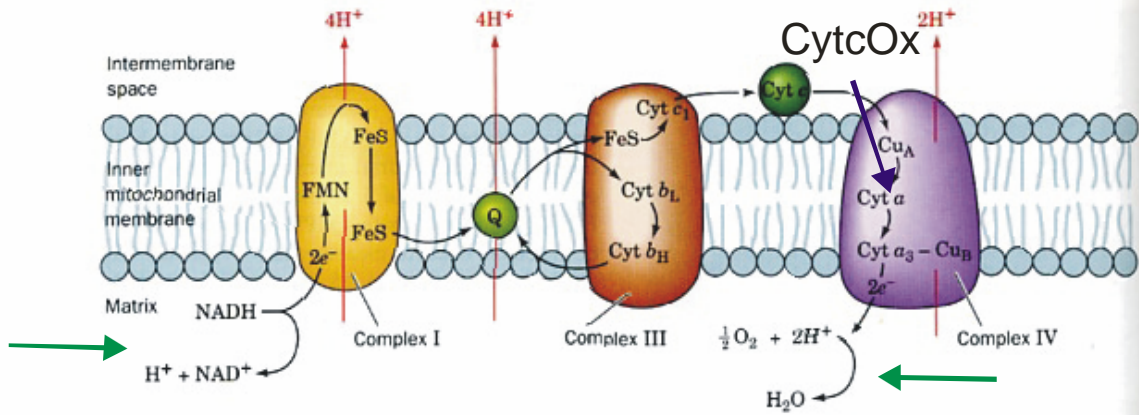


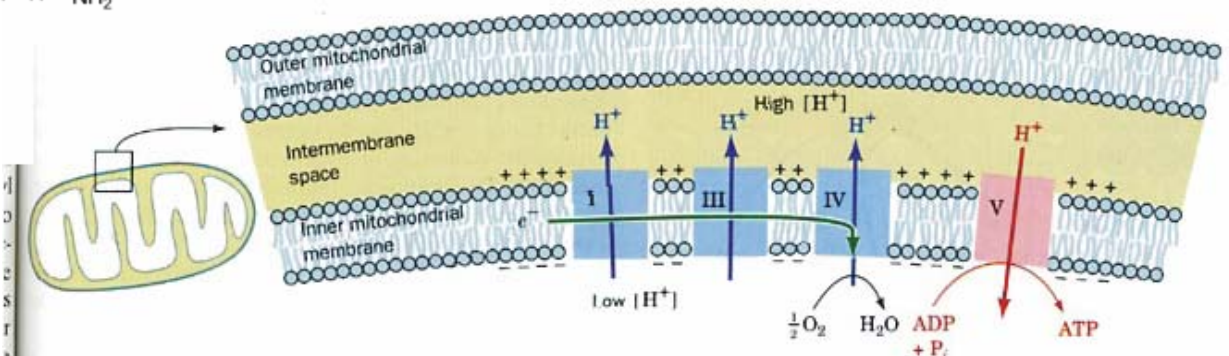
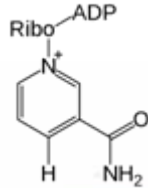
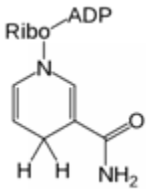
# Respiration



**FIGURE 22-14 The mitochondrial electron-transport chain.** The pathways of electron transfer (black) and proton pumping (red) are indicated. Electrons are transferred between Complexes I and III by membrane-soluble CoQ (Q) and

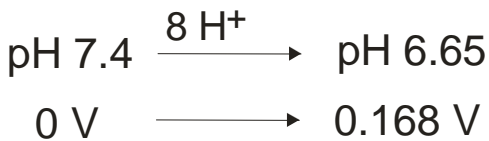
between Complexes III and IV by the peripheral membrane protein cytochrome c (Cyt c). Complex II (not shown) transfers electrons from succinate to CoQ. See the Animated Figures

(a)



**FIGURE 22-29 Coupling of electron transport (green arrow) and ATP synthesis.**  $\text{H}^+$  is pumped out of the mitochondrion by Complexes I, III, and IV of the electron-transport chain (blue arrows), thereby generating an electrochemical gradient across the inner mitochondrial membrane. The exergonic return of

these protons to the matrix powers the synthesis of ATP (red arrow). Note that the outer mitochondrial membrane is permeable to small molecules and ions, including  $\text{H}^+$ . See the Animated Figures



$$\Delta G = +174 \text{ kJ/8 mol H}^+$$