

M U N I
S C I

C5730 Biochemie - seminář

Mgr. Lukáš Faltinek

podzim 2024

M U N I
S C I

Dýchací řetězec

METABOLIC PATHWAYS

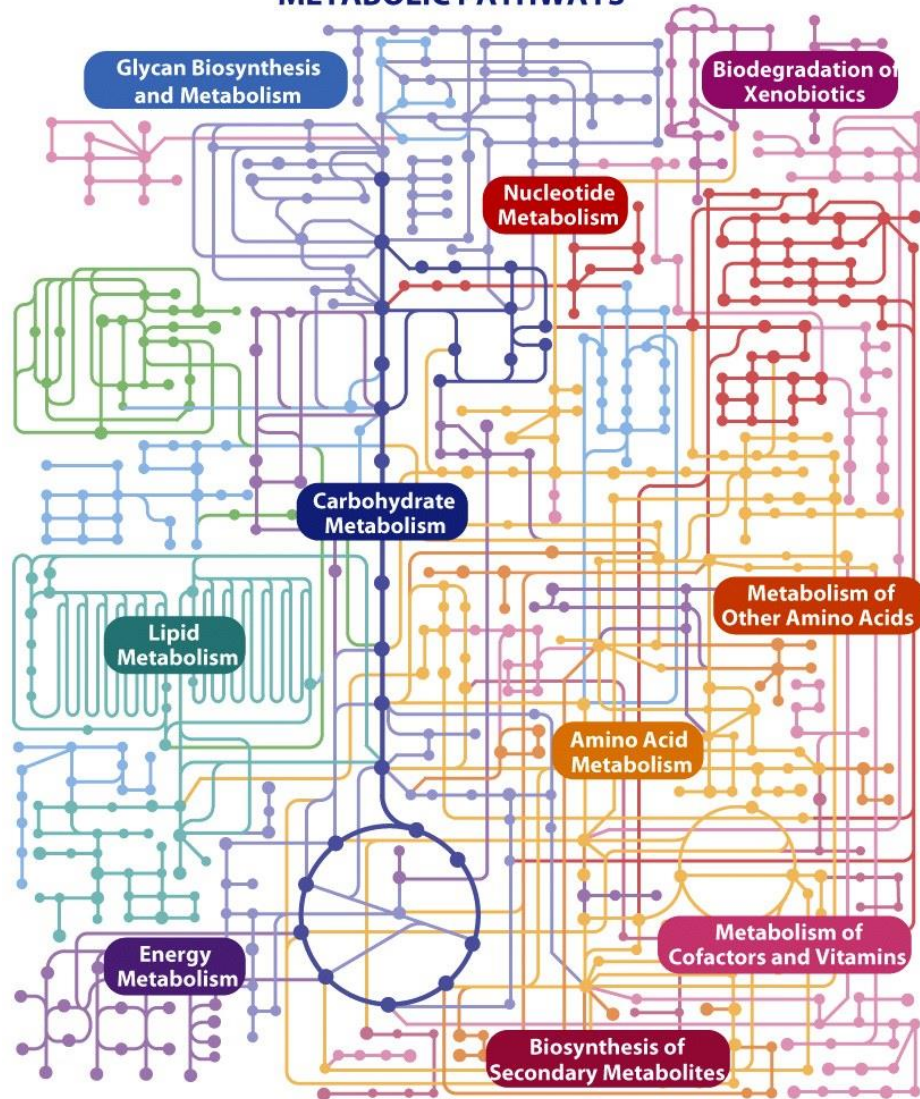
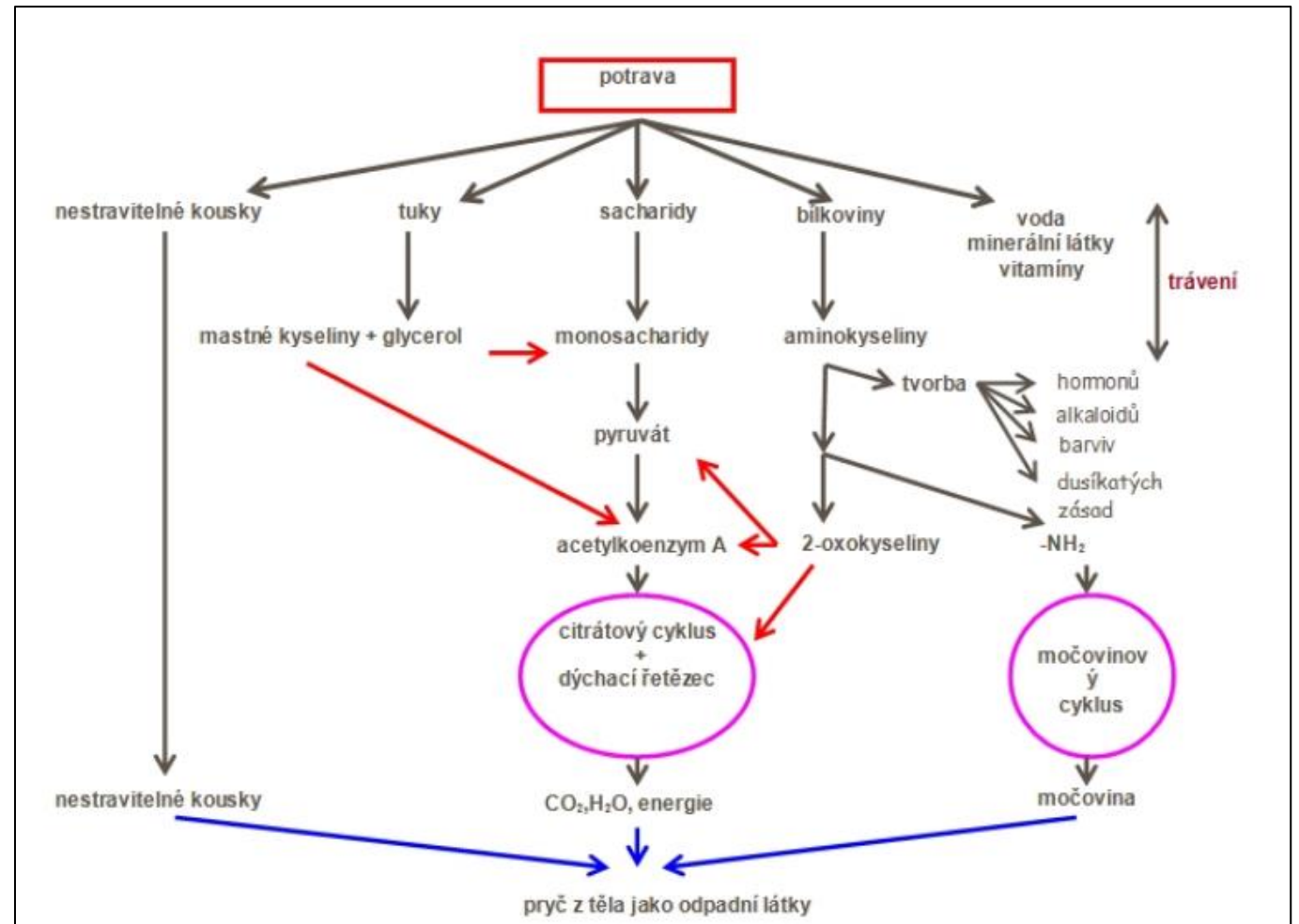


Figure 15-1
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<http://www.studiumbiochemie.cz/metabolismus>

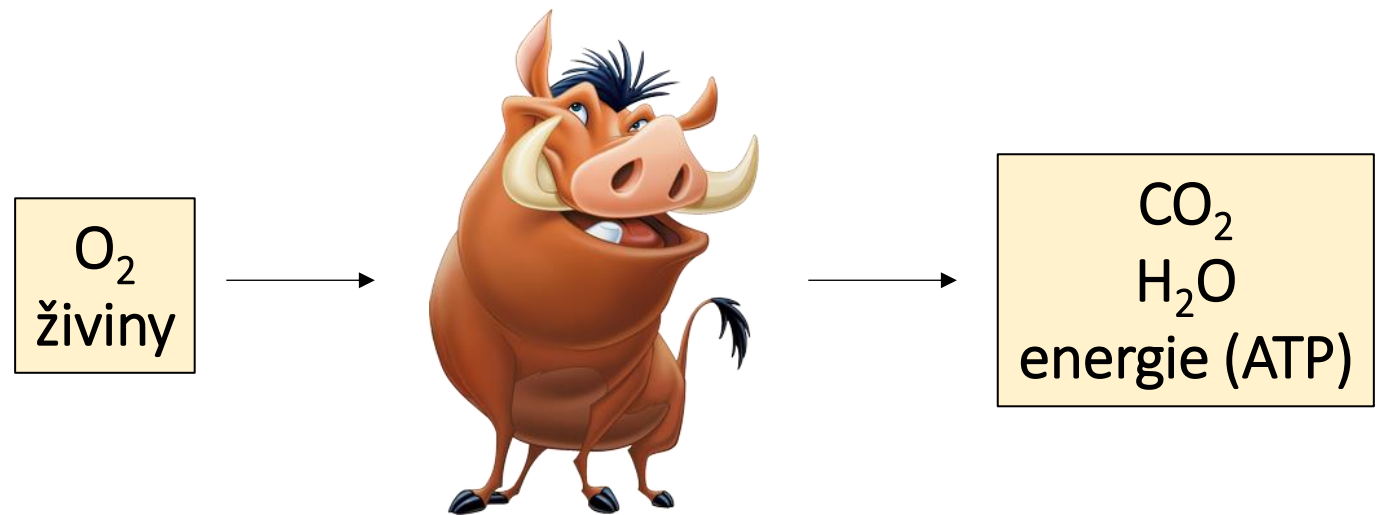
Buněčné dýchání

➤ 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 FADH₂

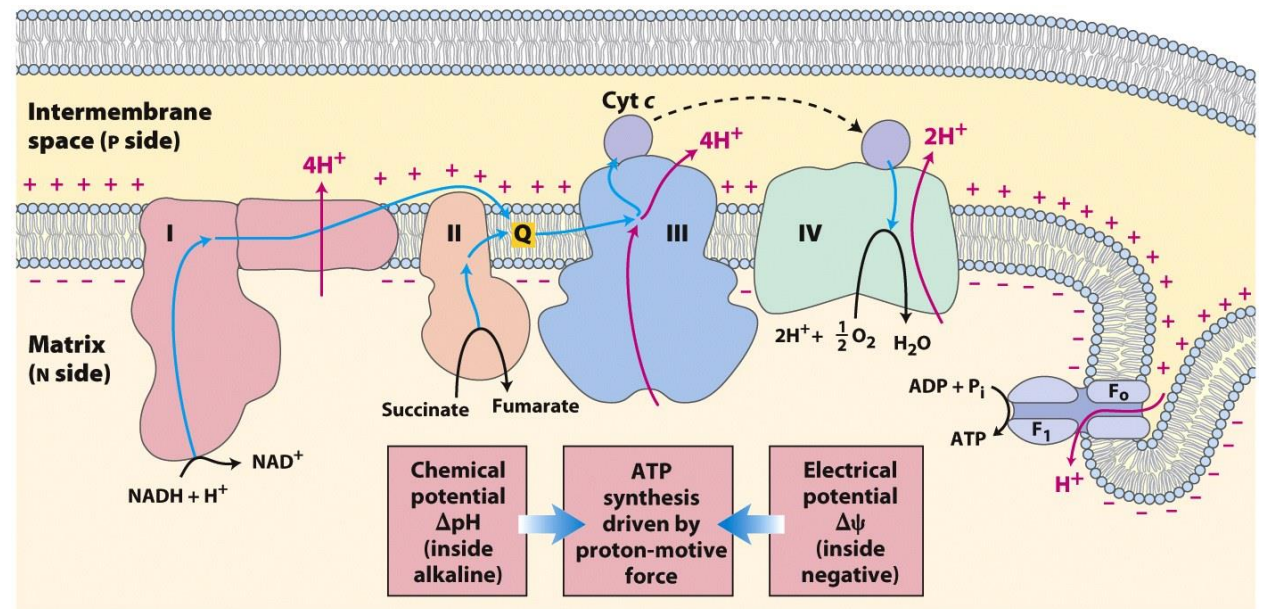


Figure 19-19
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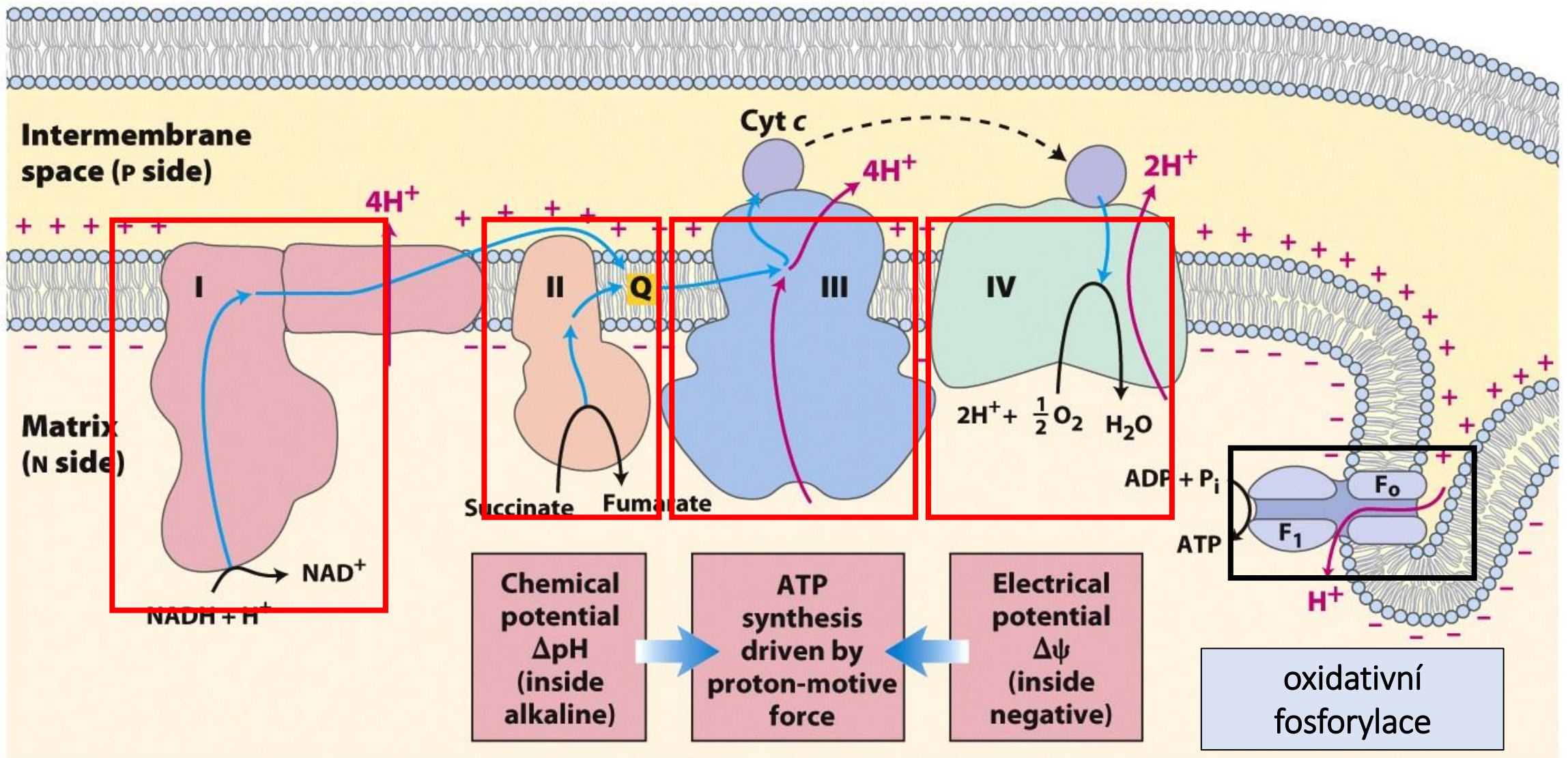


Figure 19-19

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Komplex I

NADH-ubichinonoxidoreduktasa

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

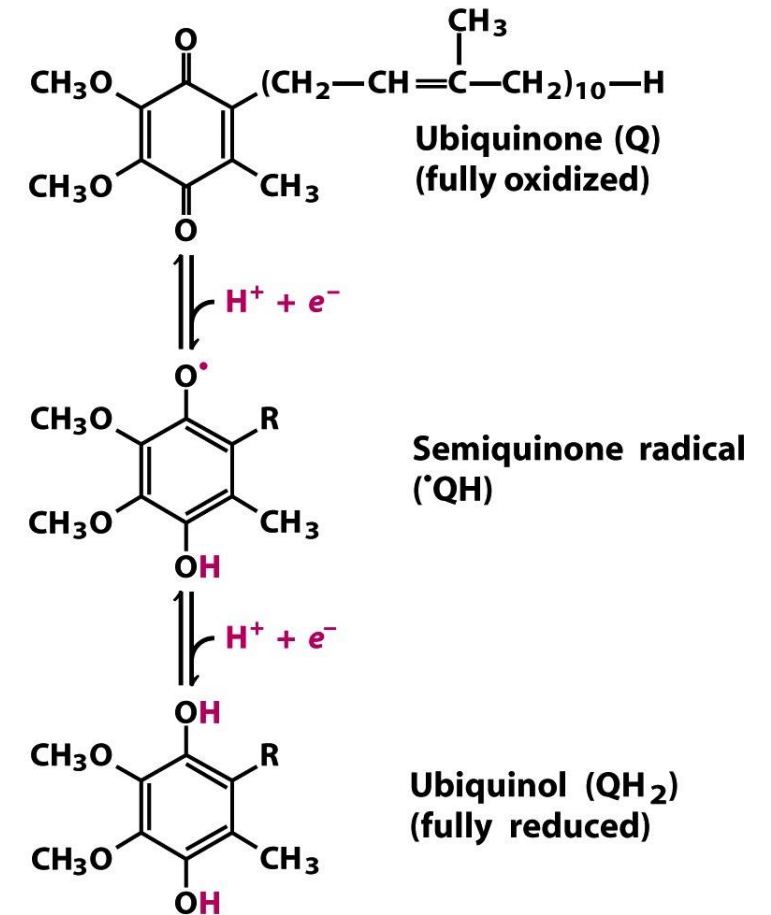
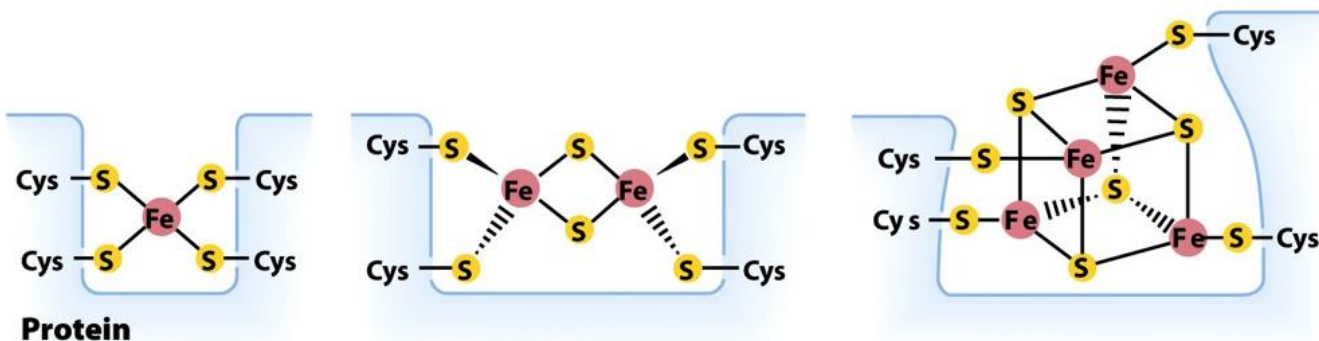
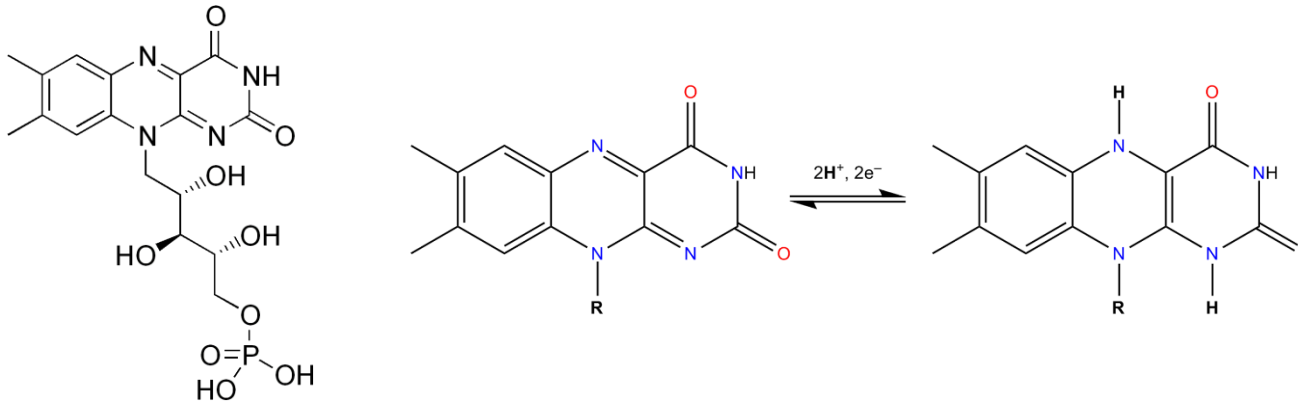
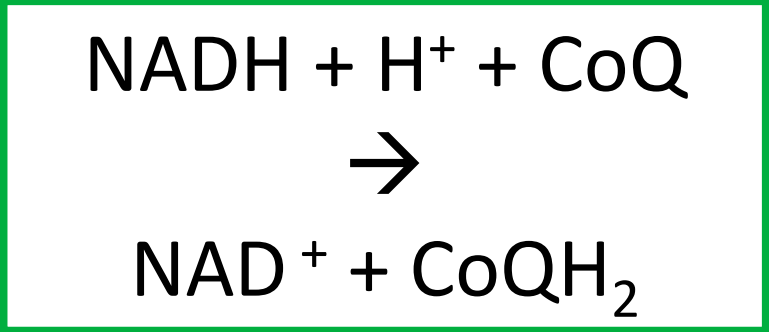
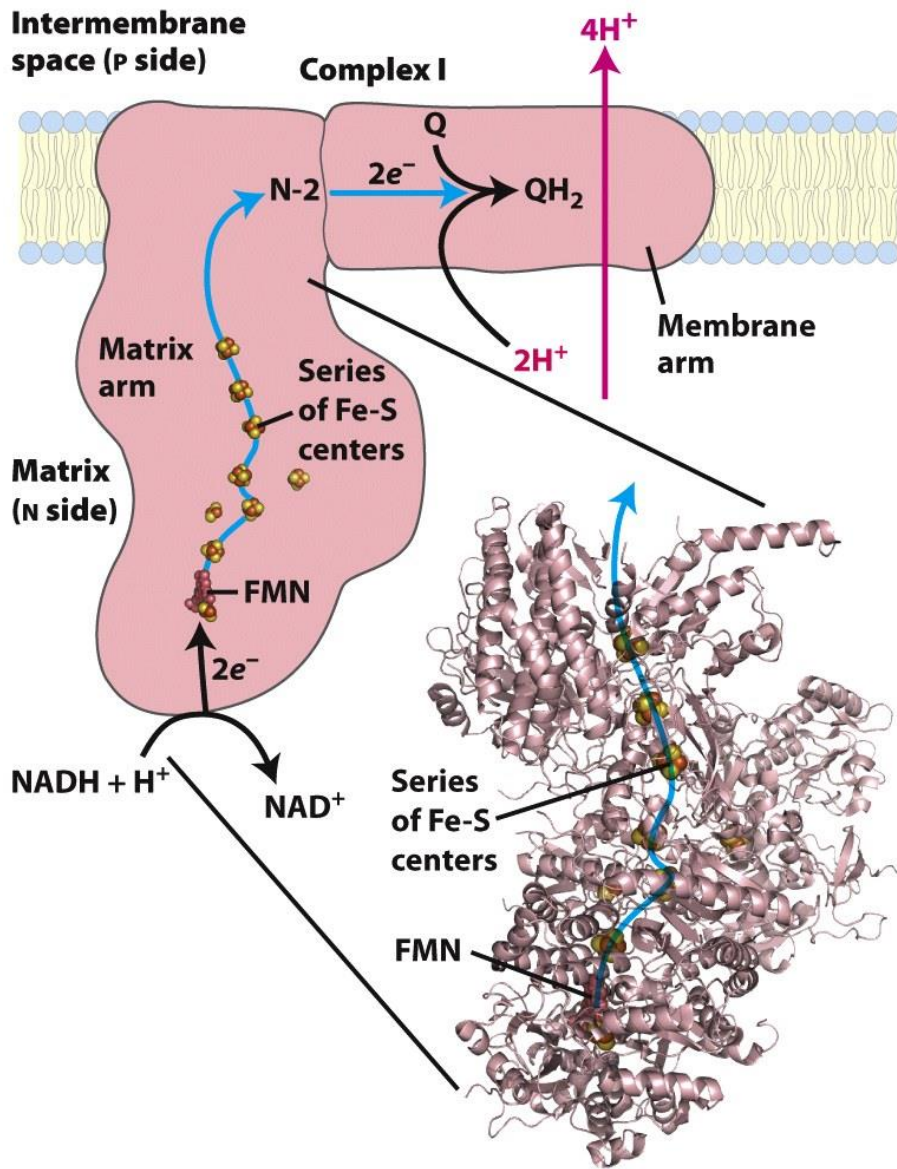


Figure 19-2
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Zároveň dochází k přenosu 4 protonů do mezimembránového prostoru.

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Malát aspartátový člunek

mezimembránový prostor

matrix

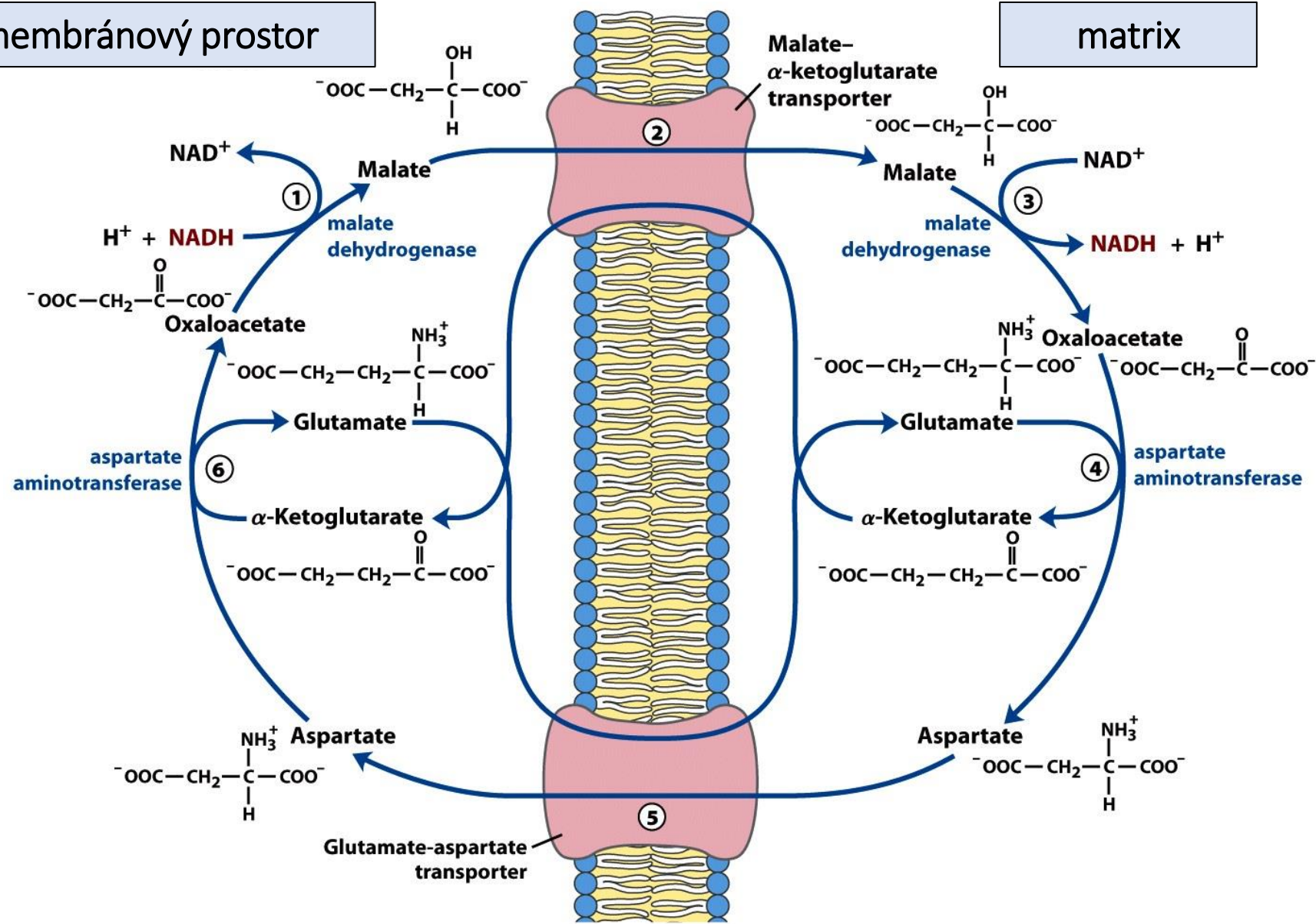
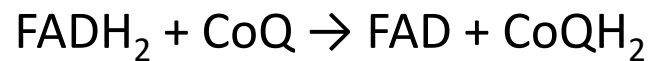
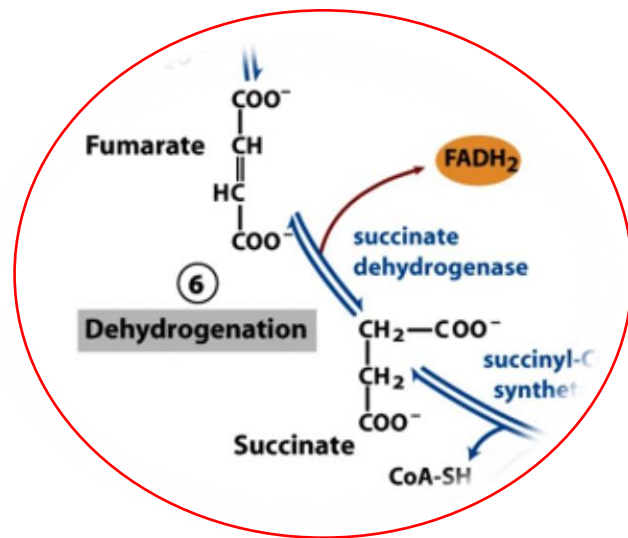
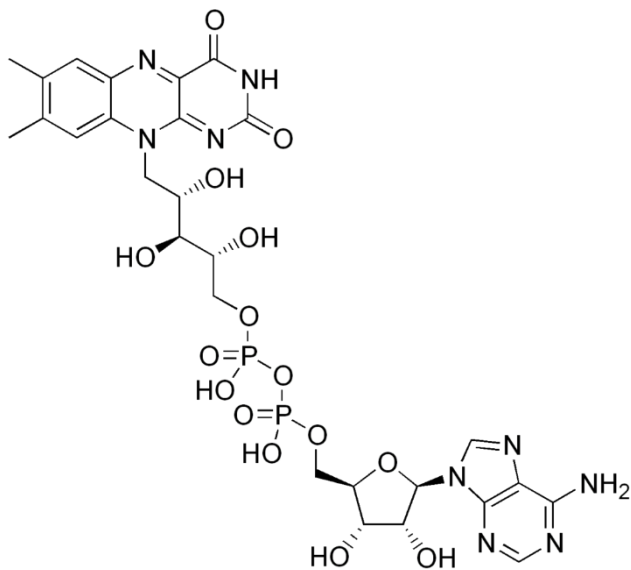


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Komplex II

sukcinát-ubichinonoxidoreduktasa

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



Intermembrane space (P side)

Phosphatidylethanolamine

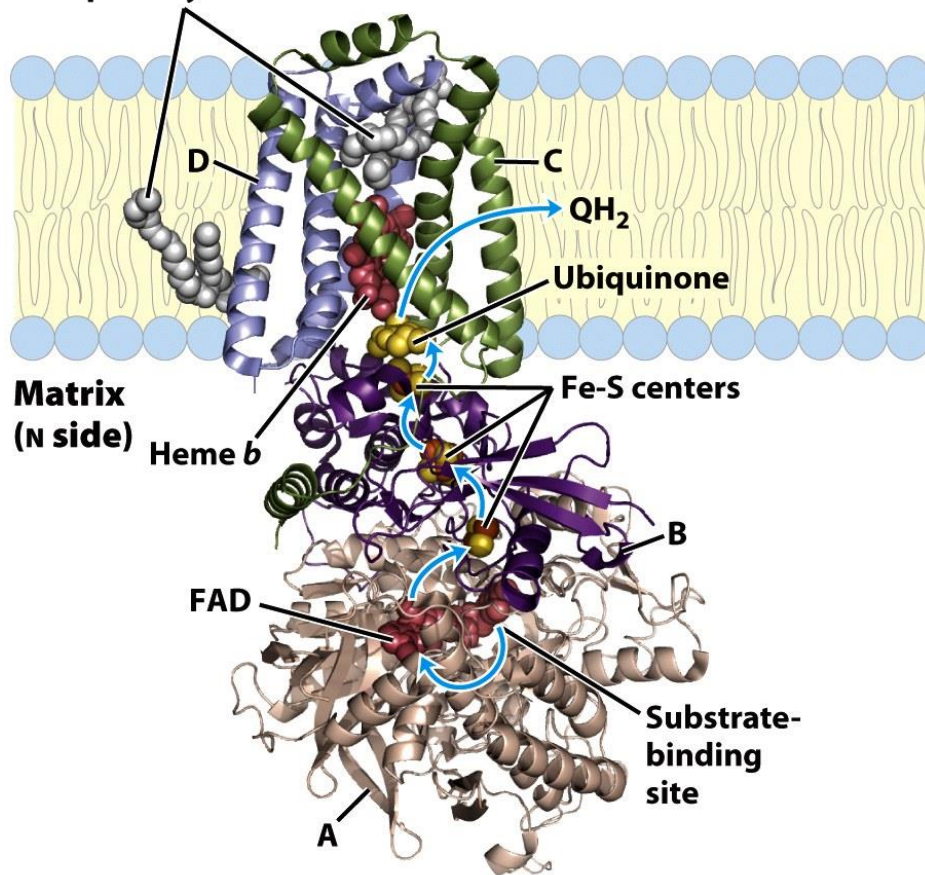


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Komplex III

ubichinol-cytochrom-c-oxidoreduktasa

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

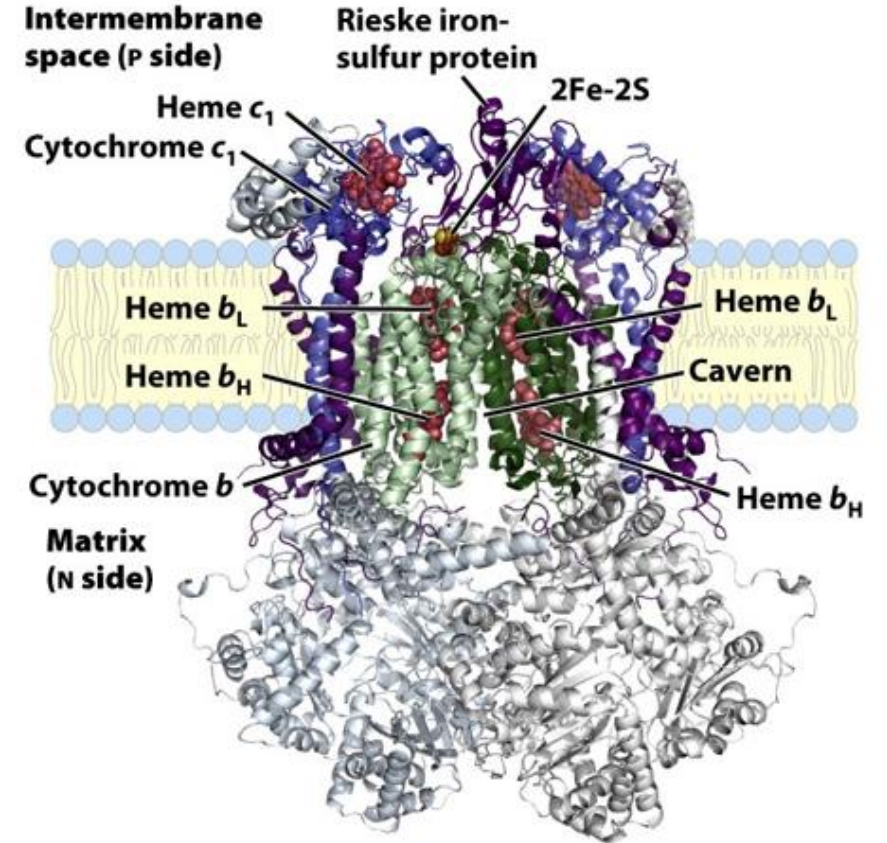
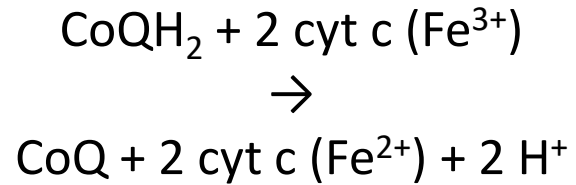
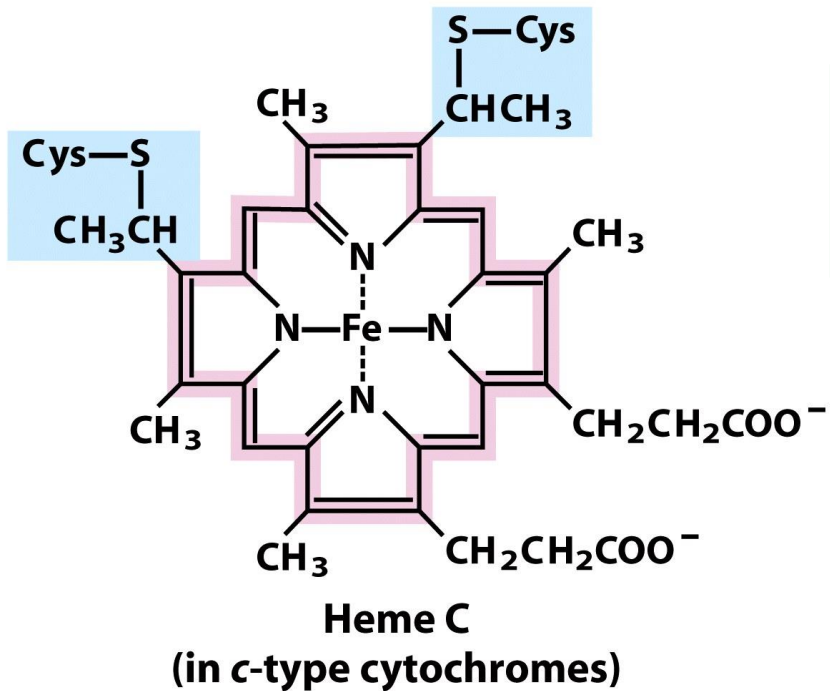


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Komplex IV

cytochrom-c-oxidasa

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

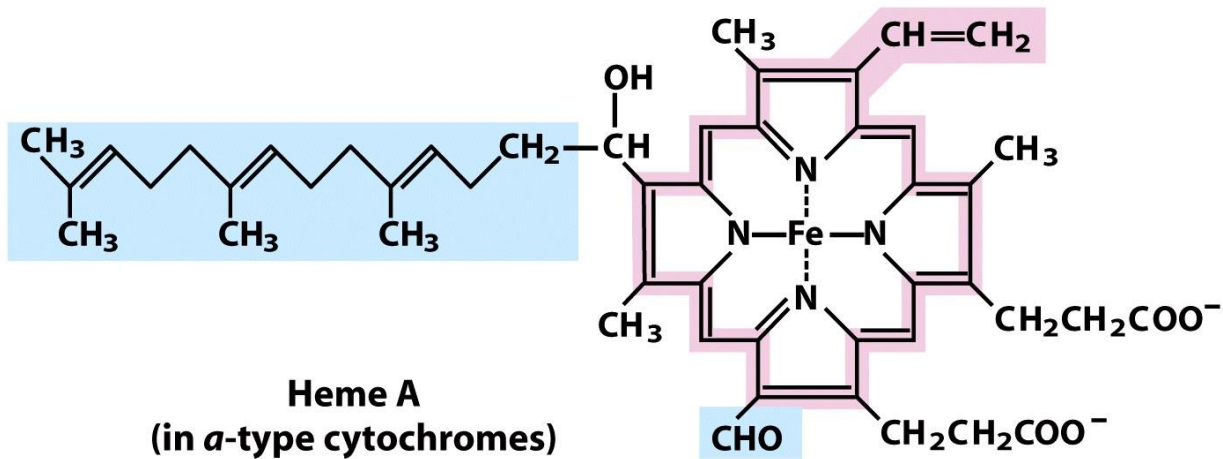


Figure 19-3 part 3
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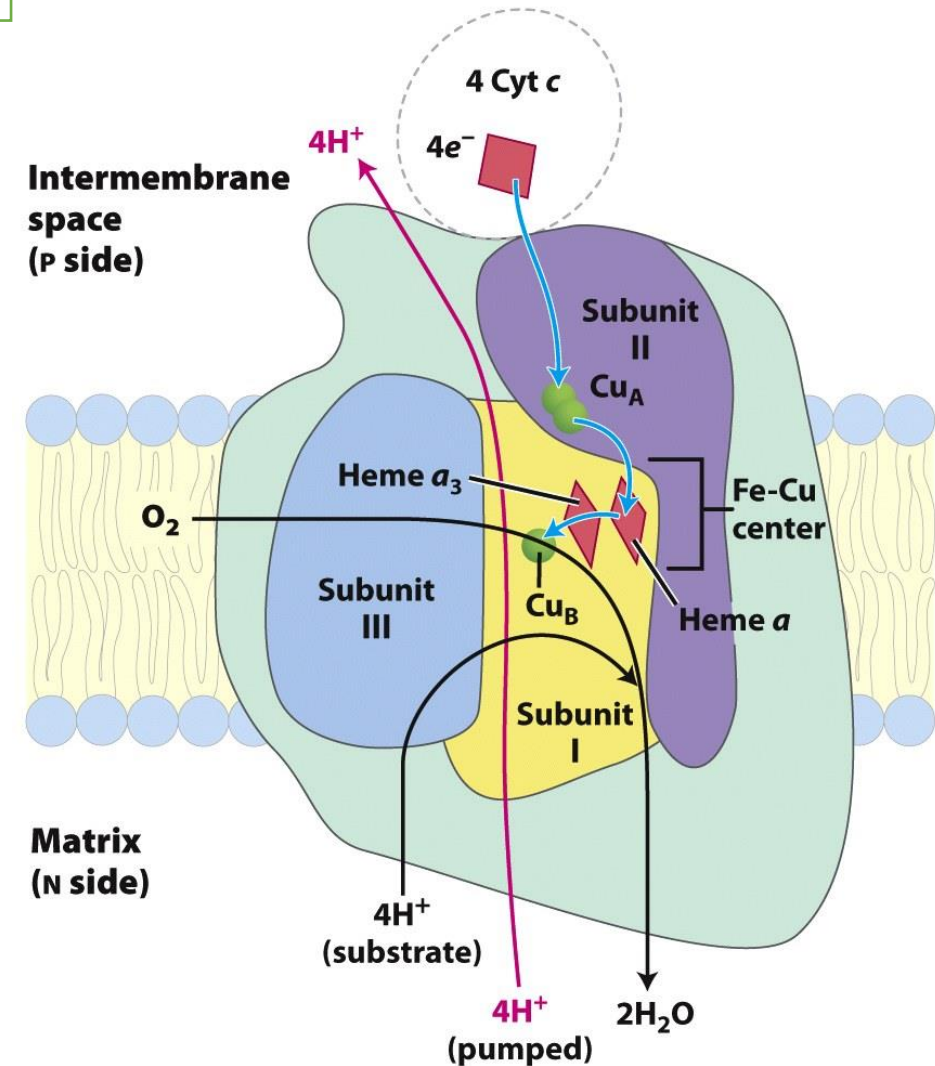


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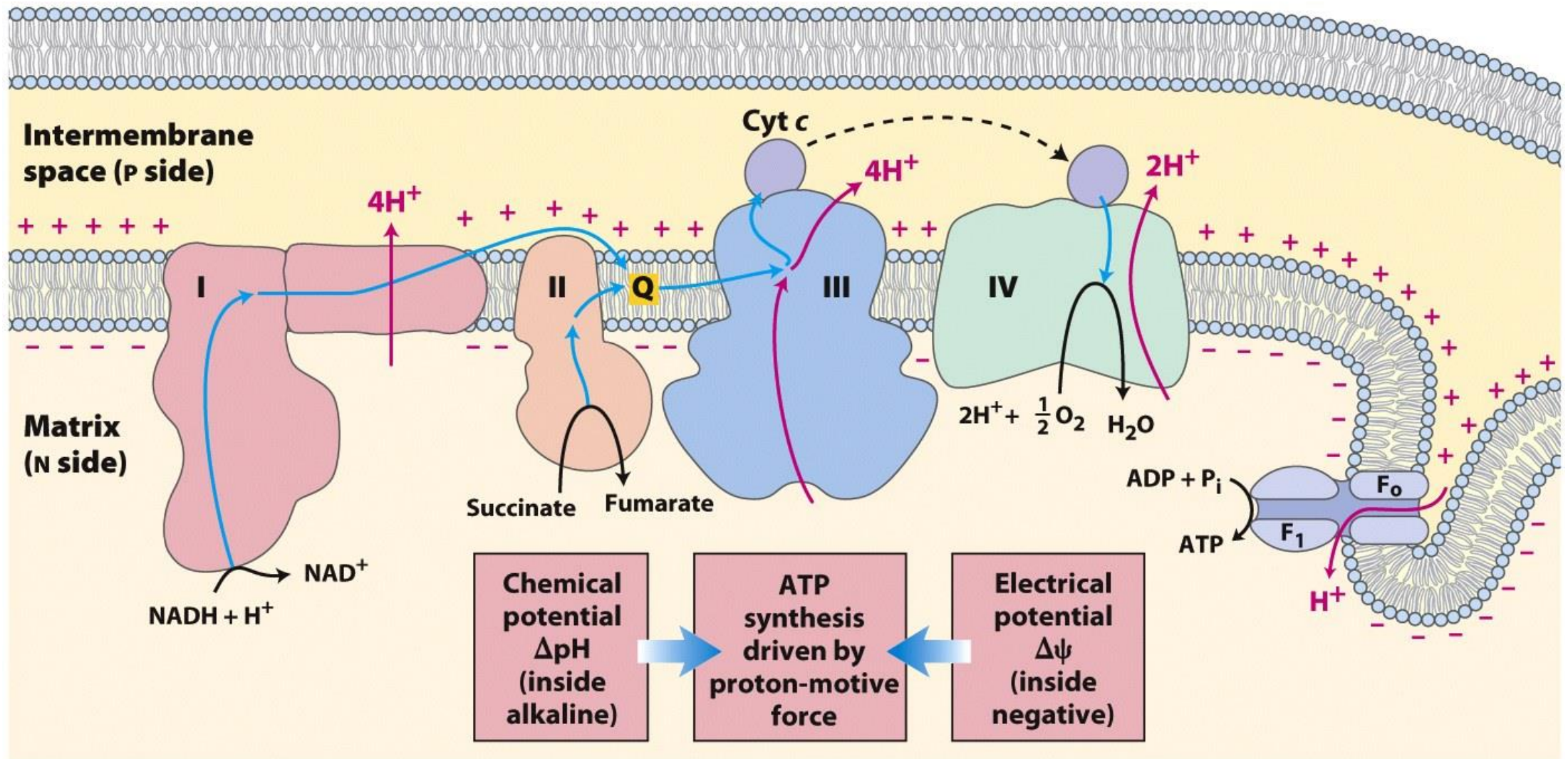


Figure 19-19

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Oxidativní fosforylace

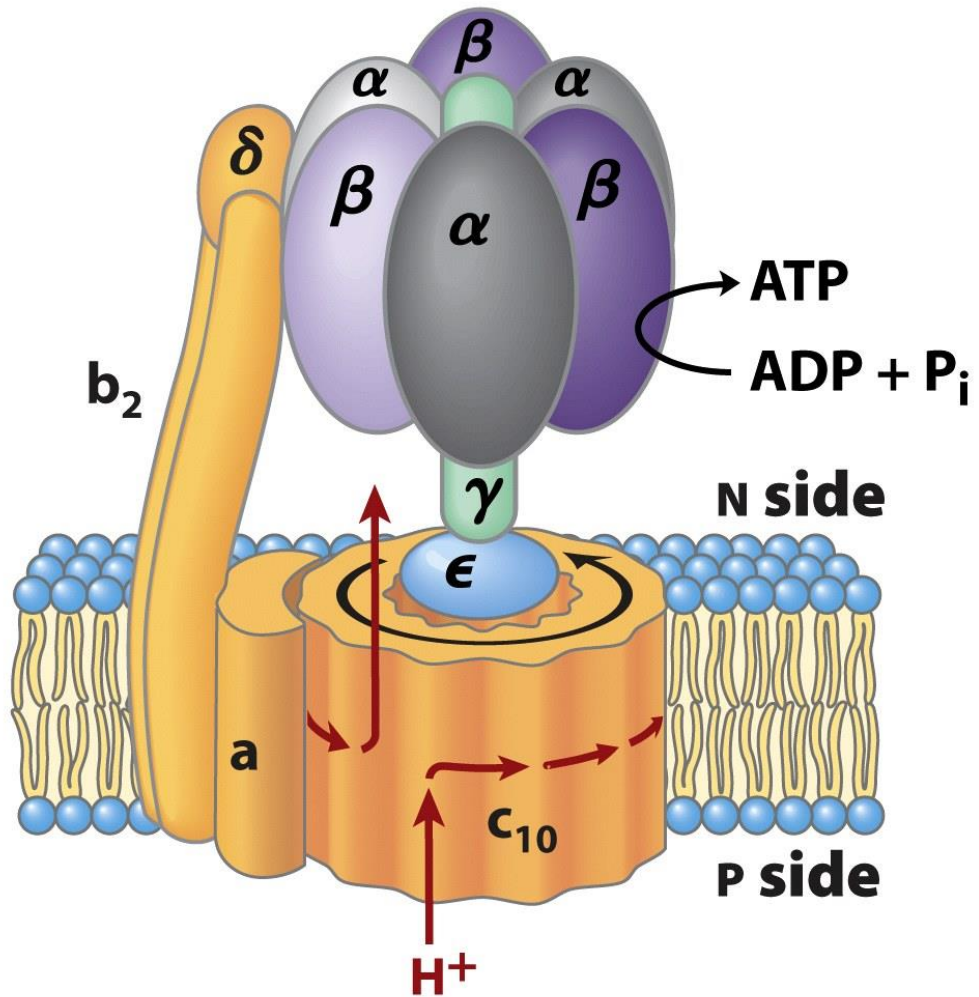


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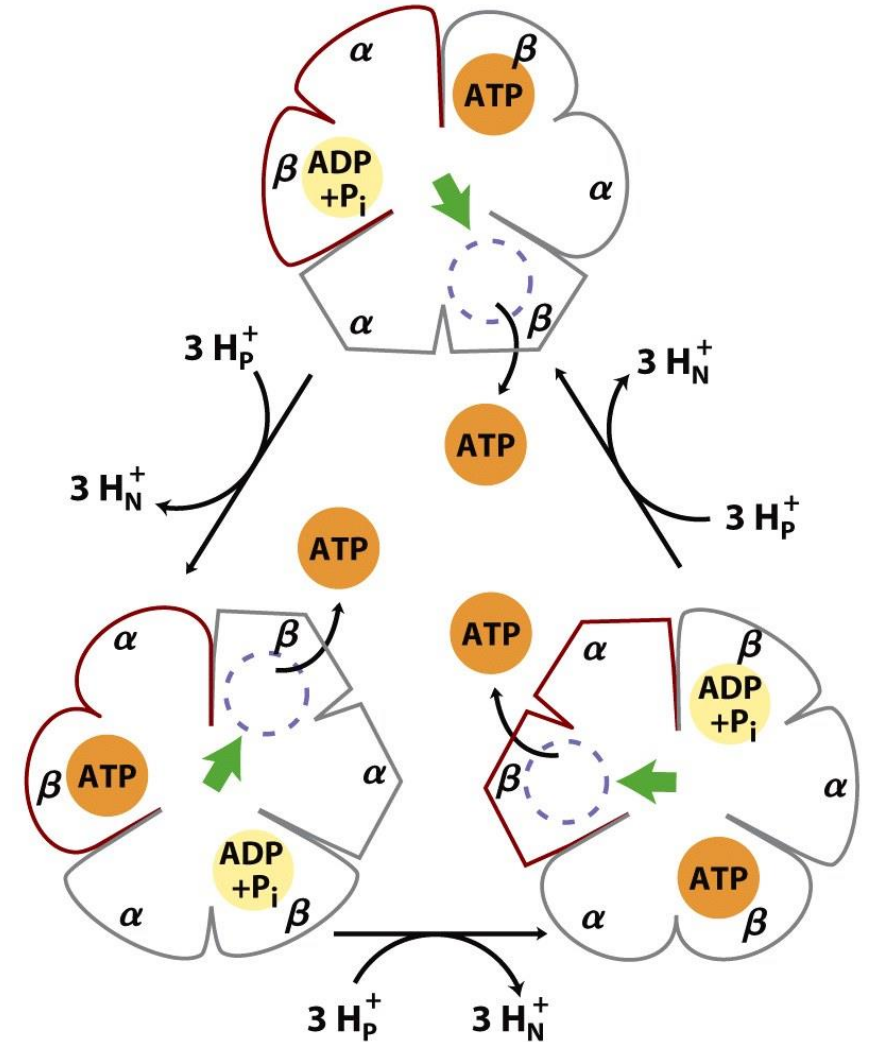


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Fotosyntéza

FOTOSYNTÉZA

- složitý BCH proces, při němž dochází k zachycení sluneční energie a její přeměny do energie chemických vazeb
- dochází k syntéze energeticky bohatých sloučenin (cukrů) z CO_2 a H_2O
- probíhá v chloroplastech

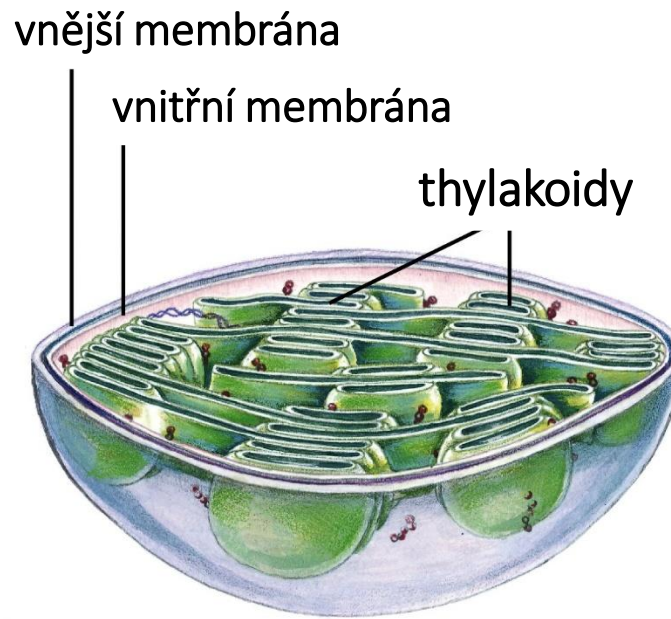


Figure 19-45a
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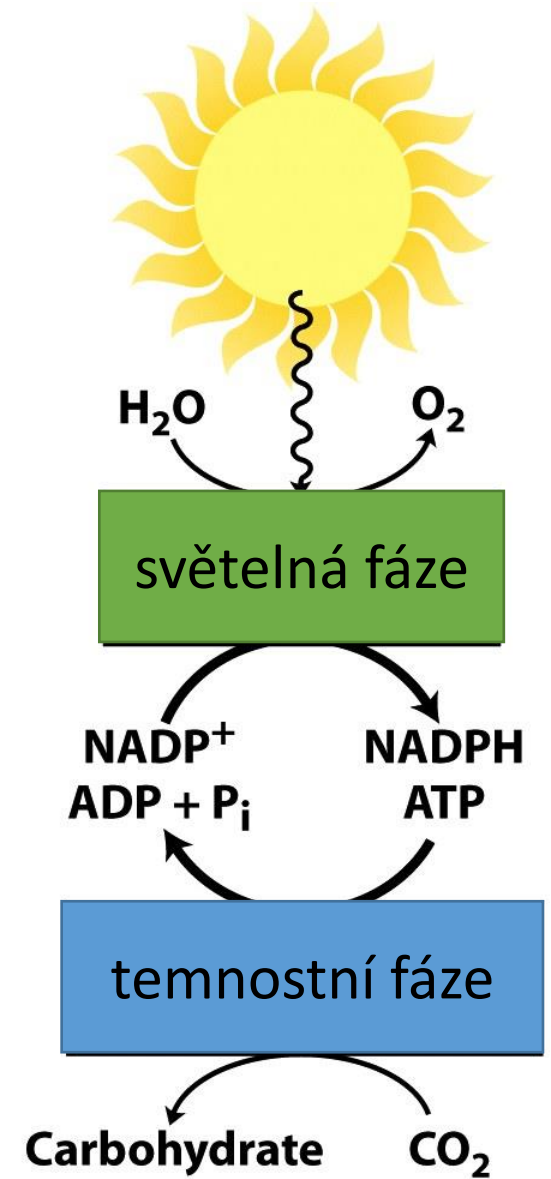


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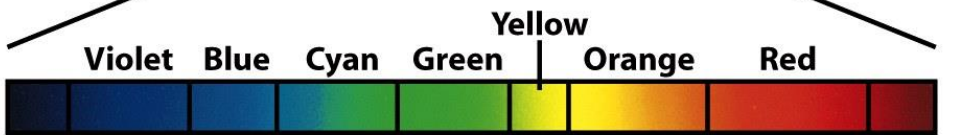
„fyzikální vsuvka“

Type of radiation
Wavelength

Gamma rays	X rays	UV	Infrared	Microwaves	Radio waves
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<1 nm 100 nm <1 millimeter 1 meter Thousands of meters

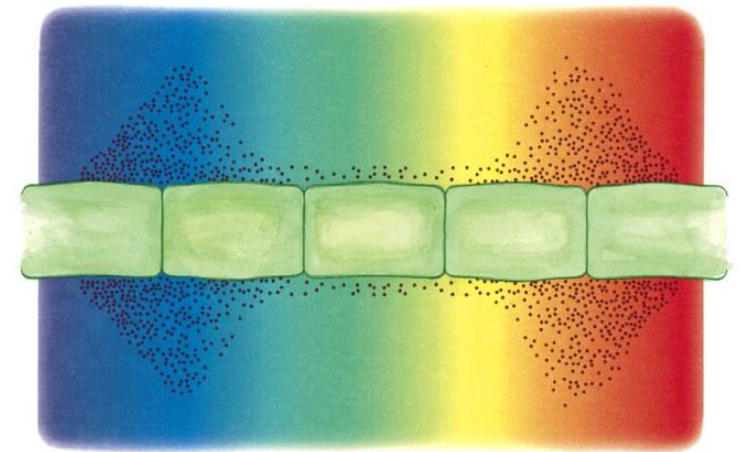
Visible light



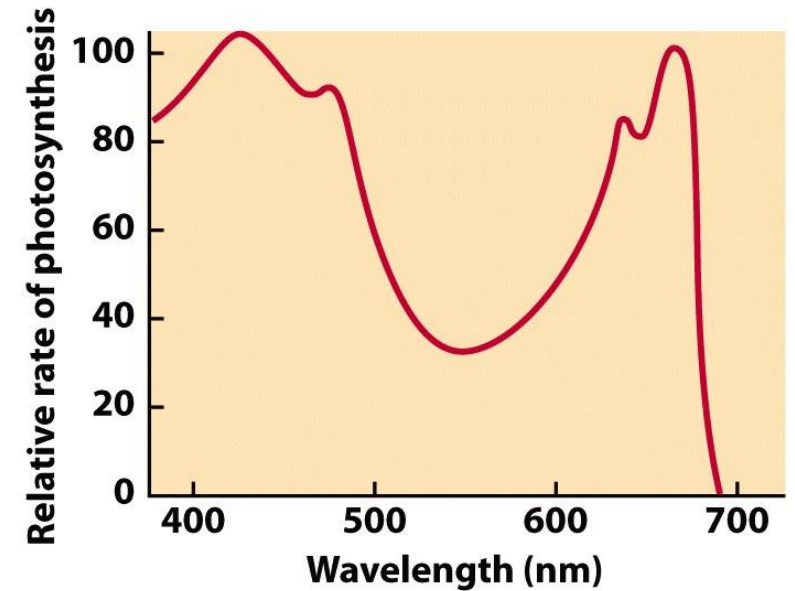
Wavelength (nm) 380 430 500 560 600 650 750

Energy (kJ/einstein) 300 240 200 170

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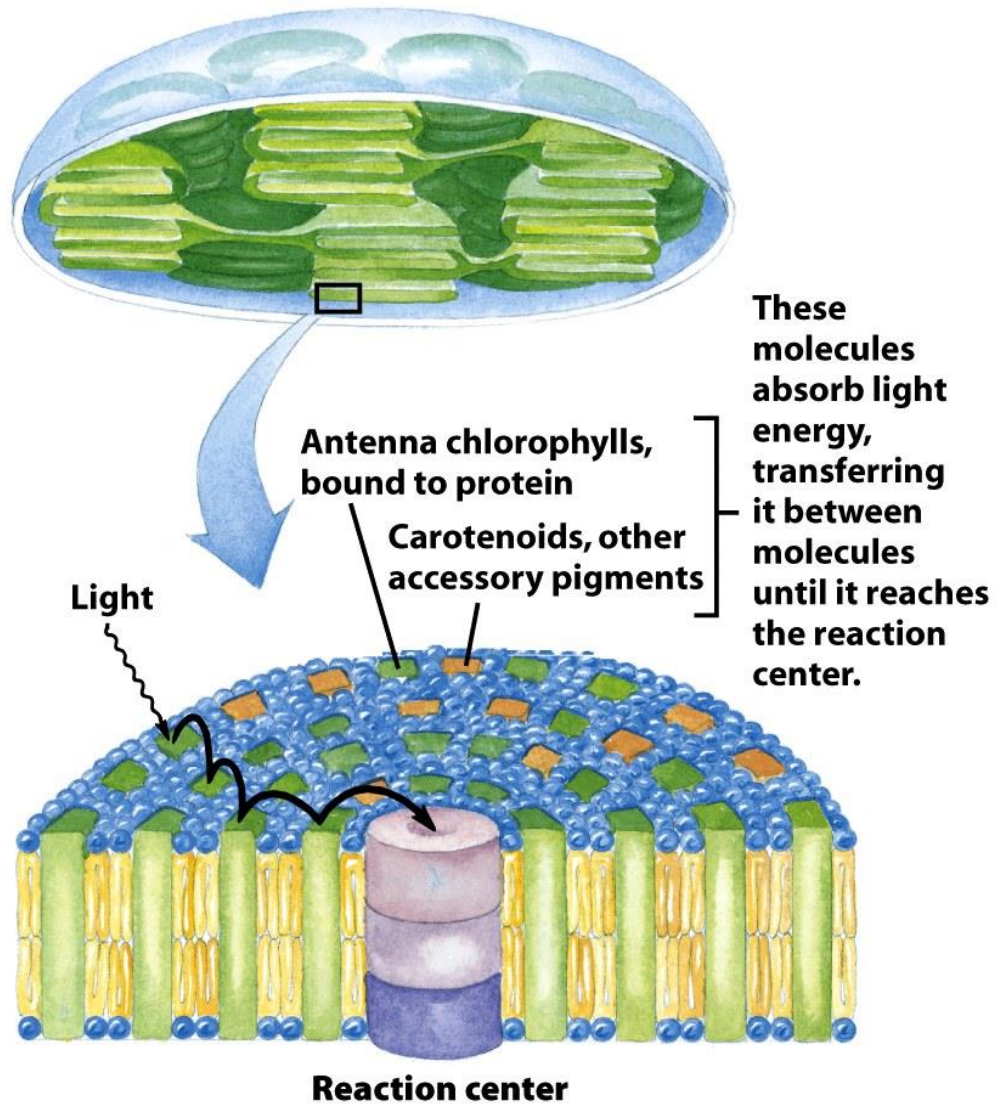


(a)



(b)

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Photochemical reaction here converts the energy of a photon into a separation of charge, initiating electron flow.

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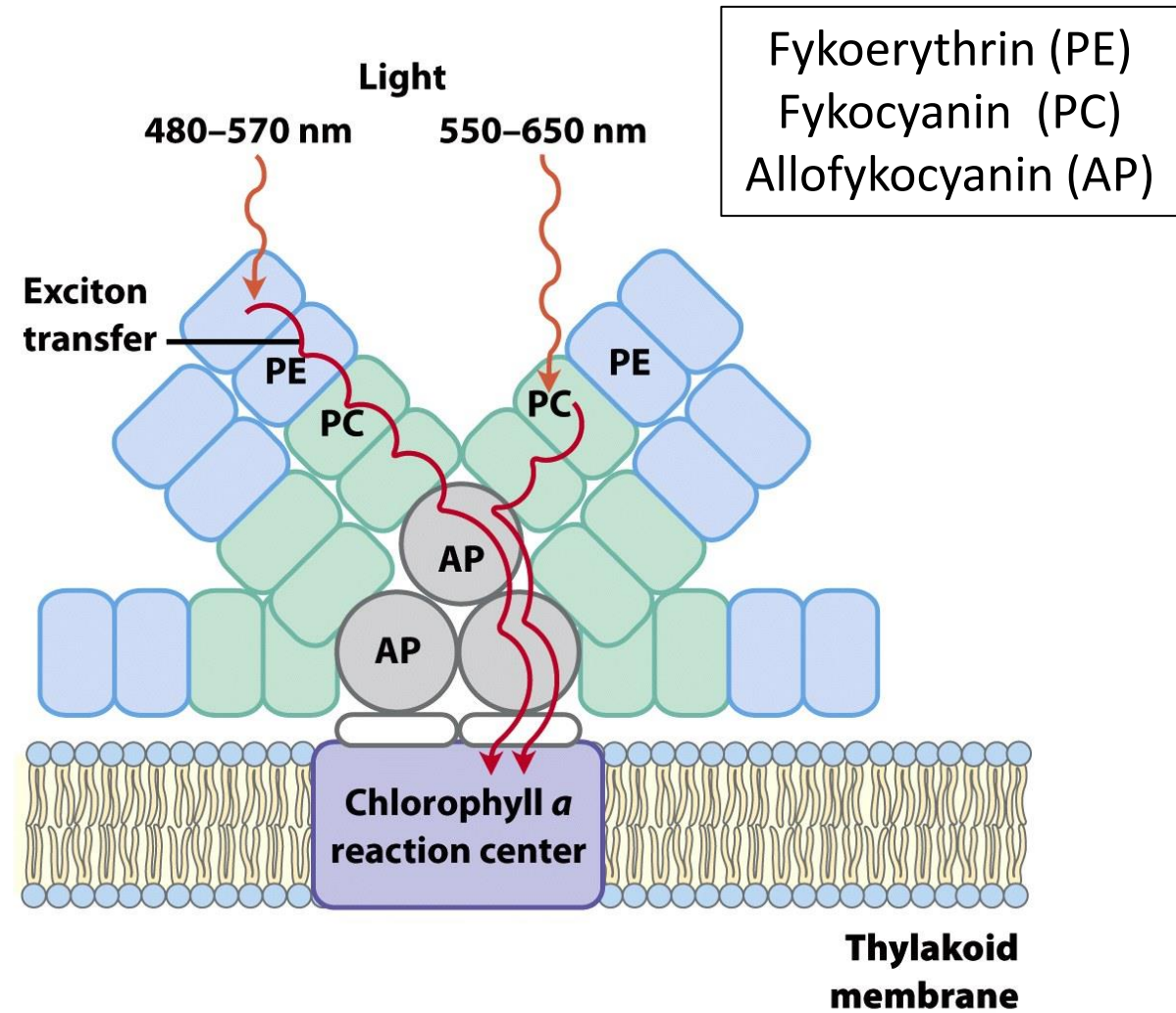
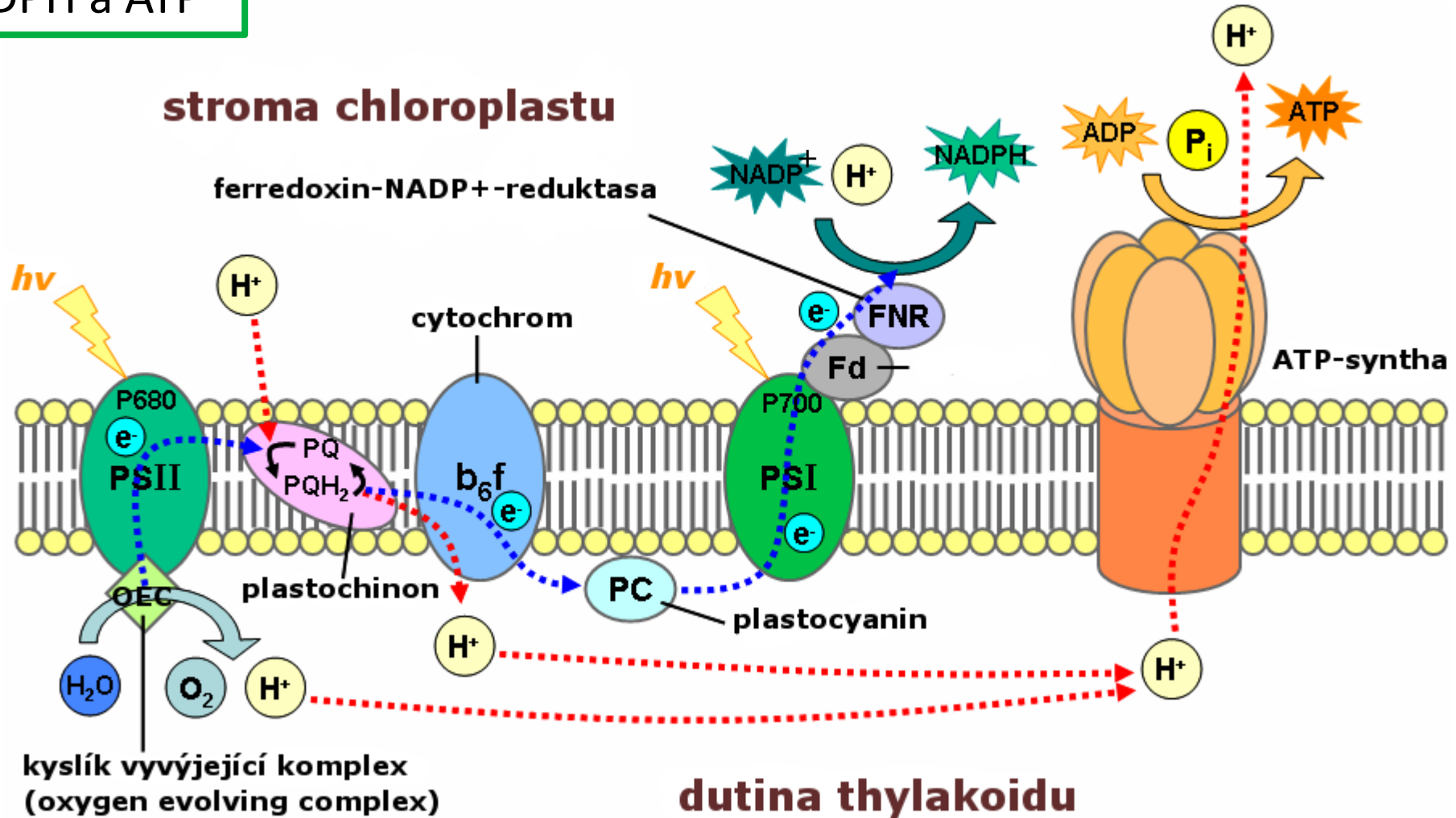


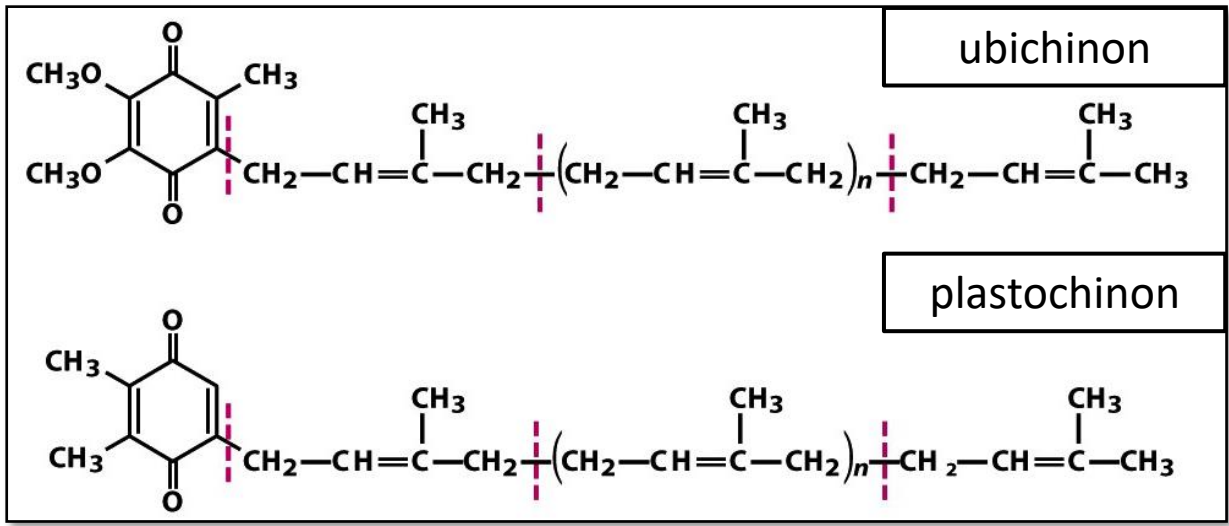
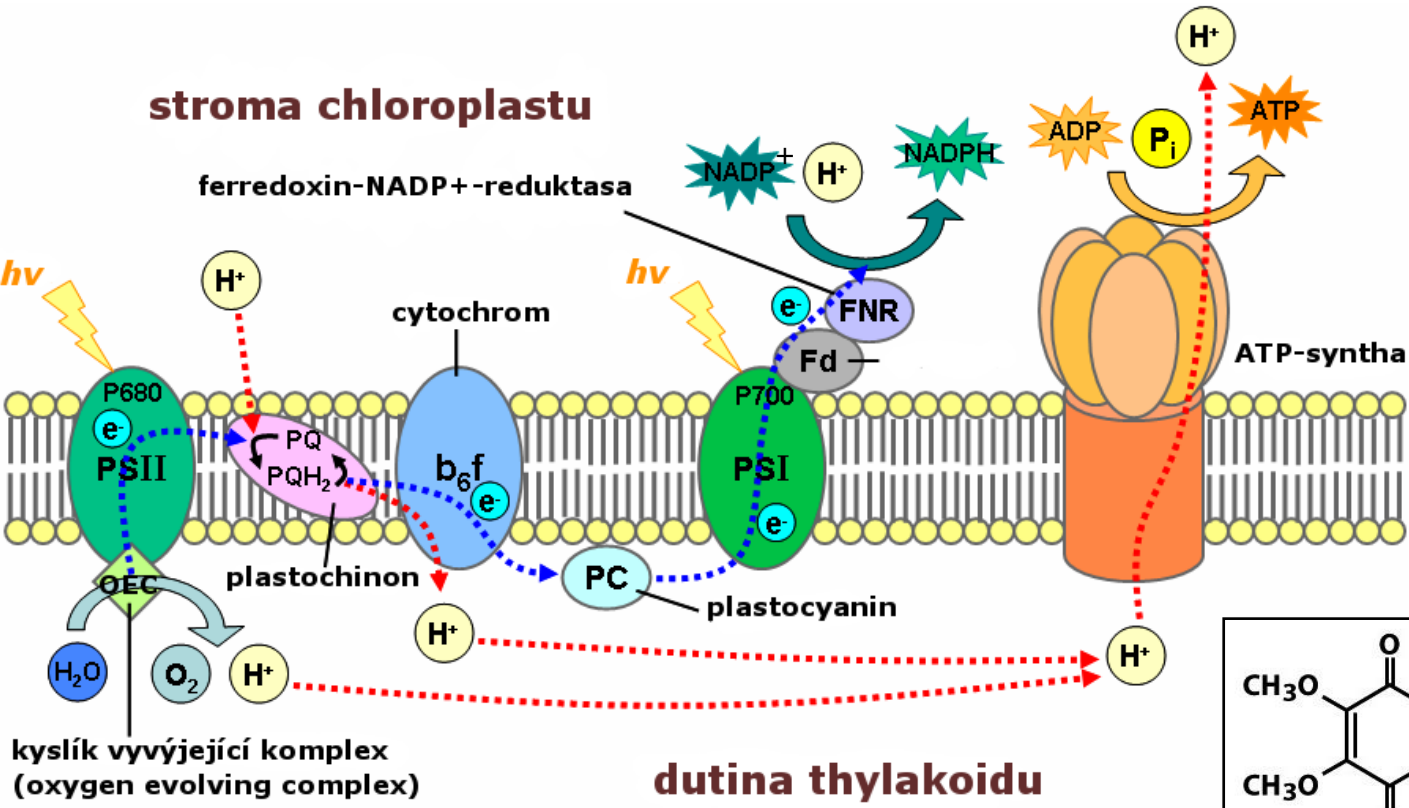
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Světelná fáze fotosyntézy

Vznik NADPH a ATP



Světelná fáze fotosyntézy



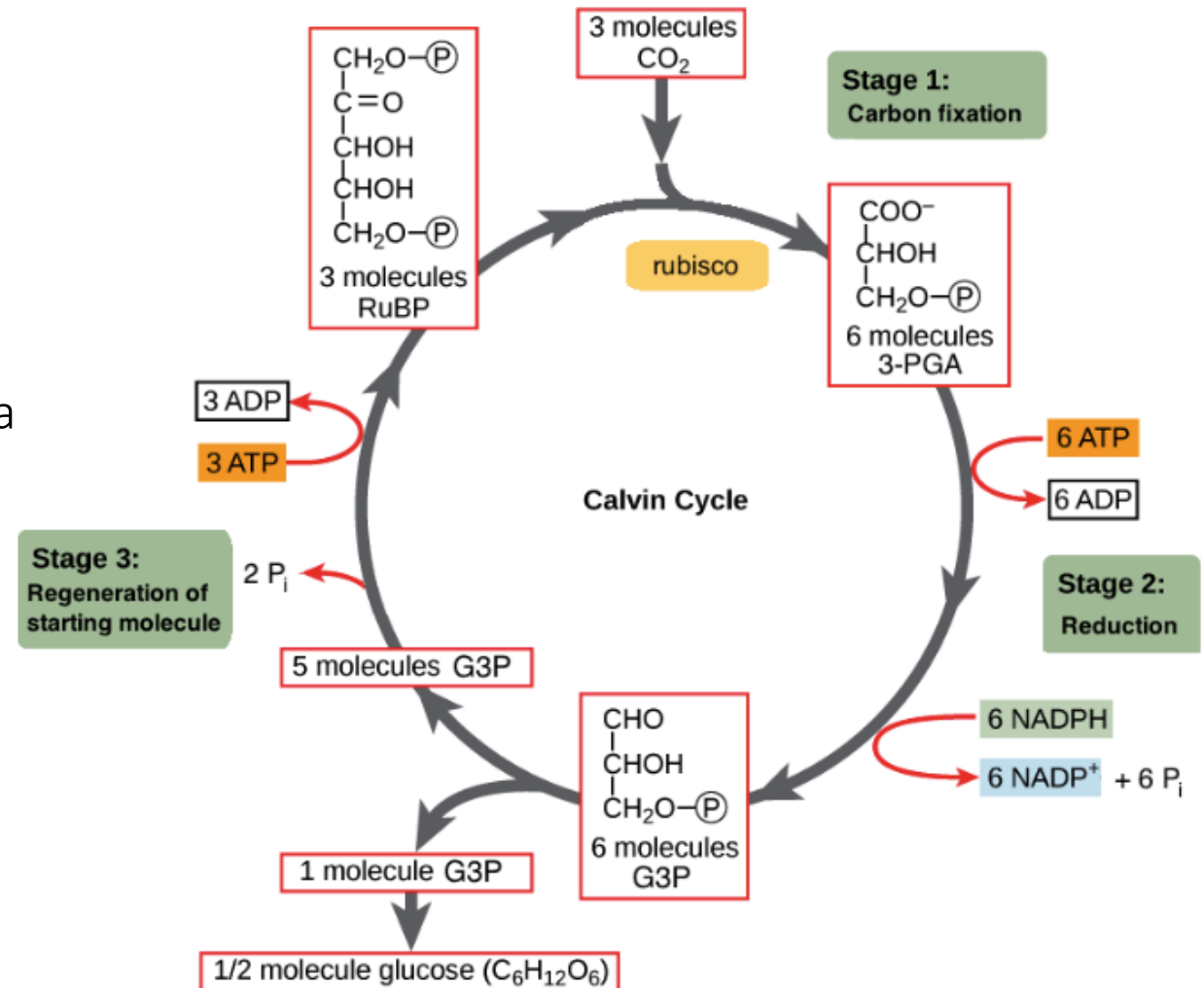
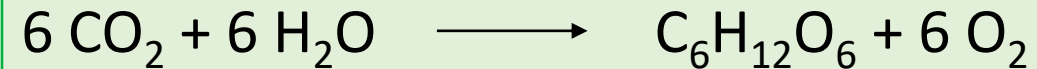
Temnostní fáze – Calvinův cyklus

➤ získaná energie ve formě ATP a NADPH slouží

k fixaci CO₂ do sacharidů

➤ enzym RuBisCO:

- ribulosa-1,5-bisfosfát-karboxylasa/oxygenasa



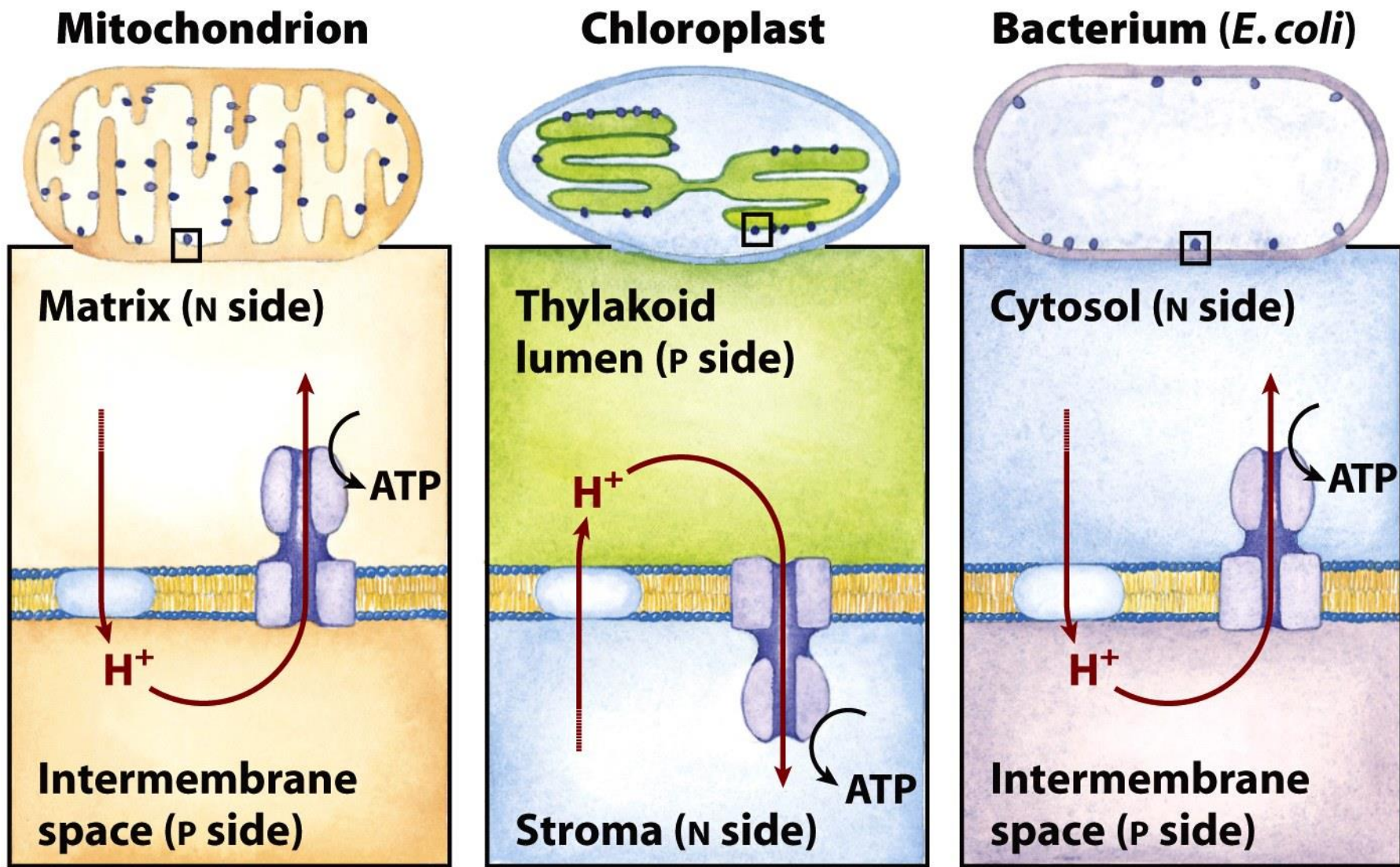


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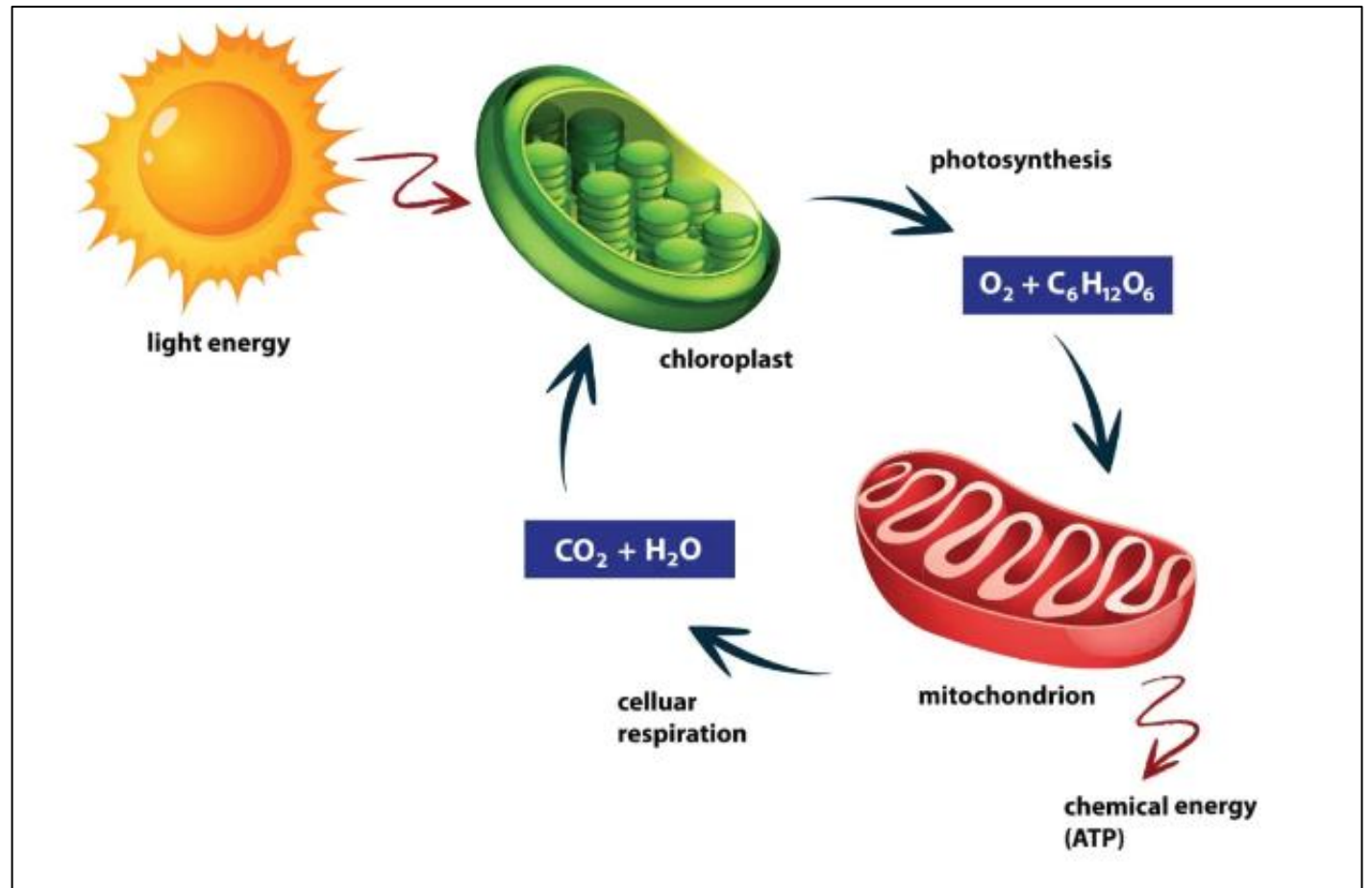
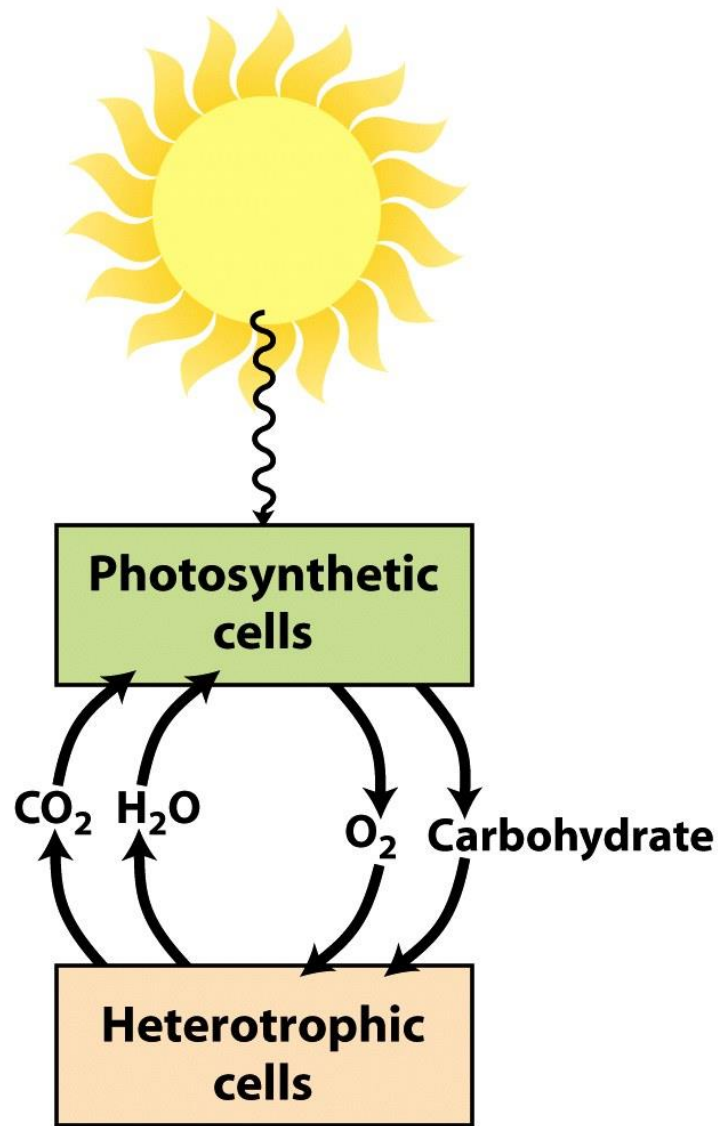


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Užitečné odkazy

Dýchací řetězec stručně a jednoduše

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

Dýchací řetězec podrobněji

<https://www.youtube.com/watch?v=LQmTKxl4Wn4&t>

ATP syntasa v akci

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

