MUNI
SCI

C5730 Biochemie - seminář

Mgr. Lukáš Faltinek

podzim 2023

MUNI
SCI

Dýchací řetězec a fotosyntéza

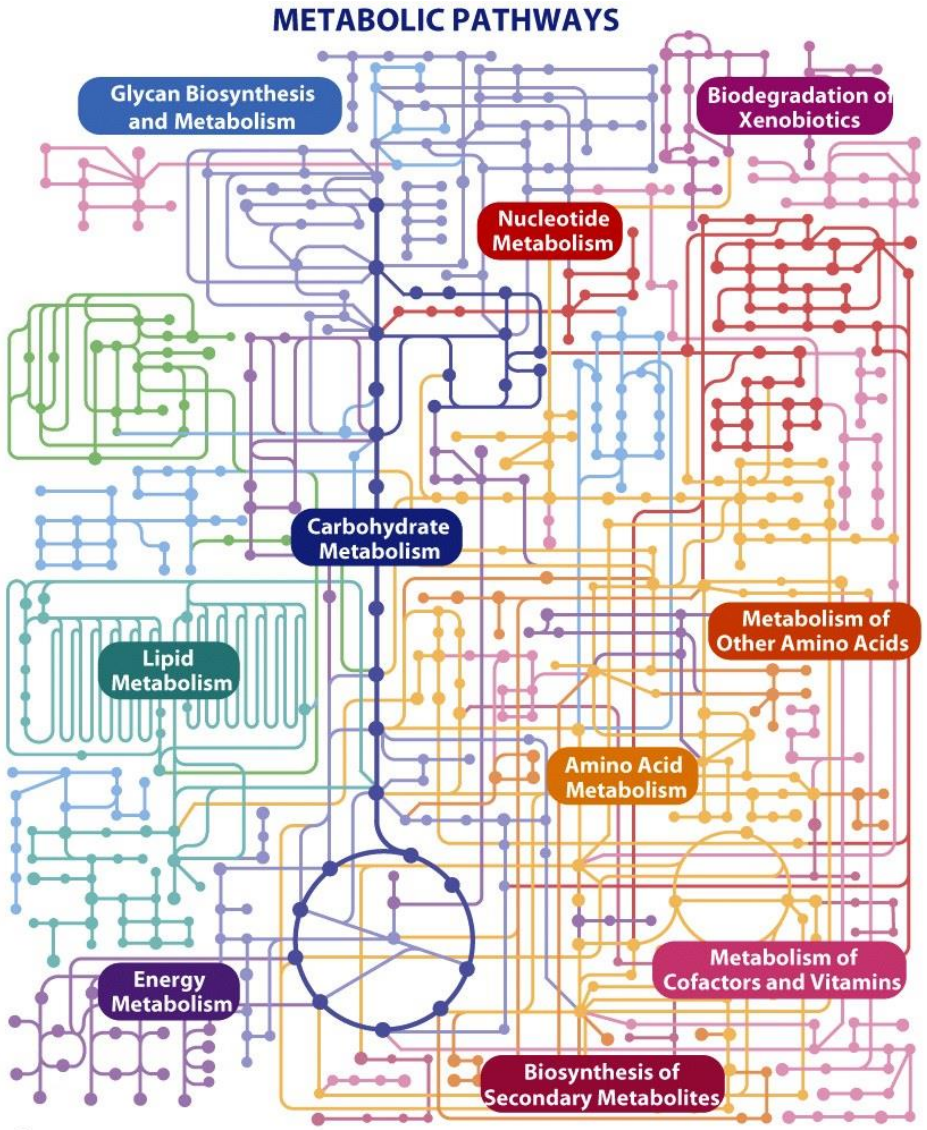
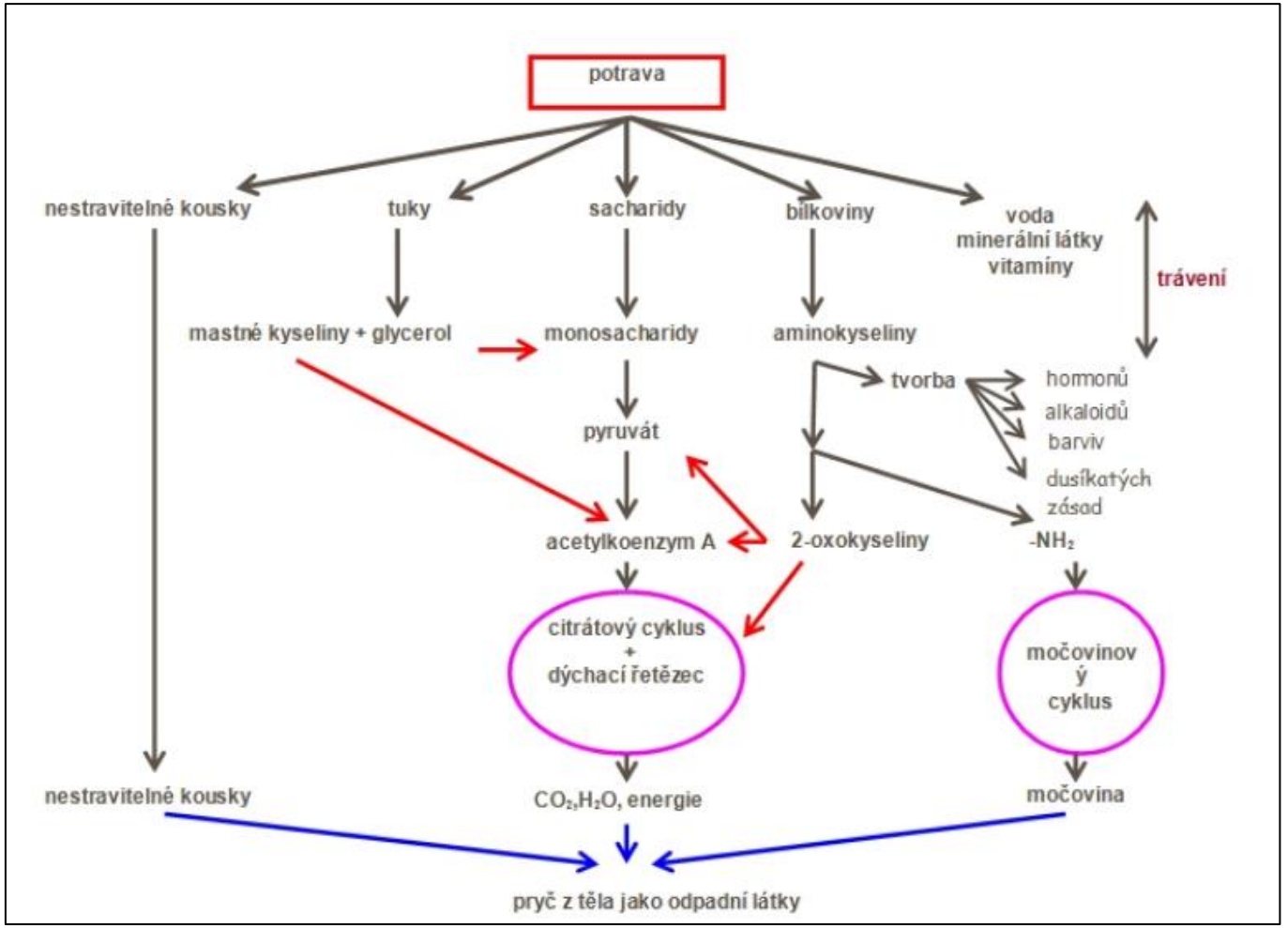


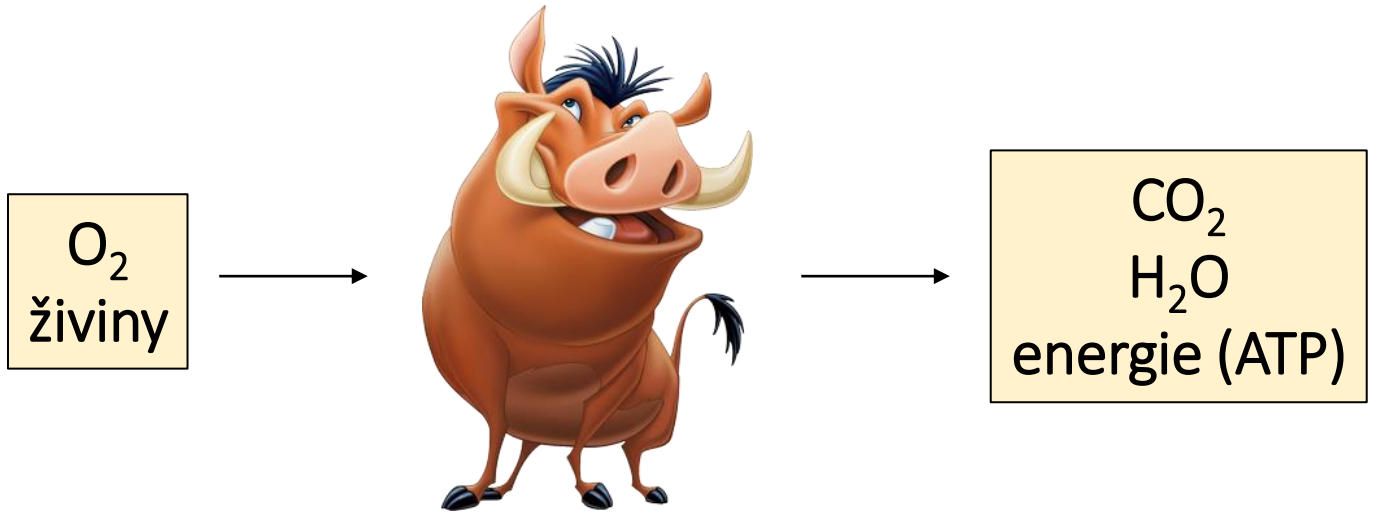
Figure 15-1
Lehninger Principles of Biochemistry, Fifth Edition



http://www.studiumbiochemie.cz/metabolismus

Buněčné dýchání

- souhrn biochemických procesů, při kterých se energie z chemických vazeb ukládá do ATP za vzniku odpadních produktů (CO_2, H_2O)
- lze rozdělit na následující fáze:
  - aerobní glykolýza
  - Krebsův cyklus
  - dýchací řetězec
  - oxidativní fosforylace



Dýchací řetězec

- elektronový transportní řetězec
- systém enzymů (zejména oxidoreduktas) lokalizovaný na vnitřní membráně mitochondrií
  - u prokaryot je dýchací řetězec umístěn na plasmatické membráně
- dochází k re-oxidaci NADH a $FADH_2$

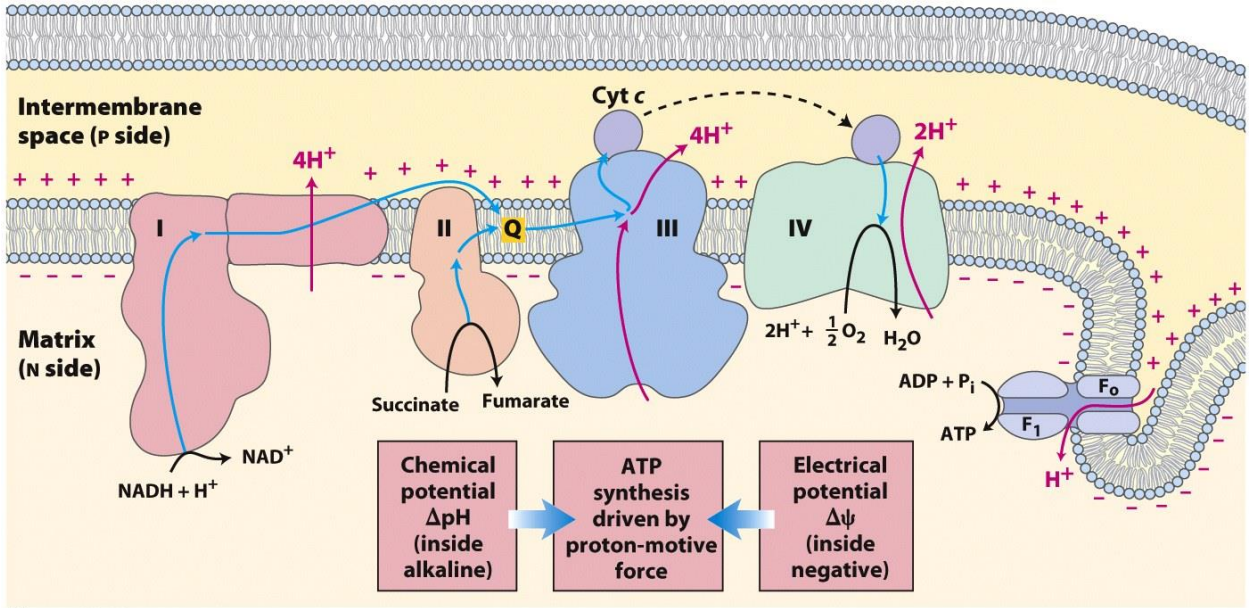
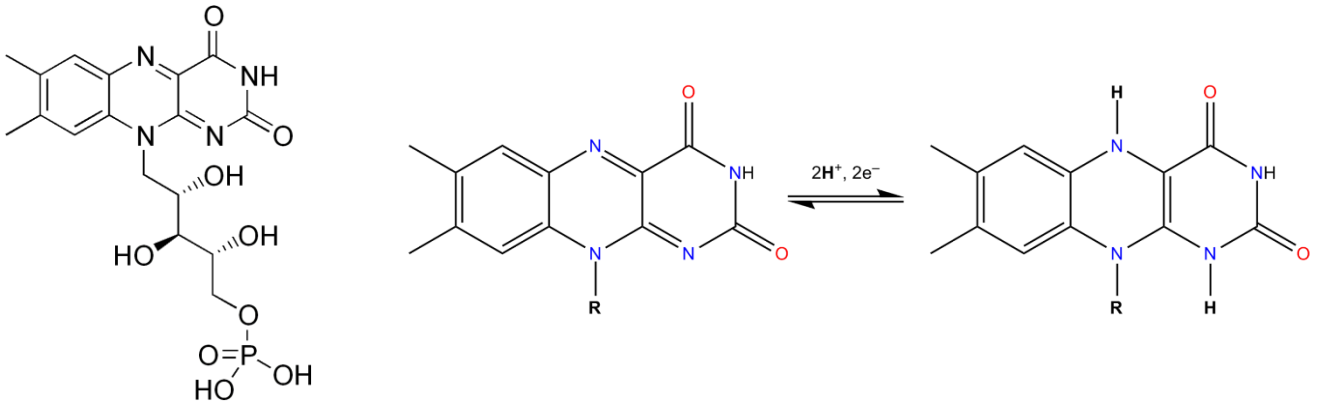


Figure 19-19
Lehninger Principles of Biochemistry, Fifth Edition

Komplex I

NADH-ubichinonoxidoreduktasa

- přenáší elektrony z NADH na koenzym Q
- obsahuje flavinmononukleotid (**FMN**) a **Fe-S klastry**



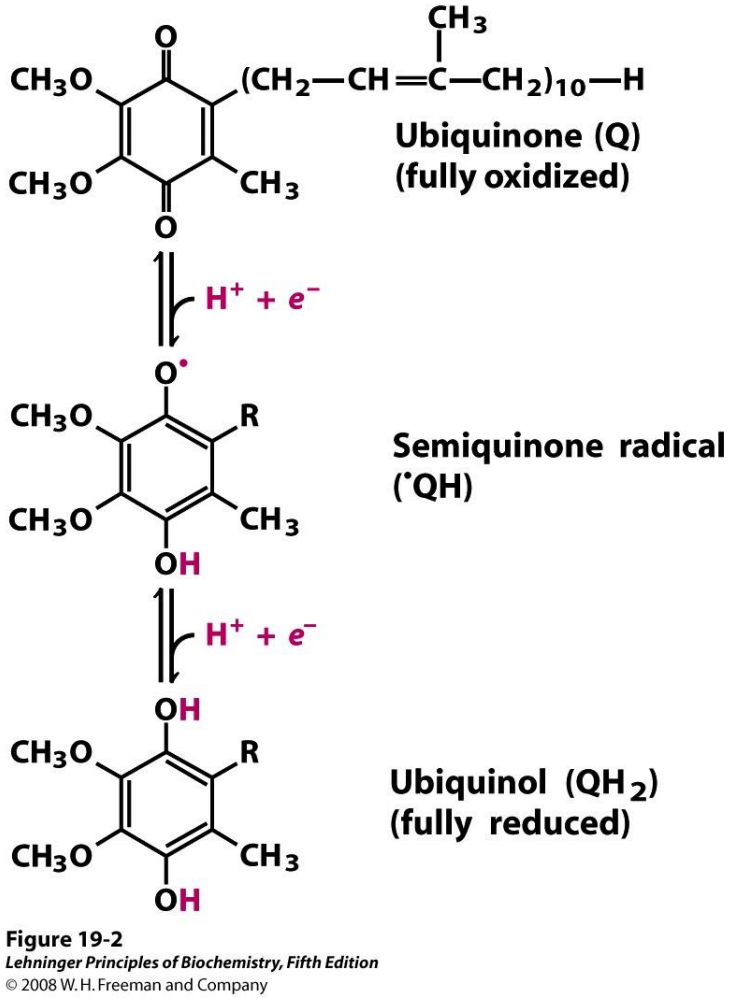


Figure 19-2
Lehninger Principles of Biochemistry, Fifth Edition
© 2008 W. H. Freeman and Company

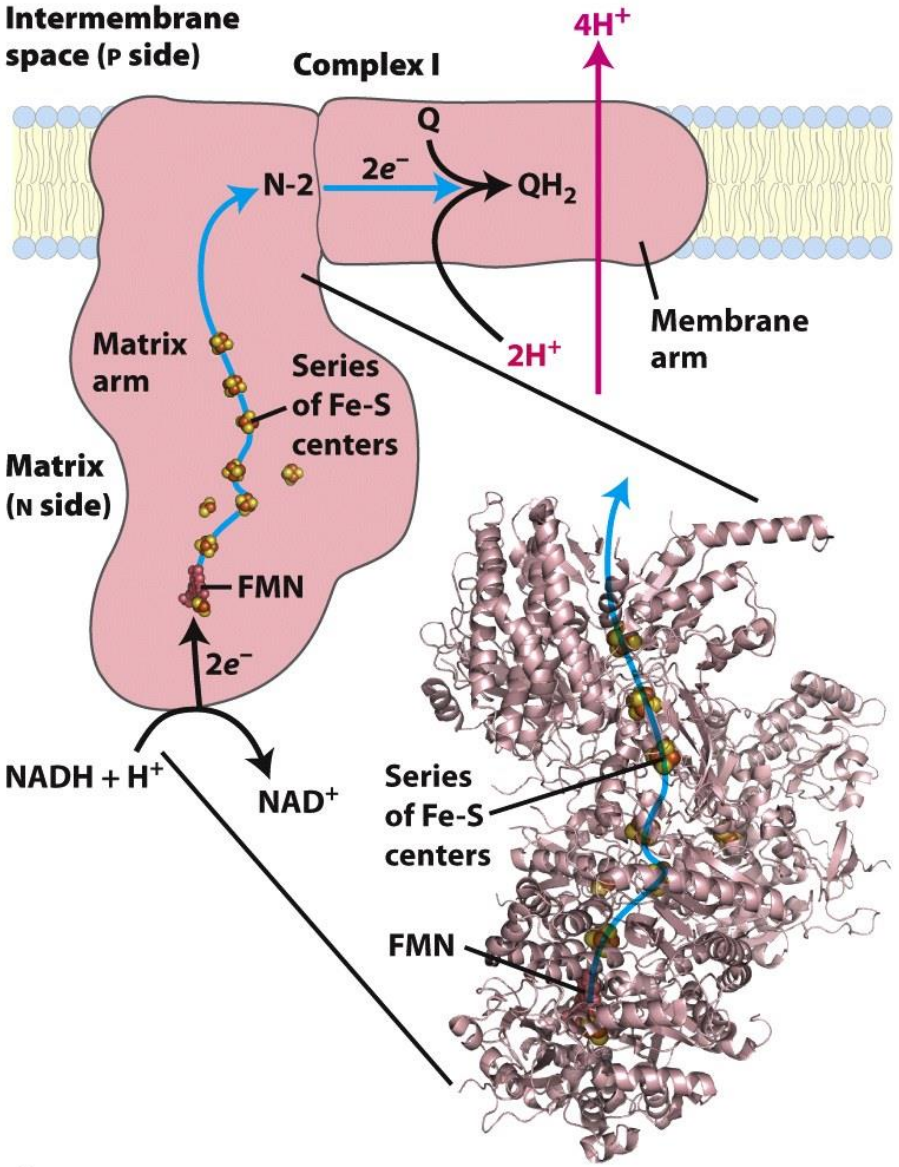


Figure 19-9
Lehninger Principles of Biochemistry, Fifth Edition

$$NADH + H^+ + CoQ \rightarrow NAD^+ + CoQH_2$$

Zároveň dochází k přenosu 4 protonů do mezimembránového prostoru.

Malát aspartátový člunek

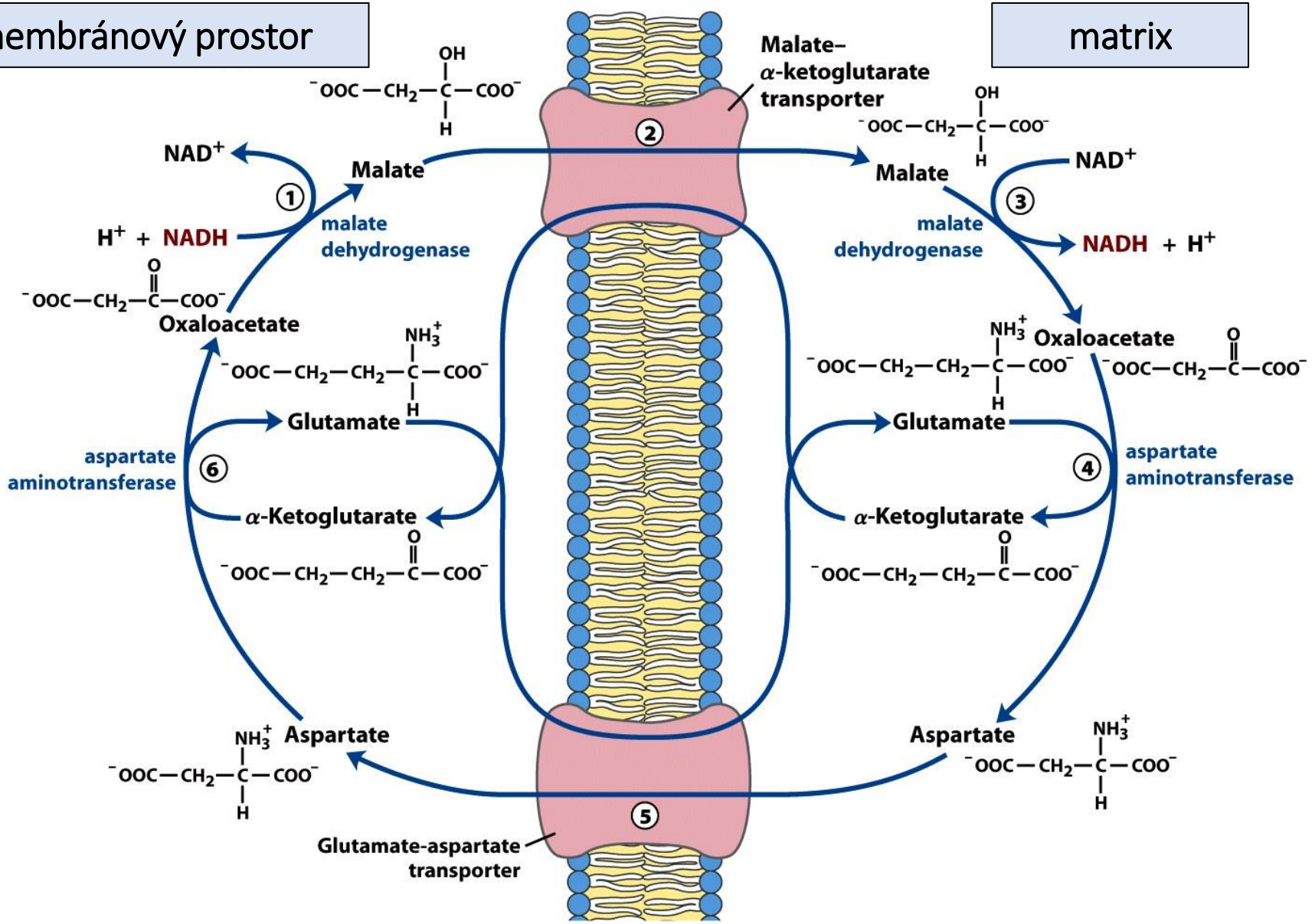
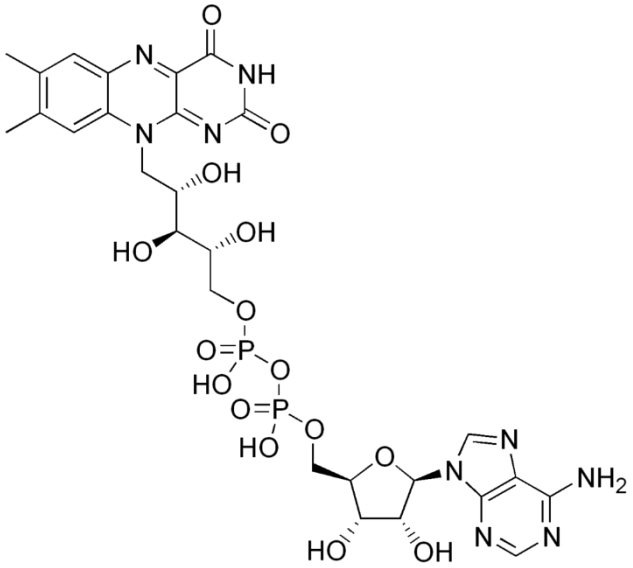


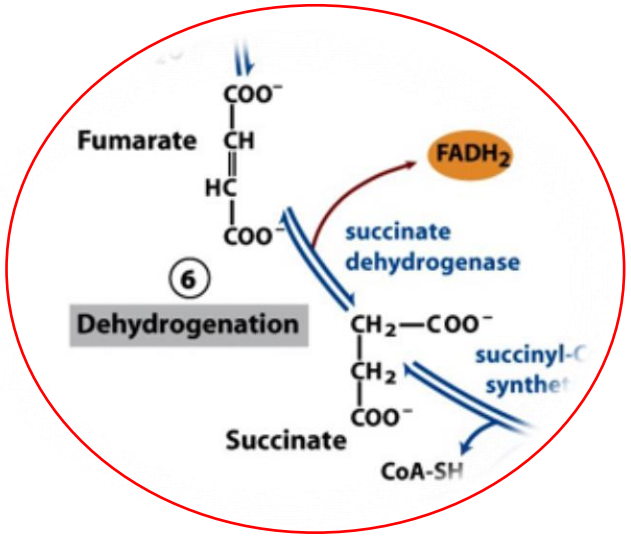
Figure 19-29
Lehninger Principles of Biochemistry, Fifth Edition

Komplex II

sukcinát-ubichinonoxidoreduktasa

- přenáší elektrony ze sukcinátu na koenzym Q
- obsahuje flavinadenindinukleotid (**FAD**) a **Fe-S klastry**





$FADH_2 + CoQ \rightarrow FAD + CoQH_2$

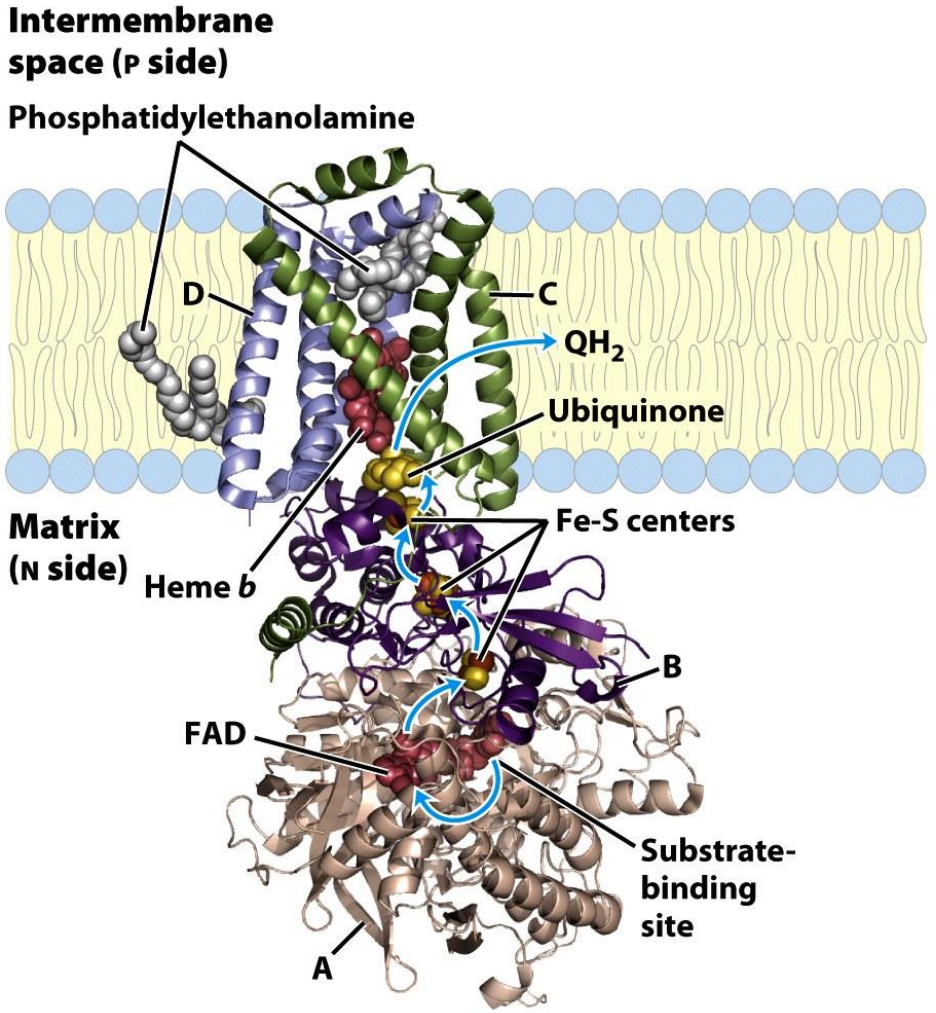


Figure 19-10
Lehninger Principles of Biochemistry, Fifth Edition

Komplex III

ubichinol-cytochrom-c-oxidoreduktasa

- přenáší elektrony z redukovaného koenzymu Q (ubichinolu) na **cytochrom c**
- obsahuje **cytochromy** a **Fe-S klastry**

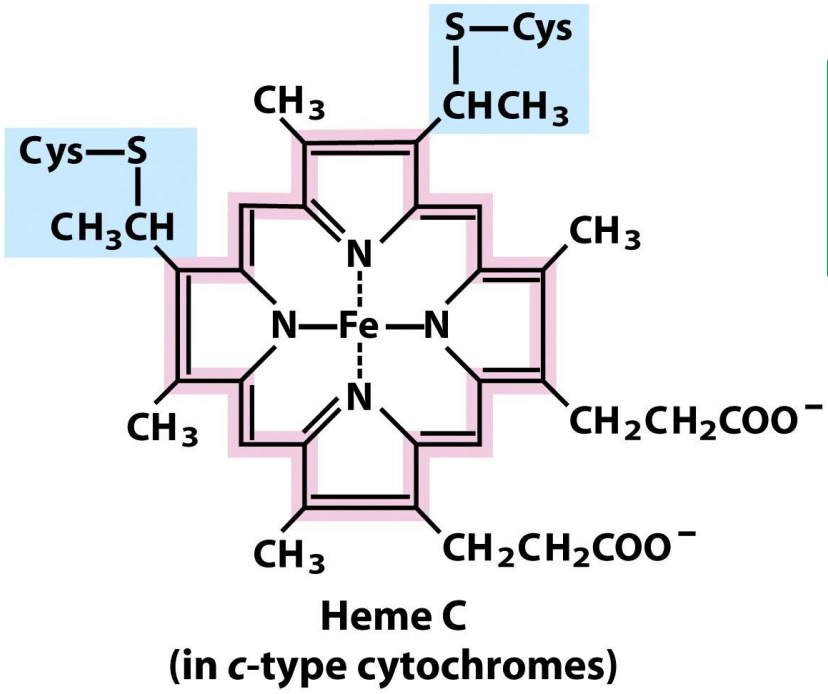


Figure 19-3 part 2
Lehninger Principles of Biochemistry, Fifth Edition

$$CoQH_2 + 2\ cyt\ c\ (Fe^{3+}) \rightarrow CoQ + 2\ cyt\ c\ (Fe^{2+}) + 2\ H^+$$

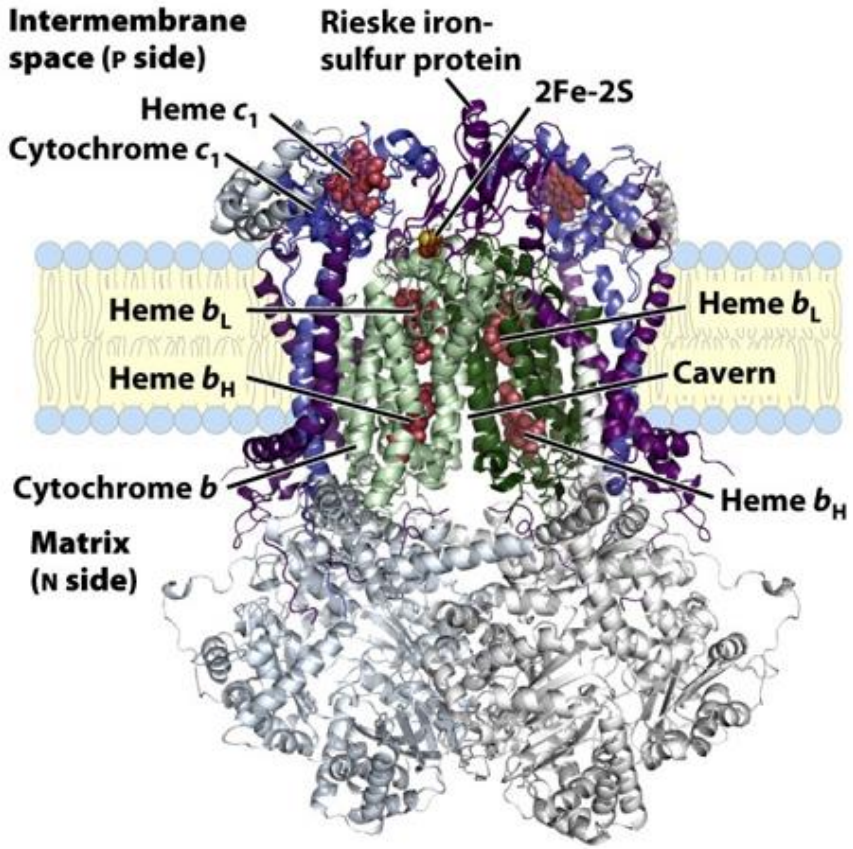


Figure 19-11
Lehninger Principles of Biochemistry, Fifth Edition

Komplex IV

cytochrom-c-oxidasa

- přenáší elektrony z redukovaného cytochromu c na **kyslík**
- obsahuje **cytochromy** a **Cu centra**

$$4\ \text{cyt c}\ (Fe^{2+}) + O_2 + 4\ H^+ \rightarrow 4\ \text{cyt c}\ (Fe^{3+}) + 2\ H_2O$$

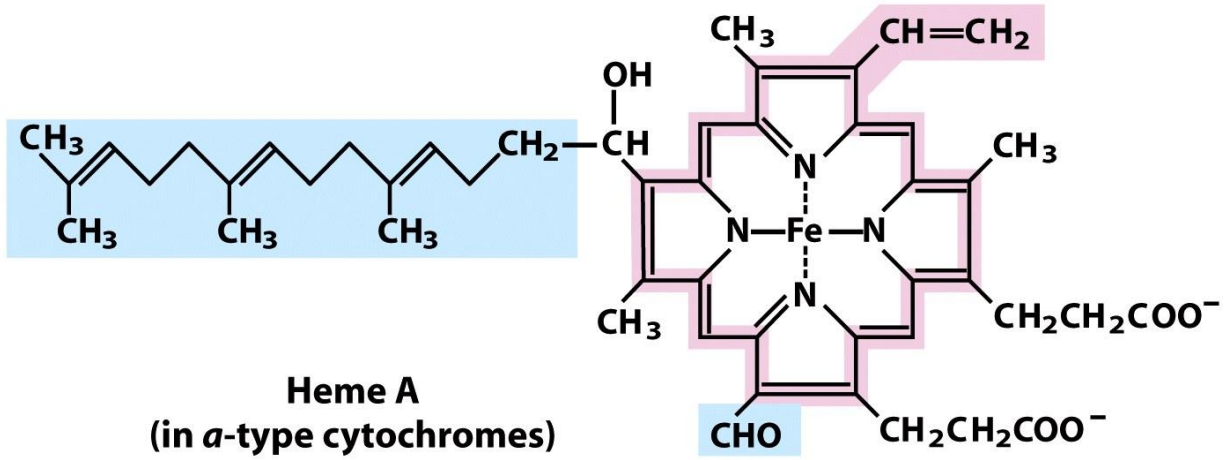


Figure 19-3 part 3
Lehninger Principles of Biochemistry, Fifth Edition

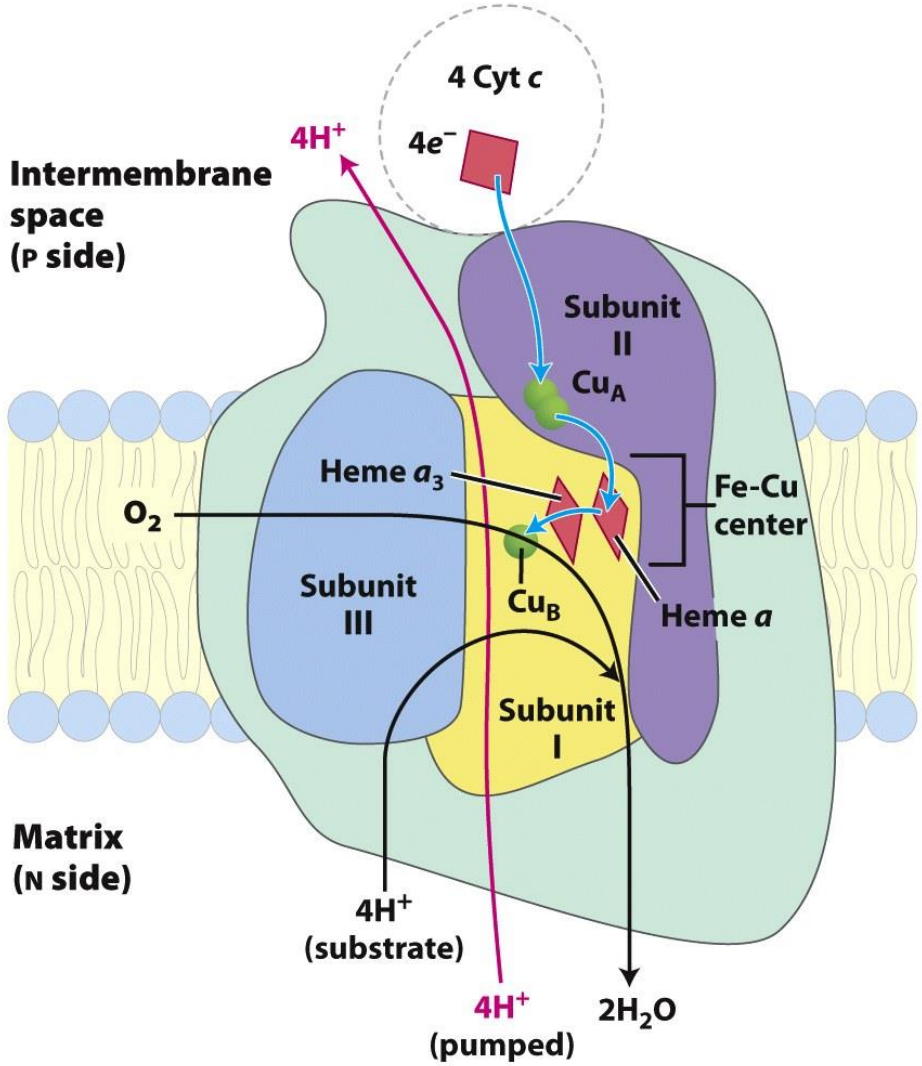


Figure 19-14
Lehninger Principles of Biochemistry, Fifth Edition

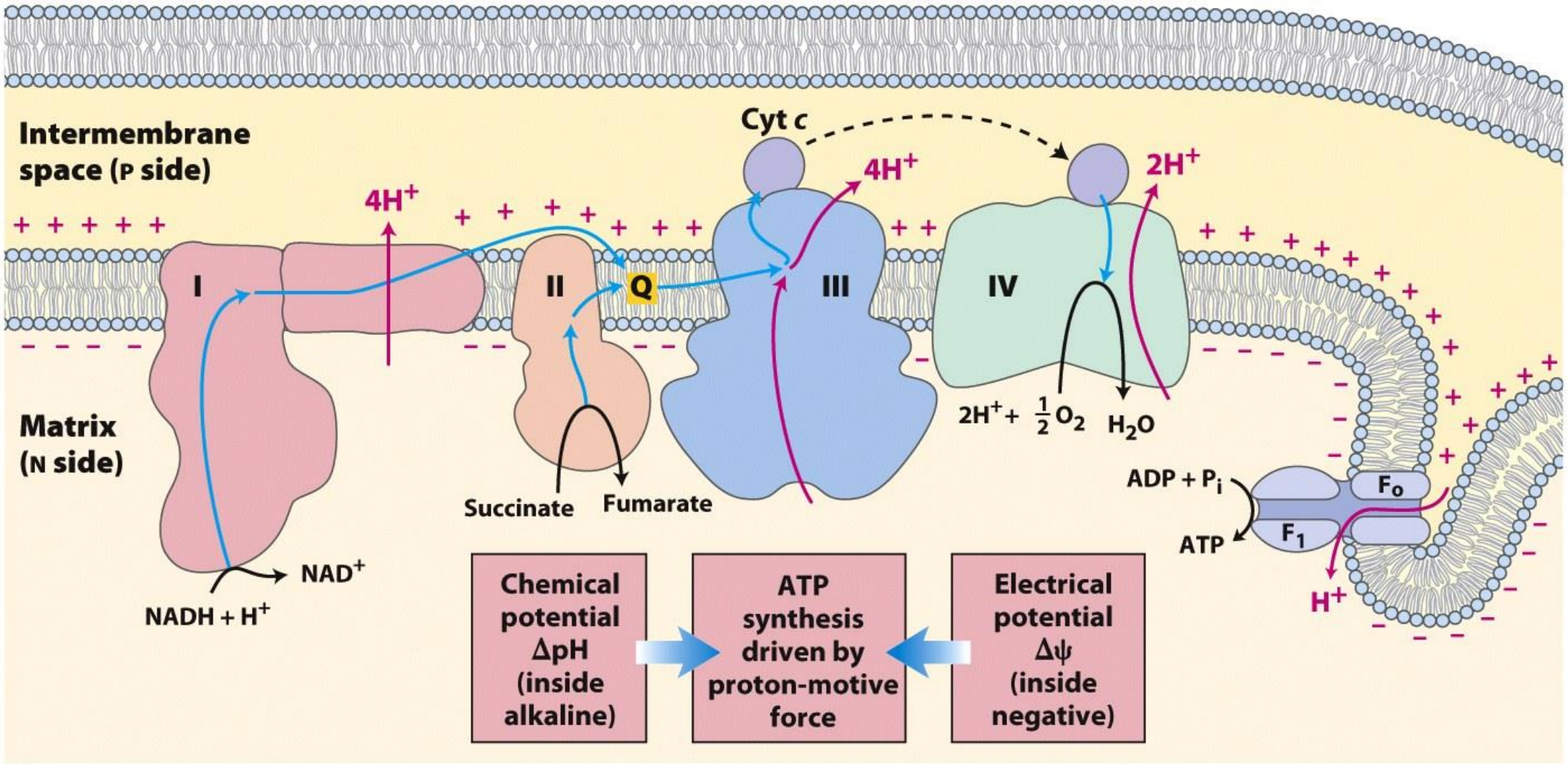


Figure 19-19

Lehninger Principles of Biochemistry, Fifth Edition

Oxidativní fosforylace

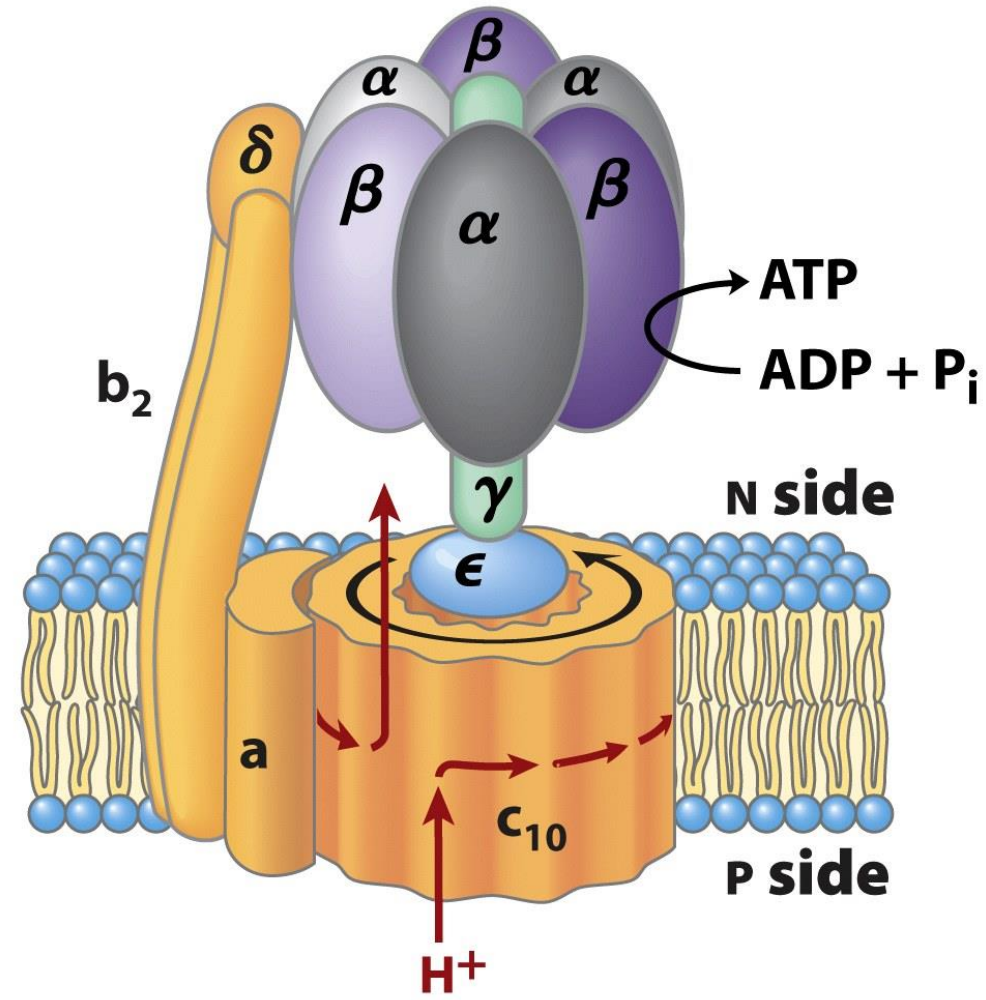


Figure 19-25f
Lehninger Principles of Biochemistry, Fifth Edition

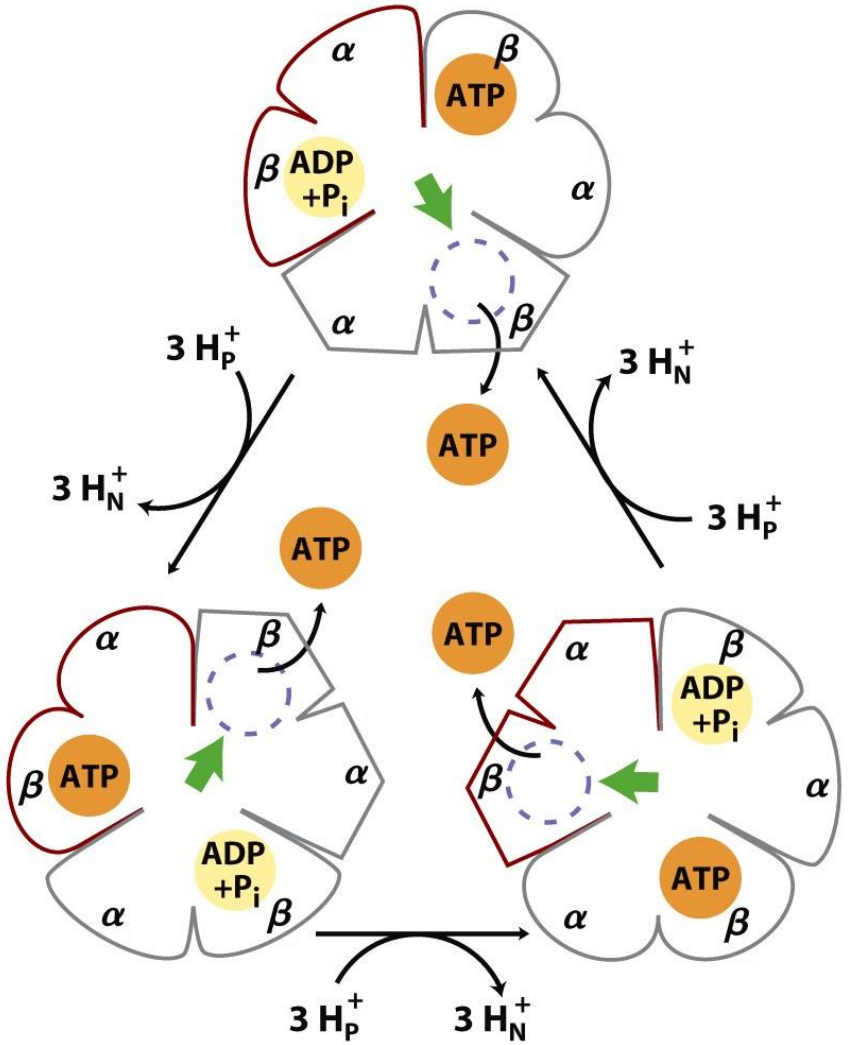


Figure 19-26
Lehninger Principles of Biochemistry, Fifth Edition

FOTOSYNTÉZA

- složitý BCH proces, při němž dochází k zachycení sluneční enegie a její přeměny

do energie chemických vazeb

- dochází k syntéze energeticky bohatých sloučenin (cukrů) z CO_2 a H_2O
- probíhá v **chloroplastech**

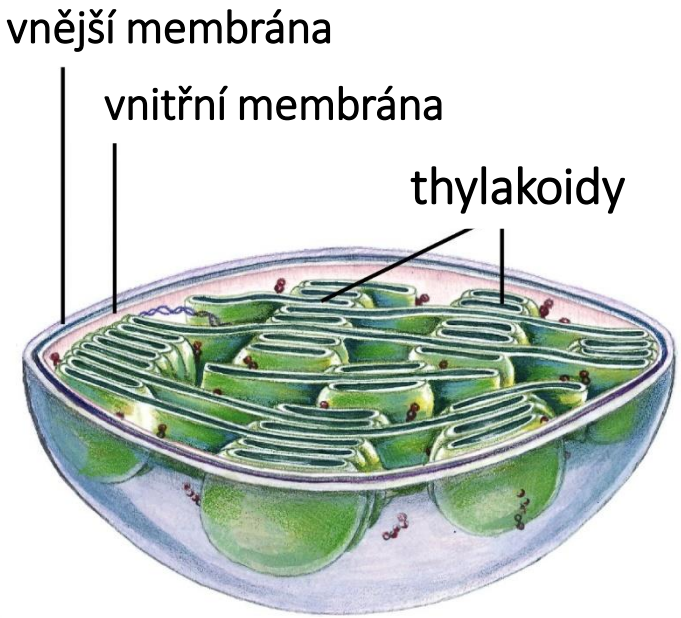


Figure 19-45a
Lehninger Principles of Biochemistry, Fifth Edition
© 2008 W. H. Freeman and Company

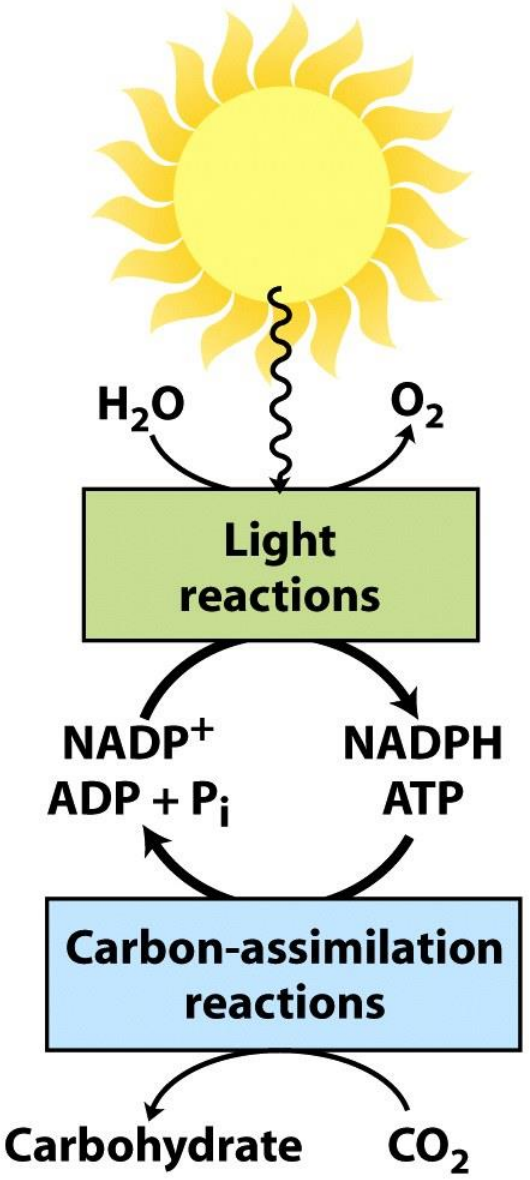


Figure 19-44
Lehninger Principles of Biochemistry, Fifth Edition
© 2008 W. H. Freeman and Company

„fyzikální vsuvka“

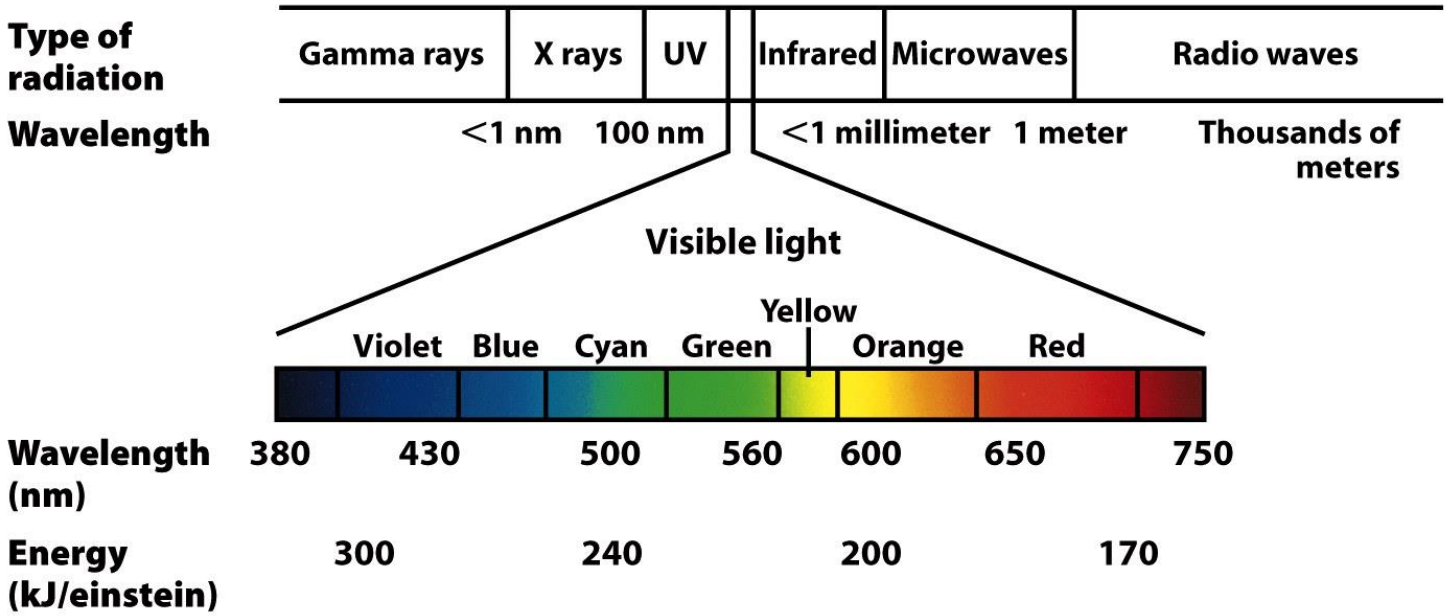


Figure 19-46
Lehninger Principles of Biochemistry, Fifth Edition

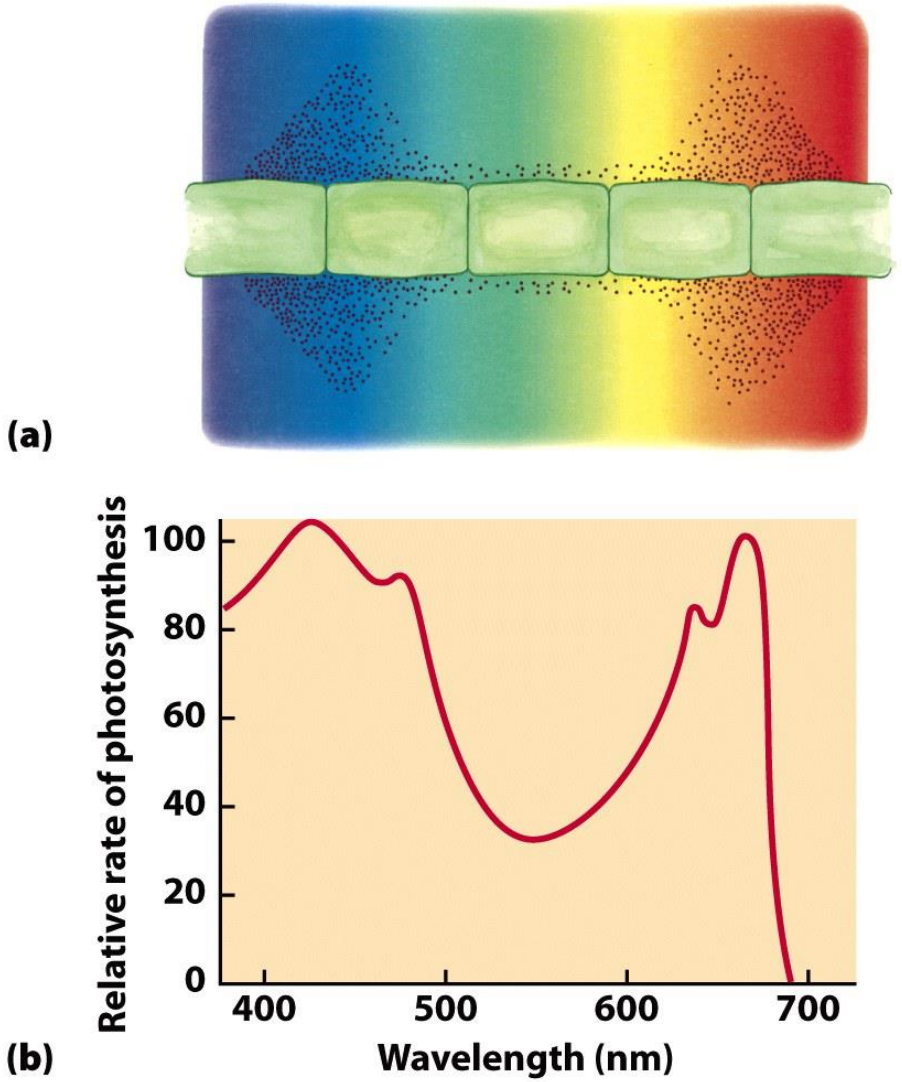


Figure 19-51
Lehninger Principles of Biochemistry, Fifth Edition

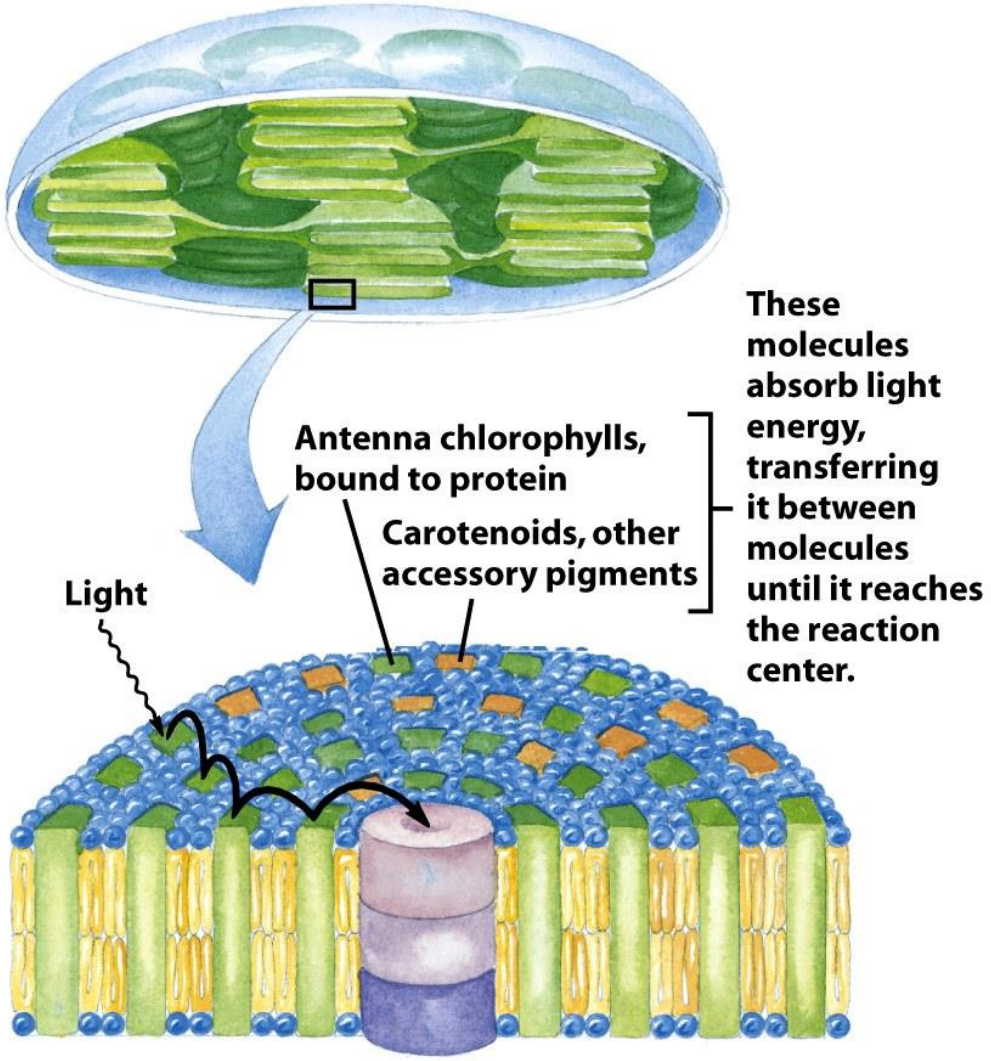


Figure 19-52
Lehninger Principles of Biochemistry, Fifth Edition

Fykoerythrin (PE)
Fykocyanin (PC)
Allofykocyanin (AP)

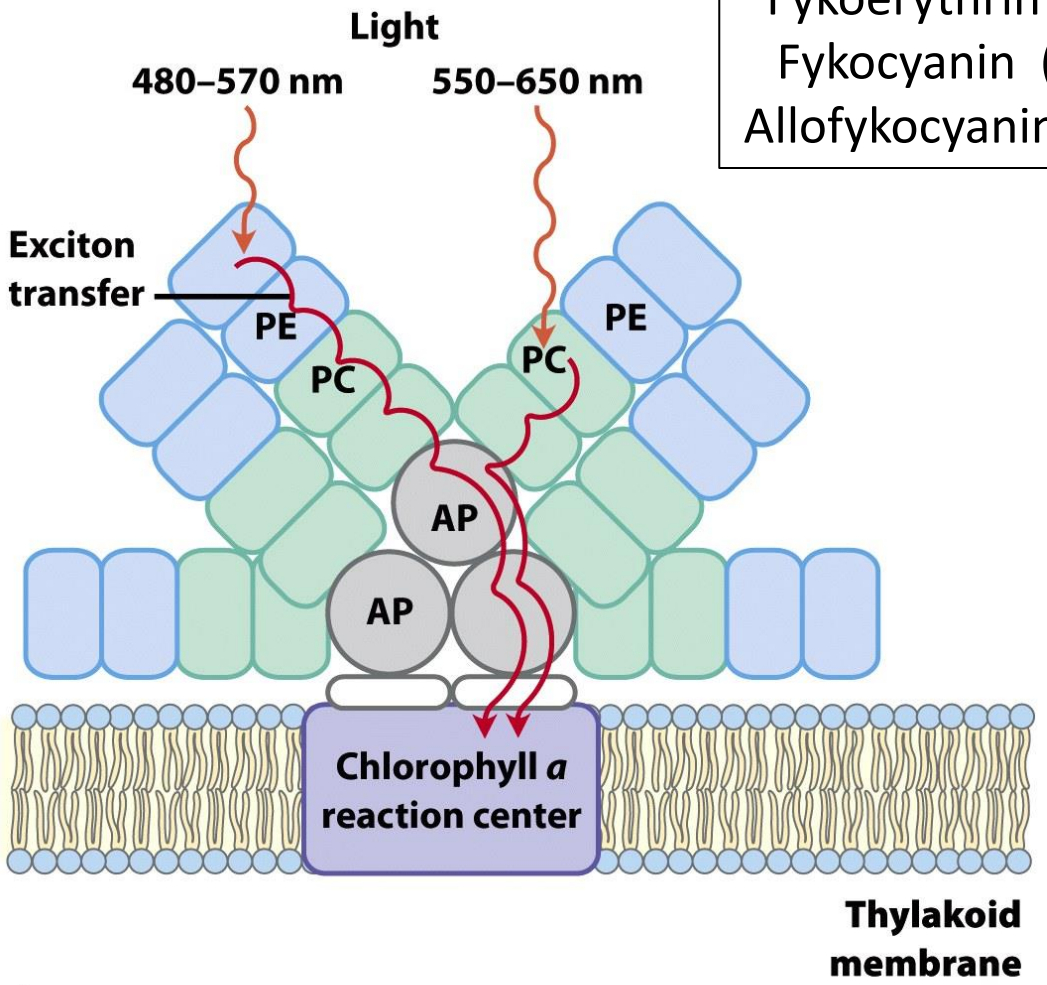
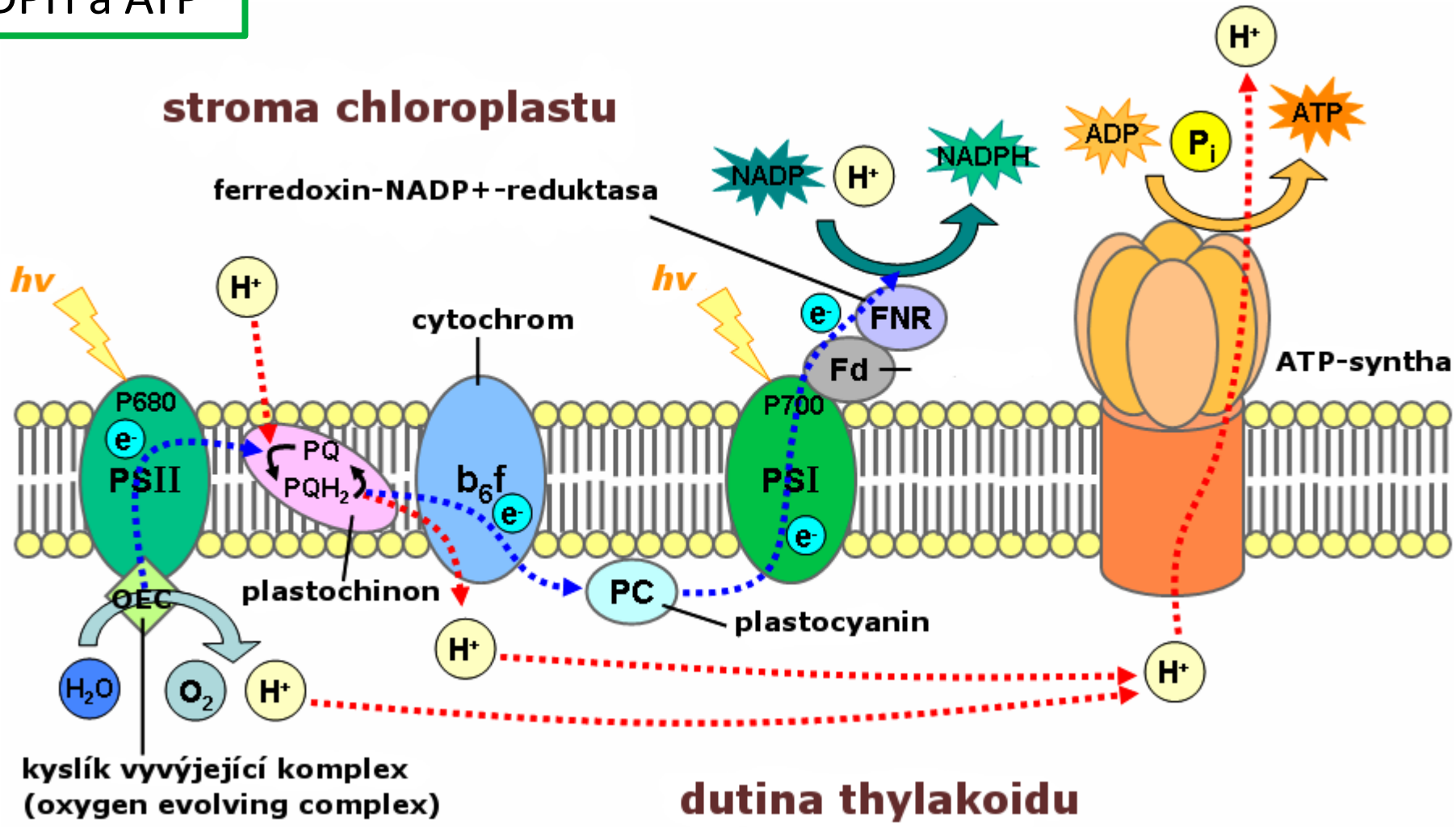


Figure 19-50
Lehninger Principles of Biochemistry, Fifth Edition

Světelná fáze fotosyntézy

Vznik NADPH a ATP

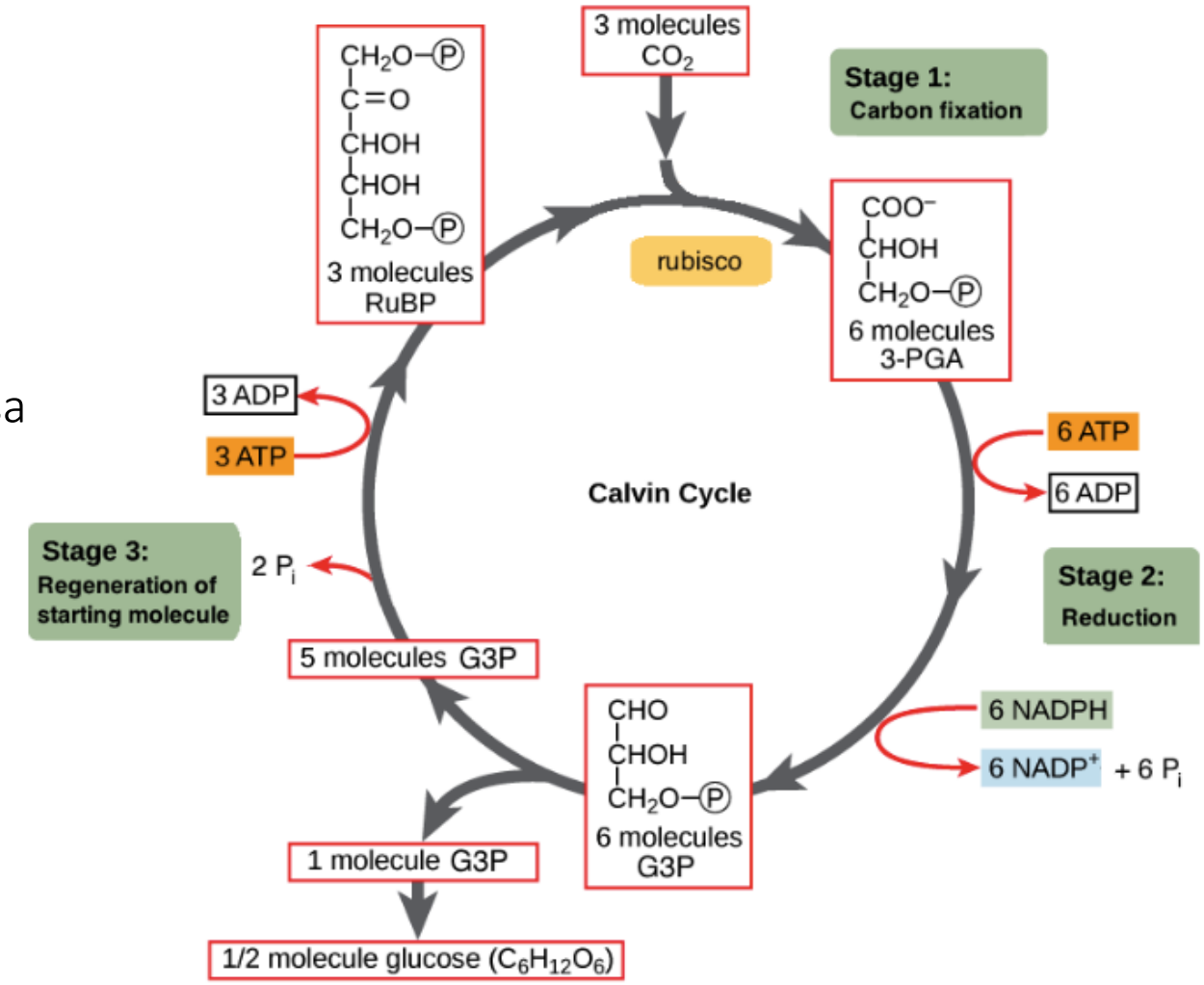


Temnostní fáze – Calvinův cyklus

- získaná energie ve formě ATP a NADPH slouží

k fixaci CO_2 do sacharidů

- enzym **RuBisCO:**
  - ribulosa-1,5-bisfosfát-karboxylasa/oxygenasa



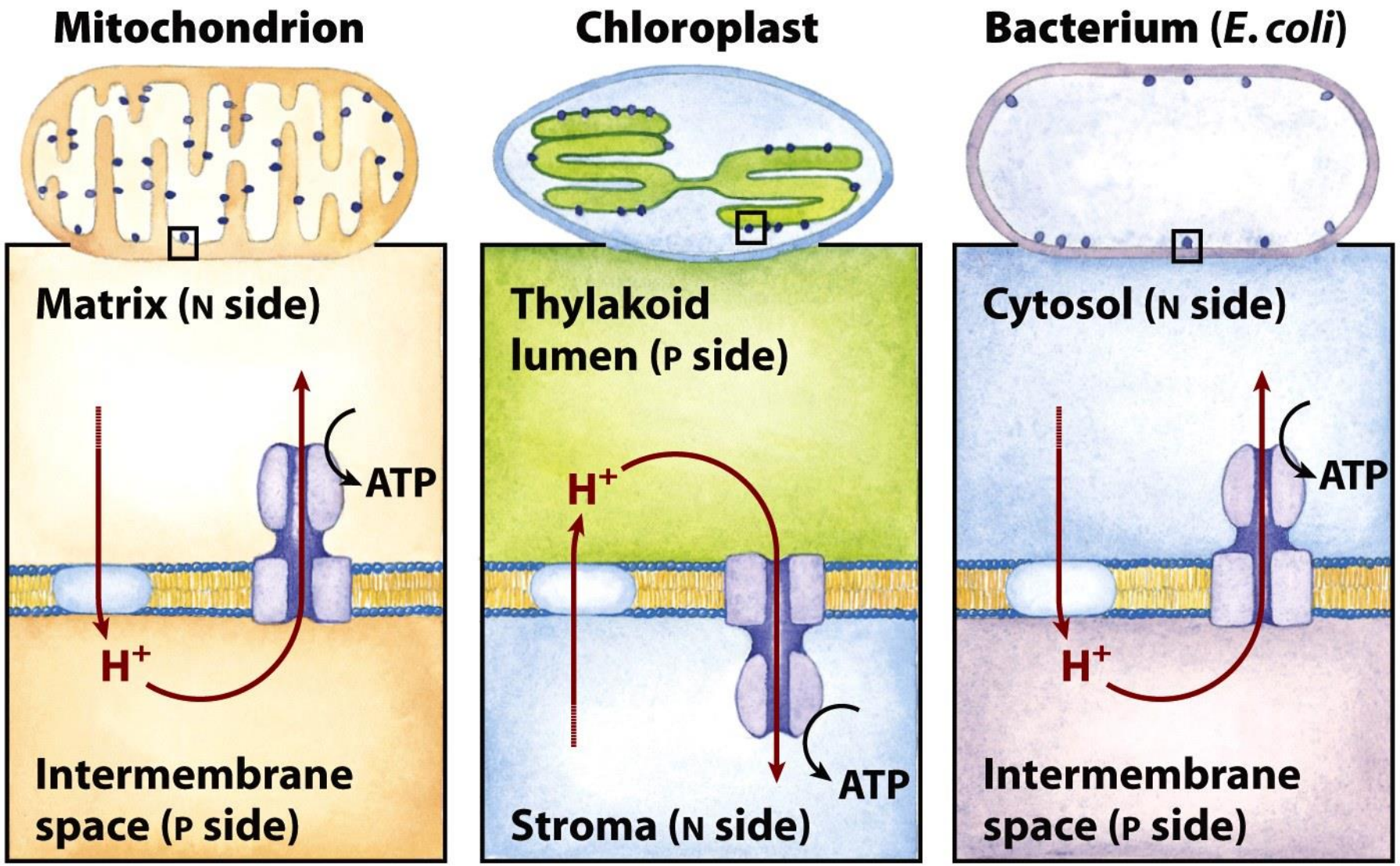


Figure 19-64
Lehninger Principles of Biochemistry, Fifth Edition

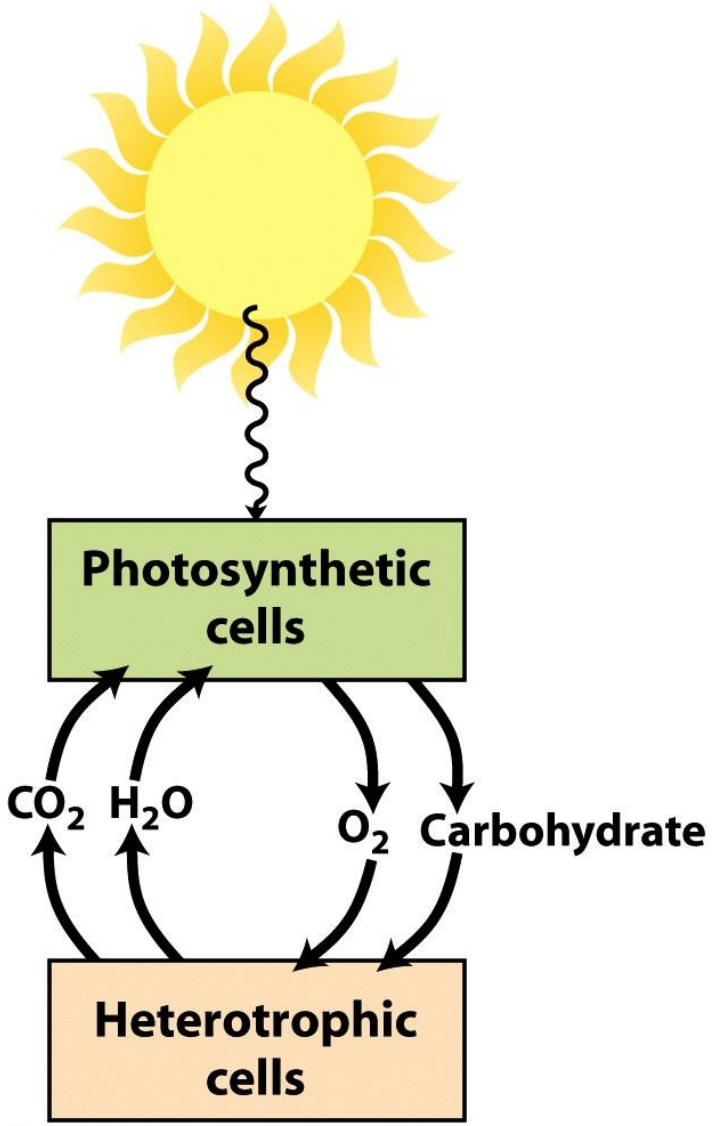
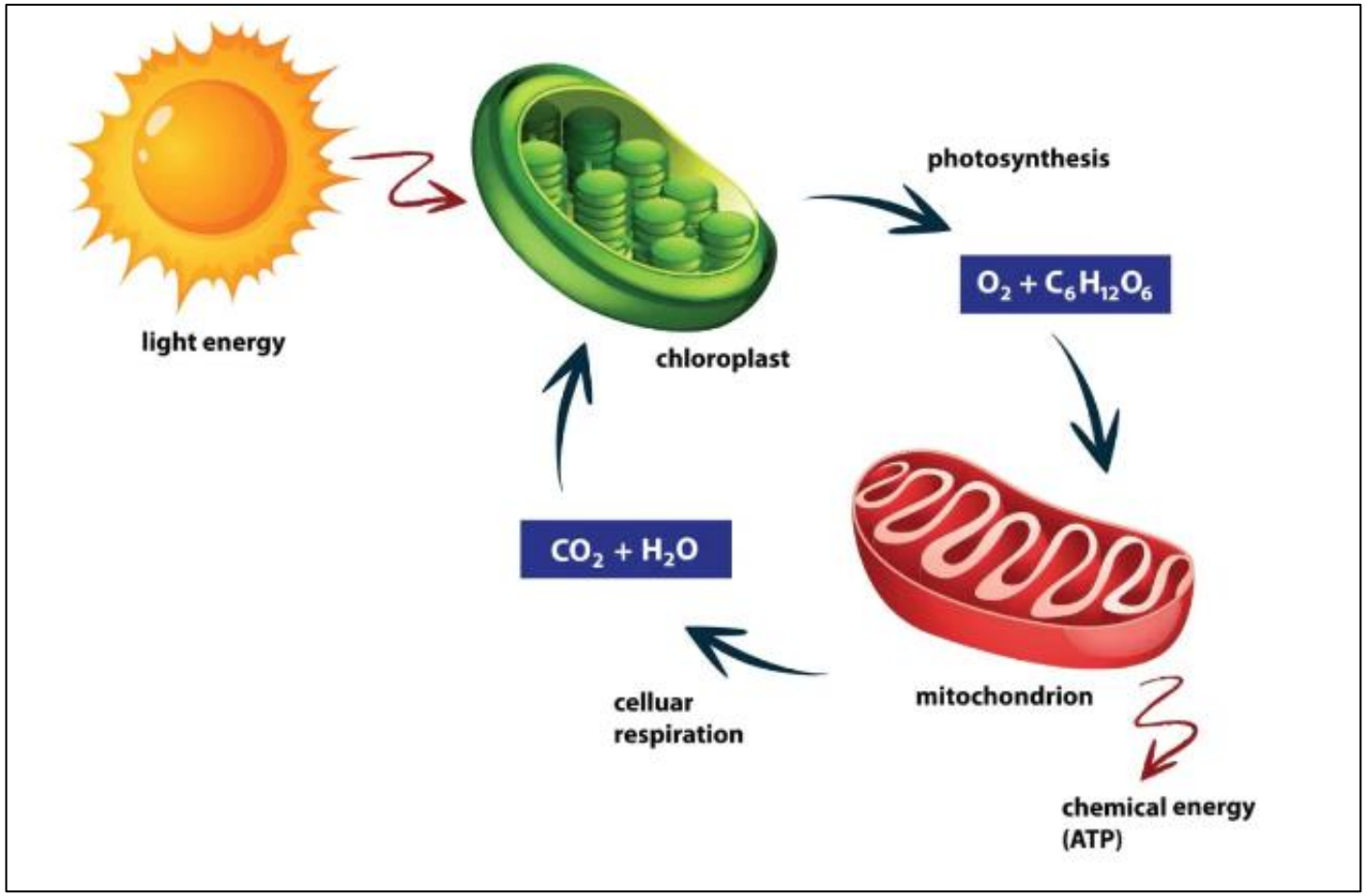


Figure 19-43
Lehninger Principles of Biochemistry, Fifth Edition



Užitečné odkazy

Dýchací řetězec stručně a jednoduše

https://www.youtube.com/watch?v=39HTpUG1MwQ

Dýchací řetězec podrobněji

https://www.youtube.com/watch?v=LQmTKxI4Wn4&t

ATP syntasa v akci

https://www.youtube.com/watch?v=kXpzp4RDGJI