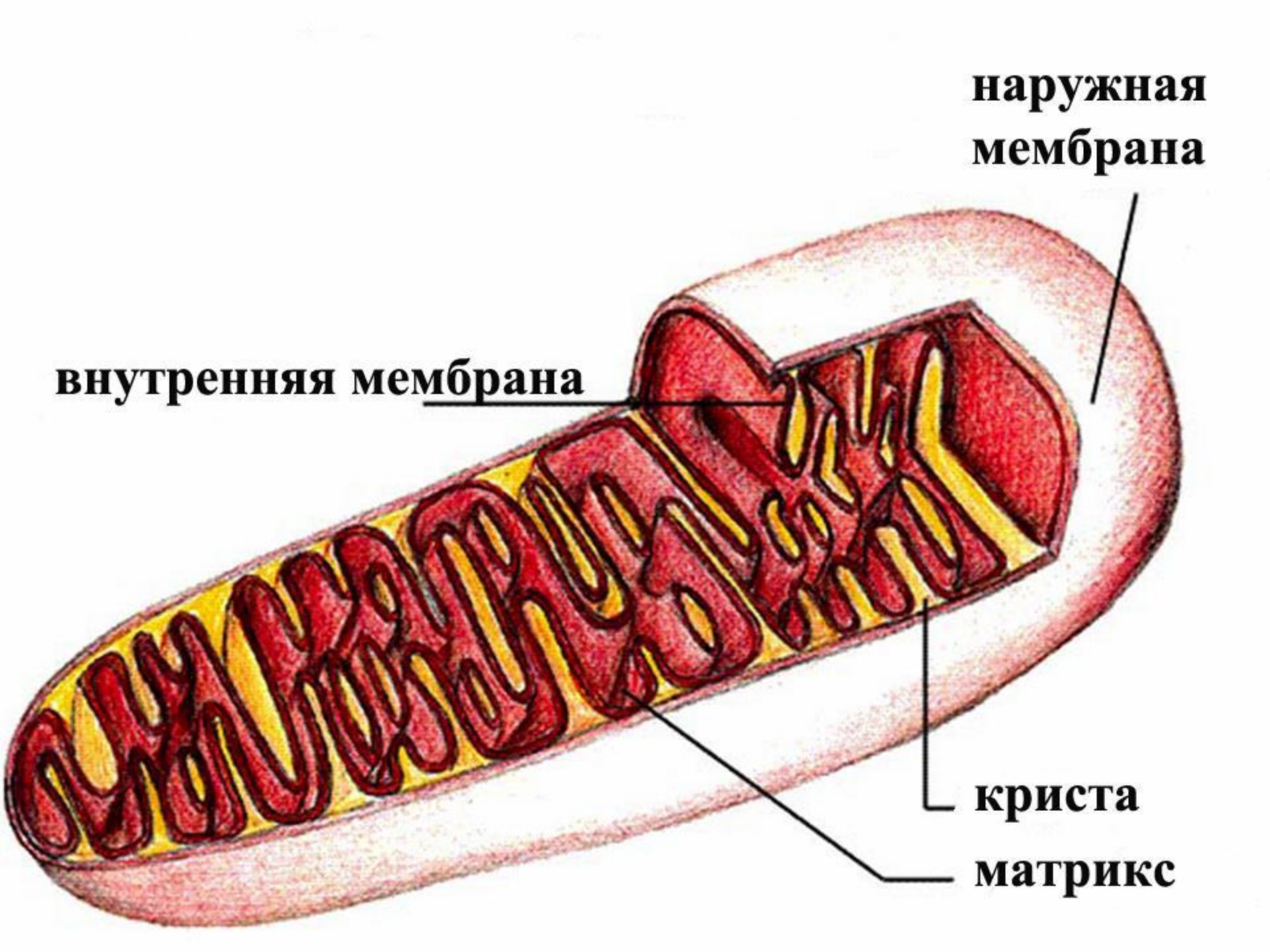
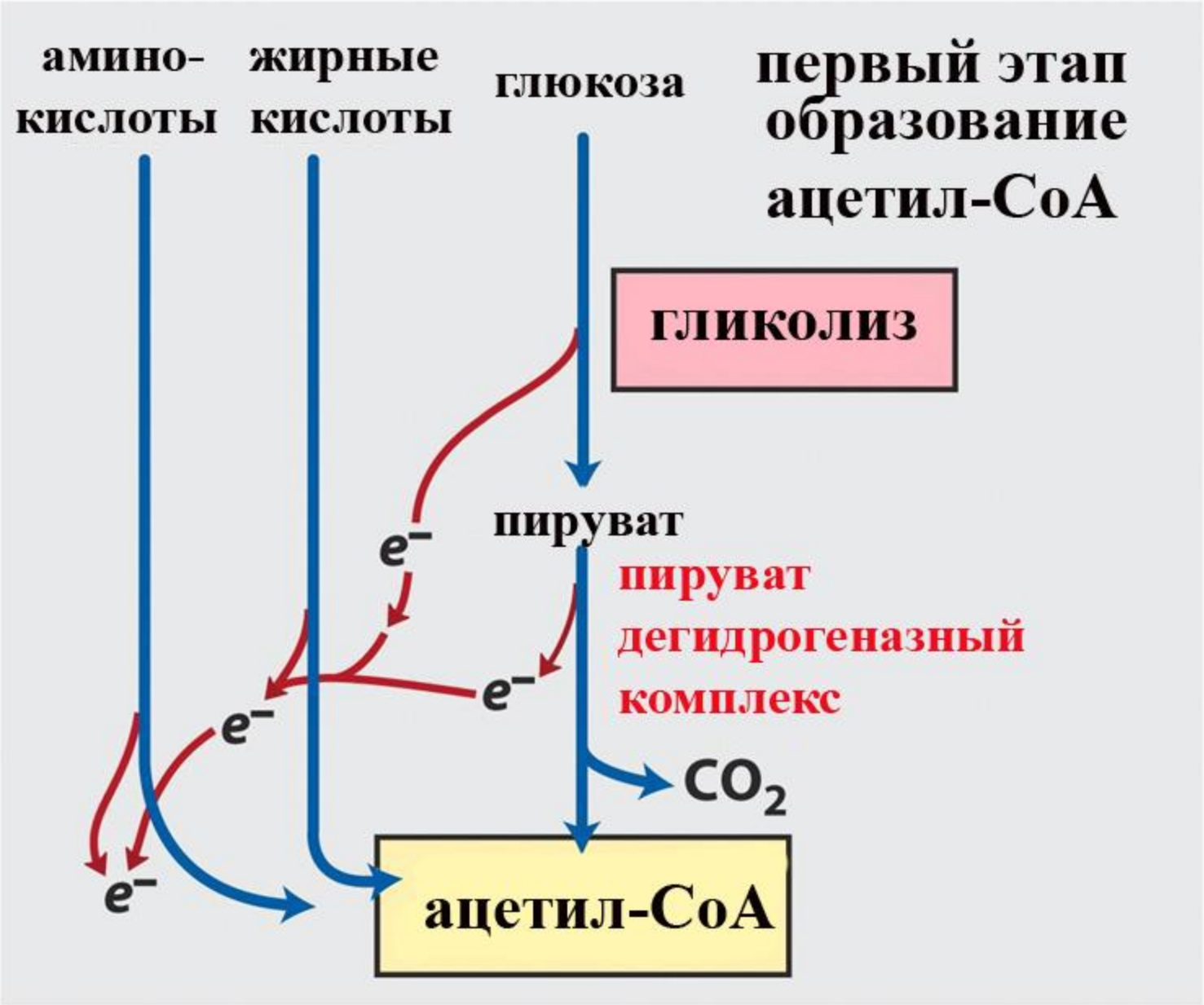
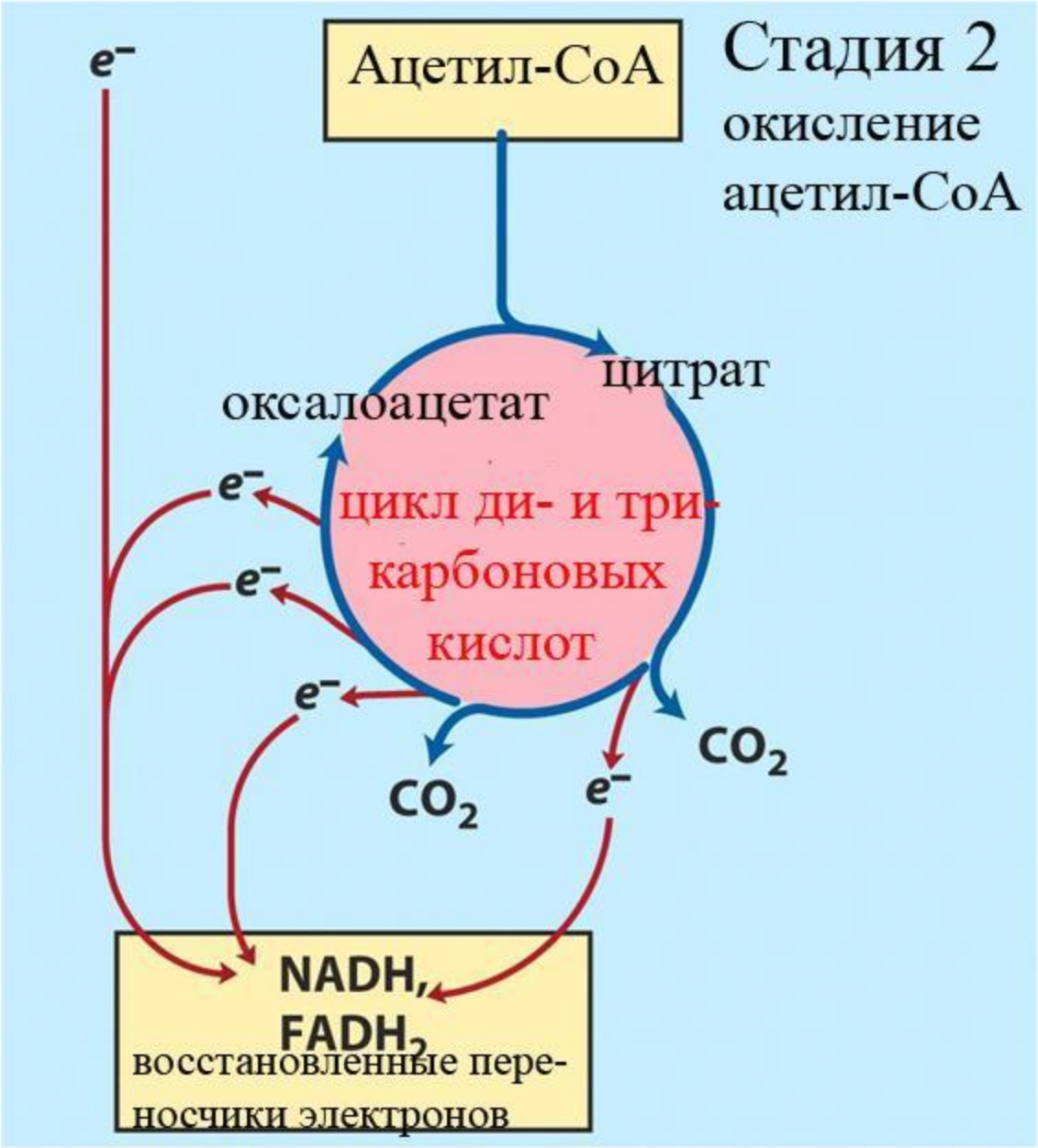
Уравнение гликолиза

$C_6H_{12}O_6$ + 2АДФ + P_i + НАД =

$2C_3H_4O_3$+2АТФ+2НАД $H+H^+$


наружная мембрана
внутренняя мембрана
криста
матрикс


амино-
кислоты
жирные
кислоты
глюкоза
первый этап
образование
ацетил-CoA
гликолиз
пируват
пируват
дегидрогеназный
комплекс
e⁻
e⁻
e⁻
e⁻
e⁻
CO_2
ацетил-CoA


Стадия 2
окисление
ацетил-CoA
Ацетил-CoA
цитрат
оксалоацетат
цикл ди- и три-
карбоновых
кислот
e^-
e^-
e^-
e^-
e^-
CO_2
CO_2
NADH,
$FADH_2$
восстановленные пере-
носчики электронов

ротенон

NADH ⊗→ Q → Cyt *b* → Cyt c_1 → Cyt *c* → Cyt $(a + a_3)$ → O_2

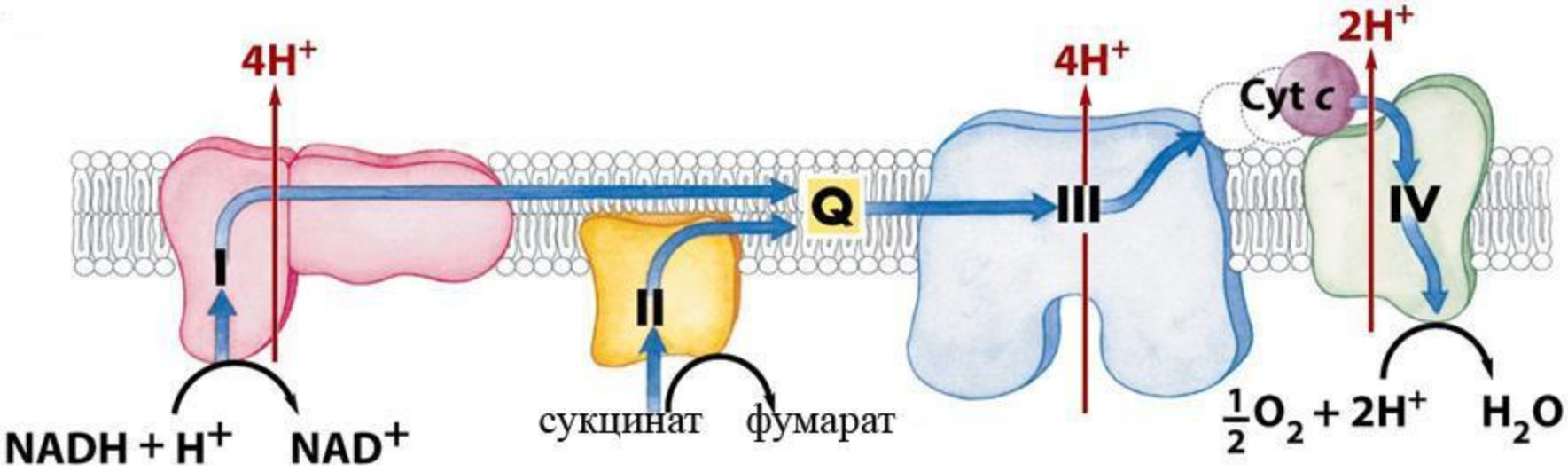
антимицин

NADH → Q → Cyt *b* ⊗→ Cyt c_1 → Cyt *c* → Cyt $(a + a_3)$ → O_2

CN^- или CO

NADH → Q → Cyt *b* → Cyt c_1 → Cyt *c* → Cyt $(a + a_3)$ ⊗→ O_2

Межмембранное пространство



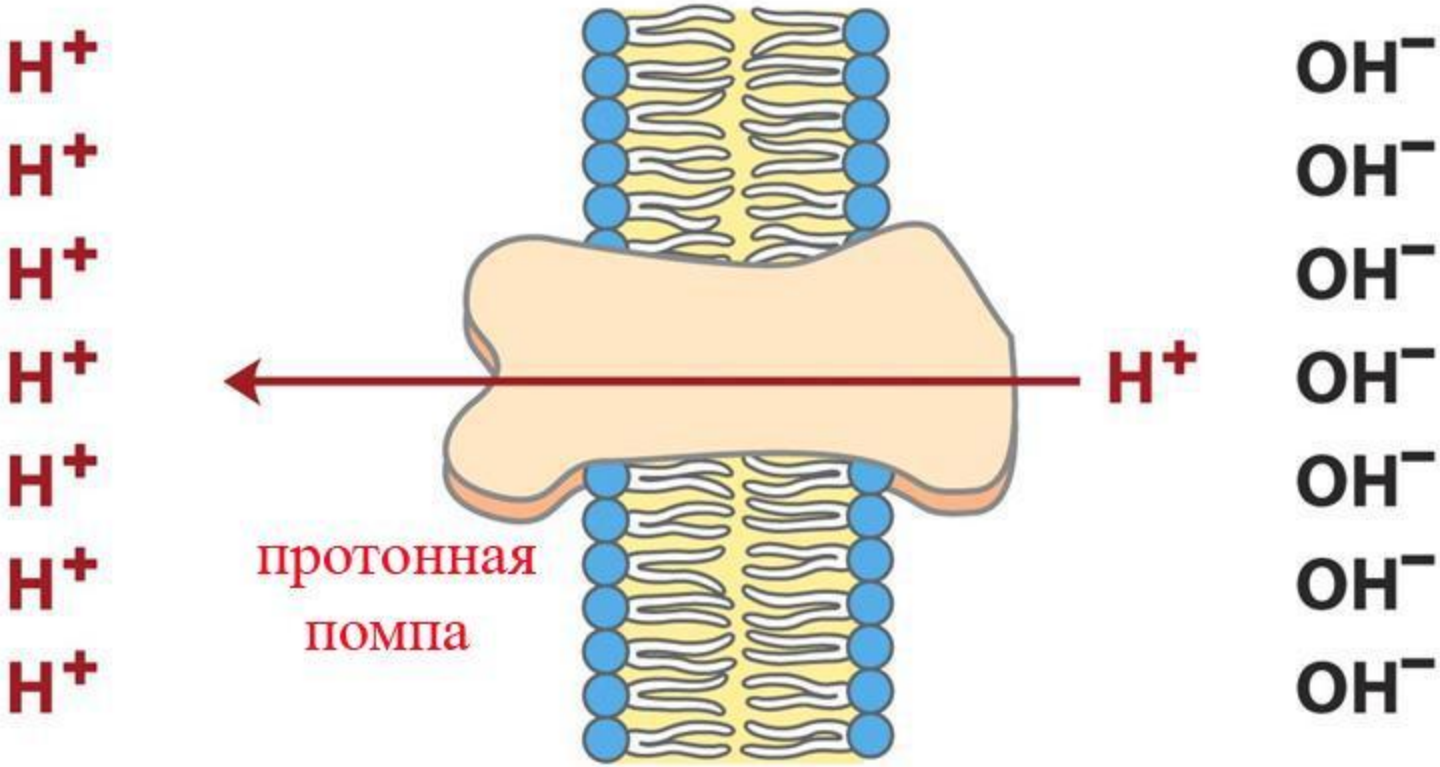
Матрикс

Межмембранное пространство

Матрикс

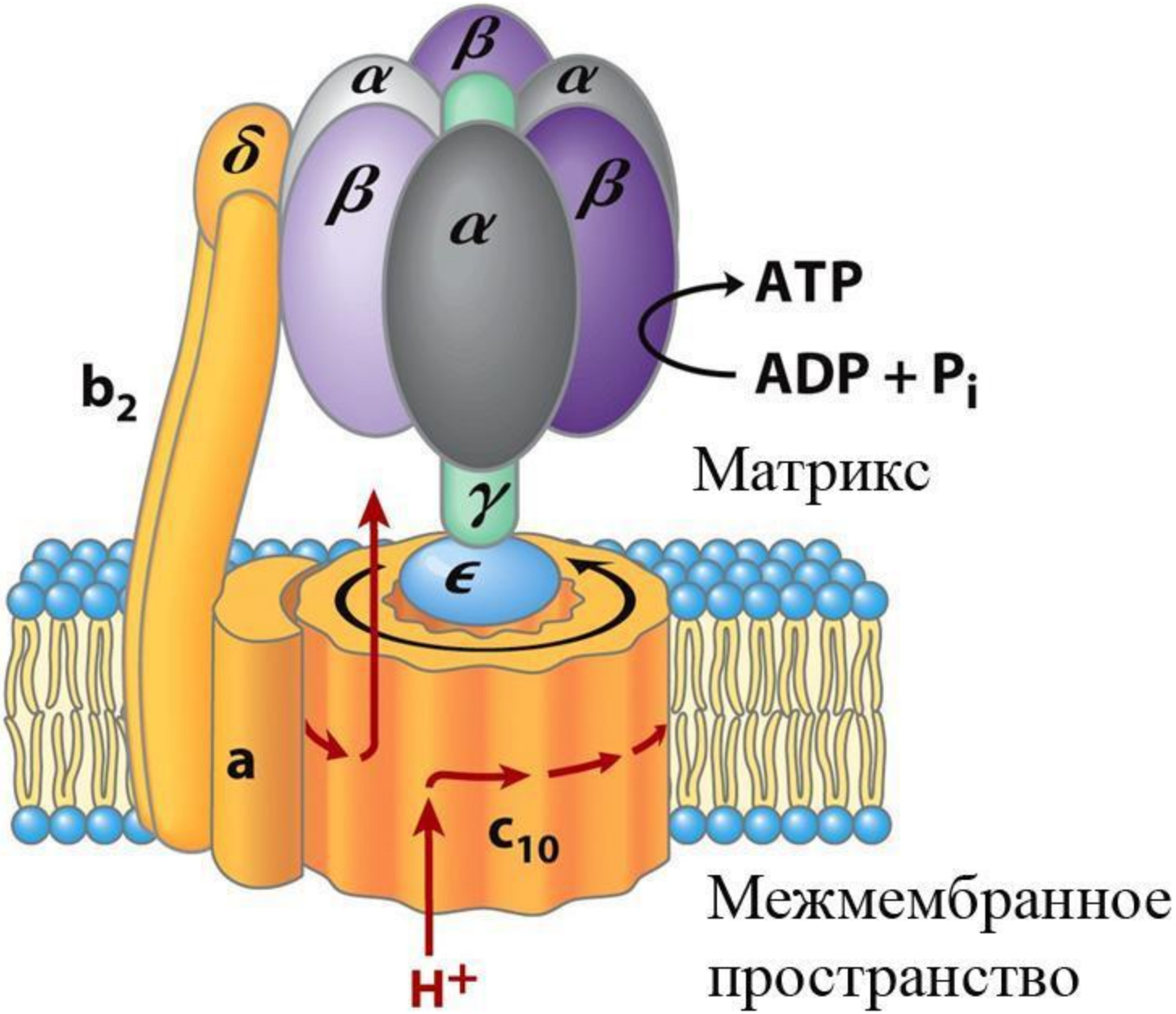
$[H^+]_P = C_2$

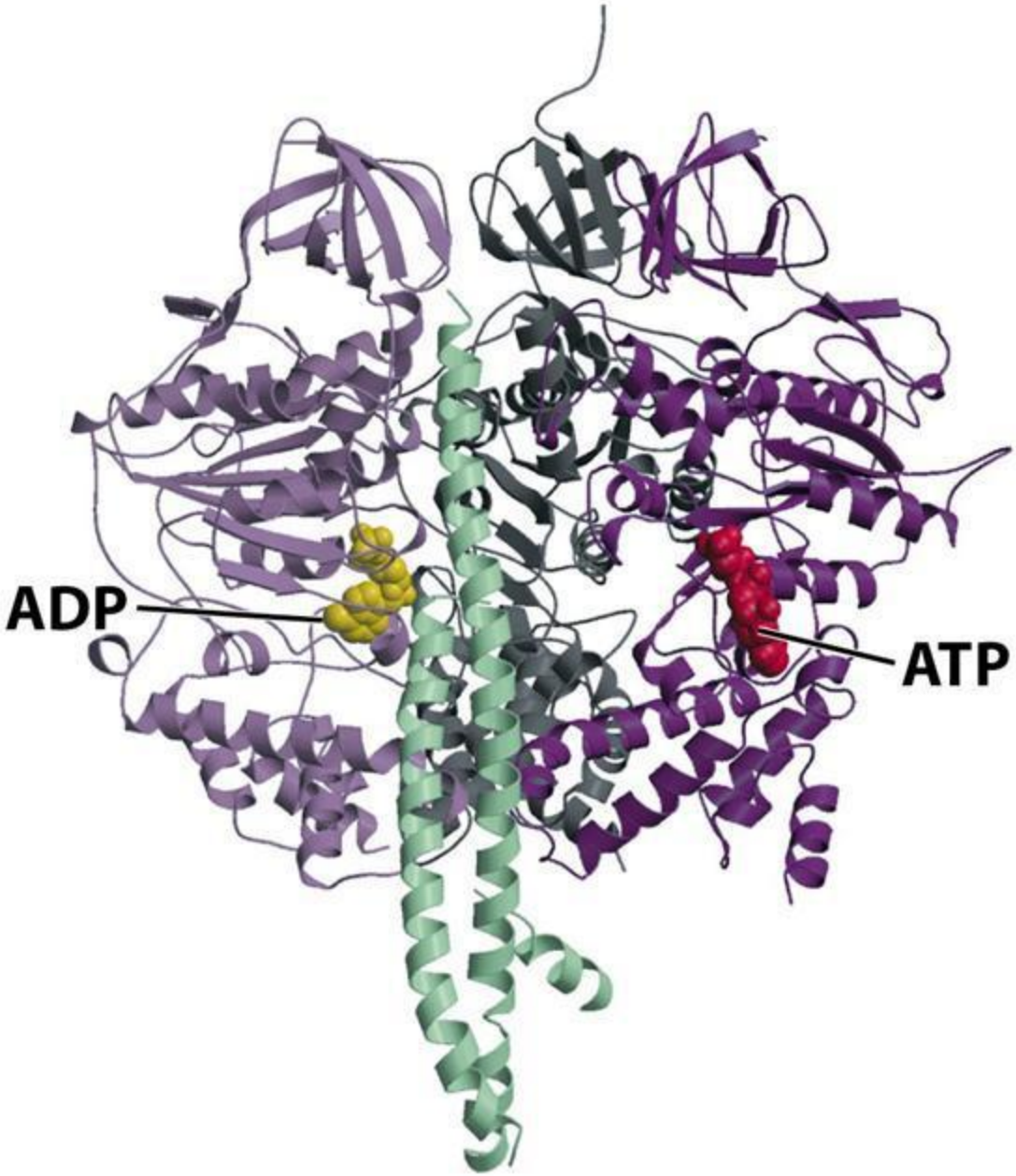
$[H^+]_N = C_1$

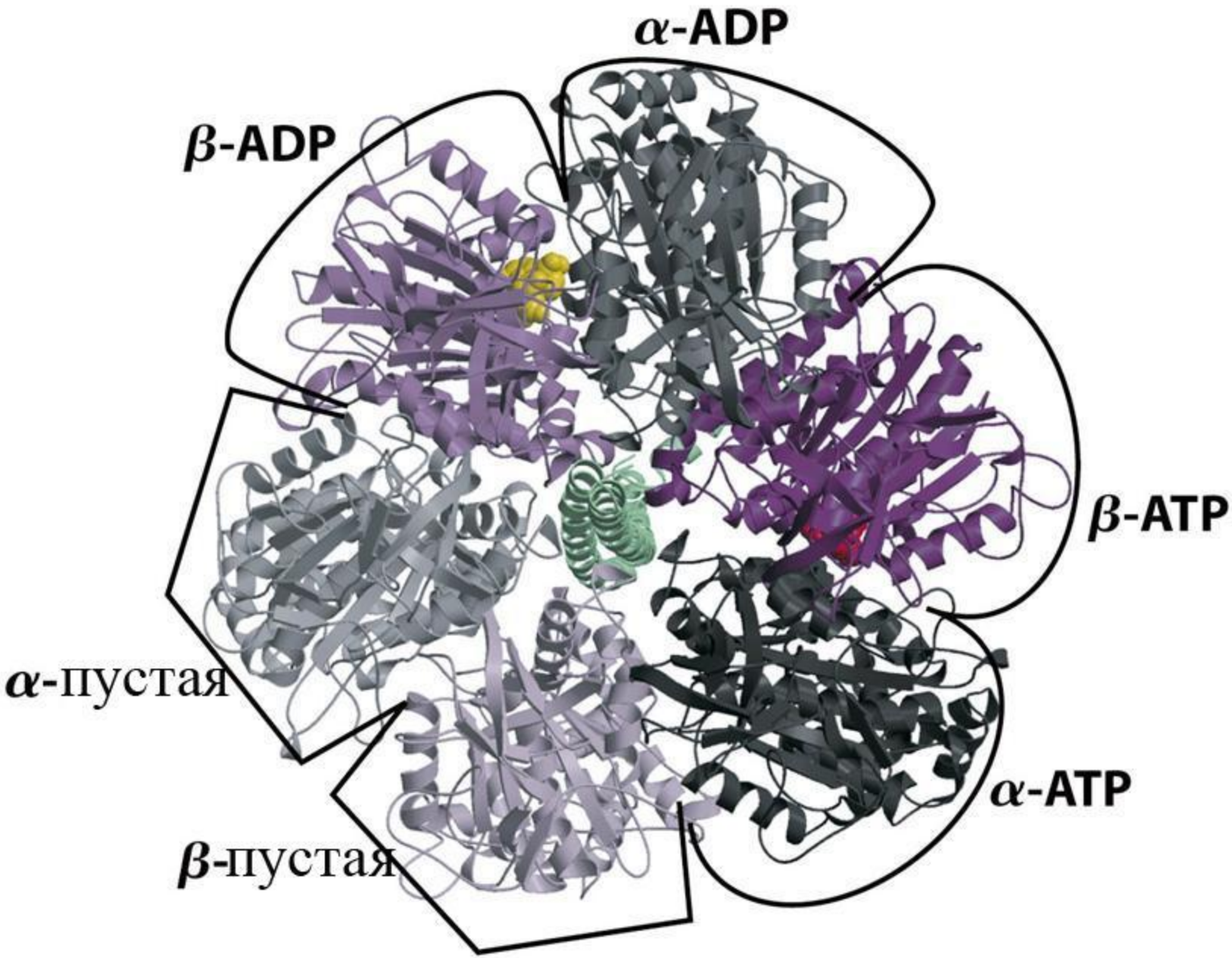


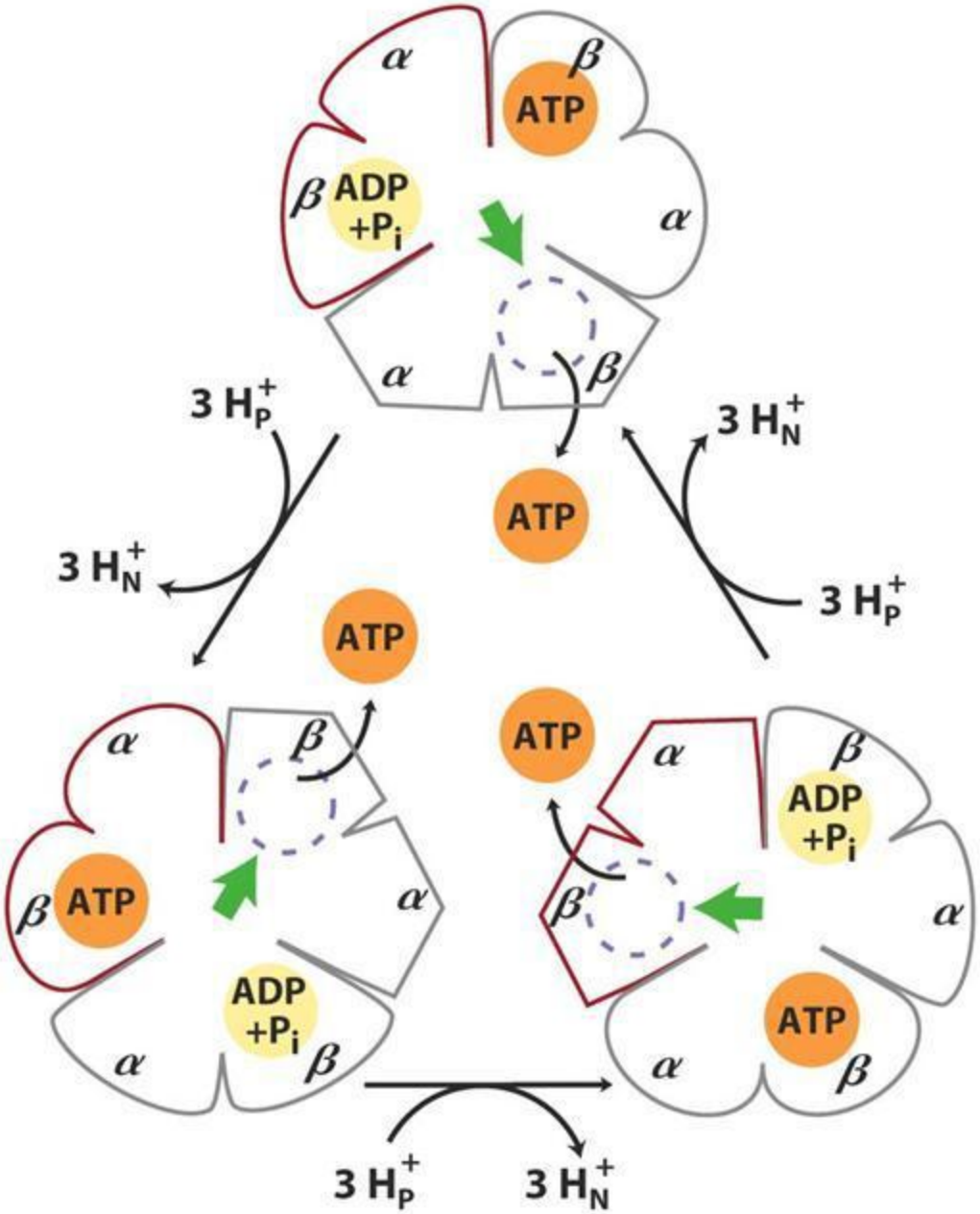
$$\Delta G = RT \ln (C_2/C_1) + Z\mathcal{F}\,\Delta\psi$$

$$= 2.3RT\,\Delta pH + \mathcal{F}\,\Delta\psi$$


β
α
α
δ
β
α
β
ATP
ADP + Pi
b2
Матрикс
γ
ϵ
a
c10
H+
Межмембранное
пространство

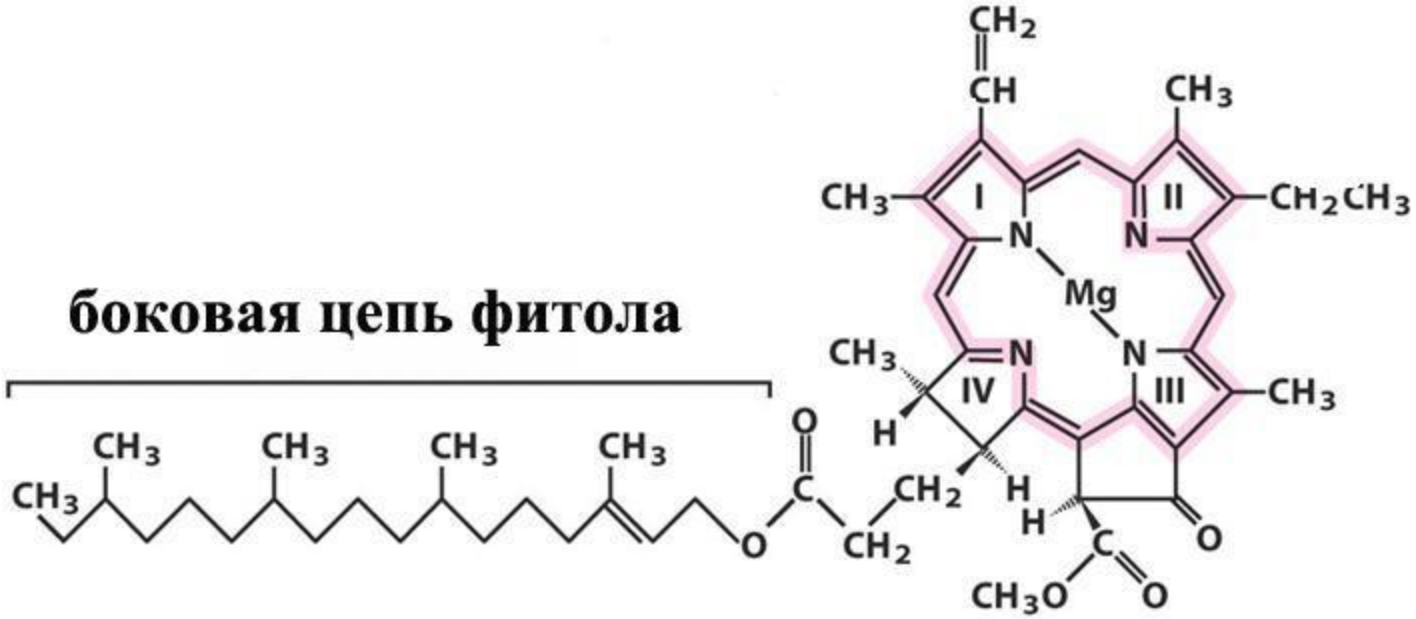

ADP
ATP


α-ADP
β-ADP
β-ATP
α-пустая
α-ATP
β-пустая


α
β
ATP
β
ADP
+Pi
α
α
β
3 HP+
3 HN+
ATP
3 HN+
3 HP+
ATP
α
β
ATP
β
ATP
α
ADP
+Pi
α
ADP
+Pi
β
α
β
ATP
α
β
3 HP+
3 HN+

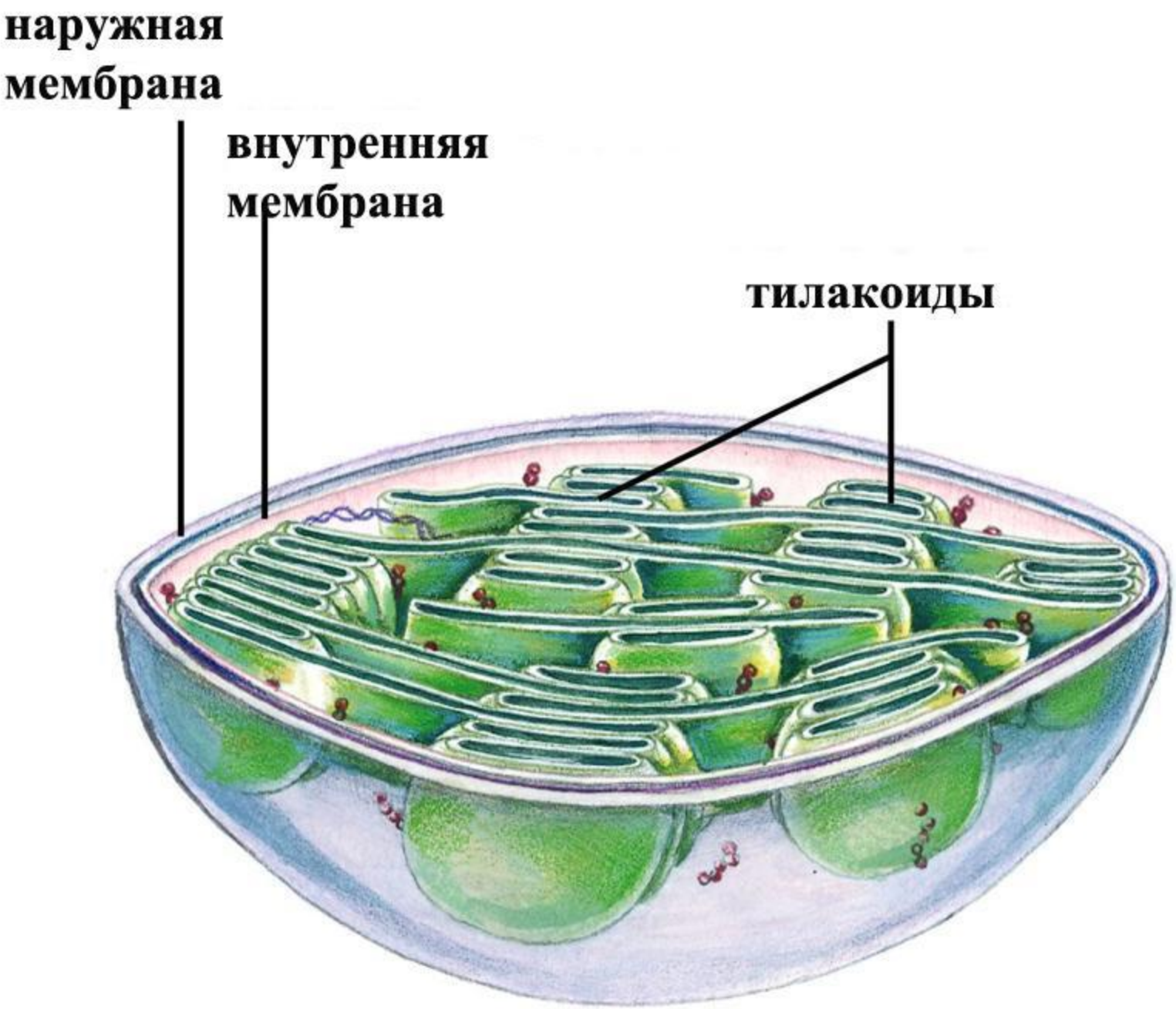
Итоговое уравнение

- Глюкоза ($C_6H_{12}O_6$)+ O_2 =
- $6CO_2$ + $6H_2O$ + 38 АТФ


боковая цепь фитола
CH2
CH
CH3
CH3
I
II
CH2CH3
N
N
Mg
CH3
N
N
IV
III
CH3
H
CH3
CH3
CH3
CH3
CH3
O
C
CH2
H
H
O
CH2
C
O
CH3O
O

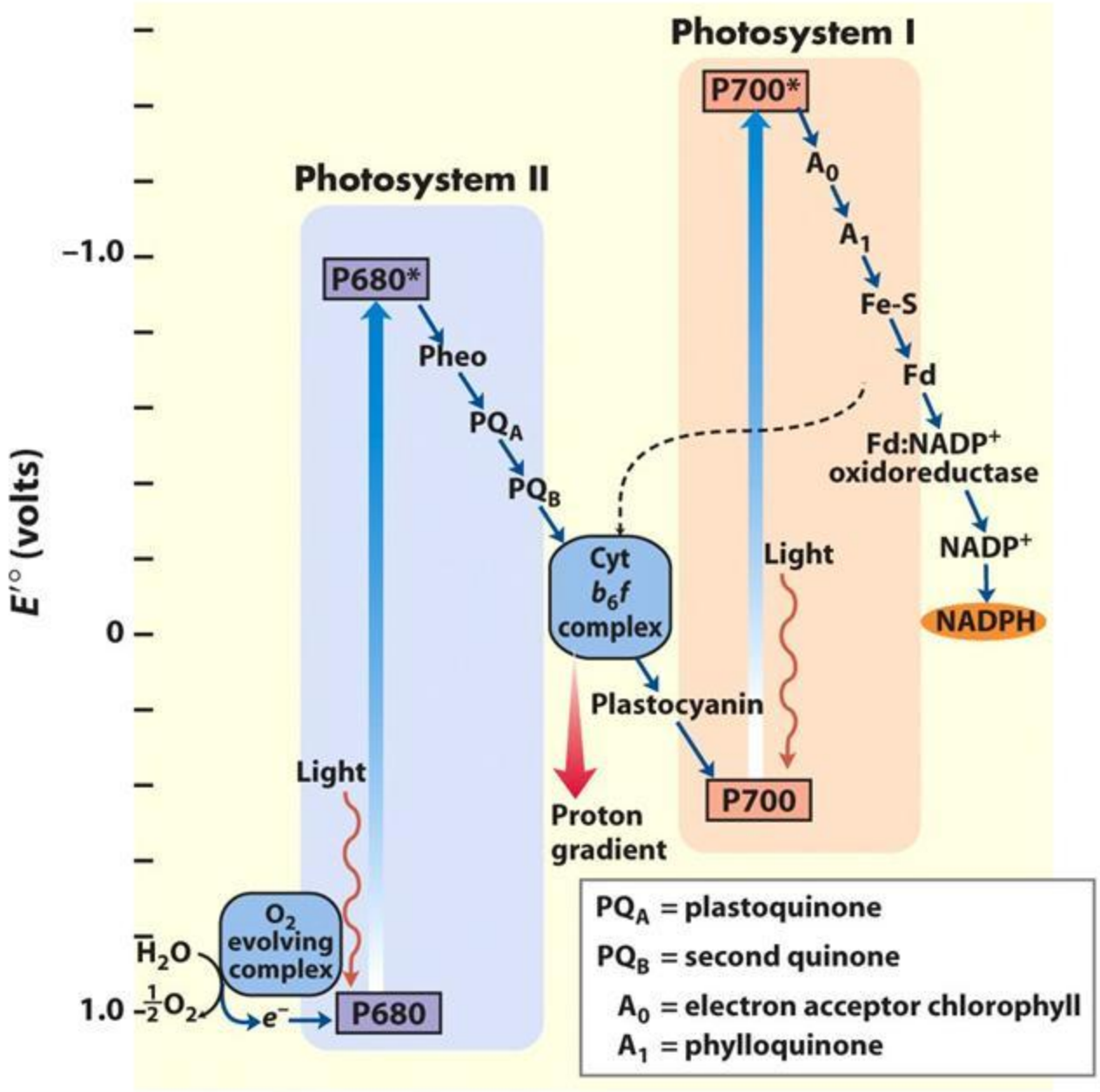
Хлорофилл а

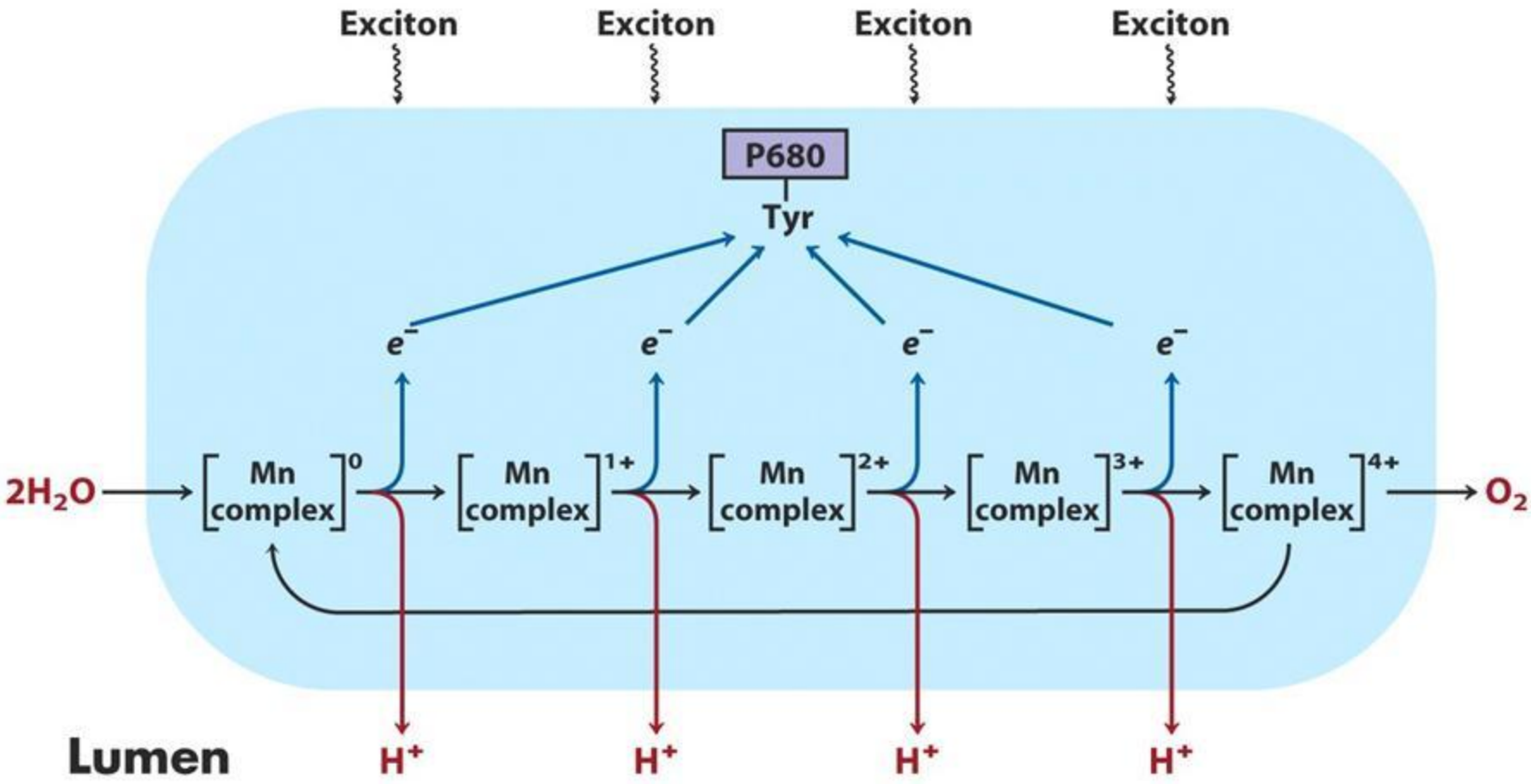
граны с тилакоидами
строма

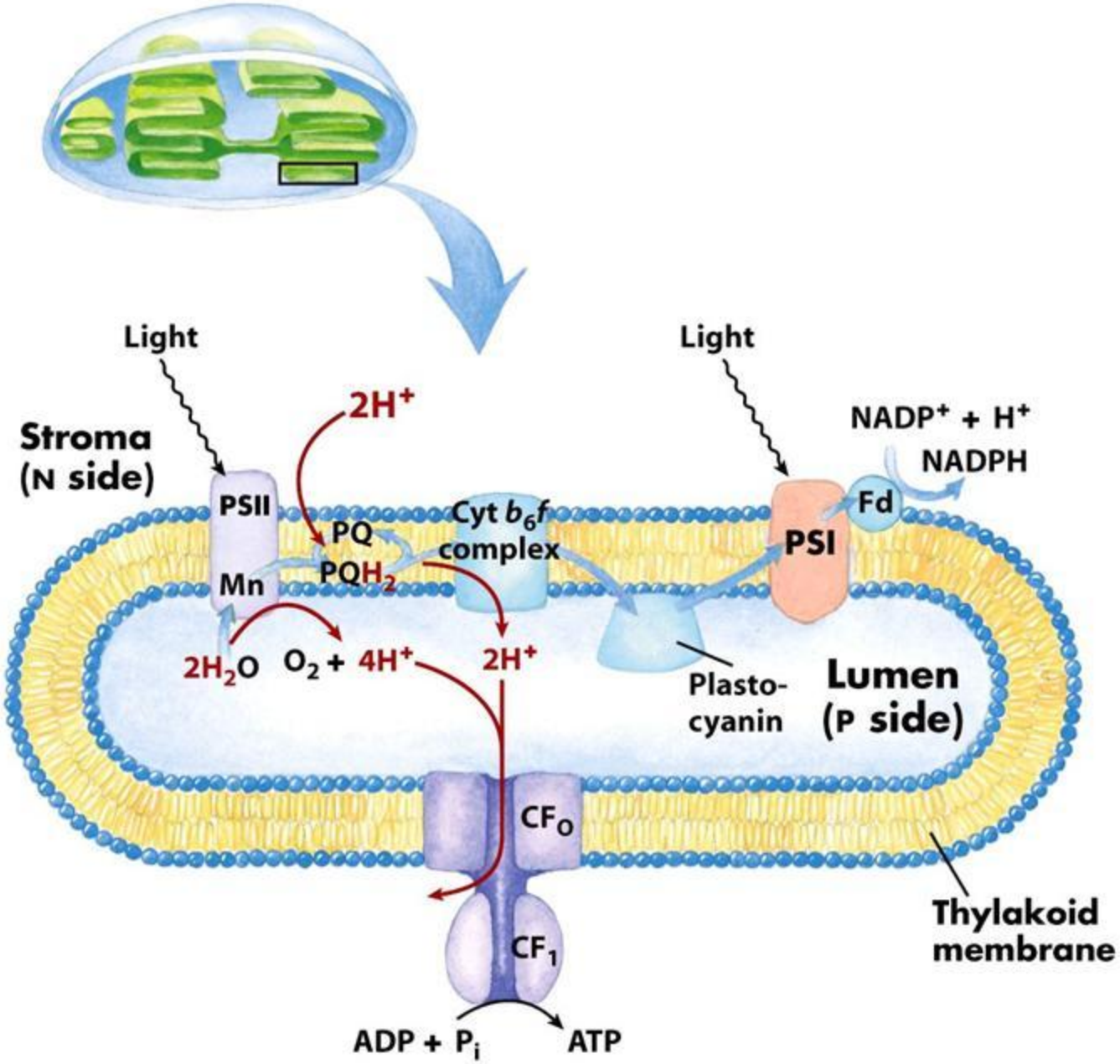

наружная мембрана
внутренняя мембрана
тилакоиды

Уравнение фотосинтеза

- $6\ CO_2 + 6\ H_2O$+энергия света =
- $C_6H_{12}O_6$ (глюкоза) + $6\ O_2$

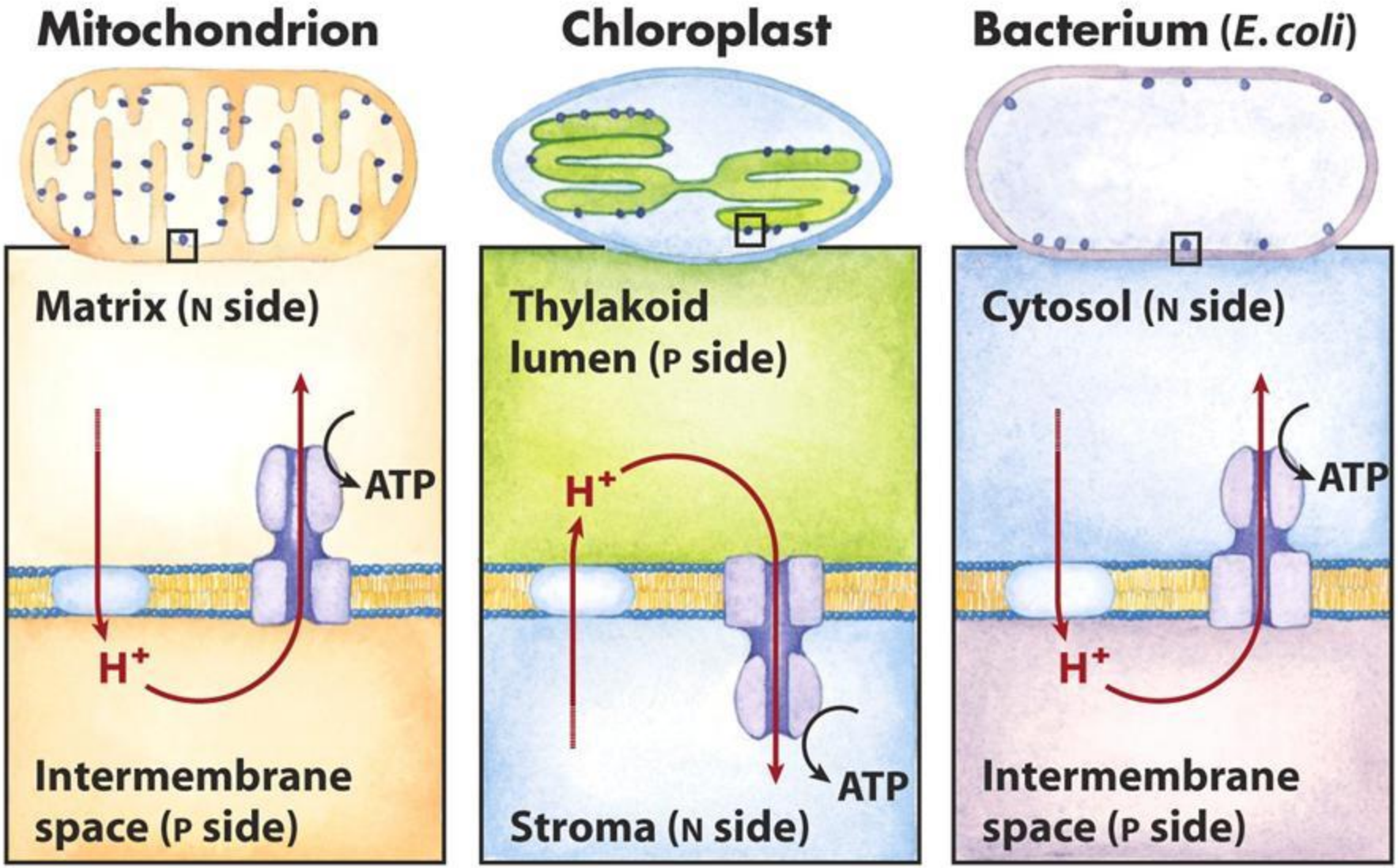

Photosystem I
Photosystem II
P700*
A0
A1
Fe-S
Fd
Fd:NADP+ oxidoreductase
NADP+
NADPH
Light
P700
Plastocyanin
Cyt b6f complex
Proton gradient
P680*
Pheo
PQA
PQB
Light
O2 evolving complex
H2O
1/2 O2
e−
P680
E'° (volts)
−1.0
0
1.0
PQA = plastoquinone
PQB = second quinone
A0 = electron acceptor chlorophyll
A1 = phylloquinone


Exciton
Exciton
Exciton
Exciton
P680
Tyr
e⁻
e⁻
e⁻
e⁻
2H₂O
Mn complex 0
Mn complex 1+
Mn complex 2+
Mn complex 3+
Mn complex 4+
O₂
Lumen
H⁺
H⁺
H⁺
H⁺


Light
Light
2H+
Stroma
(N side)
NADP+ + H+
NADPH
PSII
Fd
PQ
Cyt b6f
complex
PSI
Mn
PQH2
2H2O
O2 + 4H+
2H+
Plasto-
cyanin
Lumen
(P side)
CFO
CF1
Thylakoid
membrane
ADP + Pi
ATP

Световая стадия

- H_2O + НАДФ$^+$ + АДФ + P_i +
  - энергия света =
- АТФ + НАДФ Н + O_2 + H^+


Mitochondrion
Matrix (N side)
ATP
H+
Intermembrane space (P side)
Chloroplast
Thylakoid lumen (P side)
H+
ATP
Stroma (N side)
Bacterium (E. coli)
Cytosol (N side)
ATP
H+
Intermembrane space (P side)

Темновая стадия

- CO_2 + АТФ + НАДФН + H^+=
- $C_6H_{12}O_6$ (глюкоза) + АДФ +
- P_i + НАДФ$^+$