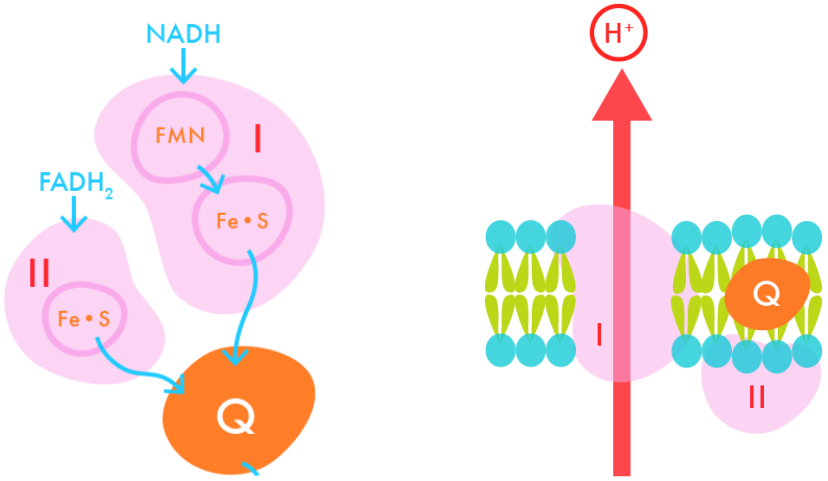
CONCEPT: OXIDATIVE PHOSPHORYLATION

- Complex I (NADH dehydrogenase) – pumps $4H^+$ into intermembrane space, prosthetic groups: FMN and Fe-S
  - □ NADH delivers $2e^-$ to complex I: NADH → FMN → Fe-S proteins → Q + $2H^+$ + $2e^-$ → QH_2
- Complex II (succinate dehydrogenase) – does not pump any protons, prosthetic groups: FAD and Fe-S
  - □ 3 FAD entry points to ubiquinone: complex II, FAD from ß-oxidation, and NADH from cytoplasm*
  - □ $FADH_2$ delivers $2e^-$ to complex II: $FADH_2$ → Fe-S proteins → Q + $2H^+$ + $2e^-$ → QH_2



- Complex III (cytochrome b) – pumps 4 protons into intermembrane space, prosthetic groups: heme and Fe-S
  - □ Q cycle electron transfer results in the reduction of 2 cyt c, the pumping of $4H^+$, and uptake of $2H^+$ from matrix
  - □ Cyt c – on periplasmic side of complex III, carries electrons 1 at a time without H^+, prosthetic group: heme
- Complex IV (cytochrome oxidase) – pumps $4H^+$ into intermembrane space, prosthetic group: heme and copper
  - □ Cyt c donates electrons to Cu in complex IV, 4cyt c + $4e^-$ → 2 Cu
  - □ Cyt c brings electrons to complex IV were they will form H_2O: cyt c → Cu → Heme a → O_2 + $4H^+$ + $4e^-$