Biochemistry 9

- iClicker 21A
- Beyond Glycolysis
- NAD+/NADH
- iClicker 21B

- Due in Lab this week
  - Pre-Lab 8
  - GFP Lab Report
  -
- Register your iClicker
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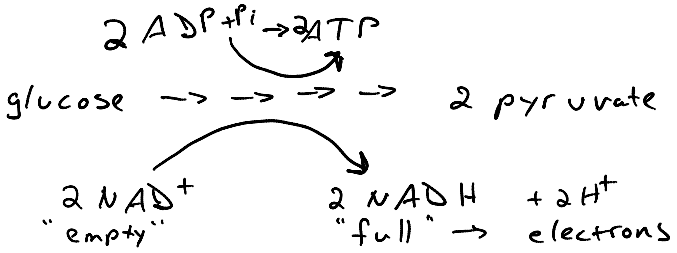
Glycolysis (10 steps) → fermentation ($no\ O_2$)
→ cellular respiration (O_2)
2 parts: - e^- transport
- Kreb's cycle



NAD^+ / NADH → electron carriers

- cell recycles

e^- "carried" as a covalent bond to H

NADH has one more bond than NAD^+

→ need to get rid of the extra e^- inorder to

recycle NADH

we need an electron acceptor

Electron Acceptor Molecules

① O_2 → very good e^- acceptor → cellular respiration

② pyruvate → fermentation (if no O_2 available)

② fermentation (ethanol)

2 pyruvates $\xrightarrow{CO_2}$ 2 acetaldehyde $\xrightarrow{2NADH + 2H}$ 2 ethanol $\xrightarrow{}$ $2NAD^+$

– recycled NADH back into NAD^+

net: glucose → $2CO_2$ + 2 ethanol

$2ADP + P_i$ → $2ATP$

only get 2 ATP/glucose

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① cellular respiration → only if O_2 is present

2 parts (A) electron transport and oxidative phosphorylation

(B) Kreb's cycle (citric acid cycle)

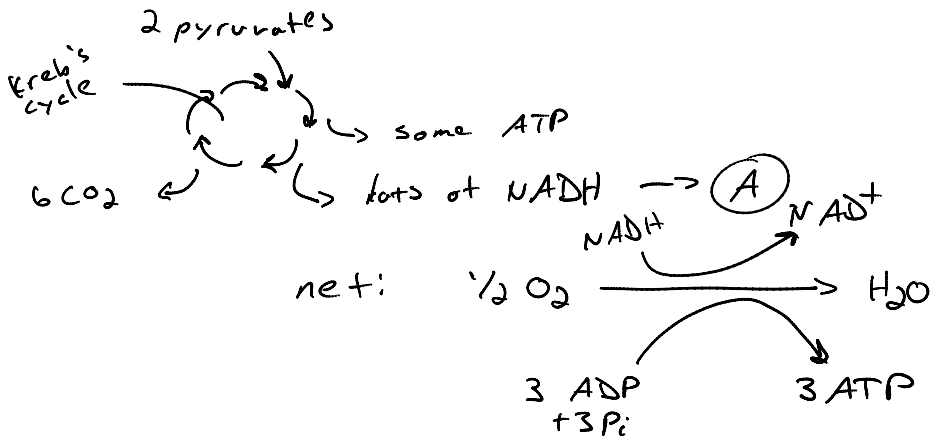
(A) $\frac{1}{2}O_2 \rightarrow H_2O$

$NADH + H \rightarrow NAD^+$

e' from NADH are transferred to O_2

$\Delta G' = -55$ kcal/mol

(B) Kreb's cycle → pyruvates → CO_2



from glycolysis + cellular respiration → 36 ATP/glucose

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fermentation : glucose $\longrightarrow$ $2CO_2$ + 2 ethanol ΔG- 50 kcal/mole

cellular res. : glucose + $6O_2$ $\longrightarrow$ $6CO_2 + 6H_2O$ ΔG- 686 kcal/mole

match : 18 KJ/g
glucose : 14 KJ/g
gasoline : 48 KJ/g
TNT : 75 KJ/g
H : 142 KJ/g

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cells want to do things $\rightarrow$ ATP (ΔG-) $\rightarrow$ recycle ADP (ΔG+) $\rightarrow$

$\rightarrow$ glycolysis $\rightarrow$ NAD^+ $\rightarrow$ recycle NADH $\rightarrow$ 2 choices for e^- acc.

w/ O_2 $\rightarrow$ cellular res. produce CO_2 - exhale

w/o O_2 $\rightarrow$ fermentation consume - O_2 - inhale

-glucose eat food

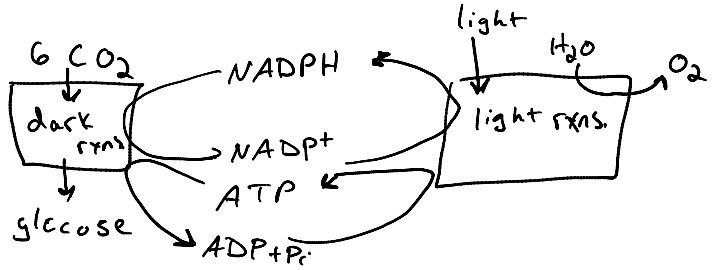
photosynthesis $\rightarrow$ plants make glucose

Photosynthesis

light + $6CO_2 + 6H_2O \longrightarrow$ glucose + $6O_2$

opposite of cellular respiration

production of glucose is ΔG+ $\rightarrow$ energy comes from light



dark reactions ~ reverse of (B) + glycolysis

light reactions ~ reverse of (A)