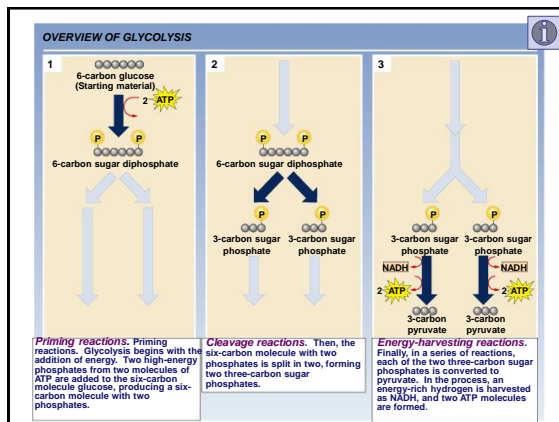
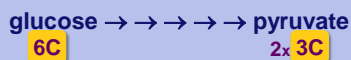


Chapter 9.2 Cellular Respiration: Pyruvate Oxidation & Citric Acid Cycle



Glycolysis is only the start

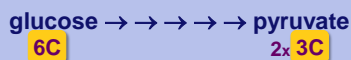
- Glycolysis



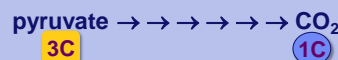
- but pyruvate has more energy to yield!
 - 3 more C to strip off (to oxidize)
 - if O₂ is not available, pyruvate is reduced to regenerate NAD⁺ (meaning that NADH is oxidized to NAD⁺)

Glycolysis is only the start

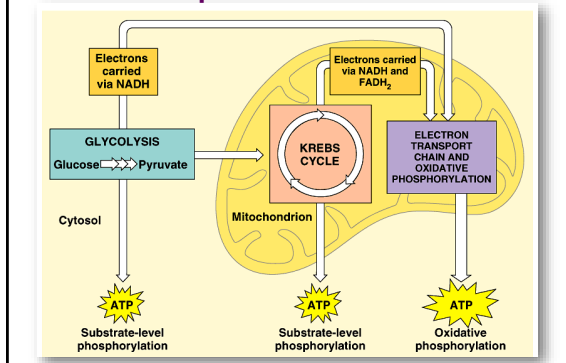
- Glycolysis



- but pyruvate has more energy to yield!
 - 3 more C to strip off (to oxidize)
 - if O₂ is available, pyruvate enters mitochondria
 - enzymes of Krebs cycle complete oxidation of sugar to CO₂



Cellular Respiration

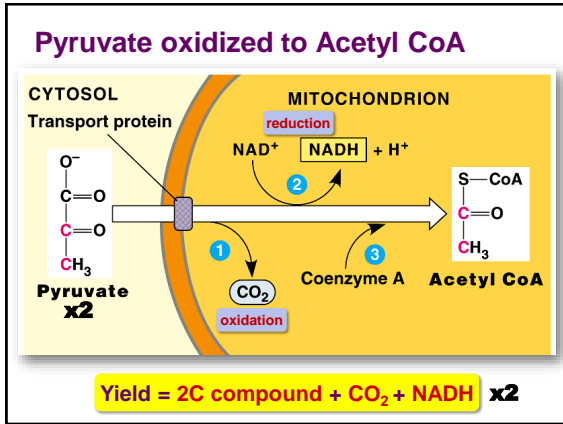


Oxidation of Pyruvate

- Pyruvate enters mitochondria



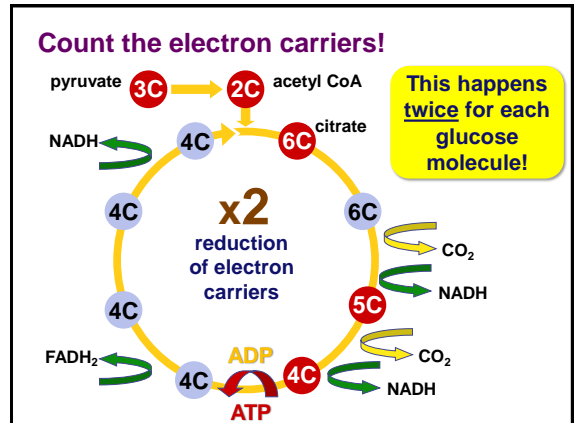
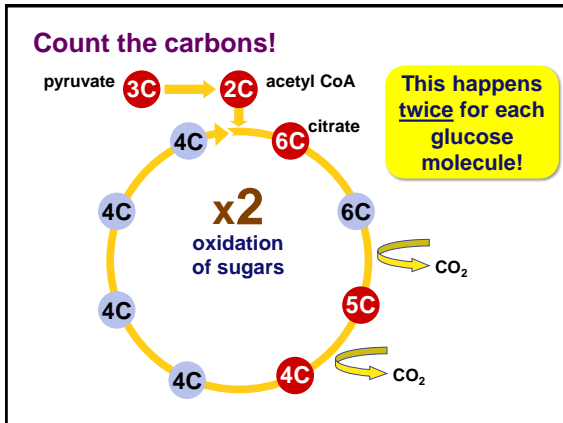
- 3 step oxidation process (on next slide)
 - releases 1 CO₂ (count the carbons!)
 - reduces NAD → NADH (stores energy—endergonic)
 - 2C combines with CoA, producing acetyl CoA
- Acetyl CoA enters Krebs cycle
 - where does CO₂ go?



Krebs cycle

- a.k.a. Citric Acid Cycle
 - ♦ in mitochondrial matrix
 - ♦ 8 step pathway
 - each catalyzed by specific enzyme
 - step-wise catabolism of 6C citrate molecule
- Evolved AFTER glycolysis
 - ♦ does that make evolutionary sense?
 - bacteria → 3.5 billion years ago (glycolysis)
 - free O_2 → 2.7 billion years ago (photosynthesis)
 - eukaryotes → 1.5 billion years ago (aerobic respiration)

Hans Krebs
1900-1981



So we fully oxidized glucose $C_6H_{12}O_6$ → CO_2 & ended up with a net gain of 4 ATP!

KREBS CYCLE

NADH & FADH₂

- Krebs cycle produces large quantities of electron carriers
 - ♦ NADH
 - ♦ FADH₂
 - stored energy!
 - they go to ETC

Pyruvate (from glycolysis, 2 molecules per glucose)

KREBS CYCLE

2 CO_2

3 NADH + 3 H^+

