiration

- Glycolysis
- Krebs Cycle
- Electron Transport Chain

How to organisms get energy?

- Cells use a high energy molecule to fuel cellular processes

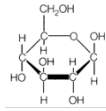
Adenosine Triphosphate (ATP)



http://en.wikipedia.org/wiki/File:ATP_chemical_structure.png

How to organisms get energy?

- Glucose is the carbon and energy source used by **most** cells.

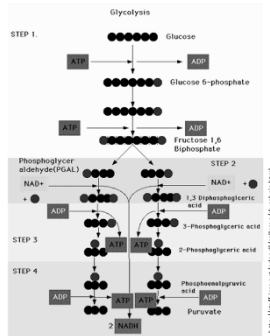


- Glucose is initially broken down in a series of steps called Glycolysis

<http://www.biology.com/learn/2008/02/29/20080229-how-organisms-get-energy/>

Glycolysis

- produce ATP, NADH, and pyruvate
- Occurs in the cytosol
- Yields a net 2 ATP, 2 NADH per glucose molecule
- Anaerobic (no oxygen)
 - anaerobes



<http://www.ck12.org/learn/2008/02/29/20080229-how-organisms-get-energy/>

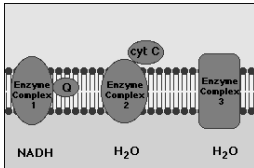
Krebs Cycle

- 3CO₂
- Produces 3 NADH, 1 FADH₂, and 1 ATP per pyruvate
- Occurs in the mitochondrial matrix



<http://www.ck12.org/learn/2008/02/29/20080229-how-organisms-get-energy/>

The Electron Transport Chain



Inter-membrane proteins and cofactors help move protons created by redox reactions to the outside of the membrane

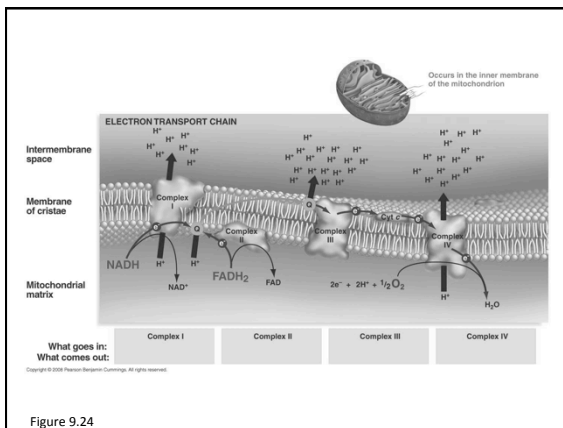
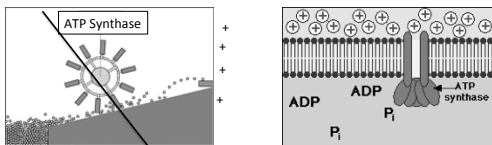


Figure 9.24

ATP Synthase

- Proton Gradient Created
- ATP synthase takes advantage of gradient
- Produces ~ 26 ATP molecules per glucose
- Membrane-bound process



Oxidative Phosphorylation

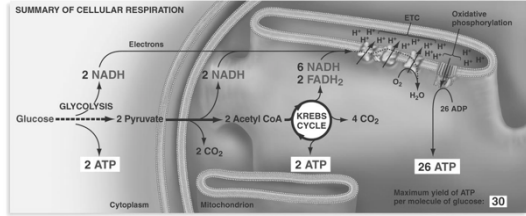
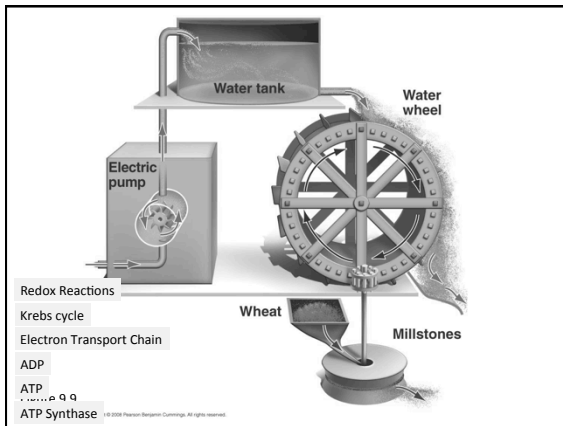
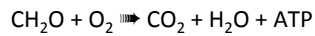


Figure 9.26



Oxidative Phosphorylation



Glucose + oxygen → Carbon dioxide + water + energy

- Oxygen is the best electron acceptor, but what if it is not around?

Fermentation

- When oxygen is low or absent, ATP can still be produced via fermentation.
- NAD⁺ is oxidized from NADH so glycolysis can begin again

Fermentation

(a) Fermentation pathways allow cells to regenerate NAD⁺ for glycolysis.

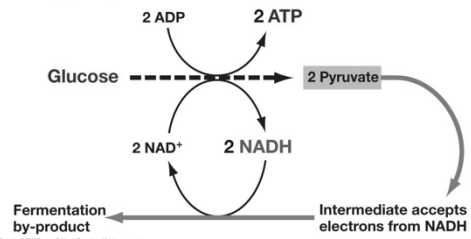


Figure 9.27

Lactic acid Fermentation

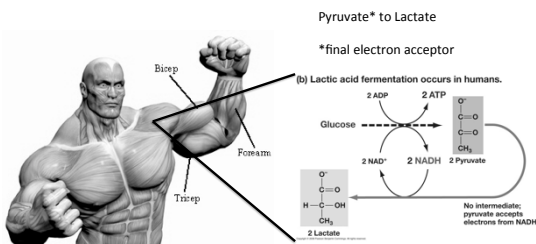



Figure 9.27

<http://themusclebody.com/>

Alcohol Fermentation



Acetaldehyde* to Ethanol
*final electron acceptor

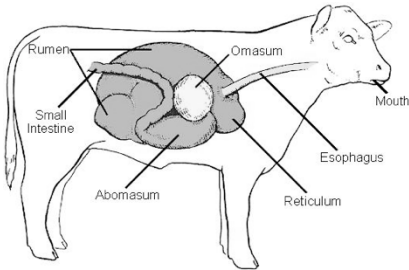
(c) Alcohol fermentation occurs in yeast.

$$\begin{array}{c}
 \text{Glucose} \xrightarrow{2 \text{ ADP} \rightarrow 2 \text{ ATP}} \text{Pyruvate} \\
 \text{Pyruvate} \xrightarrow{2 \text{ NAD}^+ \rightarrow 2 \text{ NADH}} \text{Acetaldehyde} \\
 \text{Acetaldehyde} \xrightarrow{2 \text{ Acetaldehyde} \rightarrow 2 \text{ Ethanol} + 2 \text{ CO}_2} \text{Ethanol}
 \end{array}$$

It's got bubbles!

<http://www.responsiblerservers.com/web/index.php?siteid=256&pageid=1128>

With all this oxygen around, who 'ferments' anymore?

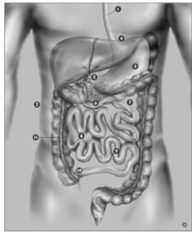


10 billion bacterial cells per milliliter of fluid

With all this oxygen around, who 'ferments' anymore?

Up to 100 trillion individual bacterial cells, representing more than 1,000 species

These bacteria are introduced into the intestines through food and natural human contact. They change very little after year 3 of life.



Symbiosis

Aphids and Proteobacteria *Buchnera*

<http://www.ipm.lsu.edu/ipm/cm/2007/6-11/aphids.html> <http://bbotab.wordpress.com/2010/1/03/love-hate-relationships-in-aphids/>

Questions

Where does the Krebs Cycle take place in the Eukaryotic cell?

The ETC creates ATP with the help of the enzyme _____

T F Oxygen is required to complete glycolysis.

What does Redox stand for?

- 9 questions total
 - 3 per section (Waste elimination, photosynthesis, respiration)
- For each section
 - 1 concept / idea question
 - 2 question reinforcing vocabulary
