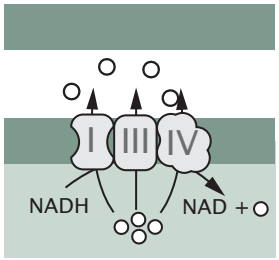
ATP synthesis



$N_{ATP\ synthase} \approx 3000$ ATP synthases — number of ATP synthase per cell

$r_{ATP\ synthesis} \approx \frac{300\ ATP\ /\ sec}{synthase}$ BNID: 114701 — ATP synthesis rate per synthase

$N_{protons} \approx 4\ H^+\ /\ ATP$ BNID: 101442 — protons transported into cytosol per ATP

$$r_{proton\ use} \approx N_{ATP\ synthase} \times r_{ATP\ synthesis} \times N_{protons}$$

$$\approx 3000\ synthases \times \frac{300\ ATP}{sec \times synthase} \times \frac{4\ H^+}{ATP}$$

$$\approx 5 \times 10^6\ H^+\ /\ sec$$

rate of proton depletion

$r_{transport} \approx 1500 \frac{H^+\ /\ sec}{e^{-1}\ transport\ chain}$ BNID: 114704 BNID: 114687 — rate of proton tranport into intermembrane space by electron transport chain

$$\frac{r_{proton\ use}}{r_{transport}} \approx \frac{5 \times 10^6\ H^+}{sec} \times \frac{1\ e^-\ transport\ chain \times sec}{1500\ H^+}$$

$$\approx 3000\ e^-\ transport\ chains$$

number of electron transport chain complexes