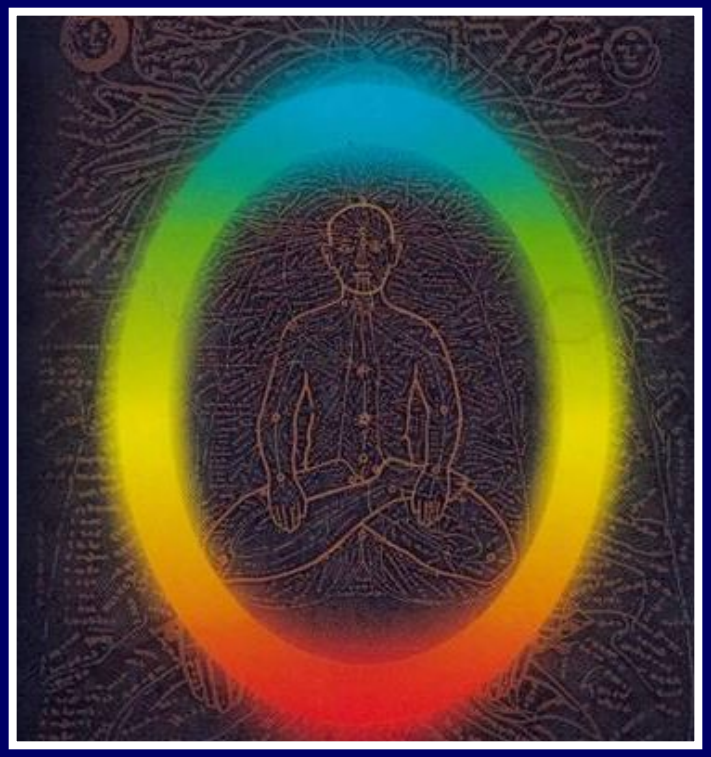
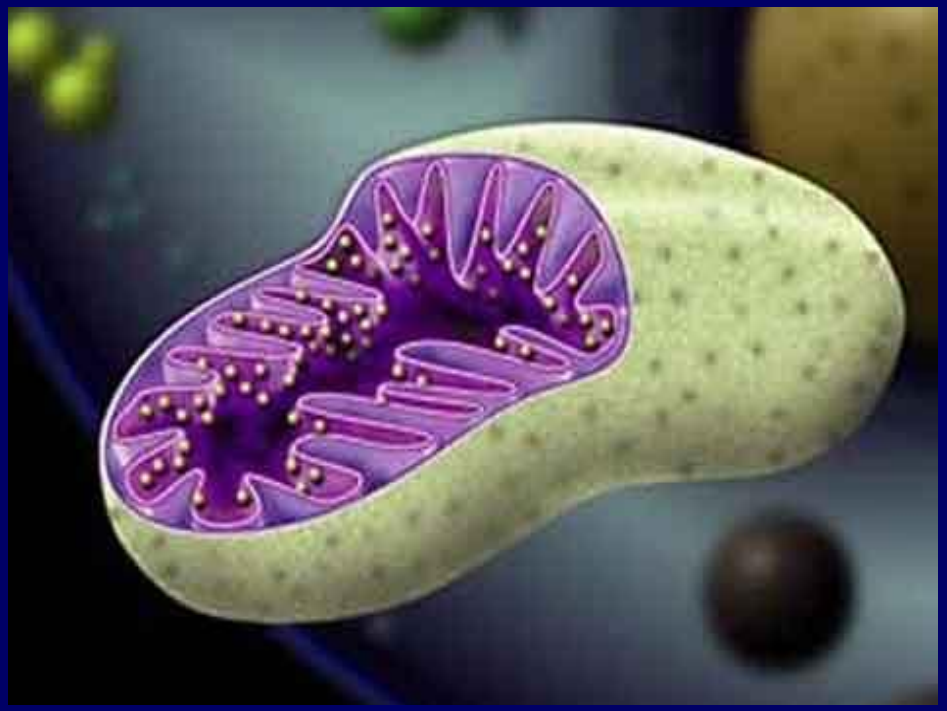
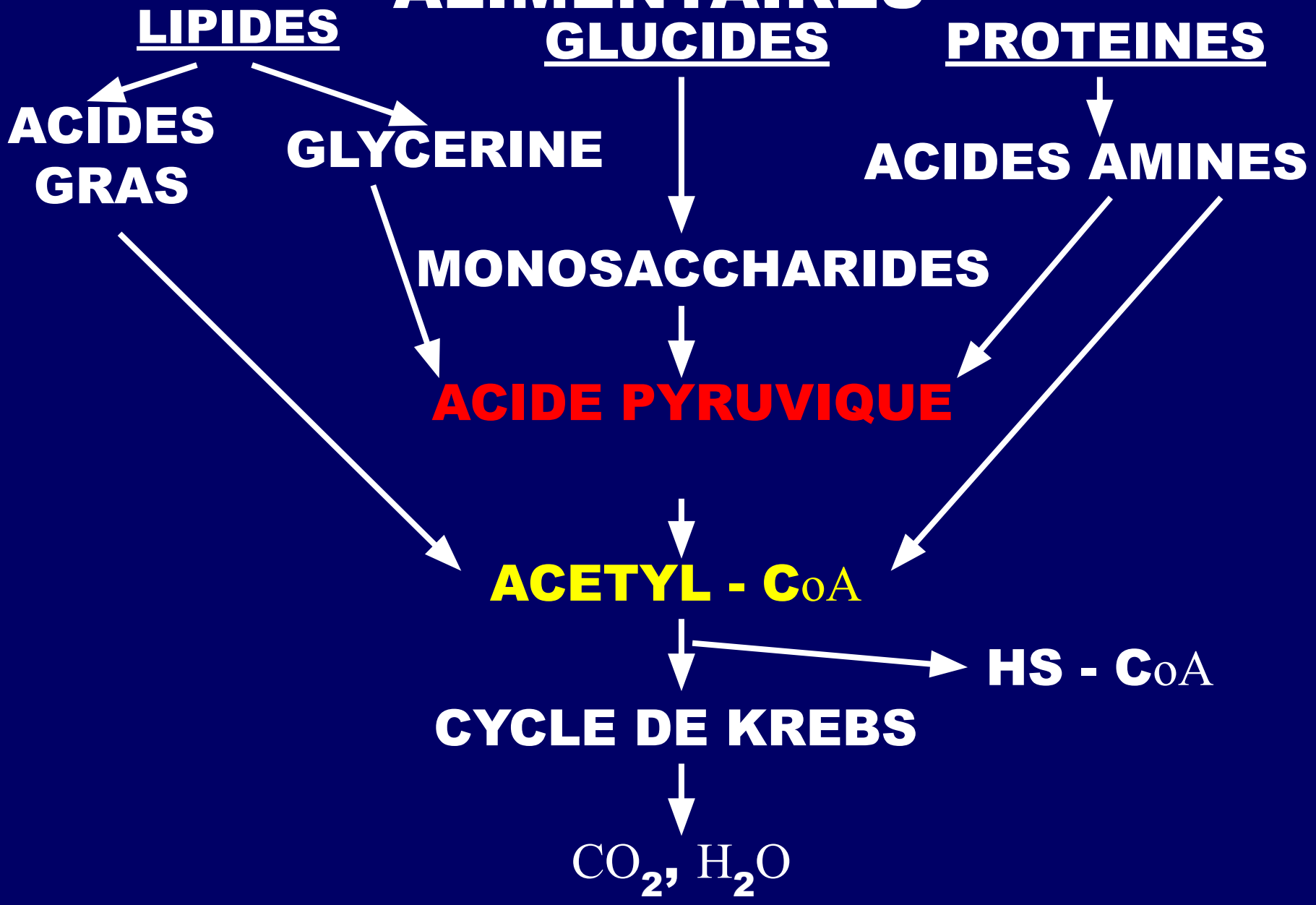
LA NOTION DE CATABOLISME ET D'ANABOLISME. LA BIOENERGETIQUE. LA CHAINE MITOCHONDRIALE DE TRANSFERT D'ELECTRONS.

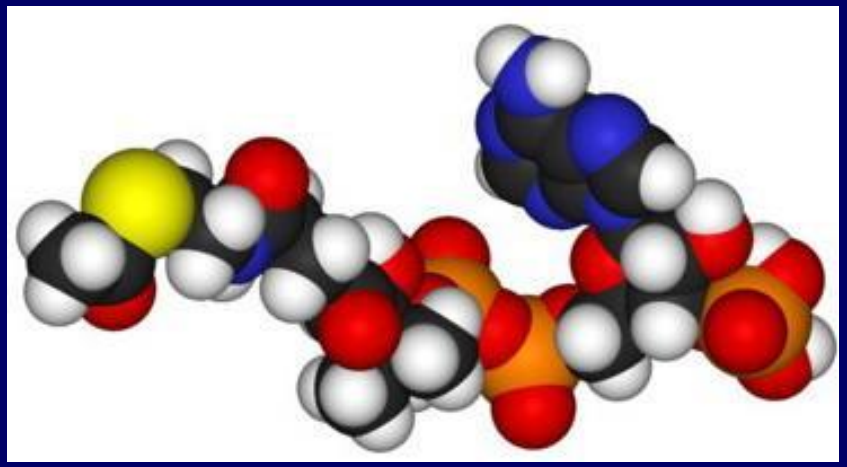




LE CATABOLISME DES SUBSTANCES ALIMENTAIRES



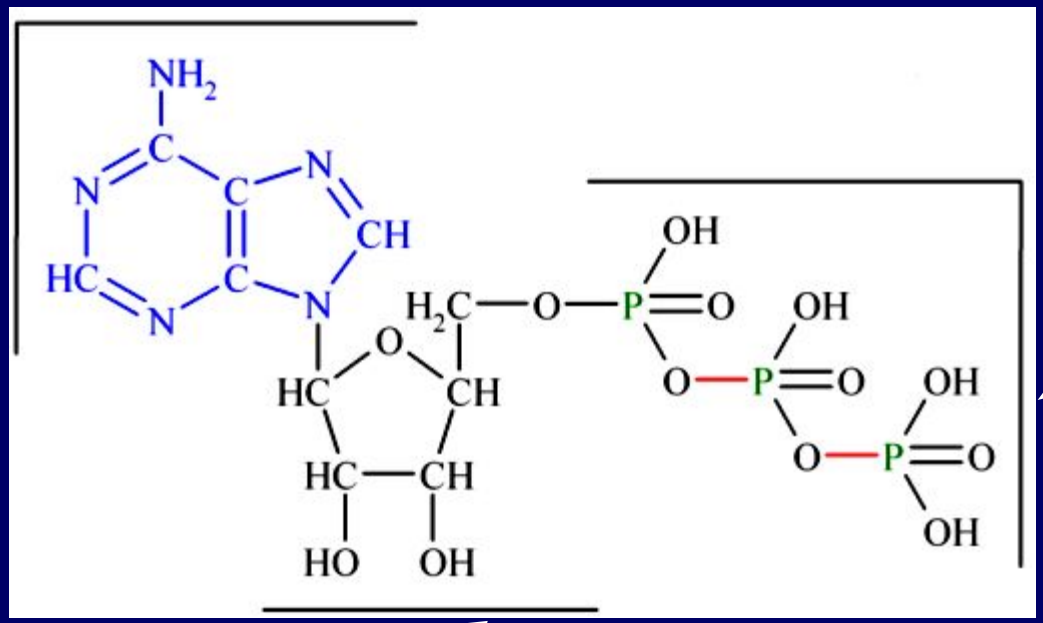
LA MOLECULE D'ACETYL-CoA



LES COMPOSES MACROERGIQUES

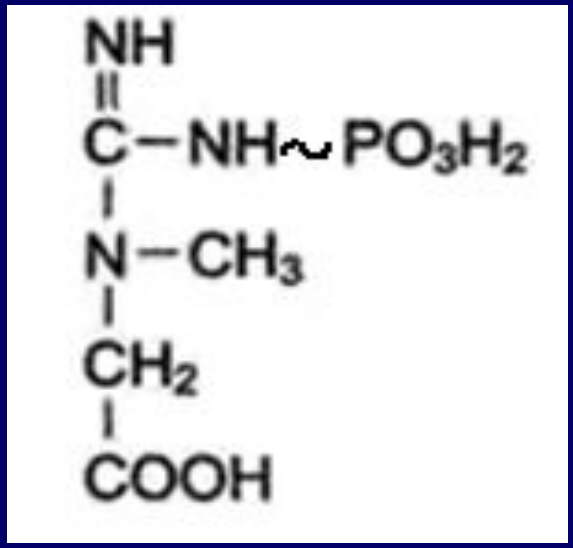
ADENINE

3 RESIDUS DE H_3PO_4

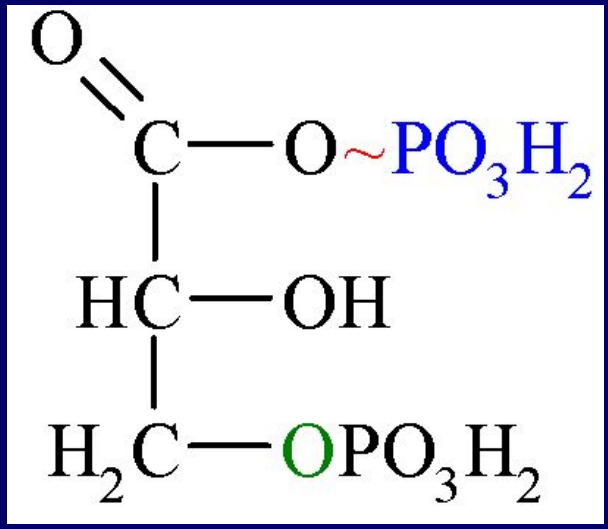


RIBOSE

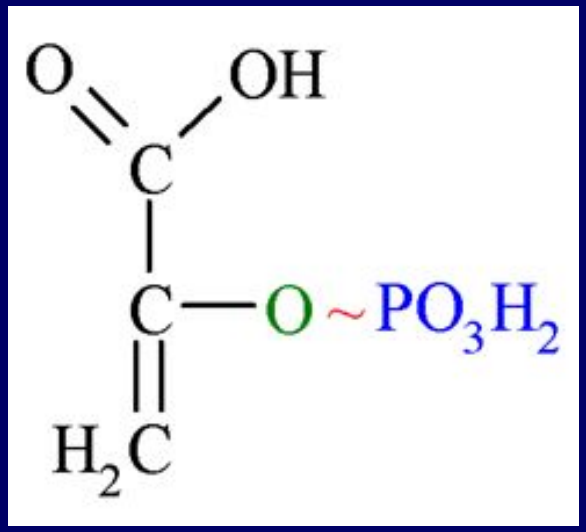
ATP



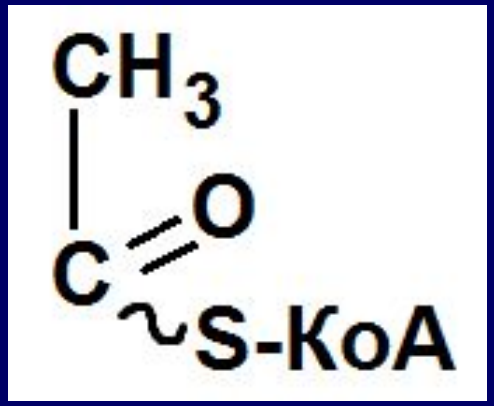
PHOSPHOCREATINE



1,3-BIPHOSPHOGLYCERATE

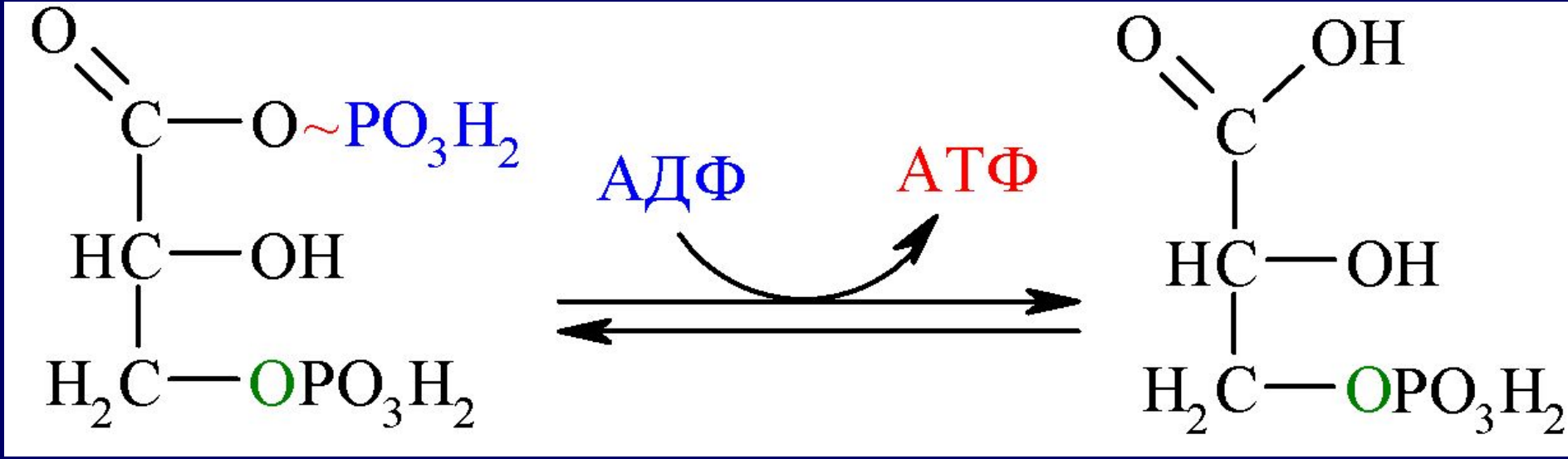


PHOSPHOENOLPYRUVATE



ACETYL-CoA

LA PHOSPHORYLATION AU NIVEAU DU SUBSTRAT



1,3-BIPHOSPHOGLYCERATE

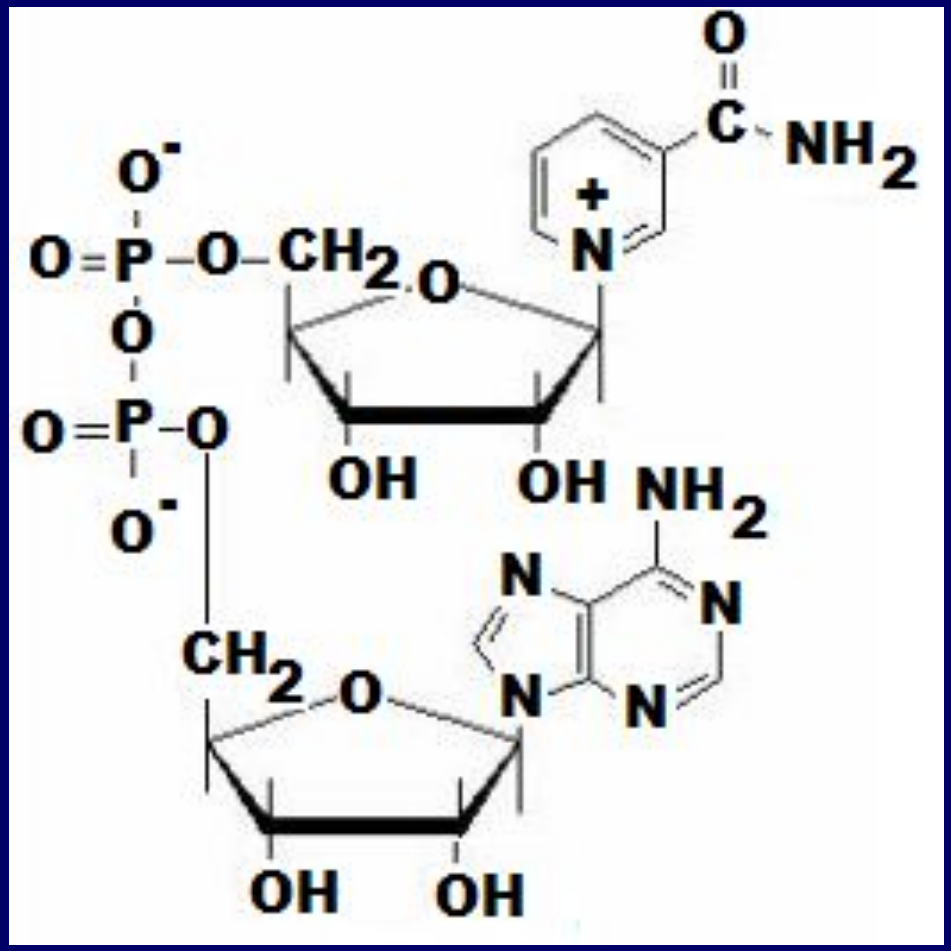
3-PHOSPHOGLYCERATE

ANTOINE LAURENT LAVOISIER

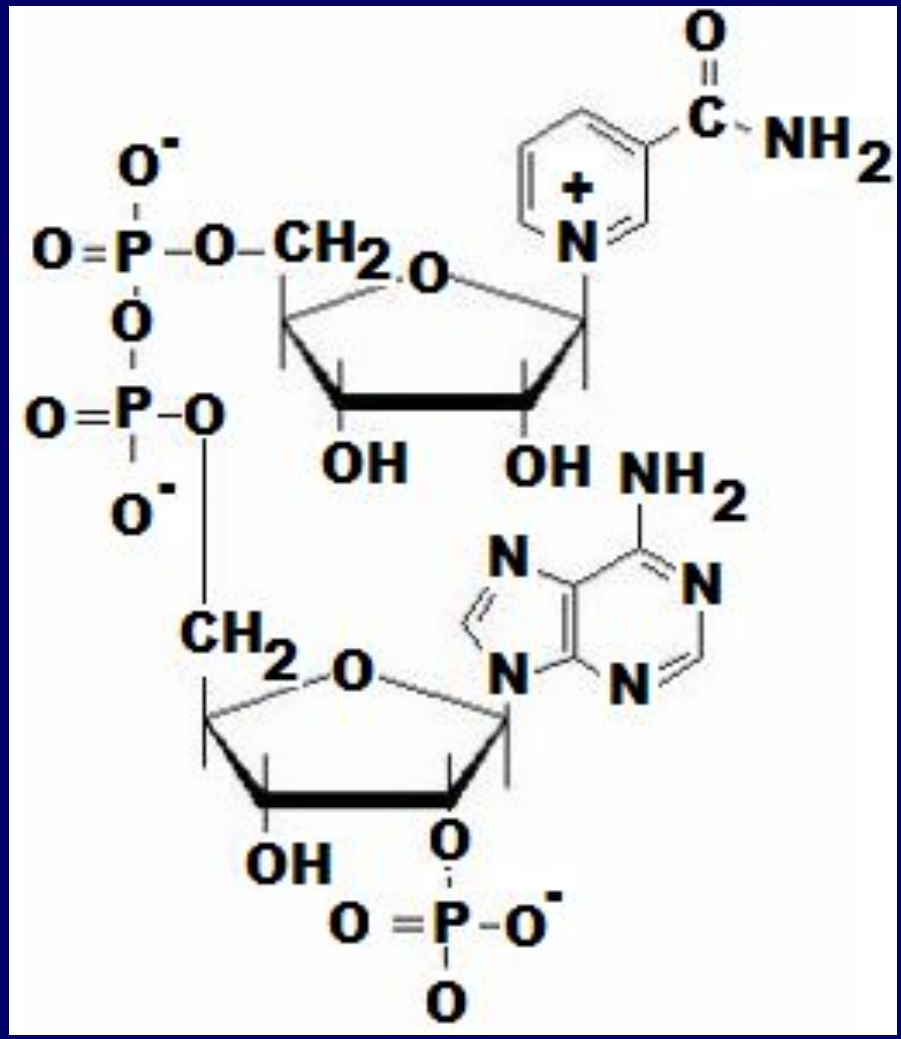
$$C_6H_{12}O_6 + 6H_2O + 12A = 6CO_2 + 12AH_2$$
$$12AH_2 + 6O_2 = 12H_2O + 12A$$

$$C_6H_{12}O_6 + 6O_2 = 6H_2O + 6CO_2$$

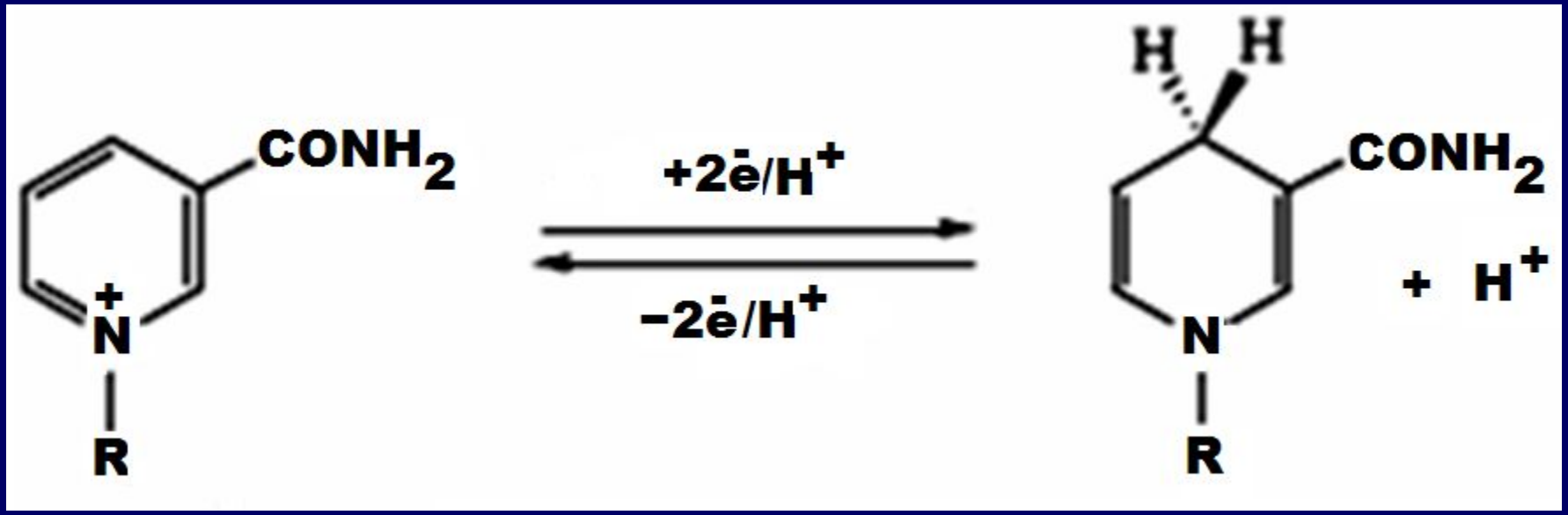
$$ADP + H_3PO_4 + \text{énergie} = ATP + H_2O$$


O
C
NH2
+
N
O-
O=P-O-CH2
O
O
O=P-O
O-
OH
OH
NH2
N
N
CH2
O
N
N
OH
OH

NAD+


O
C
NH2
+
N
O-
O=P-O-CH2
O
O
O=P-O
O-
OH
OH
NH2
N
N
CH2
O
N
N
OH
O
O=P-O-
O

NADP+

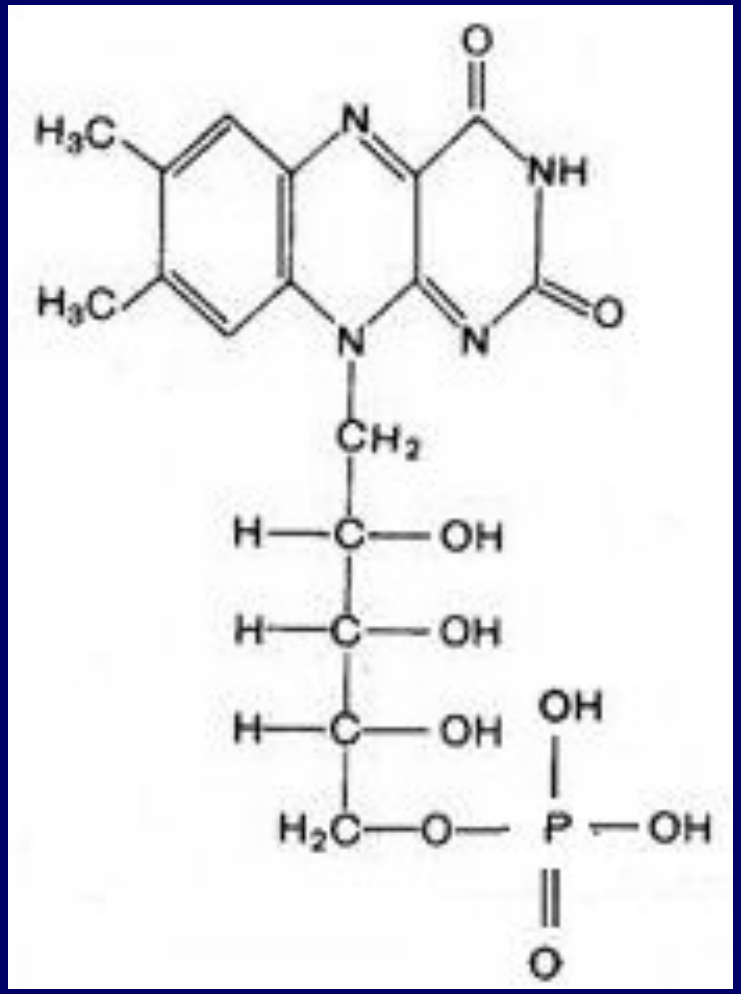


NAD$^+$

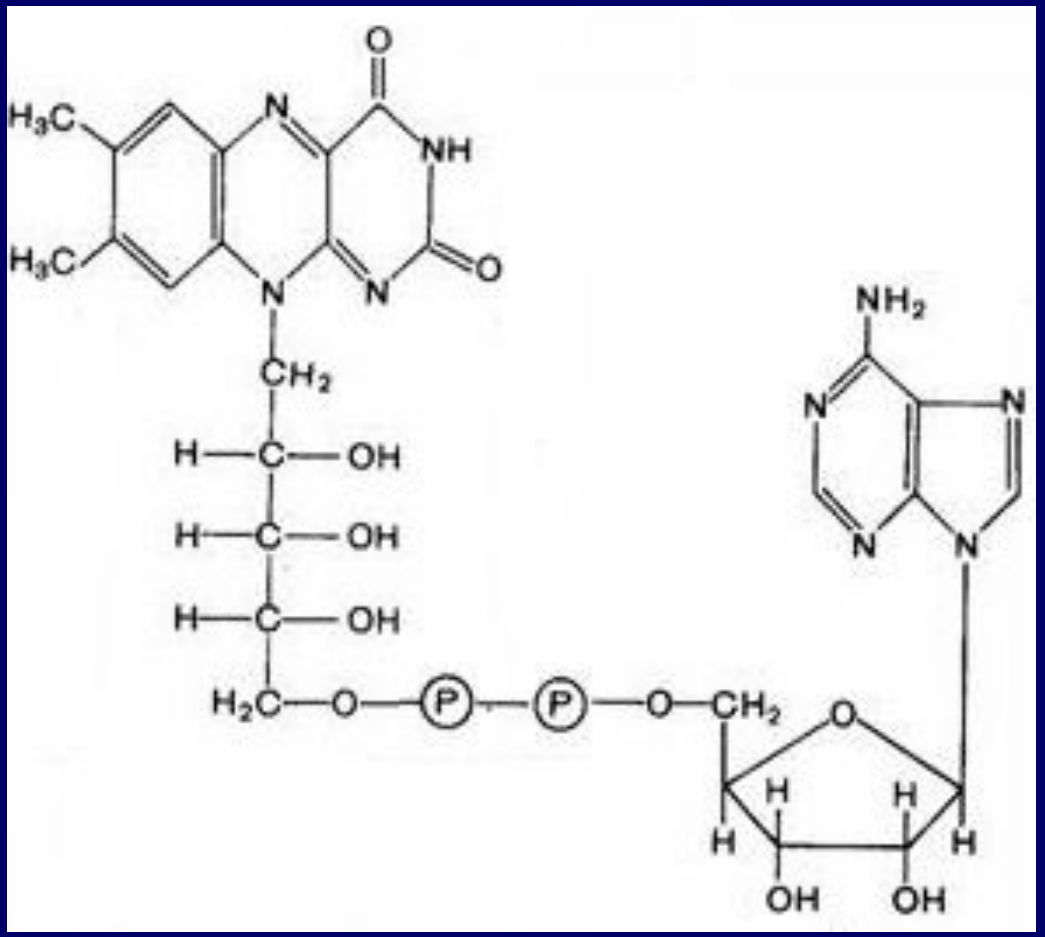
FORME OXYDEE

NADH$^+$

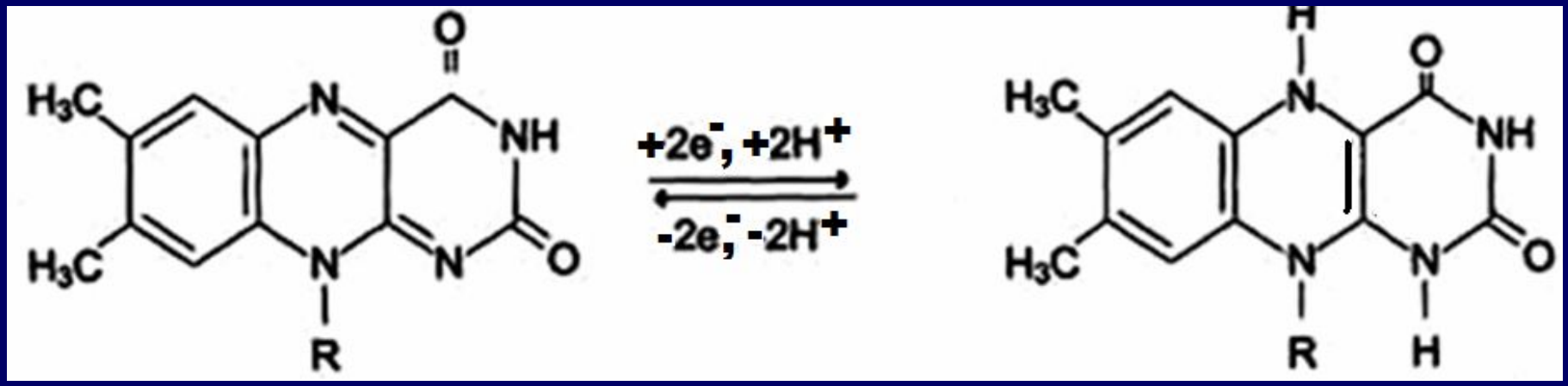
FORME REDUITE


H3C
H3C
N
O
NH
N
N
O
CH2
H—C—OH
H—C—OH
H—C—OH
H2C—O—P—OH
OH
O

FMN


H3C
H3C
N
O
NH
N
N
O
CH2
H—C—OH
H—C—OH
H—C—OH
H2C—O—P—P—O—CH2
NH2
N
N
N
N
O
H
H
H
H
OH
OH

FAD



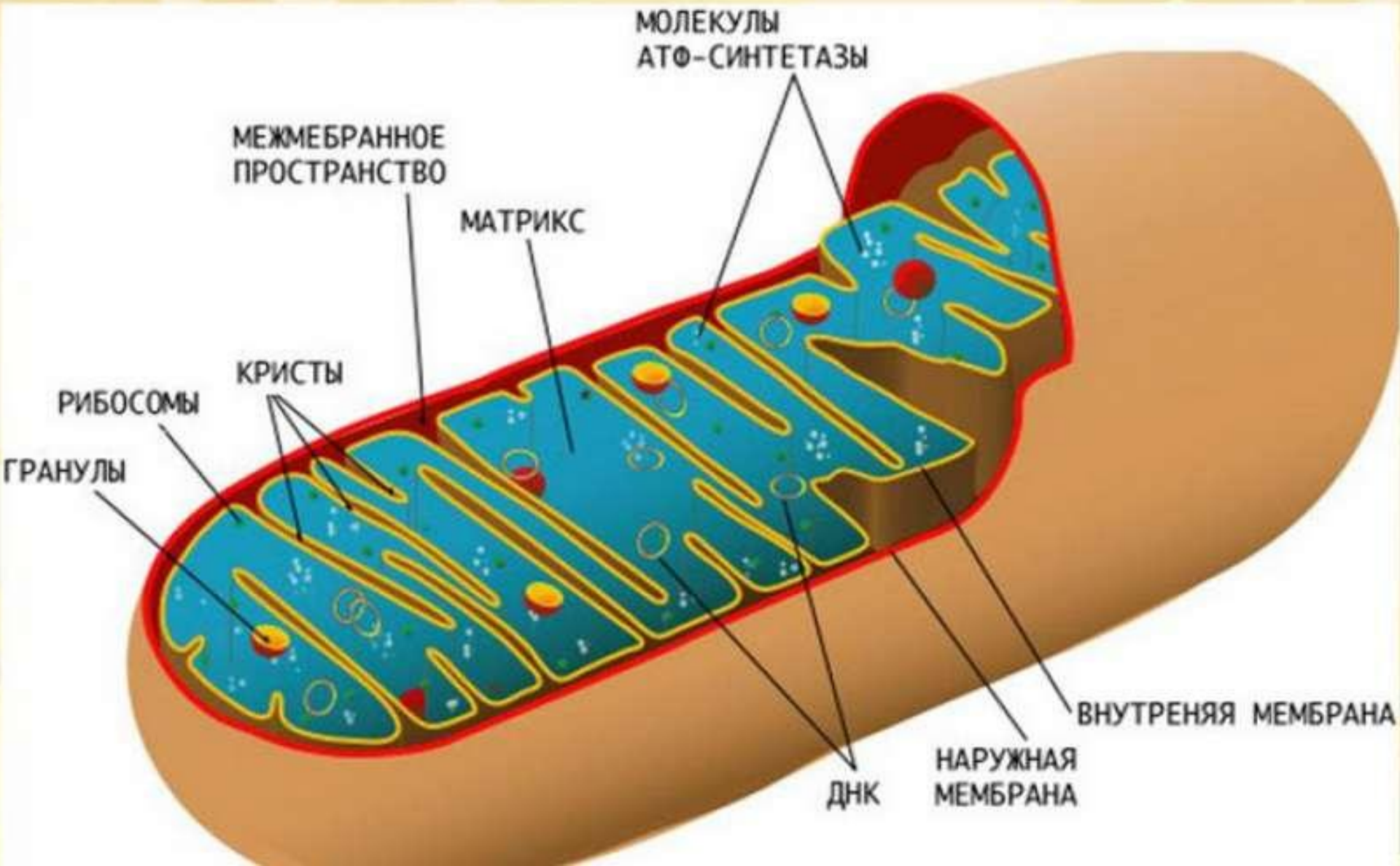
FAD

FORME OXYDEE

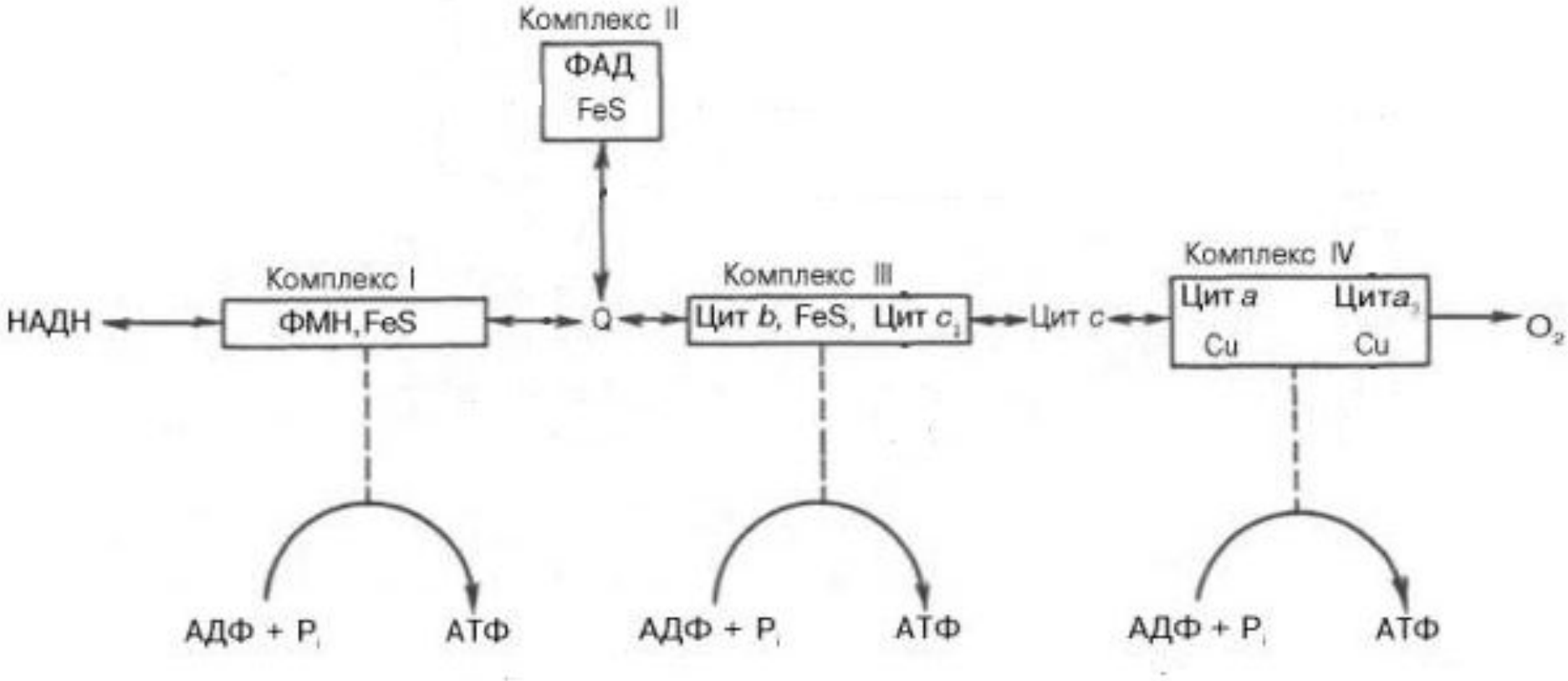
$FADH_2$

FORME REDUITE

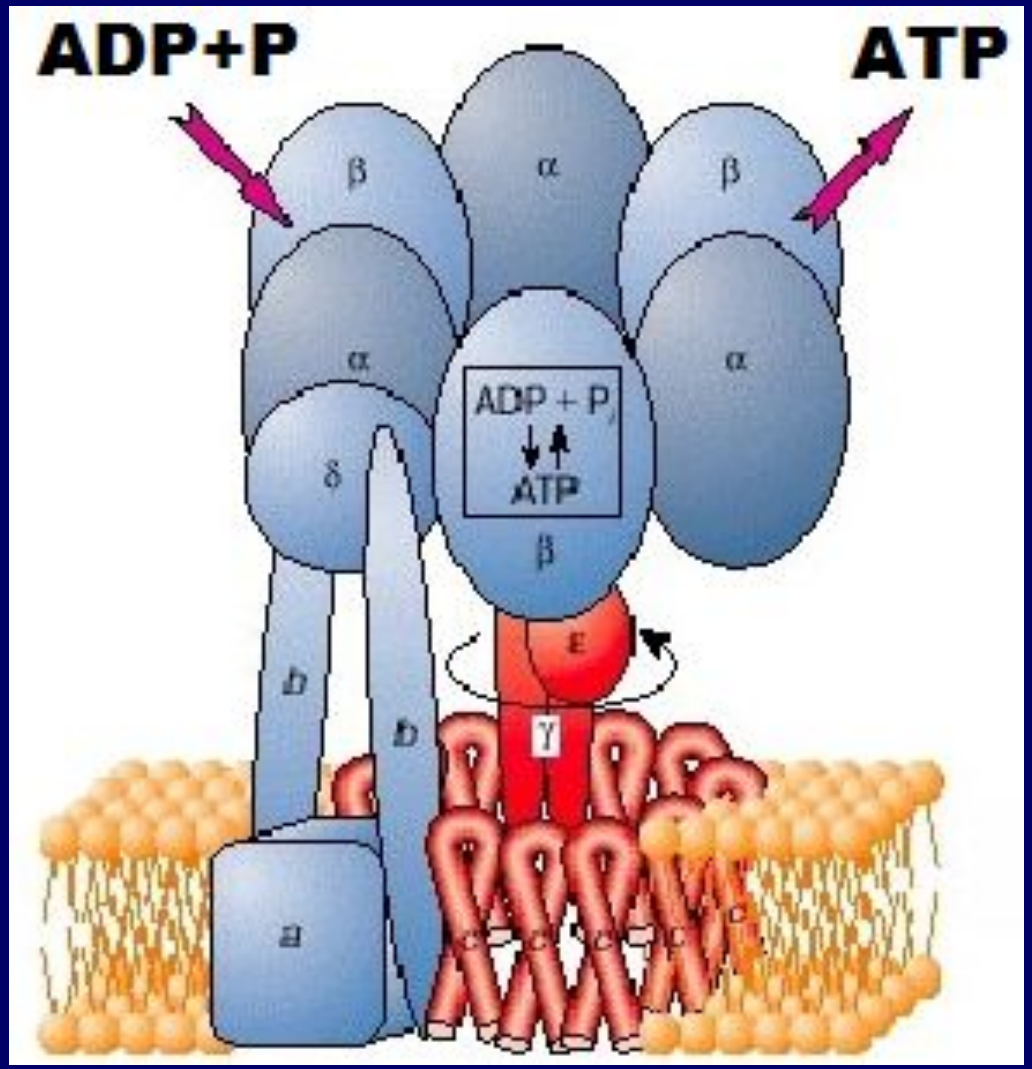
LA STRUCTURE DE LA MITOCHONDRIE

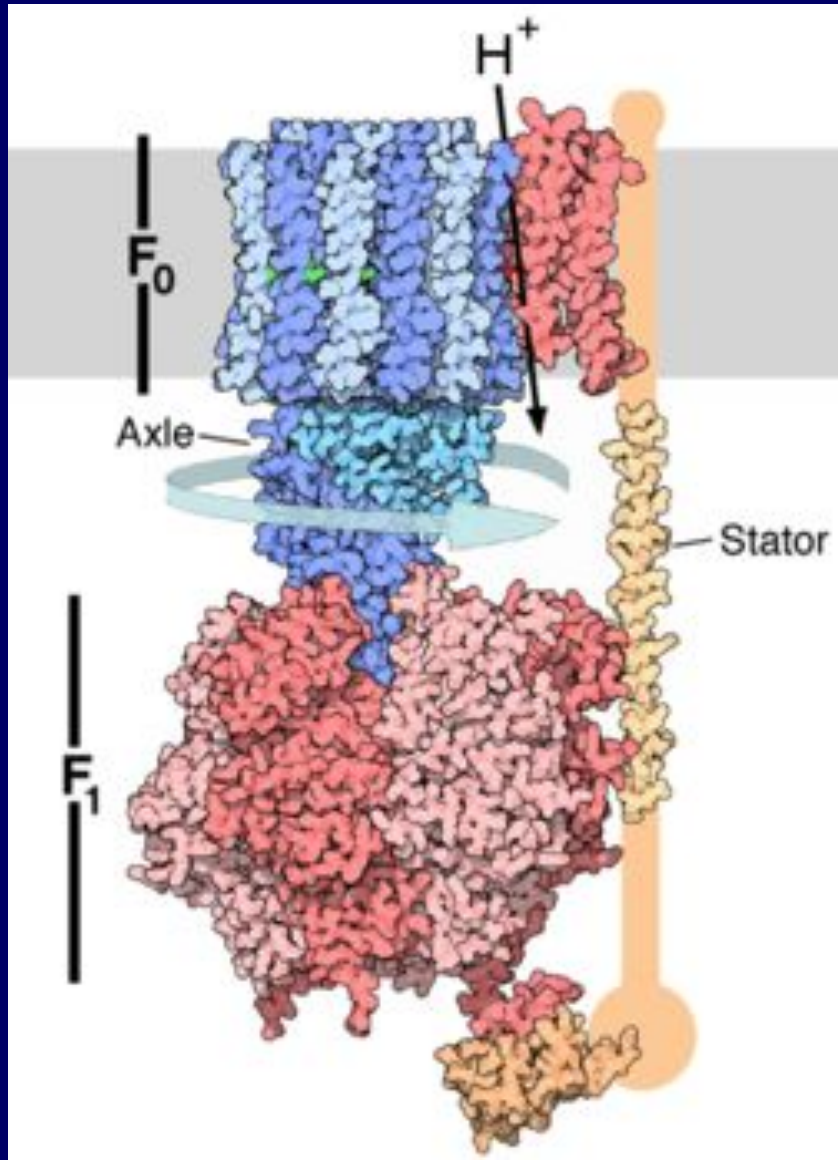


LA CHAINE RESPIRATOIRE DES MITOCHONDRIES

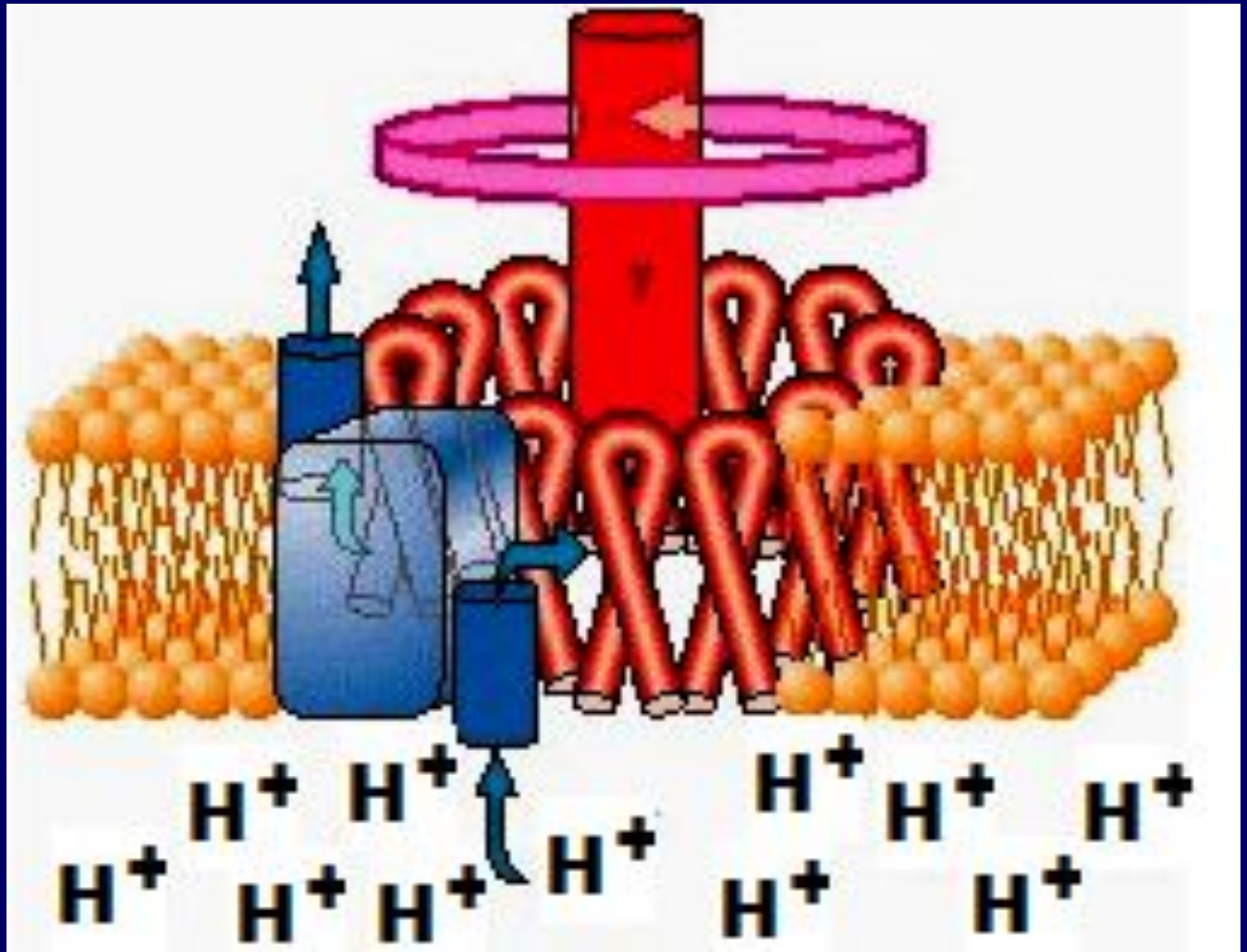


LA STRUCTURE DE L'ATP-SYNTHASE

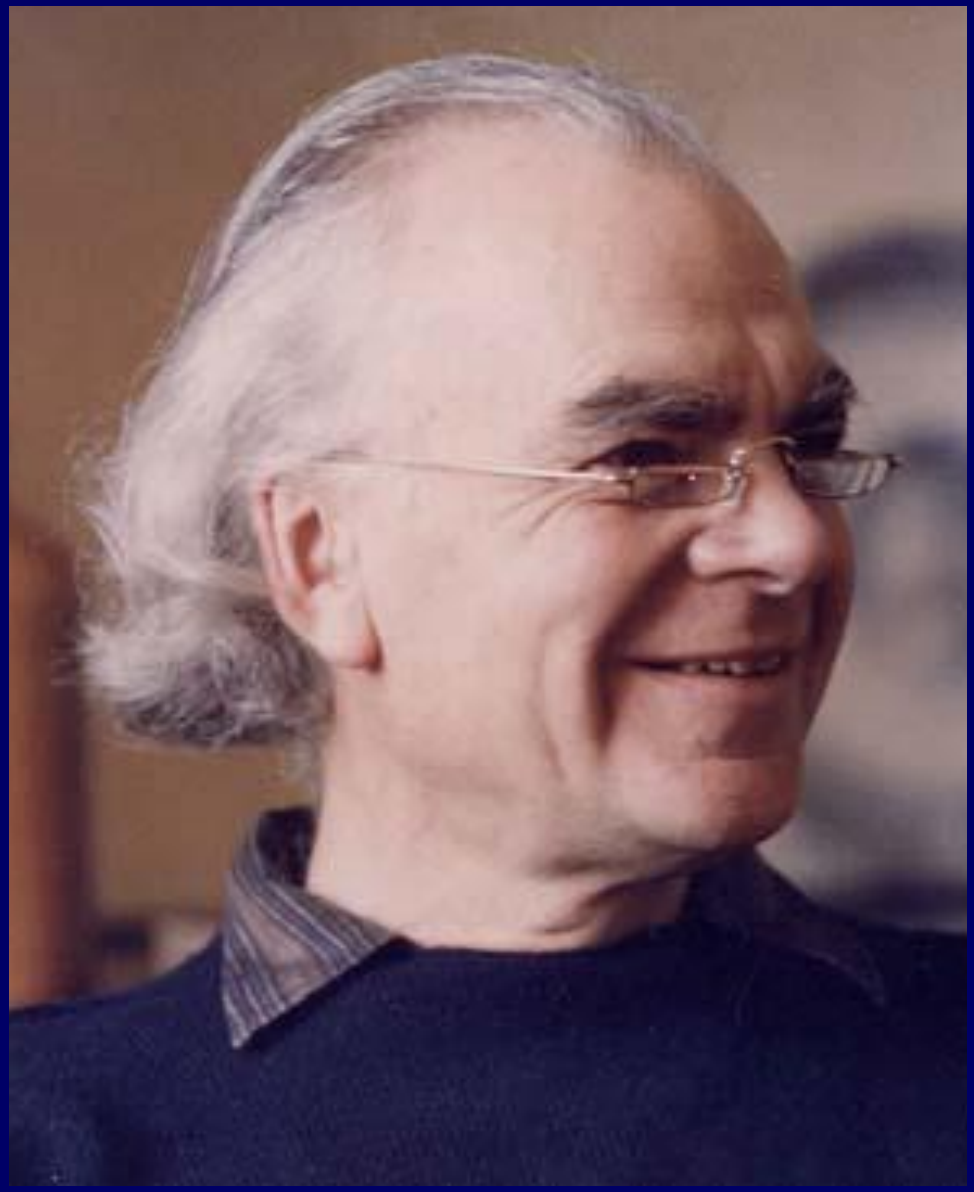




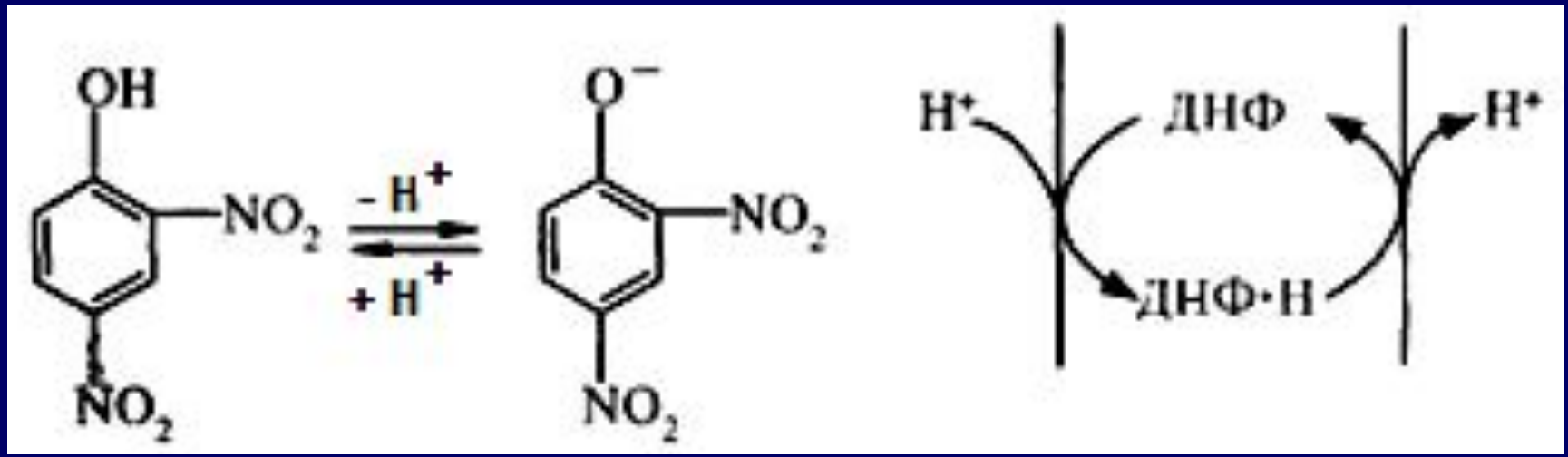
LE TRANSFERT DES PROTONS PAR L'ATP-SYNTHASE



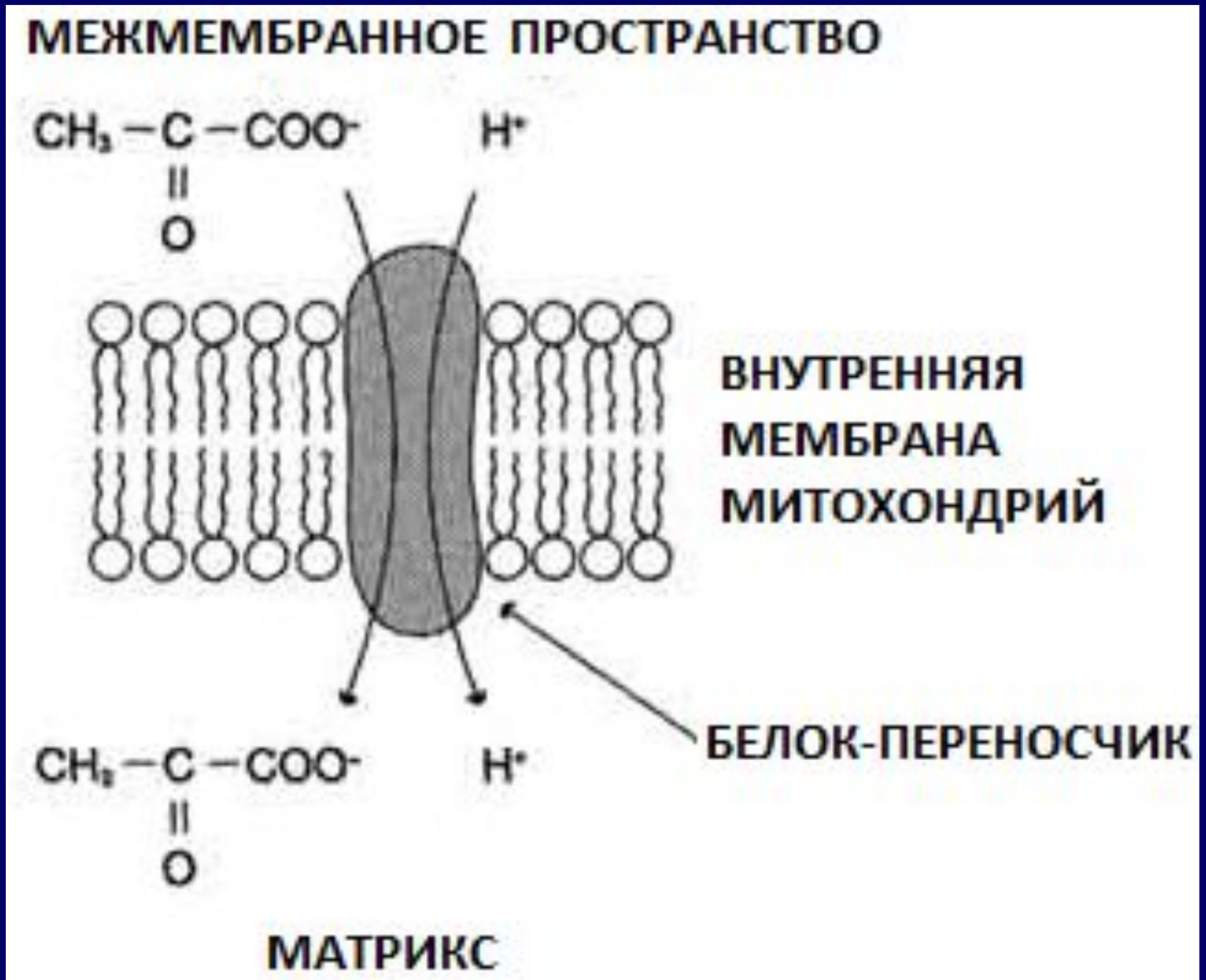
PETER DENNIS MITCHELL



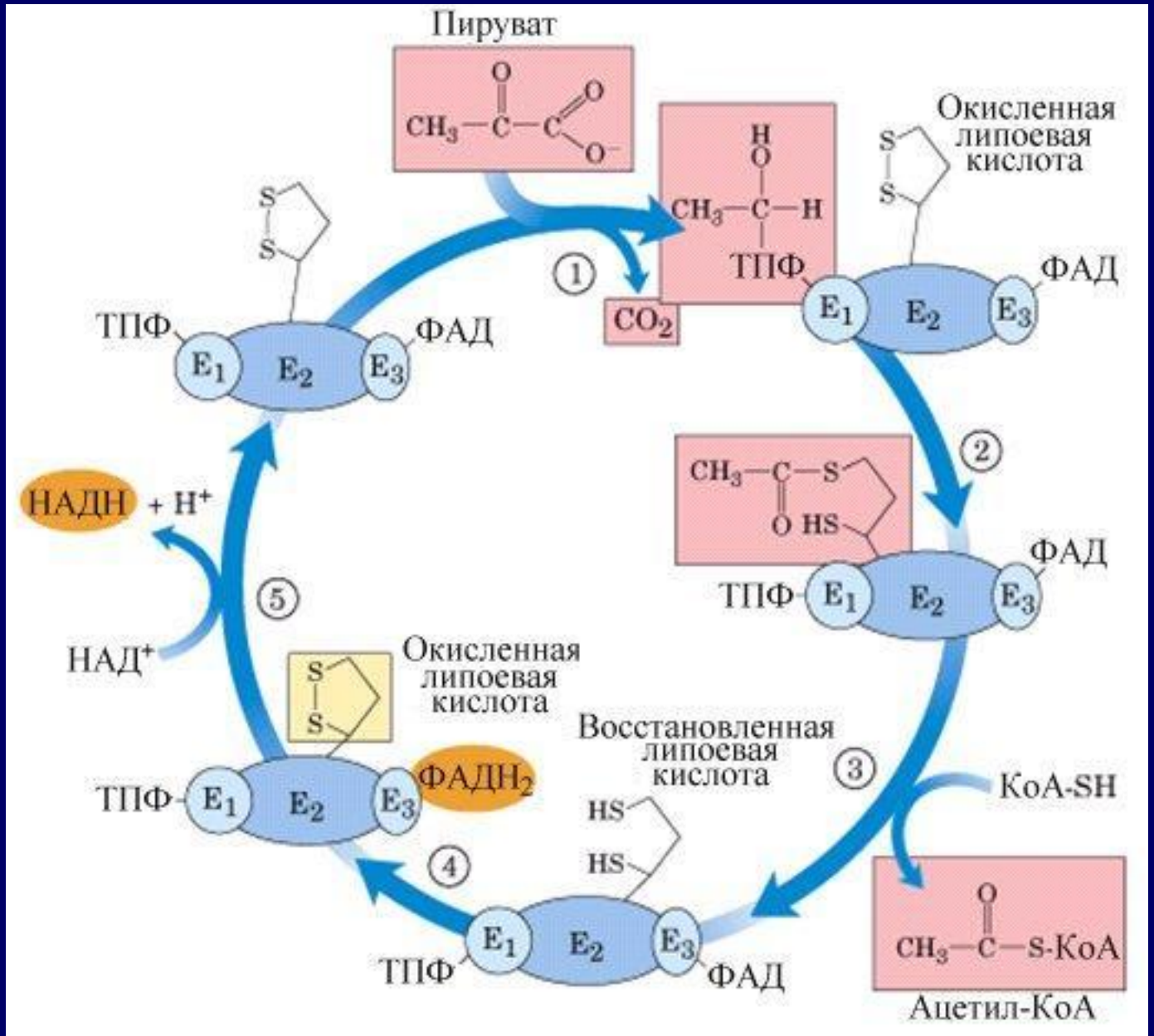
LA SEPARATION DE LA RESPIRATION ET DE LA PHOSPHORYLATION A L'EXEMPLE DU DINITROPHENOL

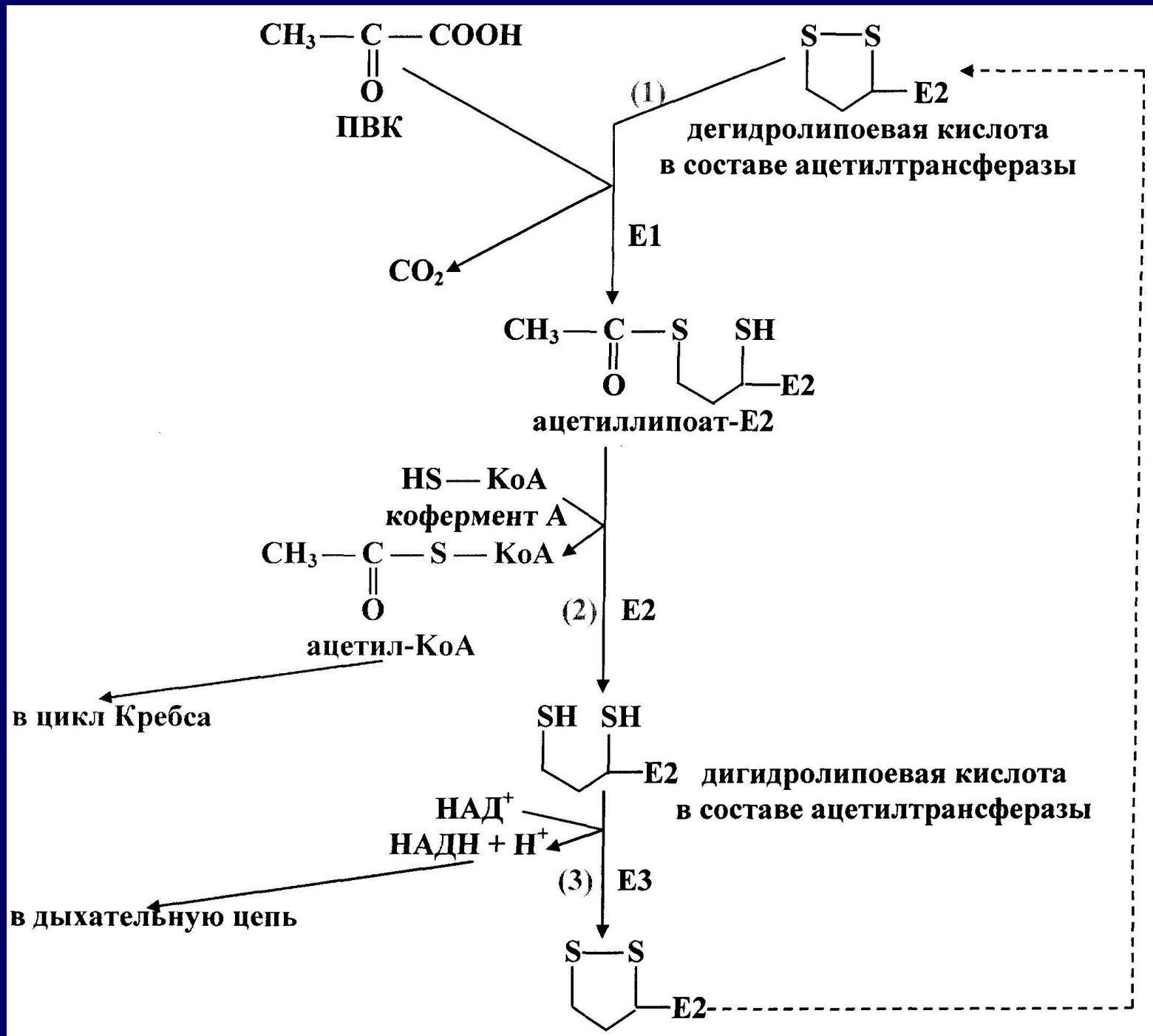


LE TRANSPORT D'ACIDE PYRUVIQUE DANS LA MITOCHONDRIE



LA DECARBOXYLATION OXYDATIVE DE L'ACIDE PYRUVIQUE

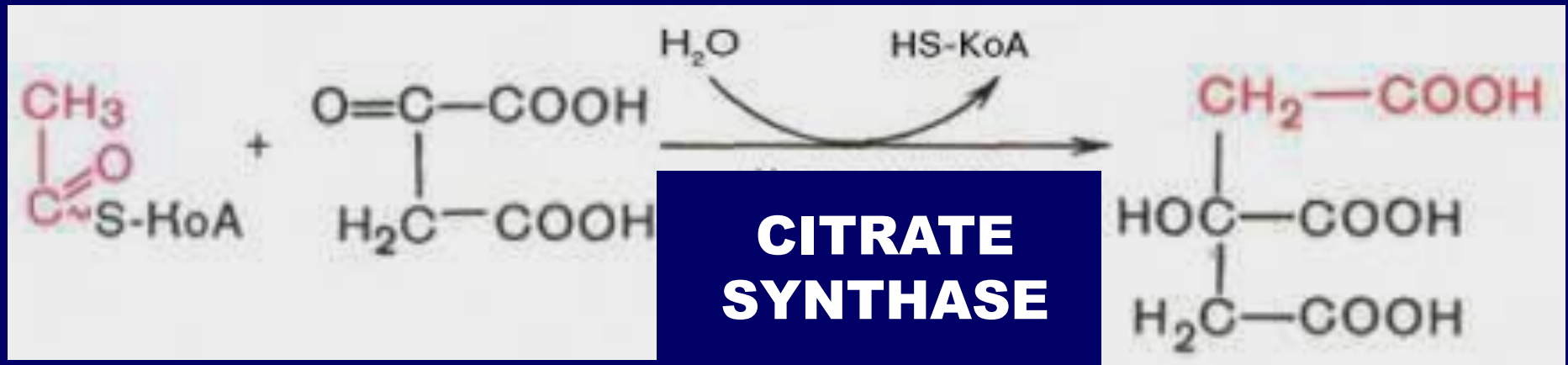



CH3 — C — COOH
O
ПВК
(1)
S — S
E2
дегидролипоевая кислота
в составе ацетилтрансферазы
E1
CO2
CH3 — C — S SH
O
E2
ацетиллипоат-E2
HS — KoA
кофермент А
CH3 — C — S — KoA
O
ацетил-KoA
(2) E2
в цикл Кребса
SH SH
E2 дигидролипоевая кислота
в составе ацетилтрансферазы
НАД+
НАДН + Н+
(3) E3
в дыхательную цепь
S — S
E2

Hans Krebs

En 1953 H. Krebs a réçu le prix Nobel pour la decouverte du cycle d'acides tricarboxyliques

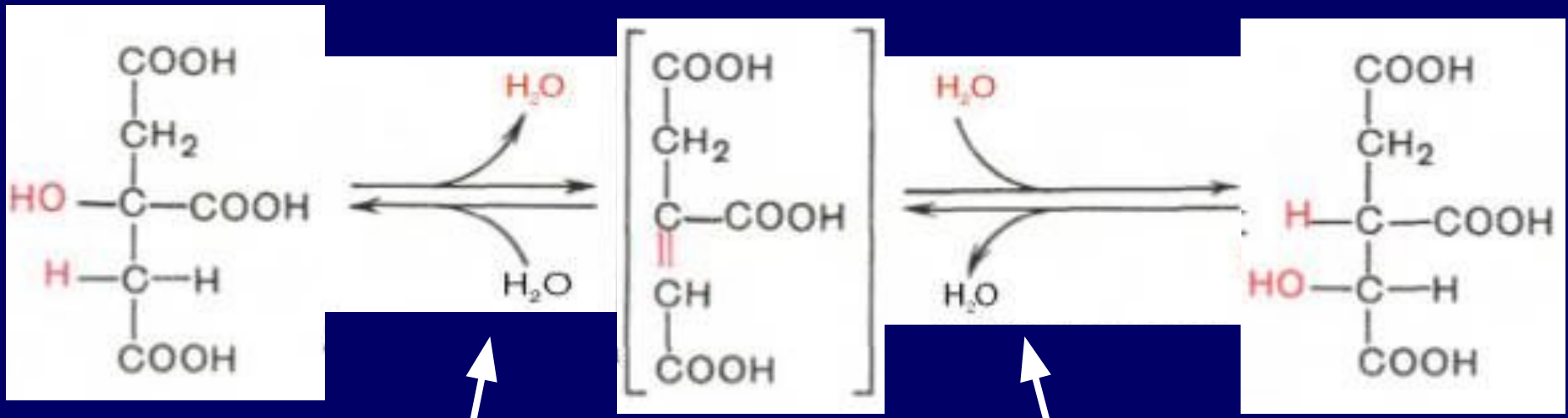
LES REACTIONS DU CYCLE DE KREBS



ACETYL-CoA

OXALOACETATE

CITRATE



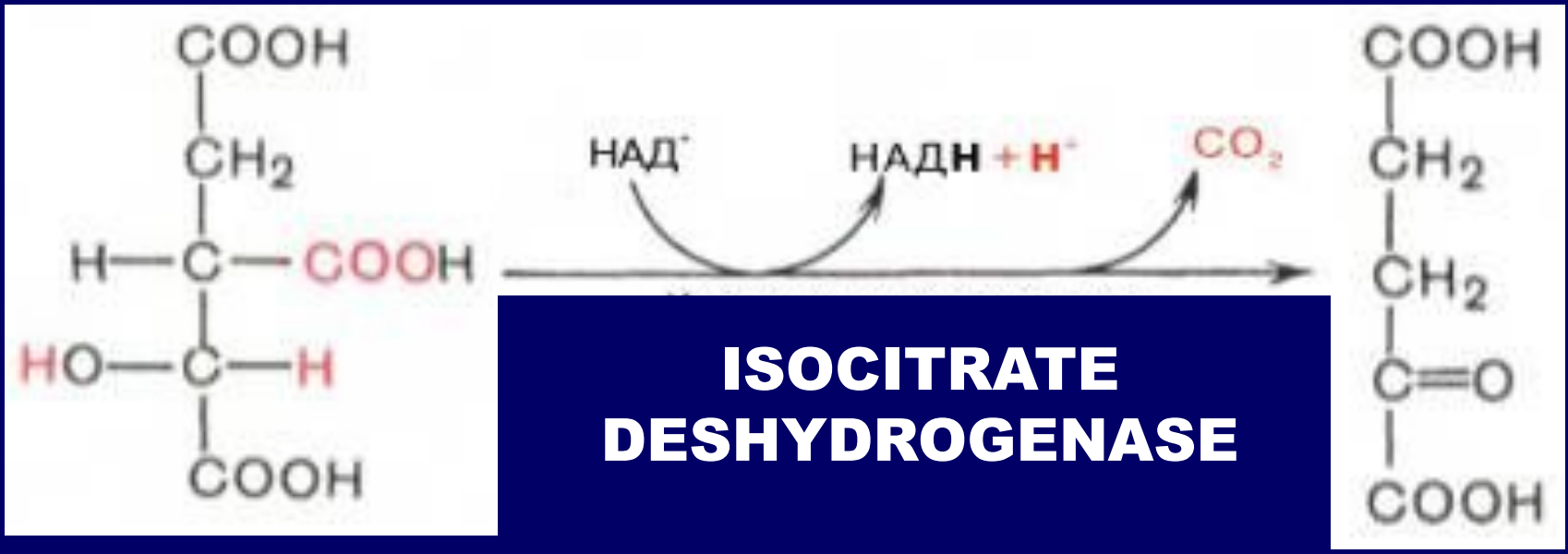
CITRATE

CIS-ACONITATE

ISOCITRATE

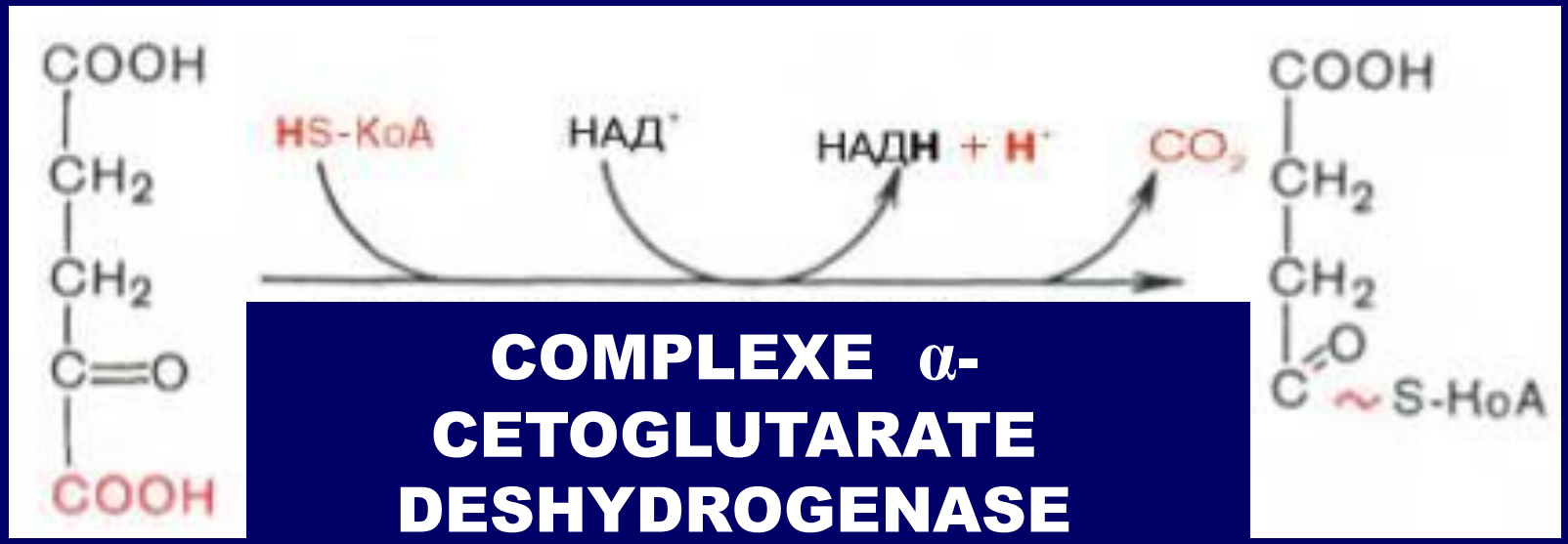
ACONITATE HYDRATASE

ACONITATE HYDRATASE



ISOCITRATE

α-CETOGLUTARATE

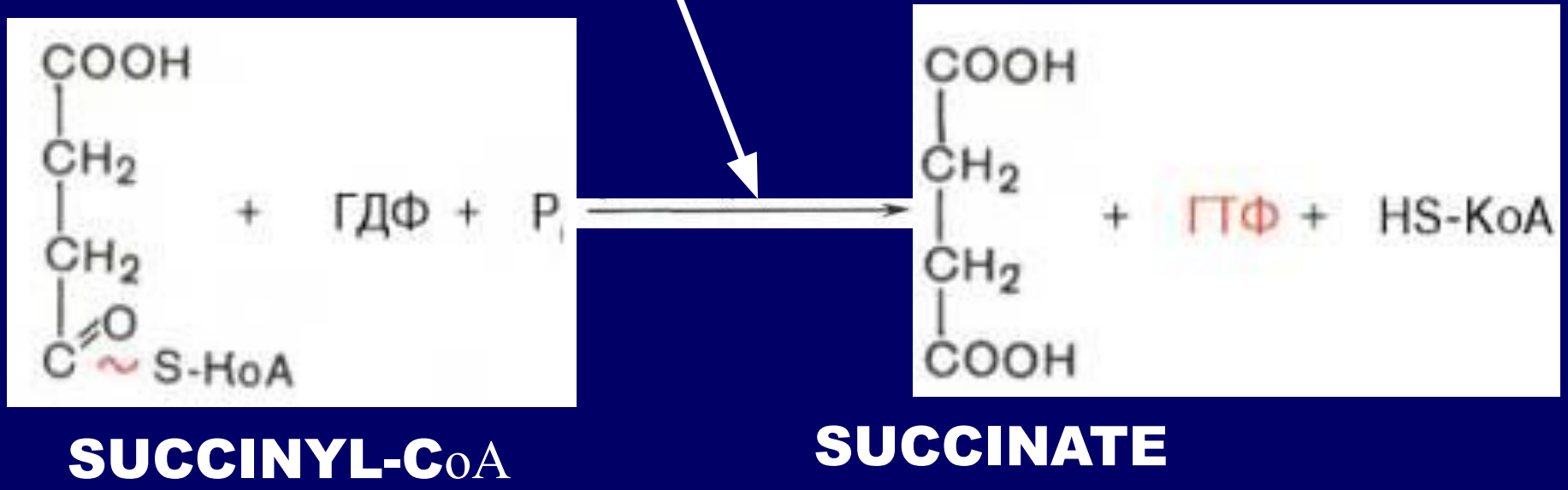


COMPLEXE α-CETOGLUTARATE DESHYDROGENASE

α- CETOGLUTARATE

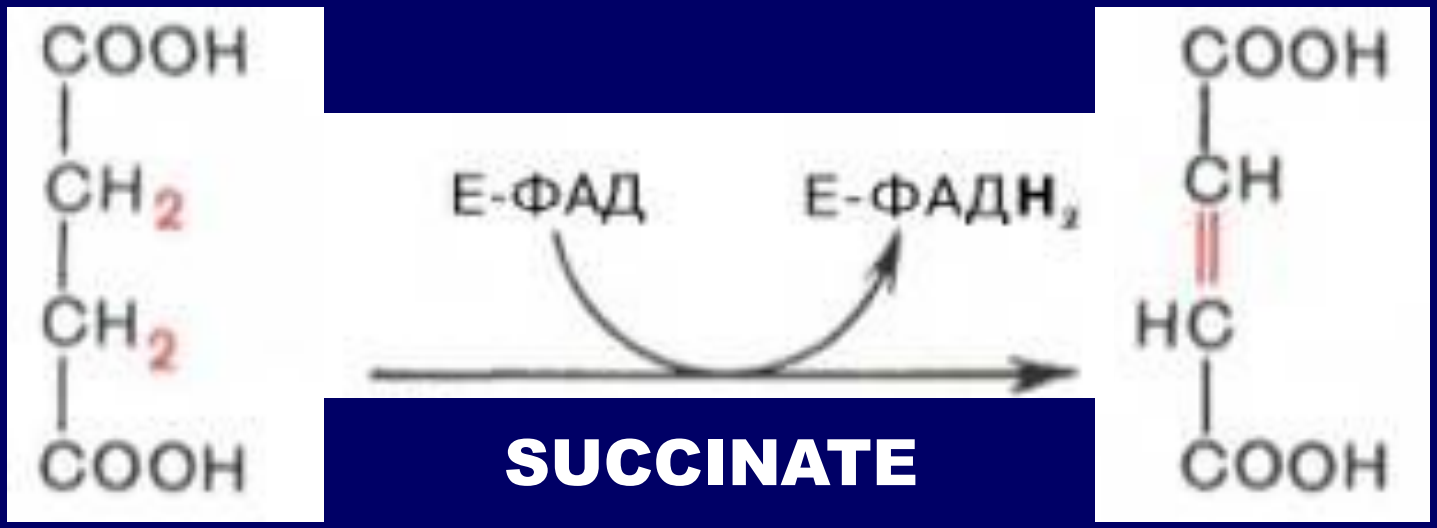
SUCCINYL-CoA

SUCCINYL-CoA SYNTHETASE



SUCCINYL-CoA **SUCCINATE**

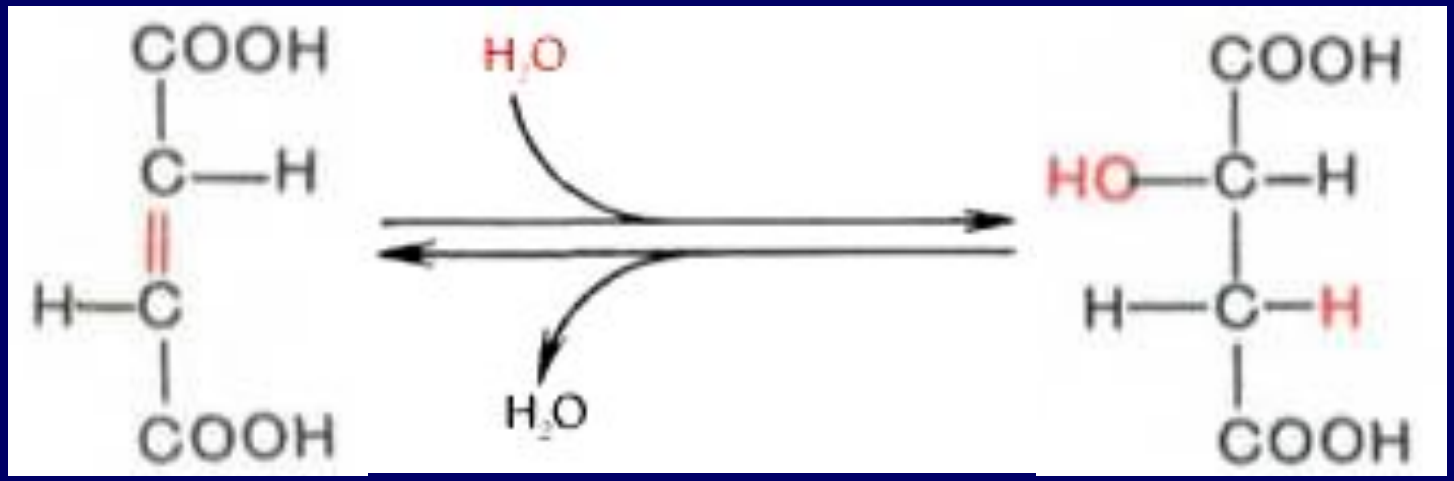
GTP + ADP → ATP + GDP



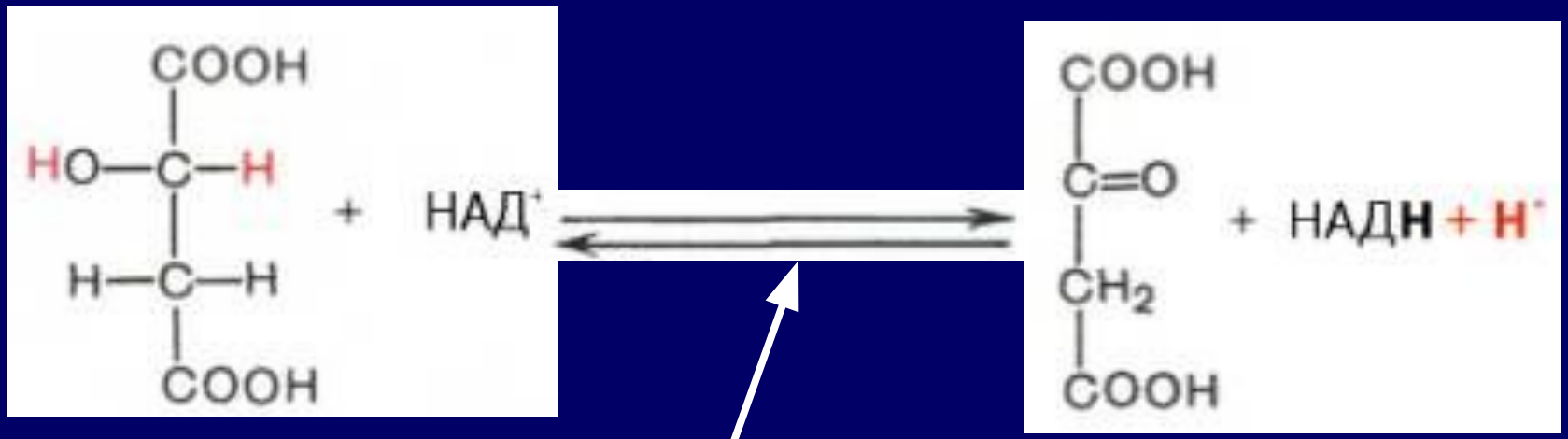
SUCCINATE

SUCCINATE DESHYDROGENASE

FUMARATE



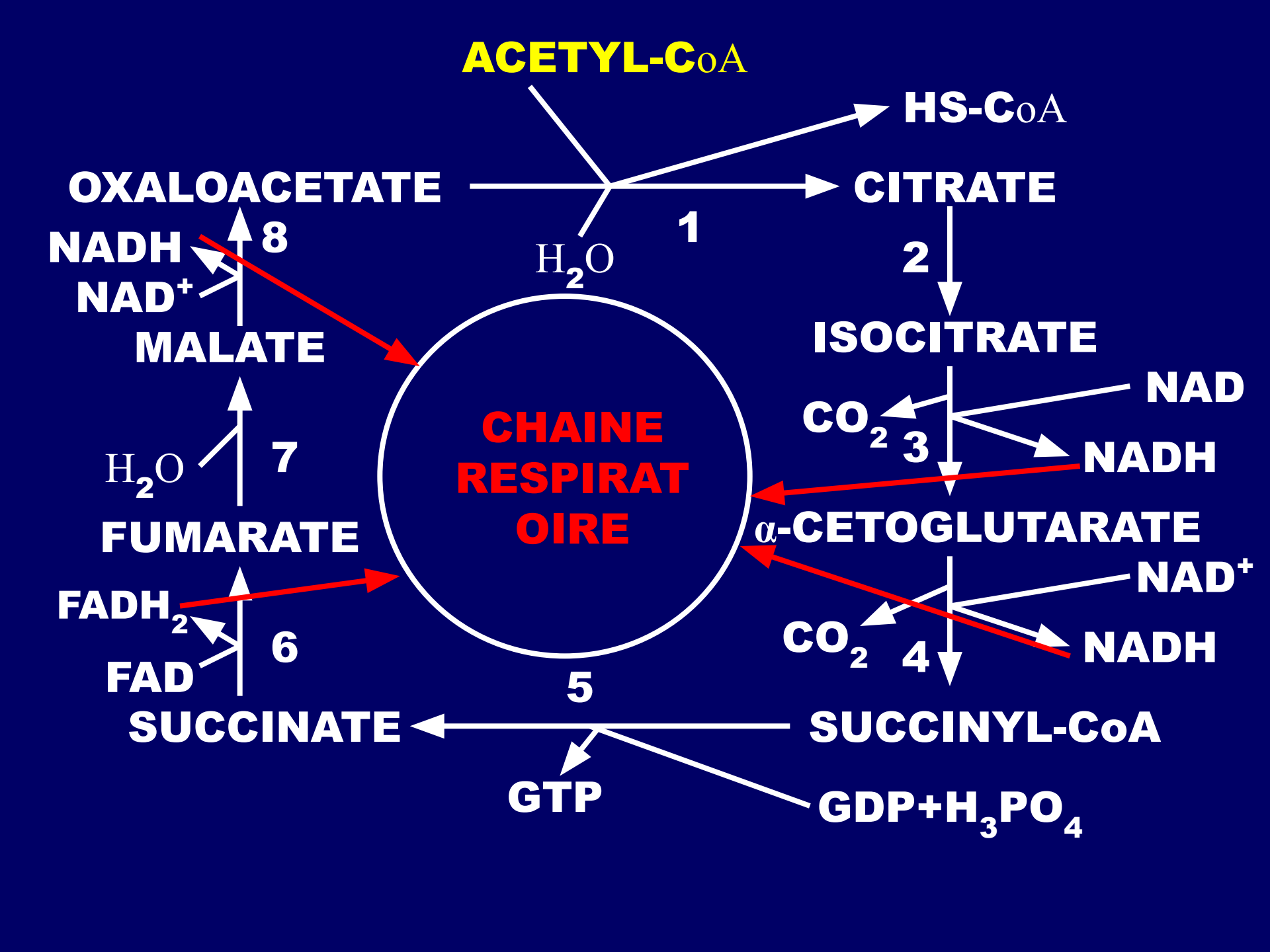
FUMARATE **FUMARASE** **L-MALATE**



L-MALATE

OXALOACETATE

MALATE DESHYDROGENASE


ACETYL-CoA
HS-CoA
OXALOACETATE
CITRATE
1
H_2O
2
NADH
8
NAD^+
MALATE
ISOCITRATE
NAD
CO_2
3
NADH
CHAINE
RESPIRAT
OIRE
H_2O
7
FUMARATE
α-CETOGLUTARATE
$FADH_2$
NAD^+
CO_2
6
4
NADH
FAD
5
SUCCINATE
SUCCINYL-CoA
GTP
$GDP+H_3PO_4$

LES FONCTIONS DU CYCLE DE KREBS

1. Интегративная функция — цикл является связующим звеном между реакциями анаболизма и катаболизма.

2. Катаболическая функция — превращение различных веществ в субстраты цикла:

Жирные кислоты, пируват,Лей,Фен — Ацетил-КоА.

Арг, Гис, Глу — α-кетоглутарат.

Фен, тир — фумарат.

3. Анаболическая функция — использование субстратов цикла на синтез органических веществ:

Оксалацетат — глюкоза, Асп, Асн.

Сукцинил-КоА — синтез гема.

CO_2 — реакции карбоксилирования.

LES REACTIONS ANAPLEROTIQUES:

1 Acides aminés → a.p.

a.p. → oxaloacétate (+ CO_2)

2 Acides aminés → Glutamate

↓

α- cétoglutarate

3 Valine

Isoleucine

→ Propionyl-CoA

↓

Succinyl-CoA

4 Acides aminés → Fumarate

5 Acides aminés → Oxaloacétate

LA REGULATION DE LA VOIE GENERALE DU CATABOLISME