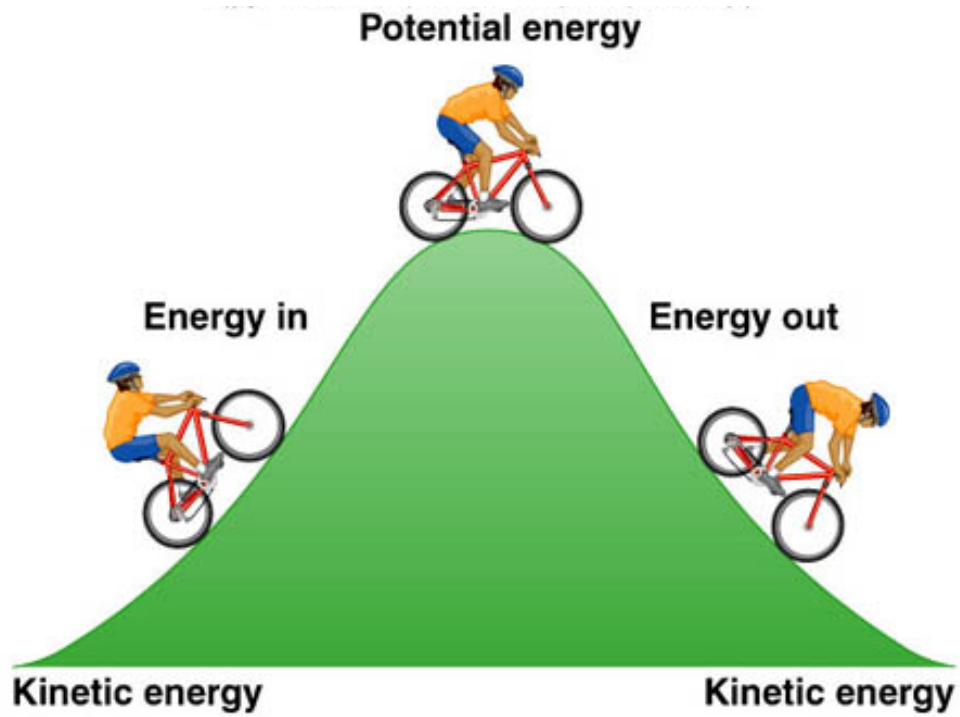
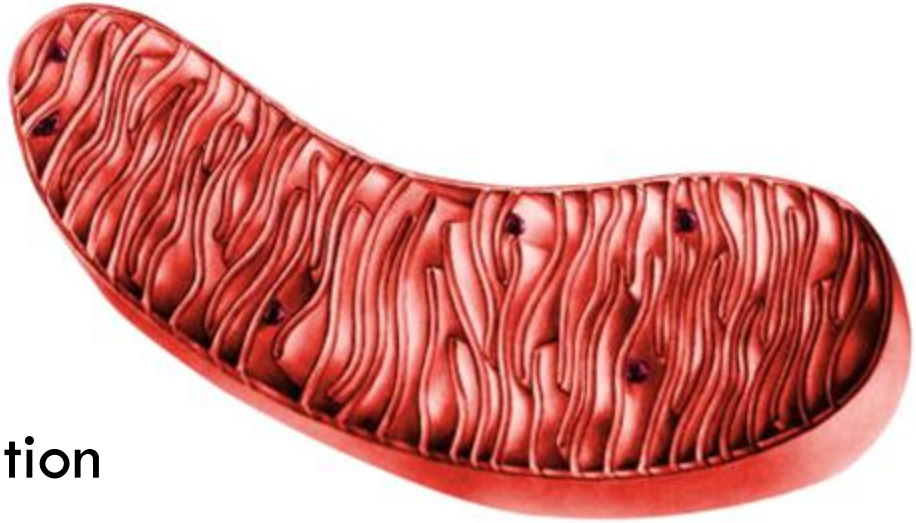
CELLULAR RESPIRATION & FERMENTATION

Respiration and fermentation

- Organic molecules store energy
  - Break down O-chem
  - Releasing energy
- Fermentation
  - w/o Oxygen
- Cellular respiration
  - w/ Oxygen



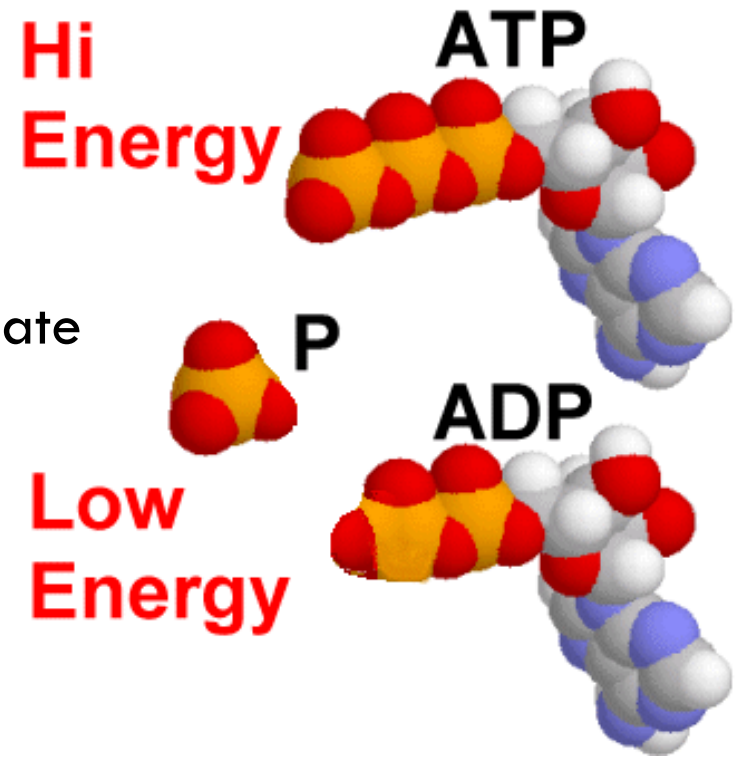
Mitochodrion



- Functions
  - Site of cellular respiration
  - Energy transformer
    - Generates ATP from sugars and fats

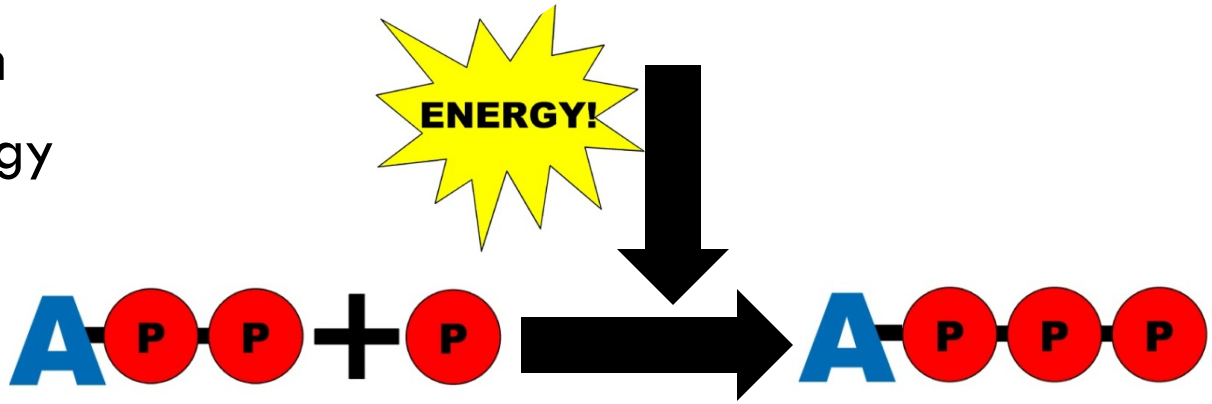
Adenosine Triphosphate

- ATP
  - "universal energy currency"
  - Triphosphate tail
    - Chemical "loaded spring"
    - "relaxes" after loss of Phosphate
  - Becomes ADP + Phosphate
- Adenosine Diphosphate

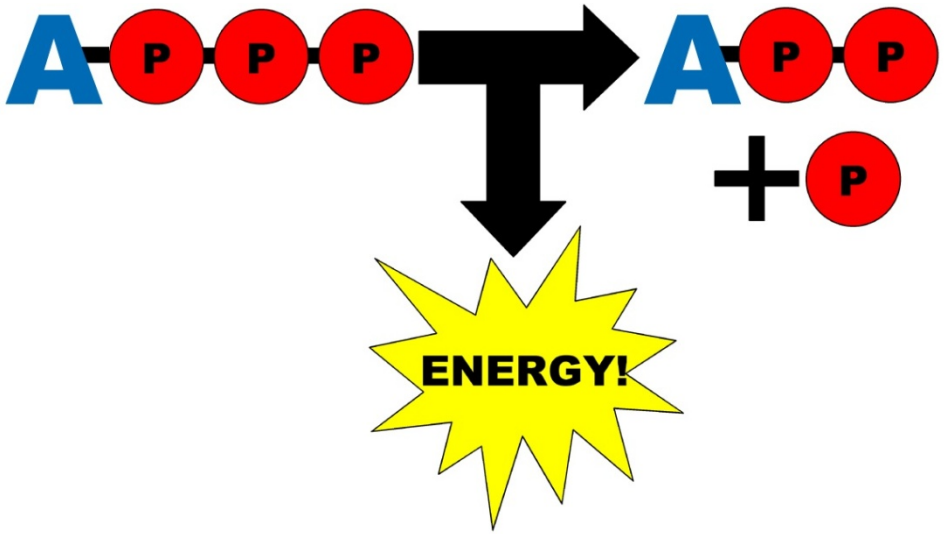


Adenosine Triphosphate

- Phosporylation
  - Requires energy

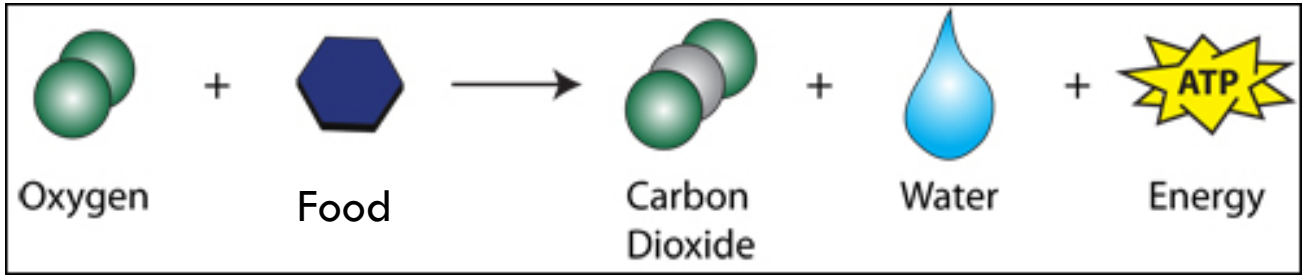


- Dephosphorylation
  - ATP loses Phosphate
  - Releases kinetic energy

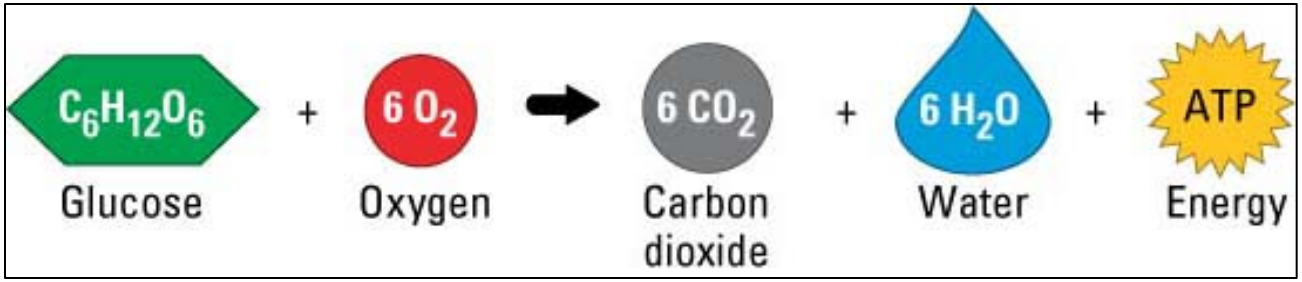


Respiration

- General equation
  - Food = Carbohydrates, fats, proteins

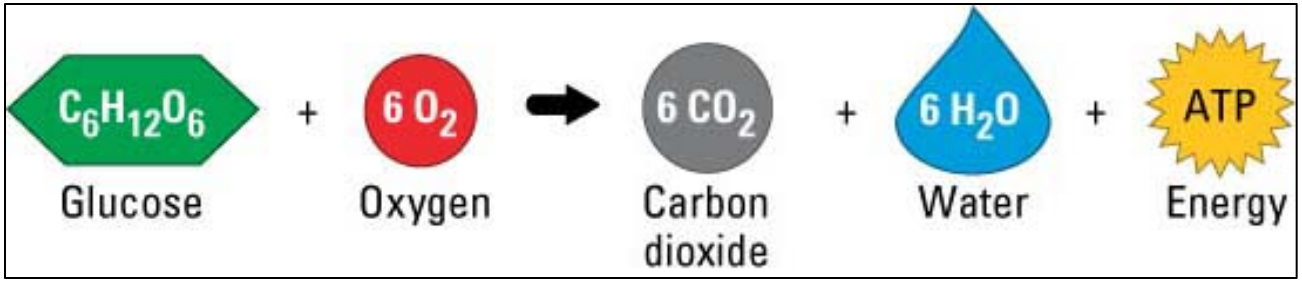


- Glucose (simple sugar)



Steps of respiration

- Glycolysis
- Kreb's cycle
- Electron transport chain

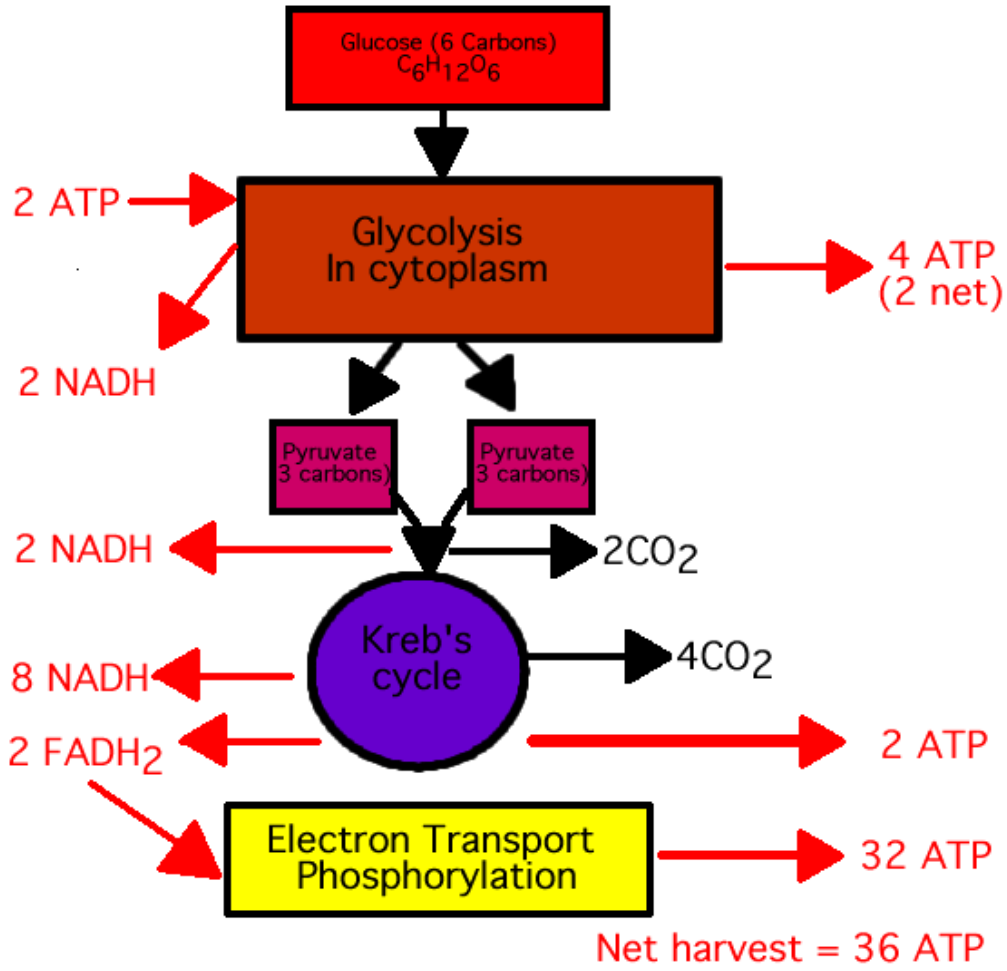


Cell energy is moving e^-

- Energy in glucose released gradually
  - Stripping e^- from H atoms
- NAD^+
  - Oxidizing agent of cells
  - Gains e^- (neutralizes)

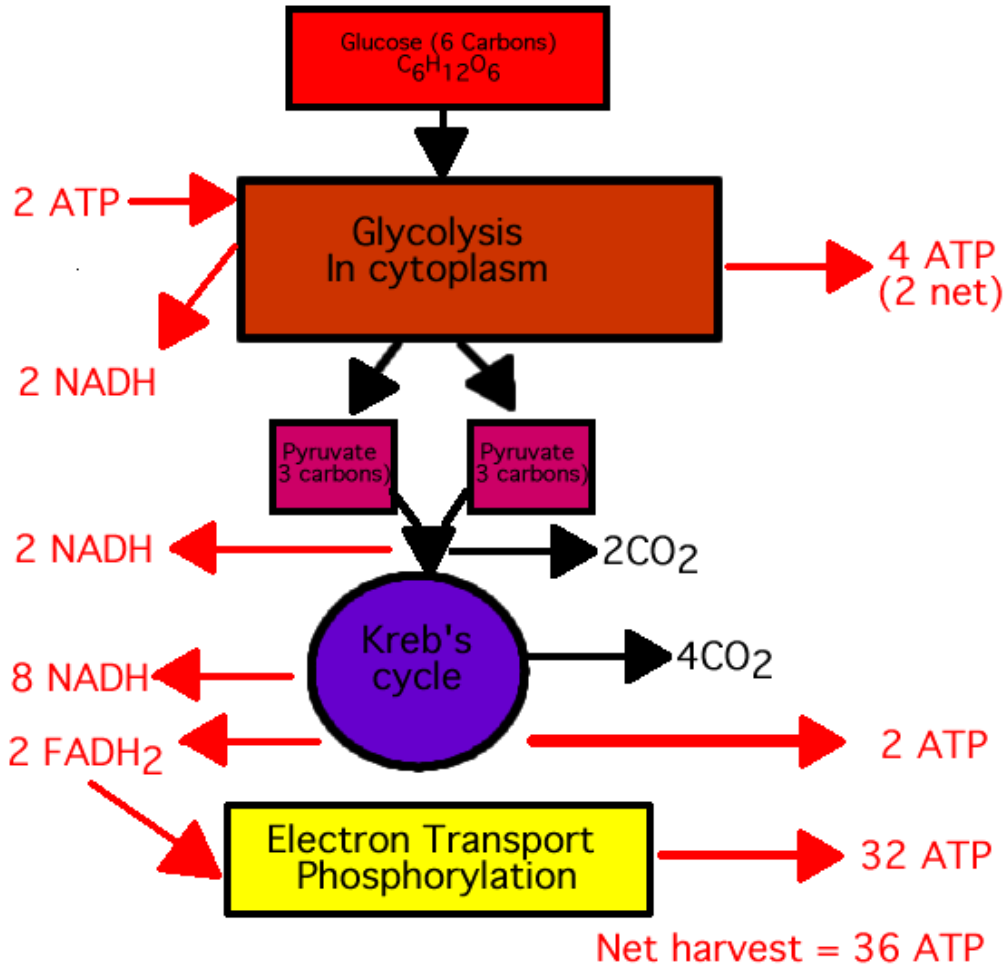
- $NAD^+ + 2[H] \underset{\text{oxidation}}{\overset{\text{reduction}}{\rightleftharpoons}} NADH$
- NADH
  - Stored energy
  - Trapped in small energy doses (single H bond)

Steps of respiration

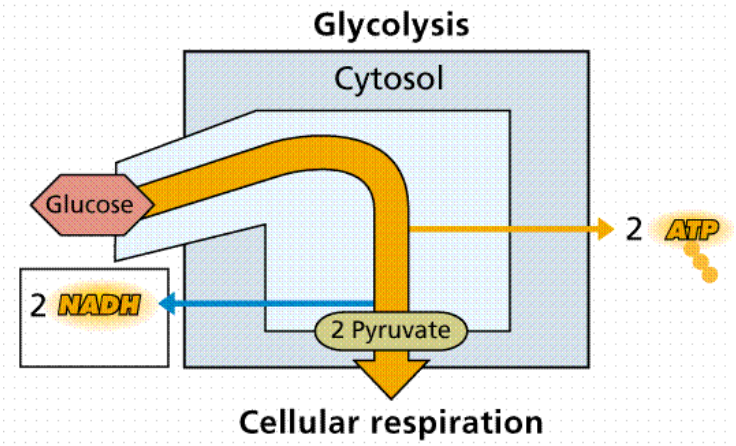


- Glycolysis
- Kreb's cycle
- Electron transport chain

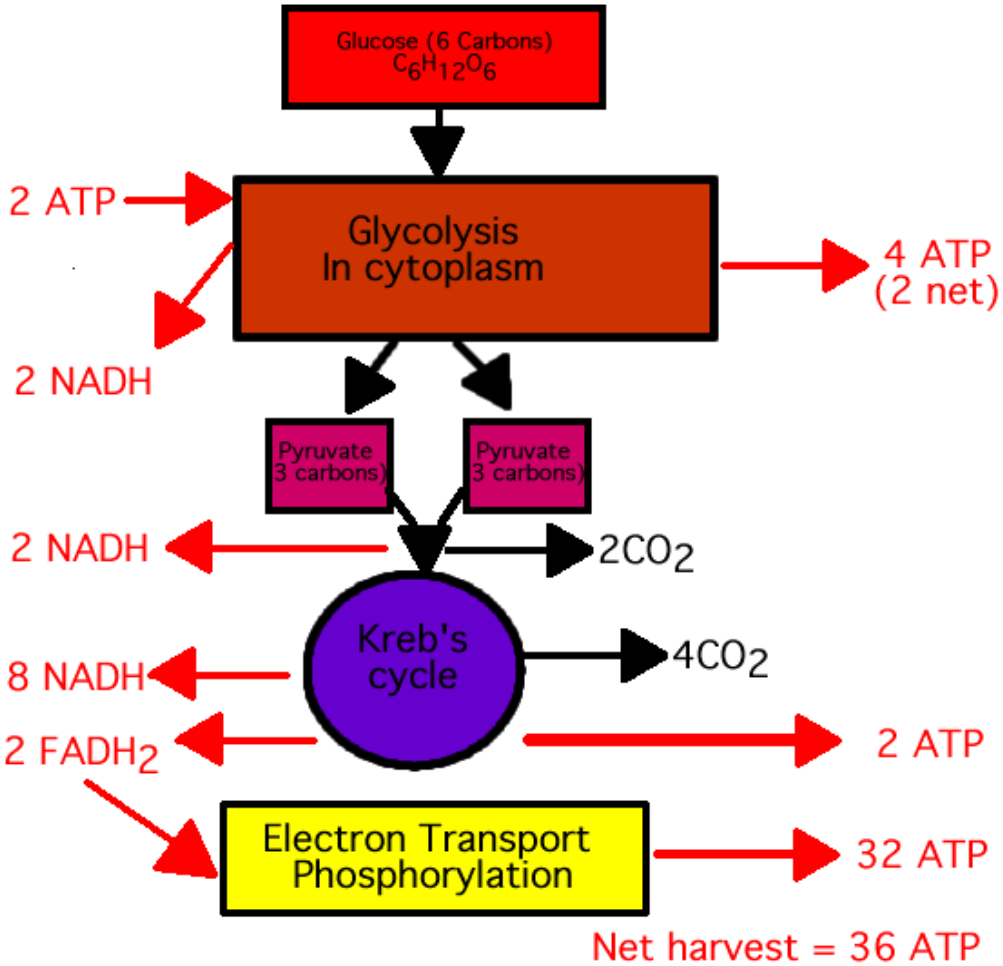
Glycolysis



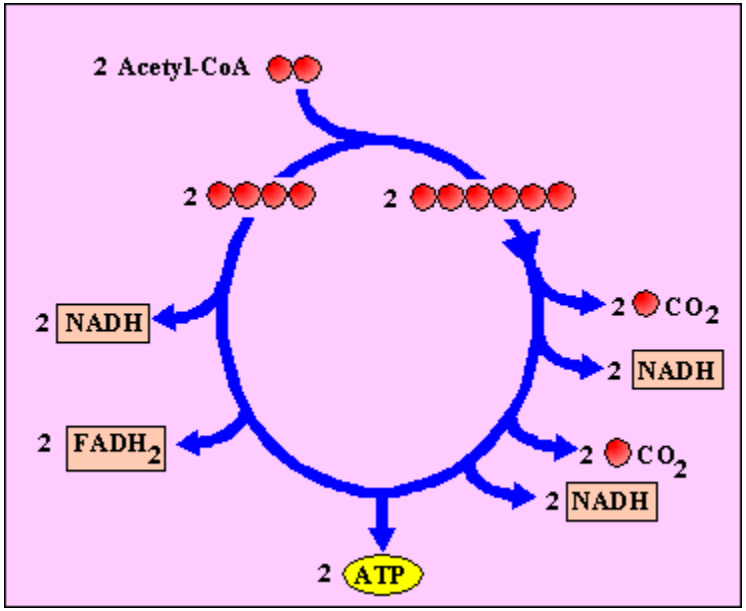
- Splits glucose into 2 pyruvate
- Uses 2 ATP
- Gains 4 ATP
- Releases 2 NADH



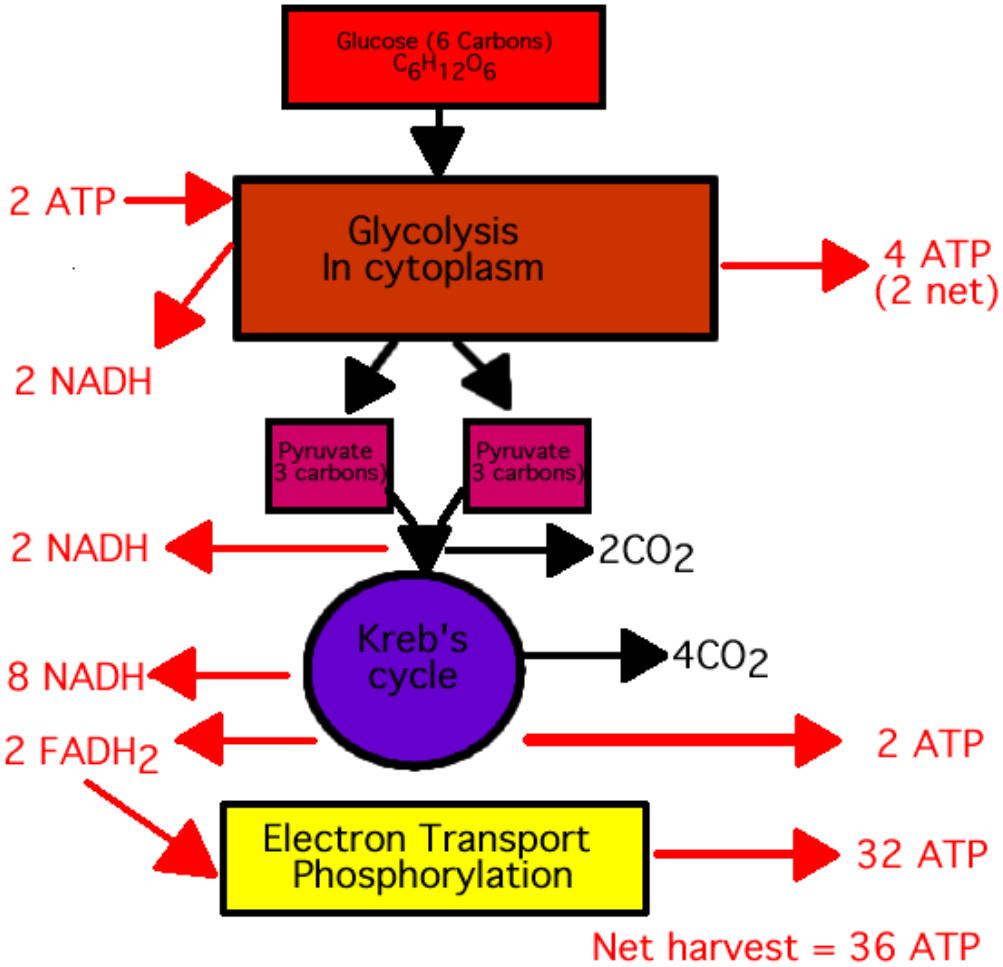
Kreb's Cycle



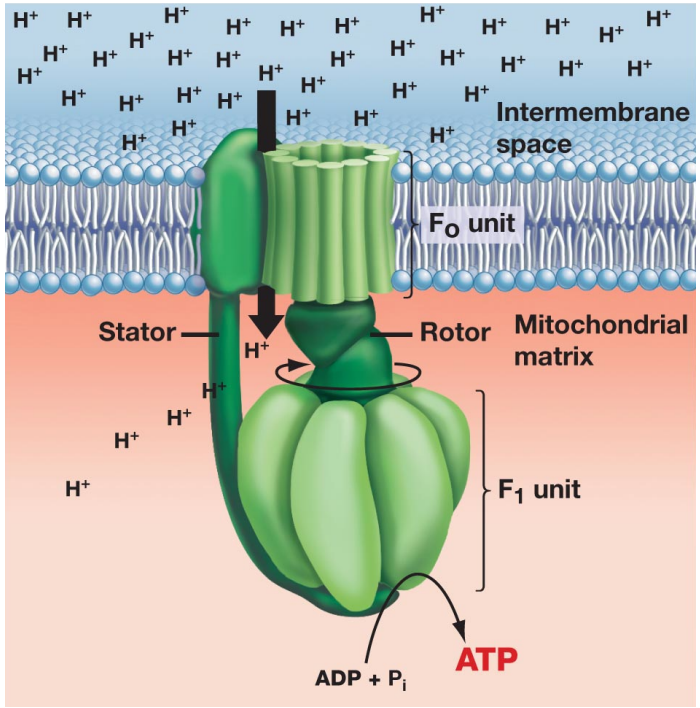
- 2 pyruvate in
- 8 NADH + 2 $FADH_2$
- 2 ATP



Electron transport chain



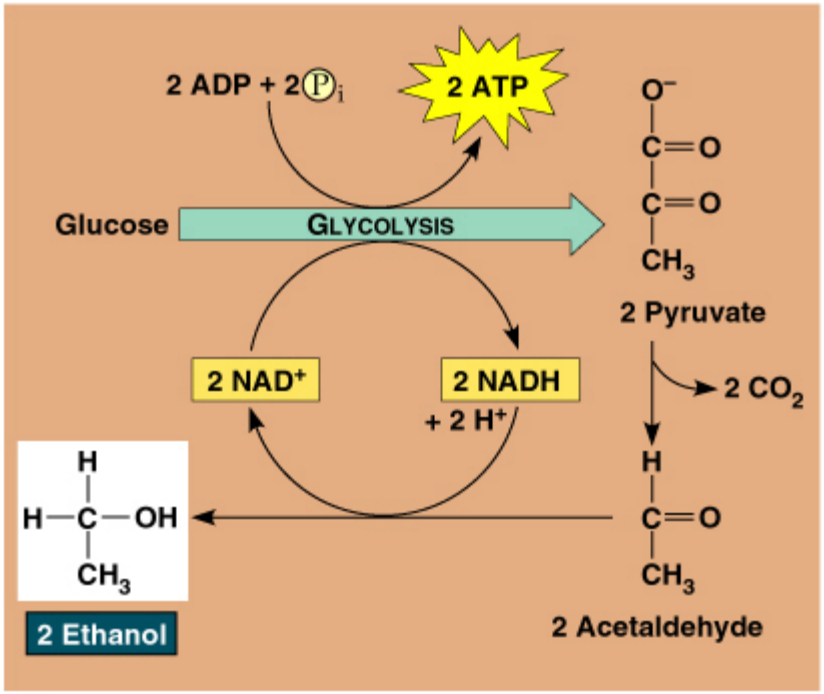
- NADH + $FADH_2$ in
- 32 ATP out



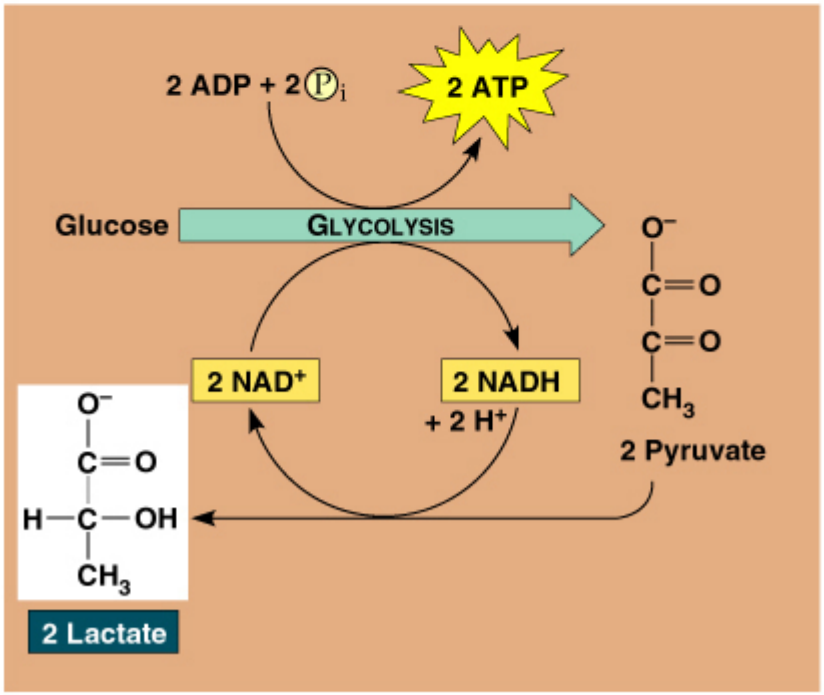
Fermentation

- Oxidation happens to any e^- acceptor
  - Not just Oxygen
- Steps
  - Glycolysis
    - Oxidizing agent = NAD^+
    - Produces 2 ATP
    - Whether O_2 present or not

Fermentation



(a) Alcohol fermentation



(b) Lactic acid fermentation