

OXIDATIVE PHOSPHORYLATION: STEPWISE OXIDATION CREATES A PROTON GRADIENT THAT IS HARVESTED TO MAKE ATP.

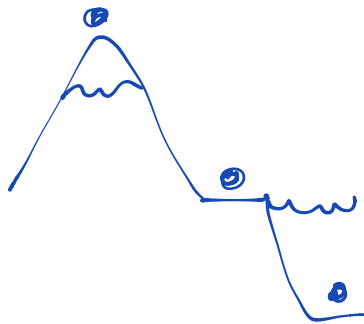
$$\begin{aligned}\Delta \mathcal{E}' &= \mathcal{E}_p - \mathcal{E}_r \\ &= 0.815 \text{ V} - (-0.315 \text{ V}) \\ &= 1.130 \text{ V}\end{aligned}$$

$$\Delta \mathcal{H} = -n F \Delta \mathcal{E}$$

$\uparrow \quad \uparrow \quad \nwarrow 1.13 \text{ V}$
 $1 \text{ } e^- \quad 96 \text{ kJ/mol} \cdot \text{V}$

$$\Delta \mathcal{H} = -217$$

← HOW CALCULATE CHANGE IN $\Delta \mathcal{H}$, $\Delta \mathcal{E}$?



e^- LIKE TO CLIMB HILLS.

$$\Delta U = mg \Delta h$$

$$h_{\text{final}} - h_{\text{initial}}$$

ALL THAT MATTERS IS CHANGE IN HEIGHT, WHATEVER "G" IS.

0.815 V O_2 -217 kJ/mol

(49 kJ/mol)

0.3 V CYT A

0.235 V CYT C

(16 kJ/mol)

0.077 V CYTOCHROME B

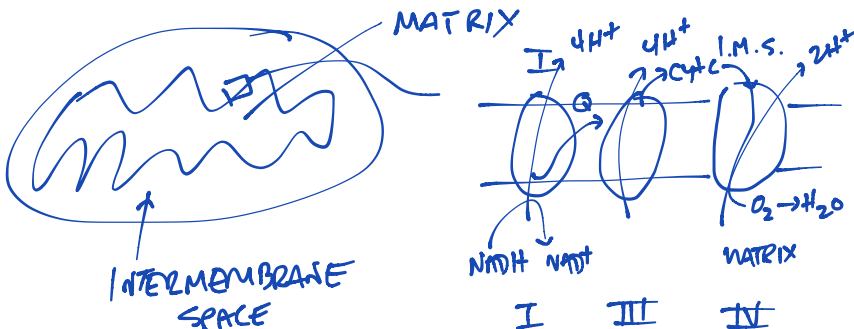
0.045 V UBIQUINONE

0 V FMN

(30)

-0.315 V NADH

0



BREAK UP STEPS FOR CONTROL, ENERGY CAPTURE, SAFETY.

HOW MUCH ENERGY IS STORED IN GRADIENT?

$$\Delta G = RT \ln \left(\frac{[H^+]_{OUT}}{[H^+]_{IN}} \right) + zF\Delta\psi$$

$$pH = 7.15 = 7.08 \times 10^{-8}$$

$$pH = 7.80 = 1.58 \times 10^{-8}$$

$$\Delta\psi = 0.170 \text{ V}$$

10 PROTONS @ 20 kJ/mol = EXTREMELY
CLOSE TO
TOTAL!