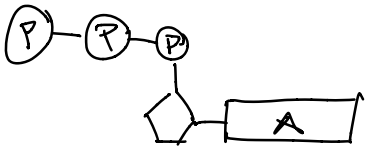
Photosynthesis → e^- from the sun → chemical pot. E^- (glucose)

Cellular Respiration → chemical pot E^- (glucose) → ATP



Photosynthesis:

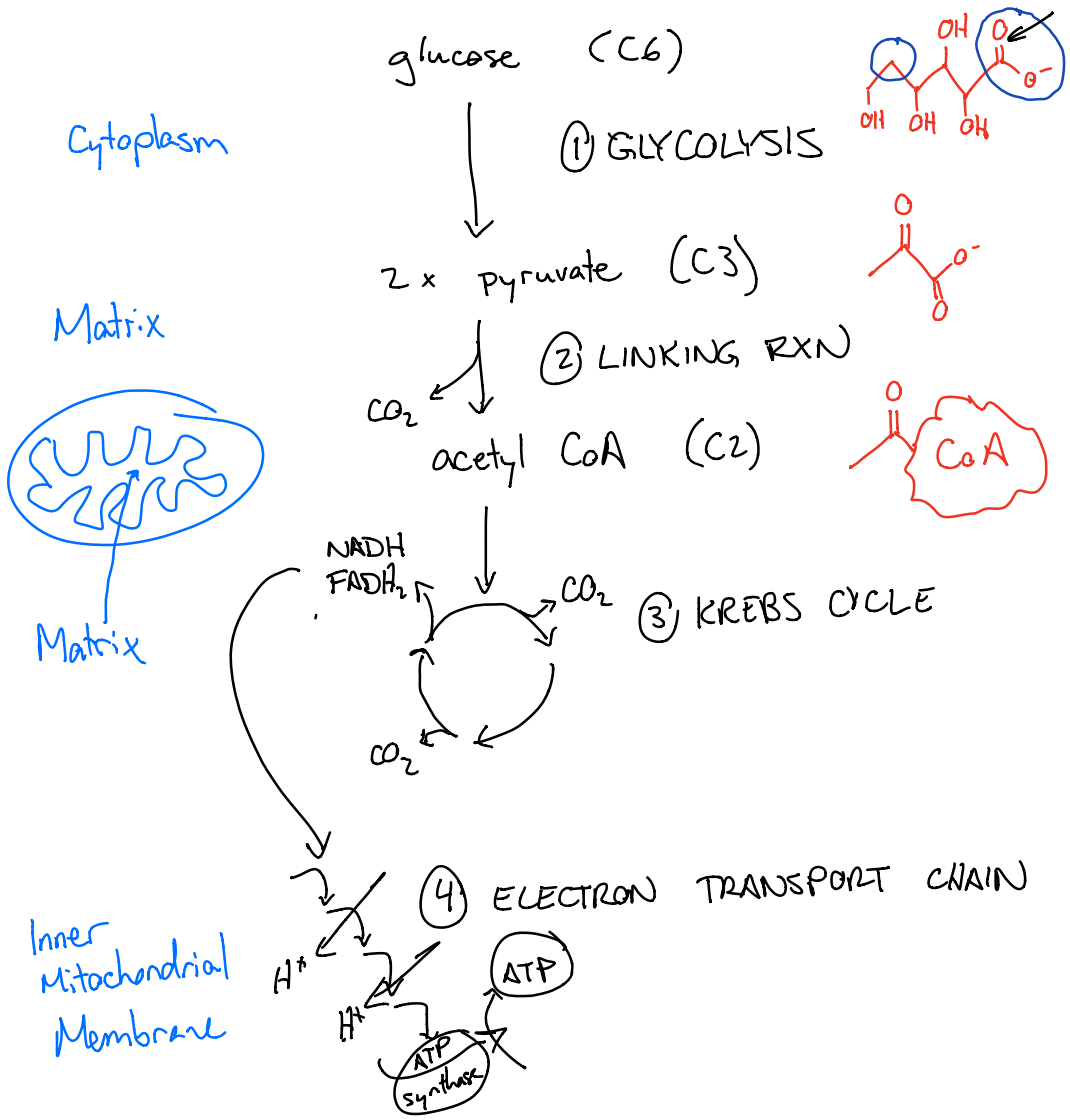
$$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$$

Cellular Respiration:

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$$

→ combustion rxn → chem pot E to heat and light (light: useless.)

→ cellular respiration captures E in chemical form (ATP)



Oxidation - Reduction Reactions "RedOx"

→ transfer of e⁻s from one reactant to another

$Na + KCl \rightarrow NaCl + K$ ← single replacement

$Na + Cl \rightarrow Na^+ + Cl^-$ ← REDOX

Na: oxidized; Cl: reduced

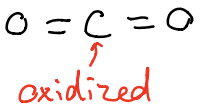
→ oxidation → loss of e^-

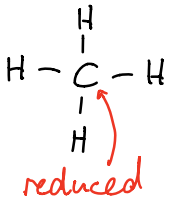
→ reduction → gain of e^-

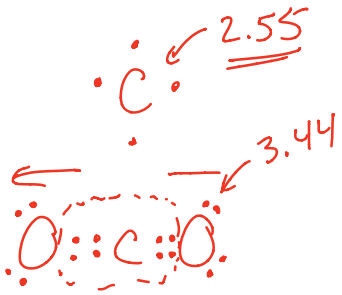
In organic systems:

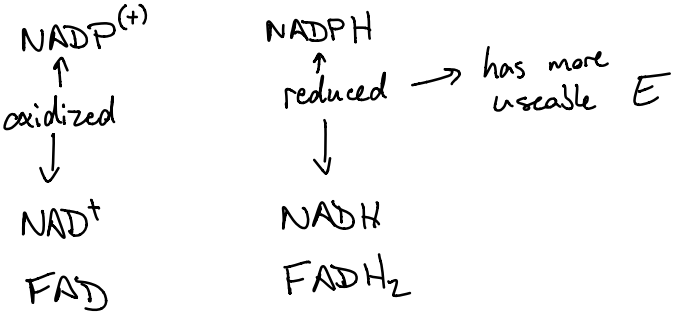
oxidation USUALLY means gaining O / losing H

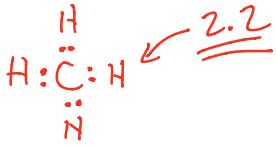
reduction USUALLY means losing O / gaining H



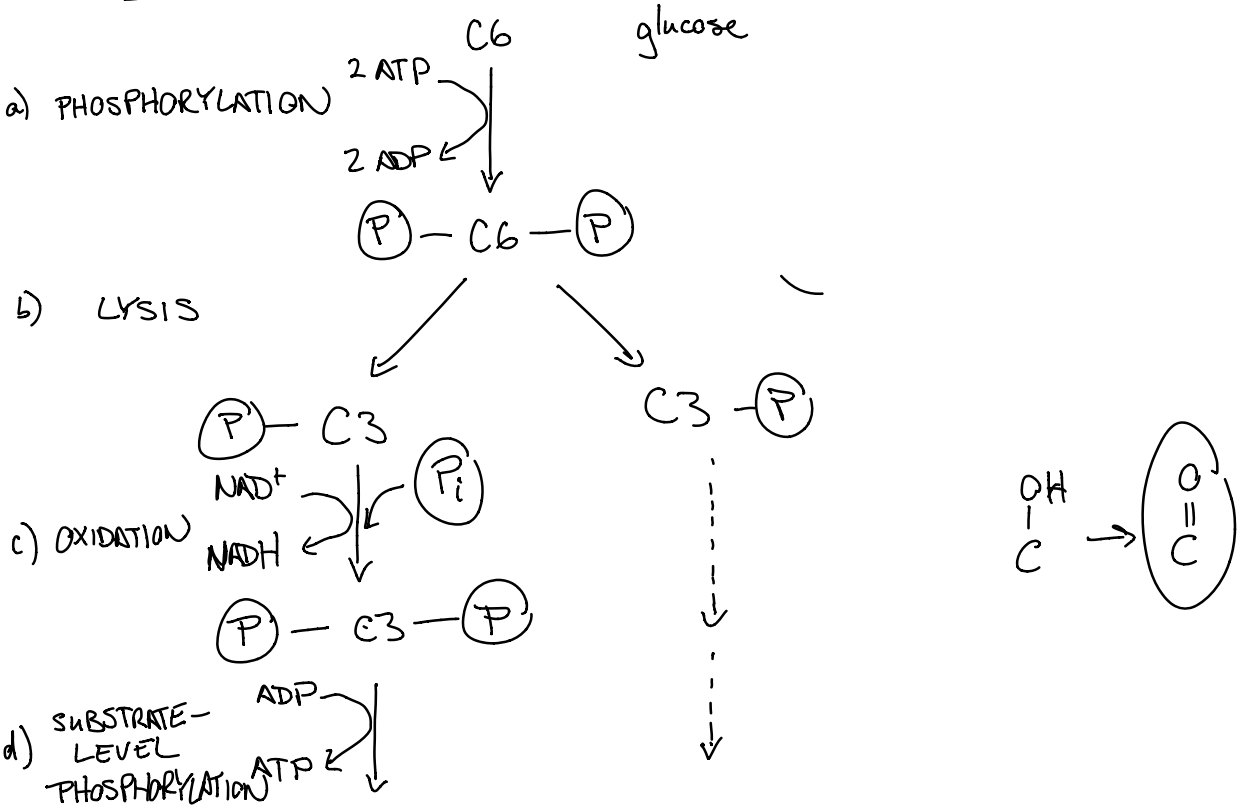


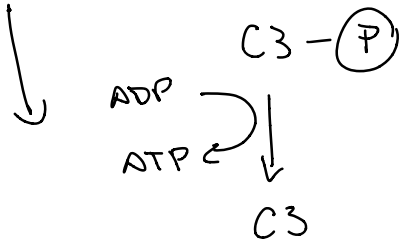




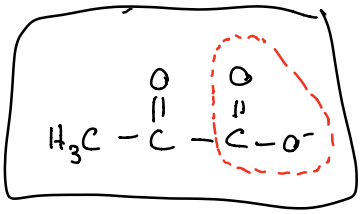


(1) Glycolysis

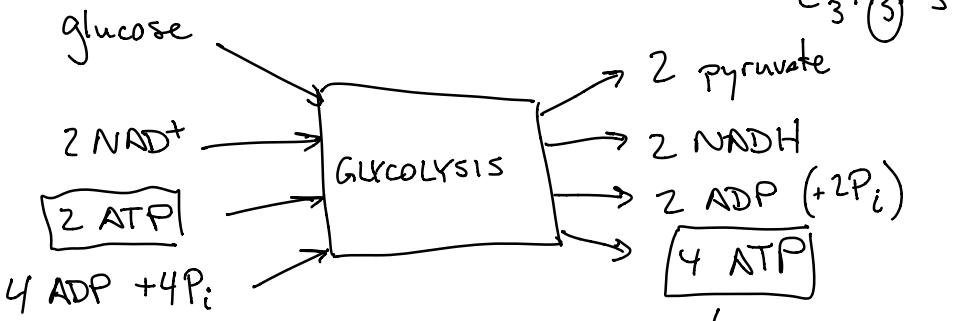




Pyruvate



$C_3H_3O_3$



↳ NET 2 ATP

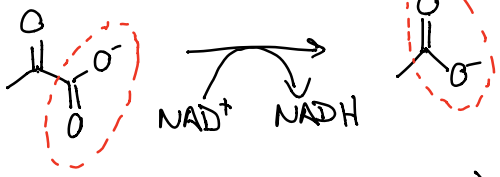
→ Linking Rxn → AEROBIC

OR

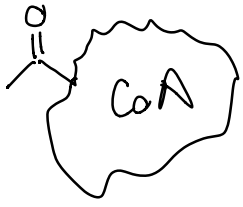
Fermentation → ethanol / lactic acid → ANAEROBIC

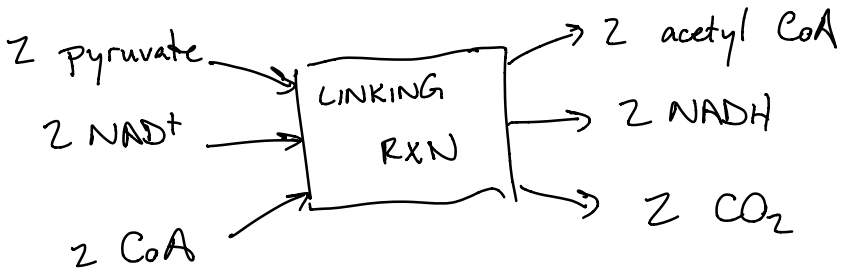
(2) Linking Reaction → get rid of the useless end of pyruvate.

a) oxidative decarboxylation



b) attach CoA (coenzyme A)



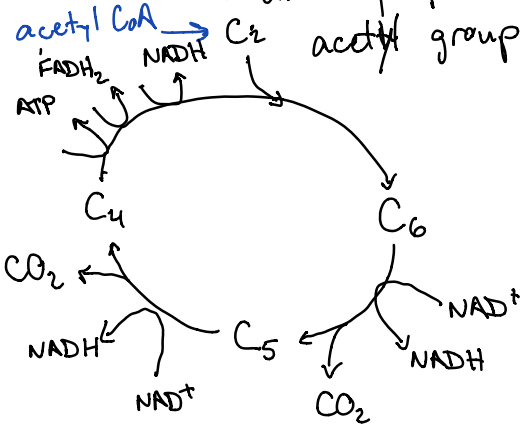


(3) Krebs Cycle

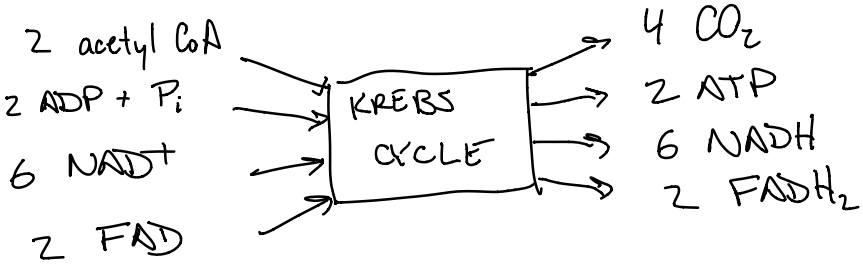
→ dismantle the acetyl group, collect as much $\bar{e}$ as possible → 4 seperate redox rxns

→ capturing $\bar{e}$ as NADH, $FADH_2$

→ directly produce 1 ATP + 2 CO_2 for each acetyl CoA → C_2 acetyl group



- for each decarboxylation you get an NADH.
- reorganizing and oxidizing C4 gets 1 of everything



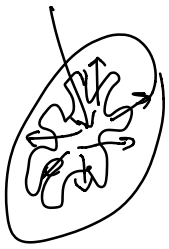
NET
- 4 ATP
- 10 NADH
- 2 $FADH_2$

} carry e^-s to ETC

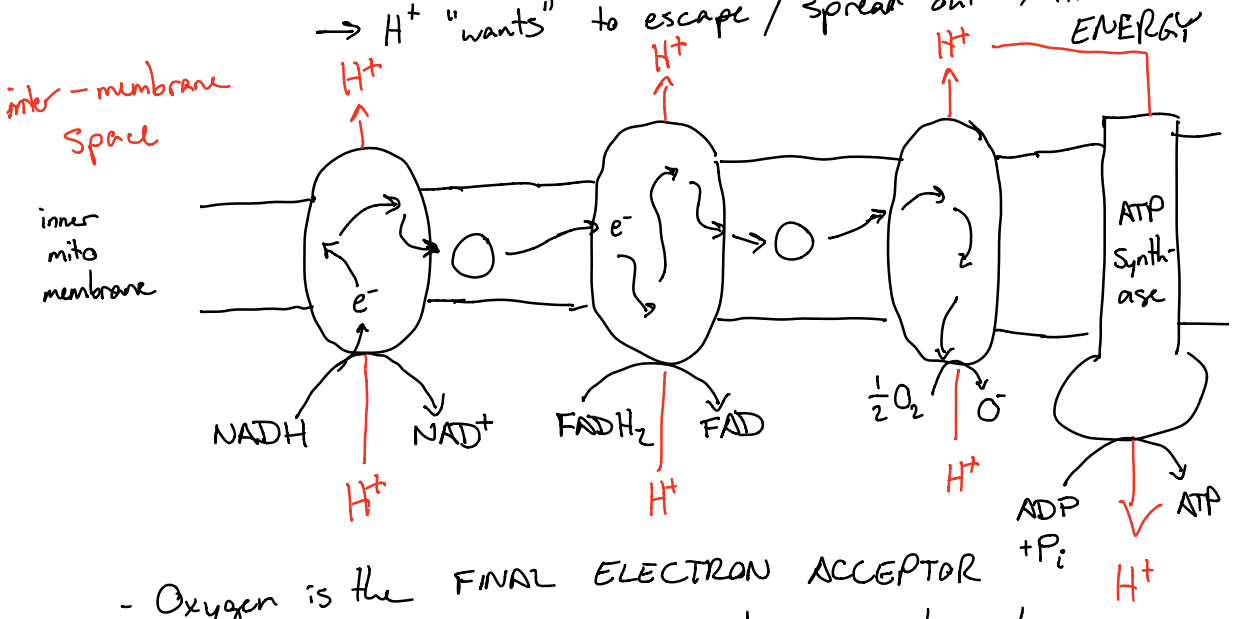
(4) Electron Transport Chain

- chain of electron carriers
- organized in order of electronegativity

  Least ⟶ Most
- e⁻s are passed from one carrier to another that is slightly more electronegative
  - → e⁻'s have less E as they go along.
  - → E released from e⁻'s is used to pump H^+ across inner mitochondrial membrane

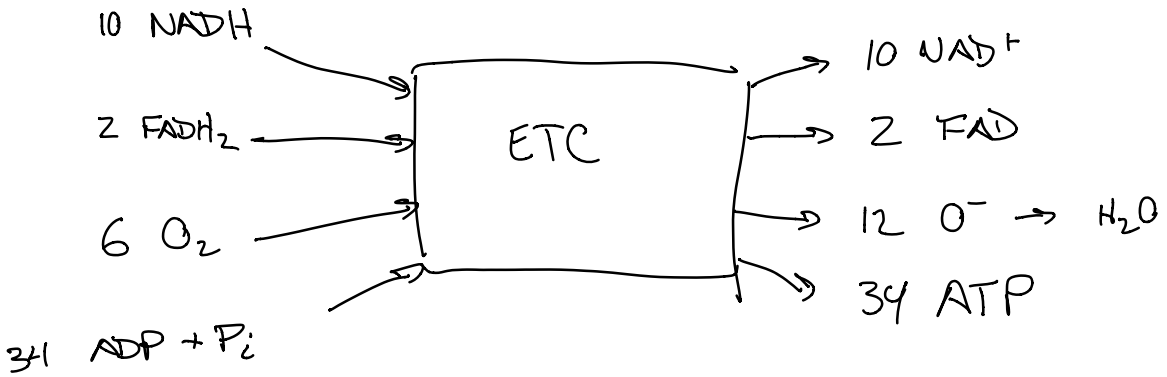


  - → H^+ builds up in inter-membrane space
  - → H^+ "wants" to escape / spread out → HIGH ENERGY



- Oxygen is the FINAL ELECTRON ACCEPTOR
  - ↳ oxygen ions will pick up protons to form water.
- ATP Synthase has a channel that allows H^+ to travel through DOWN its [gradient]
  - ↳ E released used to attach ADP + P_i → ATP

oxidative phosphorylation



Overall → 4 + 34 = 38 ATP

↳ THEORETICAL

≈ 32 ATP on average