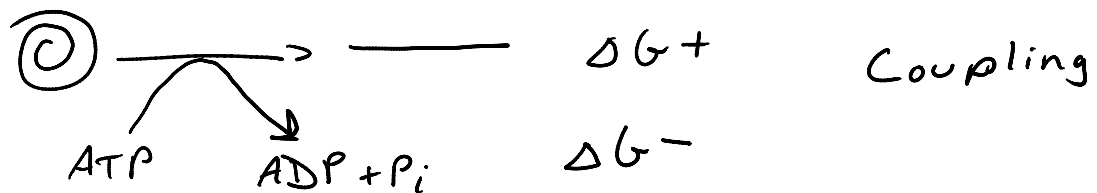


Biochemistry 8

- iClicker 20A
- Coupled Reactions
- ATP – Energy Currency in the Cell
- ~~Glycolysis~~ Glycolysis
- iClicker 20B

- Due in Lab this week
 - Pre-Lab 8
 - GFP Lab Report
 -
- Register your iClicker
-

Summary



Bio 111 ATP & ADP

3 neg. charges repel each other → weak bonds

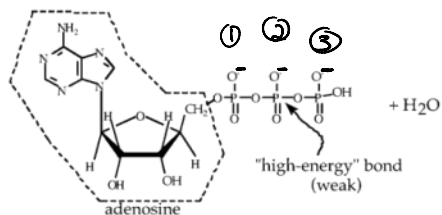
ATP - cell's energy currency



$$\Delta G = -12 \text{ kcal/mol}$$

→ releases a lot of energy
→ to make $\Delta G+$ reactions happen

ATP Adenosine tri phosphate



high-energy form (weak bonds)

"charged up"

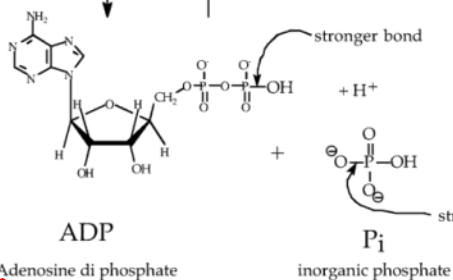
breaking weak bonds
and making strong bonds
 $\Delta G-$

releases energy
($\Delta G = -12 \text{ kcal/mol}$)
[spending energy]
[done by many reactions in cell needed for life]

requires energy input
($\Delta G = +12 \text{ kcal/mol}$)
[storing energy]
[done by glycolysis/respiration = "burning food"]

break strong bonds
make weak bonds
 $\Delta G+$

rechargeable battery



low energy form (strong bonds)

"discharged"
(dead battery)

Biochemistry 8-2

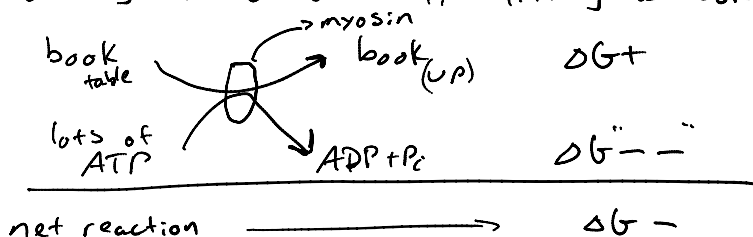
Examples of ATP use to drive essential $\Delta G+$ reactions

① amino acids → protein formation is $\Delta G+$

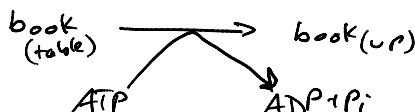
- "costs" the cell 3 ATP per amino acid added
($3 \text{ ATP} \rightarrow 3 \text{ ADP} + 3 P_i$)

② lots of other chemical reactions → making monomers (p.e)

③ moving muscles → ex. lifting a book



Standard notation:



in one cell of your body : ~ 10 billion $ATP \rightarrow ADP + P_i$ reactions every second

~ 1 billion ATP mol.

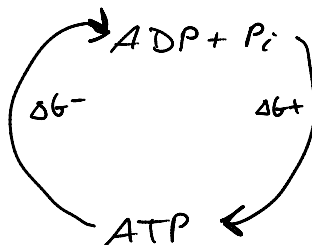
ATP has to be recycled

ATP cycle

reactions of life
- helps move ΔG^+ reactions forward

- lift muscles
- make protein

end w/ dead battery

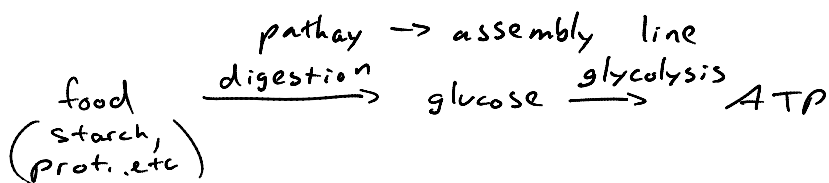


glycolysis & cellular respiration

- burn food to get energy

end w/ a charged battery

Glycolysis \rightarrow first part of a multi-enzymatic pathway that extracts chemical energy from glucose in the form of ATP

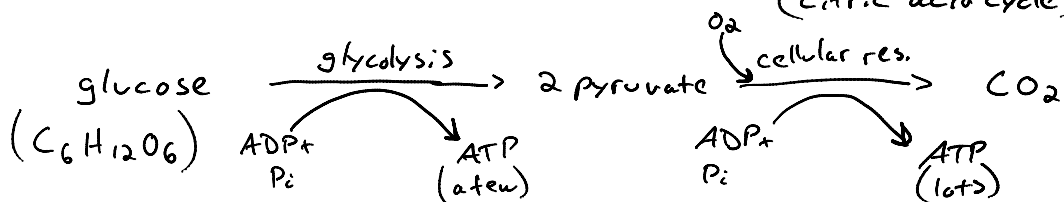


Glycolysis produces 2 pyruvate molecules and a little bit of ATP

glycolysis \rightarrow fermentation (no O_2)
glycolysis \rightarrow cellular respiration (with O_2)

\rightarrow 2 parts: ① electron transport

② Kreb's cycle (citric acid cycle)



~ 36 ATP /pyruvate

Glycolysis (points)

- ① each step is small and done by a specific enzyme
- ② goal is to rearrange glucose to make molecules with weak bonds to add P_i to ADP \rightarrow ATP
- ③ recycling \rightarrow a cell has small amounts of ATP + NAD \rightarrow both molecules must be recycled