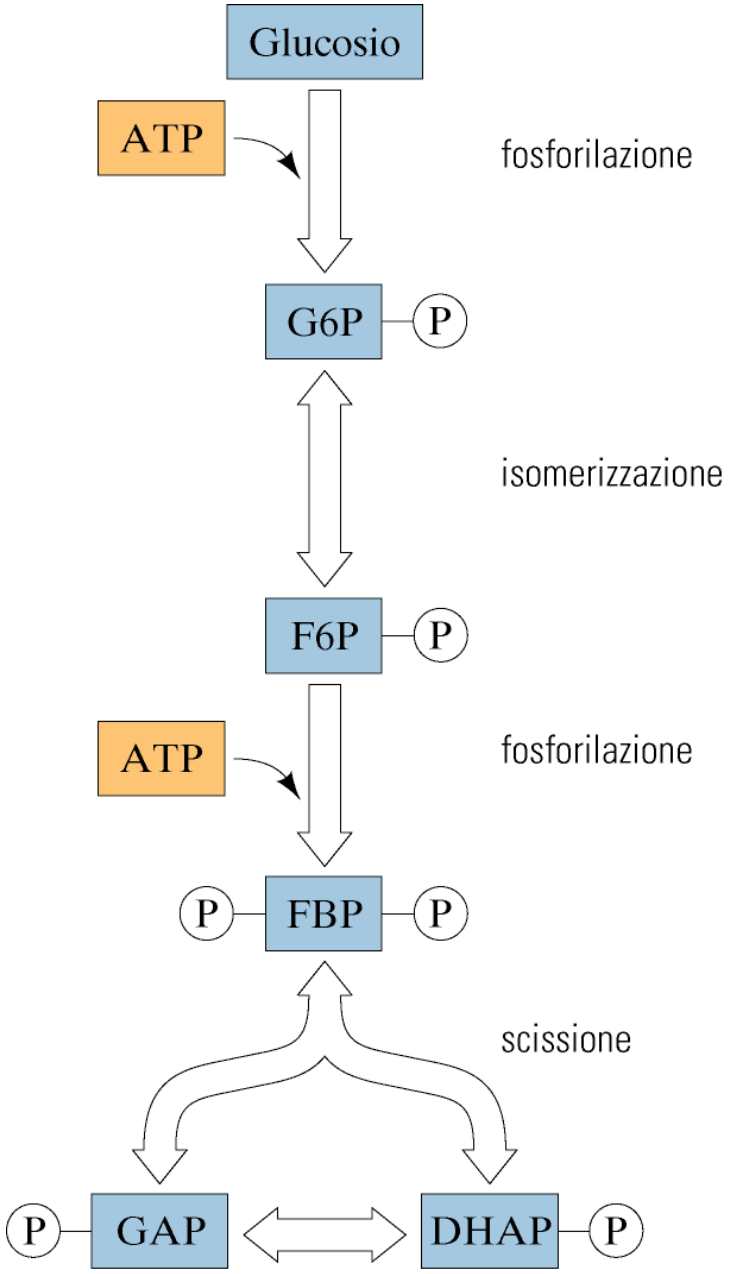
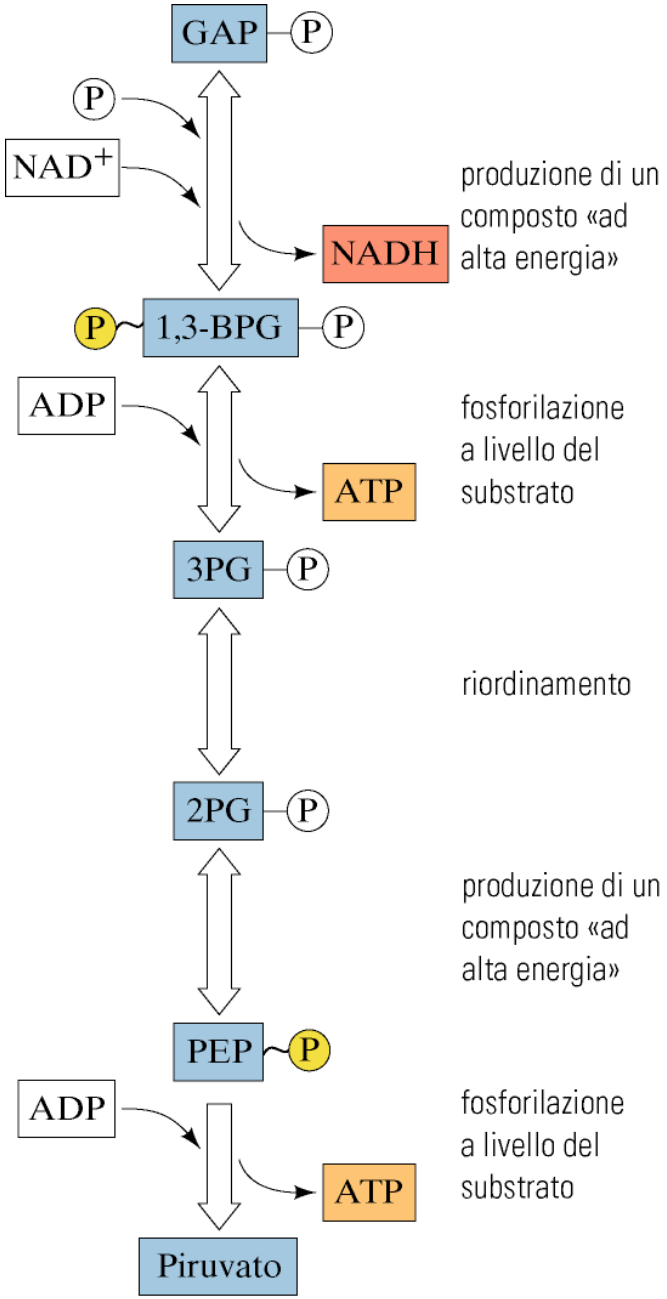
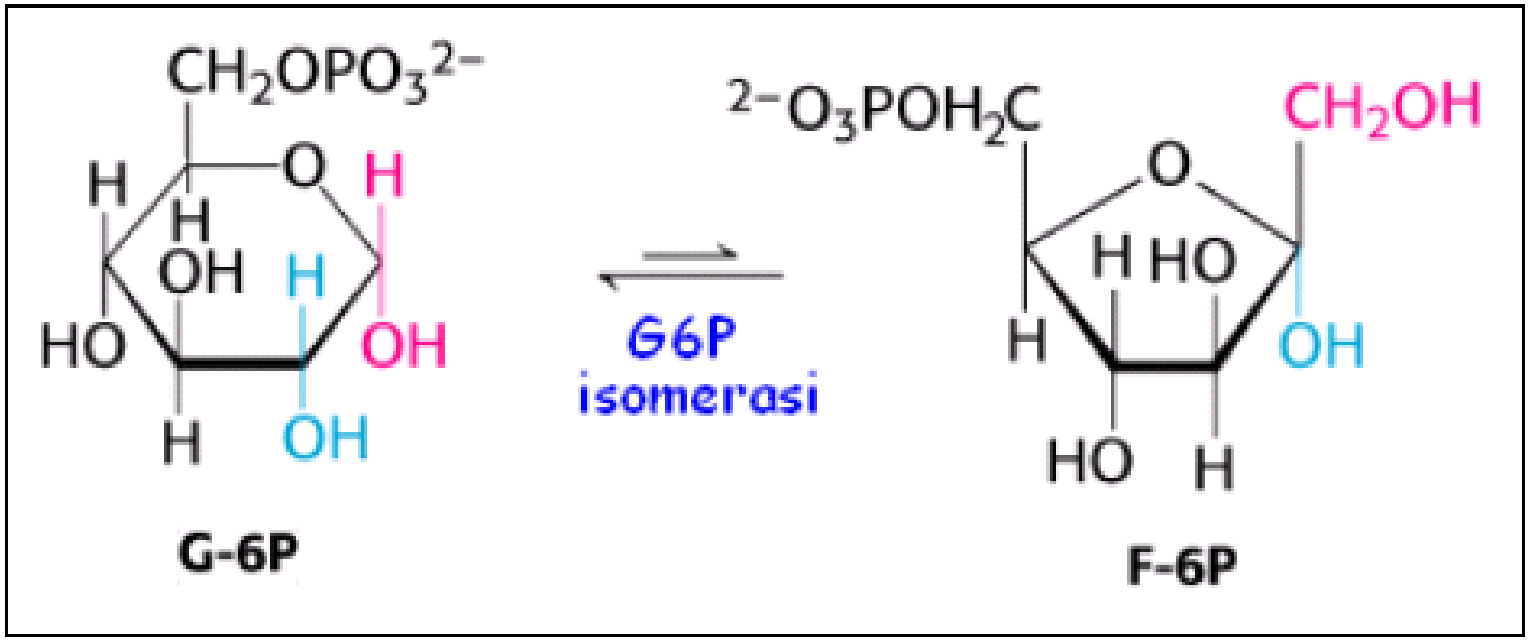
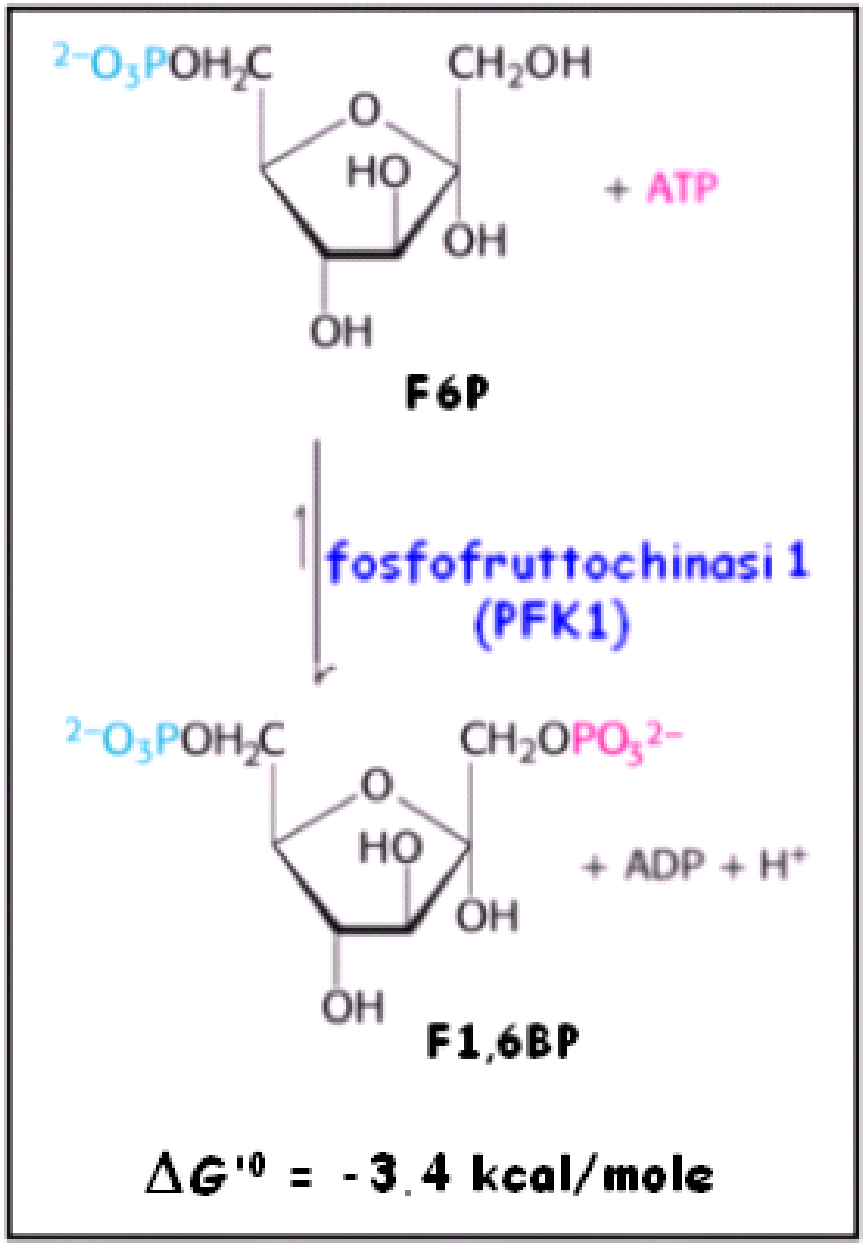
FASE PREPARATORIA



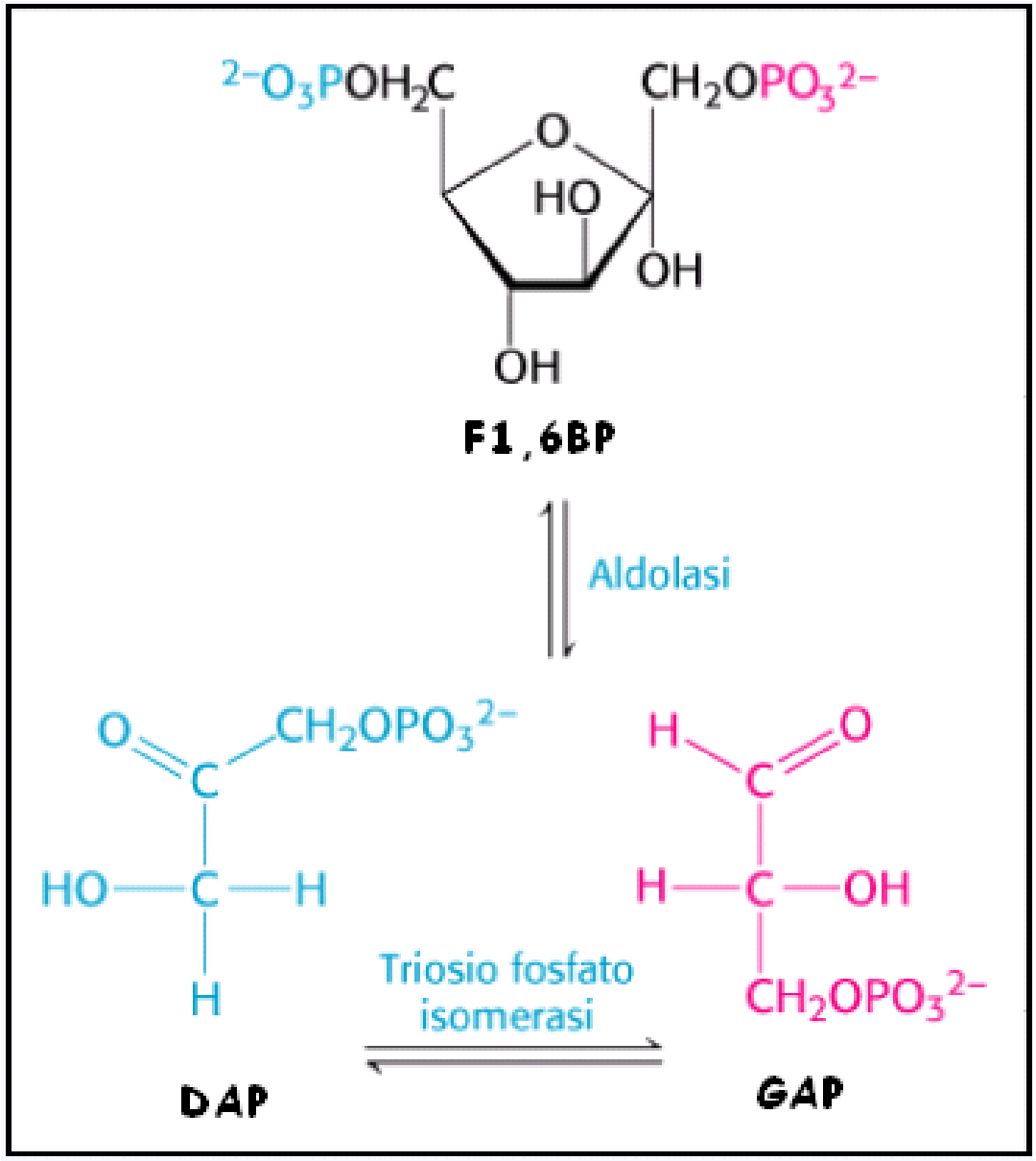
FASE DI RECUPERO ENERGETICO

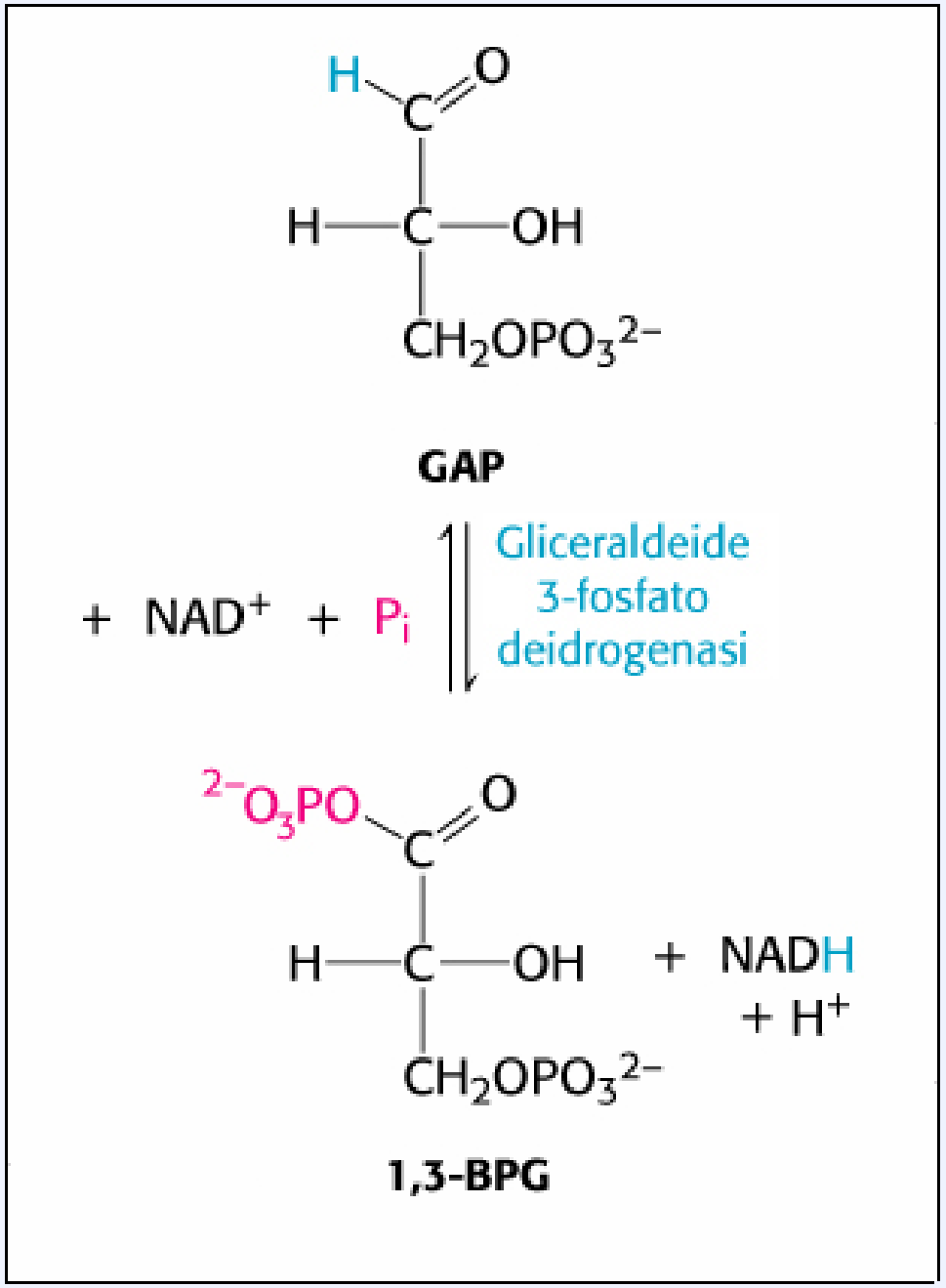


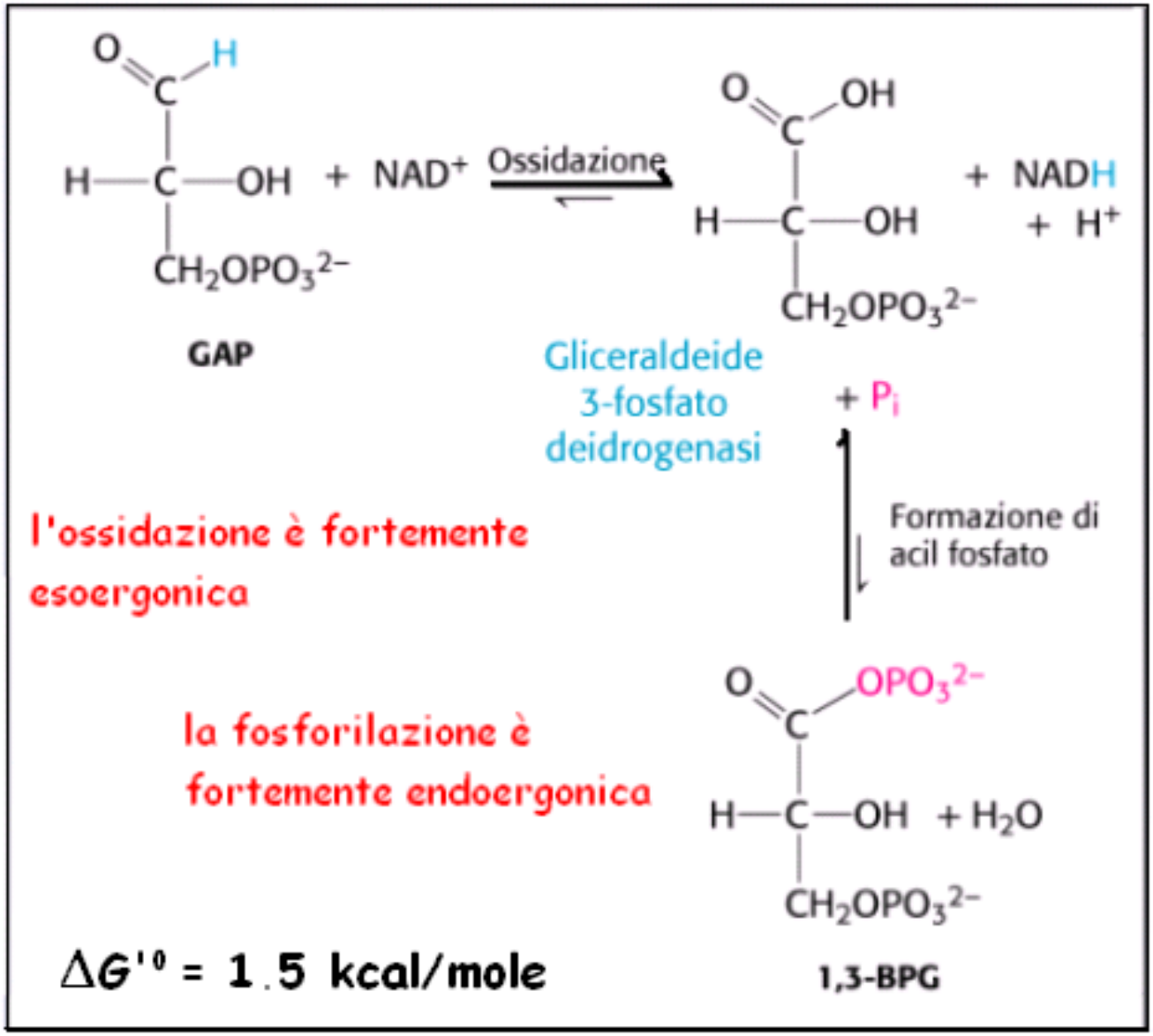

CH2OPO3 2−
H
O
H
H
OH
H
HO
OH
H
OH
G-6P
G6P
isomerasi
2−O3POH2C
CH2OH
O
H
HO
H
OH
HO
H
F-6P

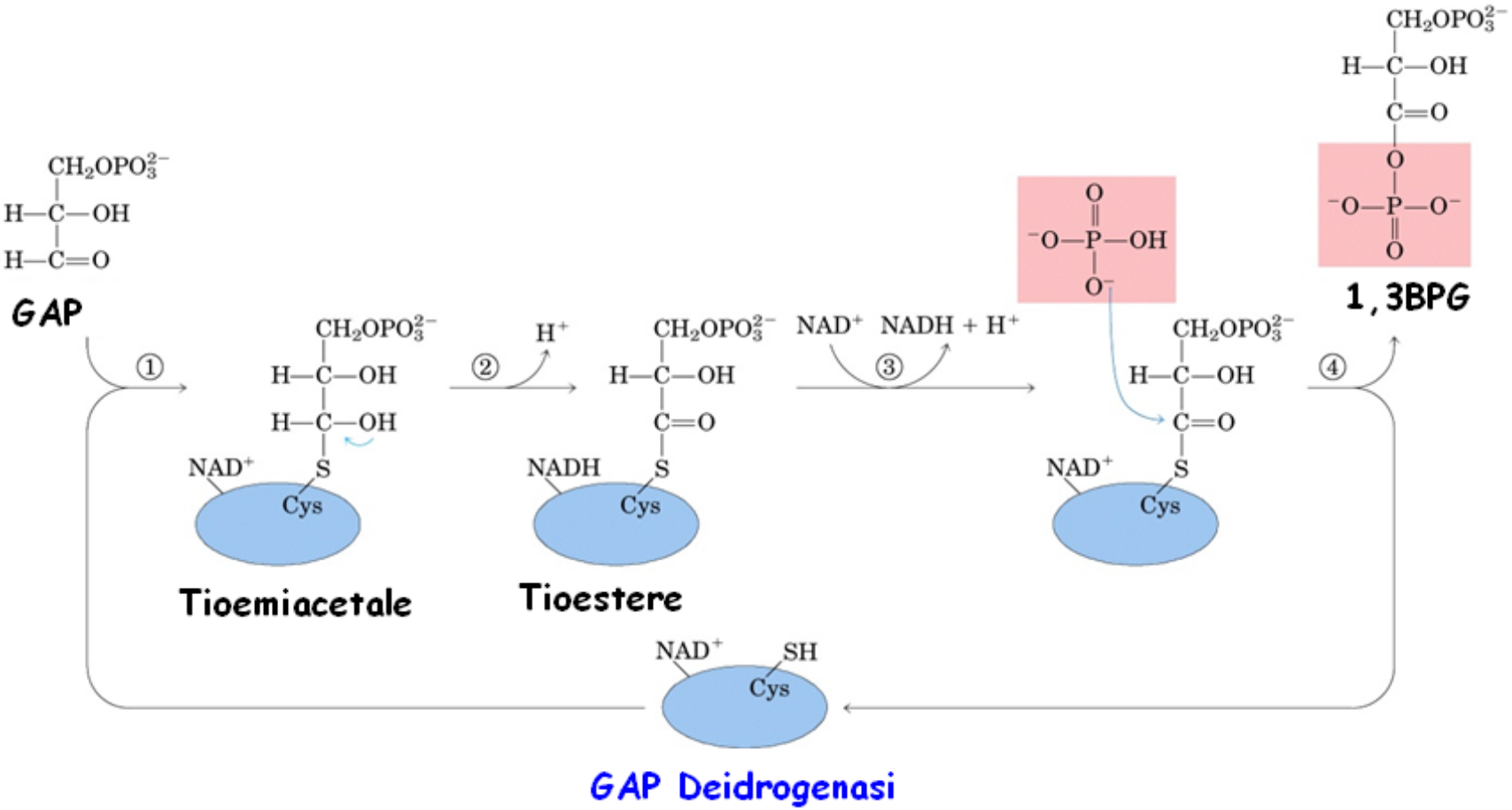


sito principale di regolazione della glicolisi


$^{2-}O_3POH_2C$
$CH_2OPO_3^{2-}$
O
HO
OH
OH
F1,6BP
Aldolasi
O
$CH_2OPO_3^{2-}$
C
HO
C
H
H
DAP
Triosio fosfato
isomerasi
H
O
C
H
C
OH
$CH_2OPO_3^{2-}$
GAP

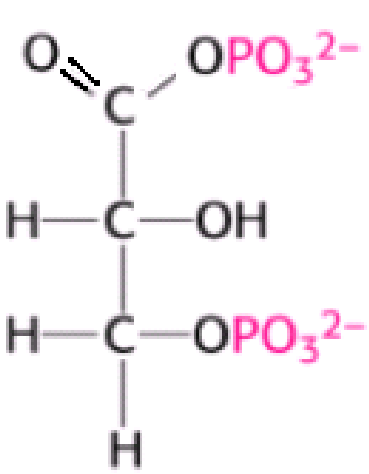

H
O
C
H
C
OH
CH2OPO3 2−
GAP
+ NAD+ + Pi
Gliceraldeide
3-fosfato
deidrogenasi
2−O3PO
O
C
H
C
OH
CH2OPO3 2−
+ NADH
+ H+
1,3-BPG


GAP
+ NAD+
Ossidazione
+ NADH
+ H+
Gliceraldeide
3-fosfato
deidrogenasi
+ Pi
Formazione di
acil fosfato
l'ossidazione è fortemente
esoergonica
la fosforilazione è
fortemente endoergonica
+ H2O
1,3-BPG
ΔG'0 = 1.5 kcal/mole


GAP
Tioemiacetale
Tioestere
1,3BPG
GAP Deidrogenasi

L'1,3 BPG possiede un elevato potenziale di trasferimento del P

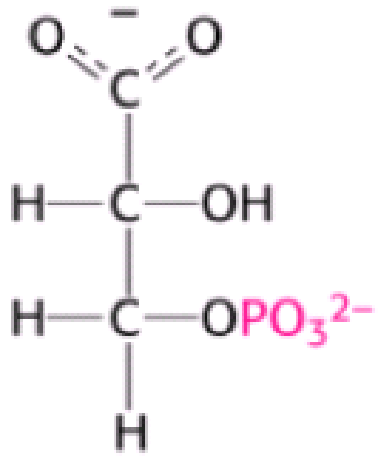
$\Delta G'^{0} = -11.8$ Kcal/mole



1,3BPG

+ ADP

Fosfoglicerato chinasi

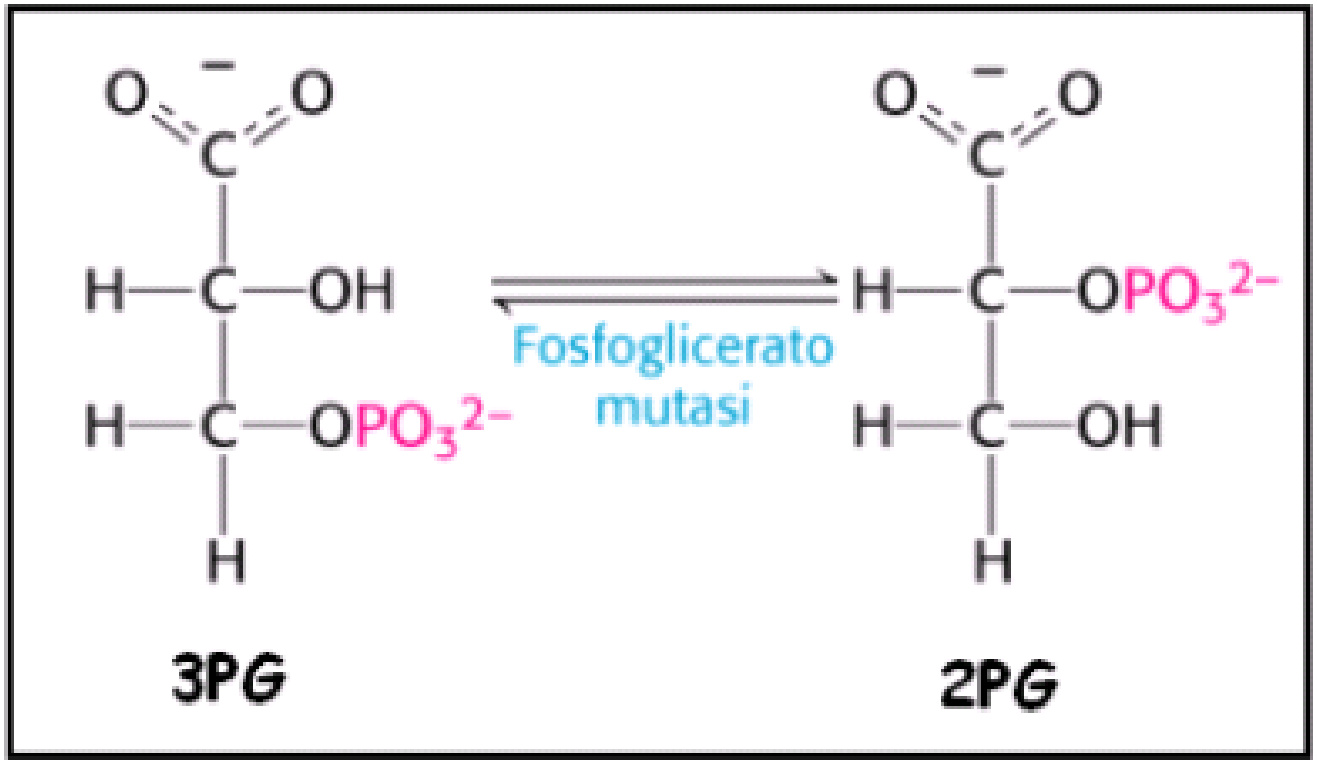


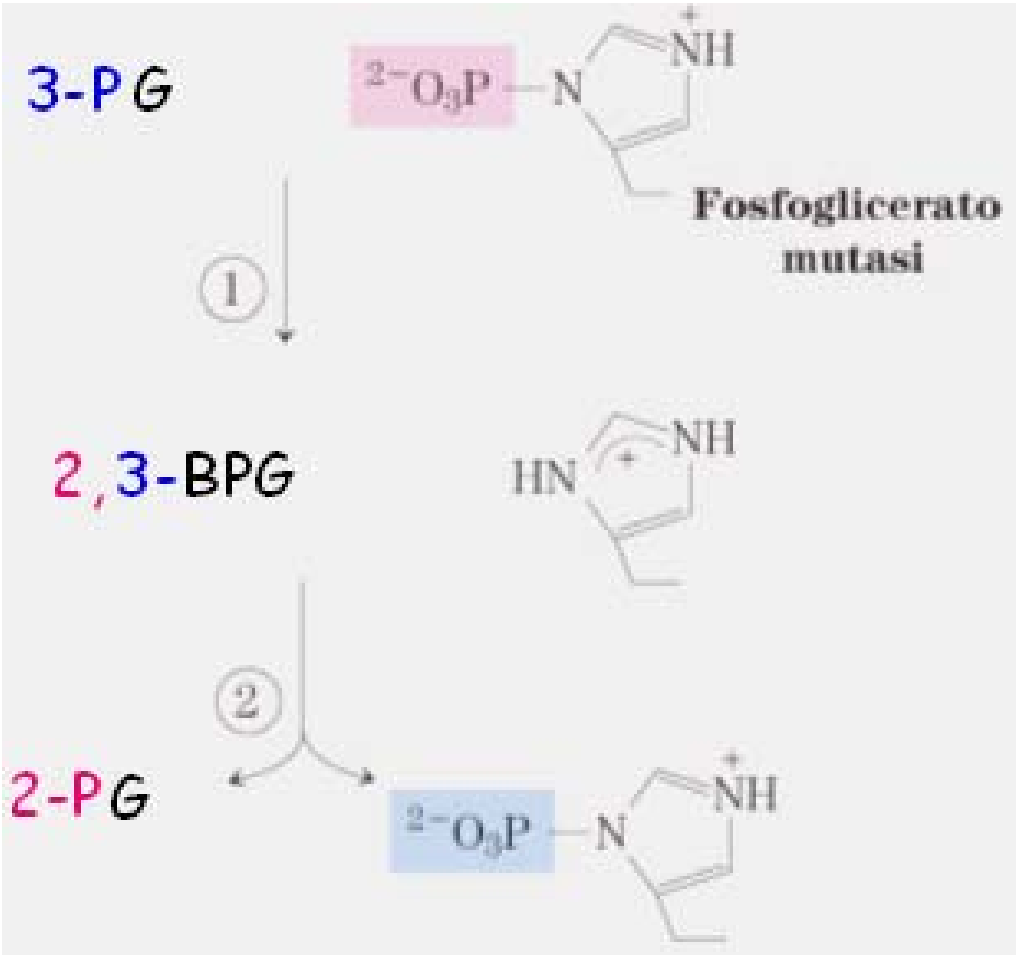
3PG

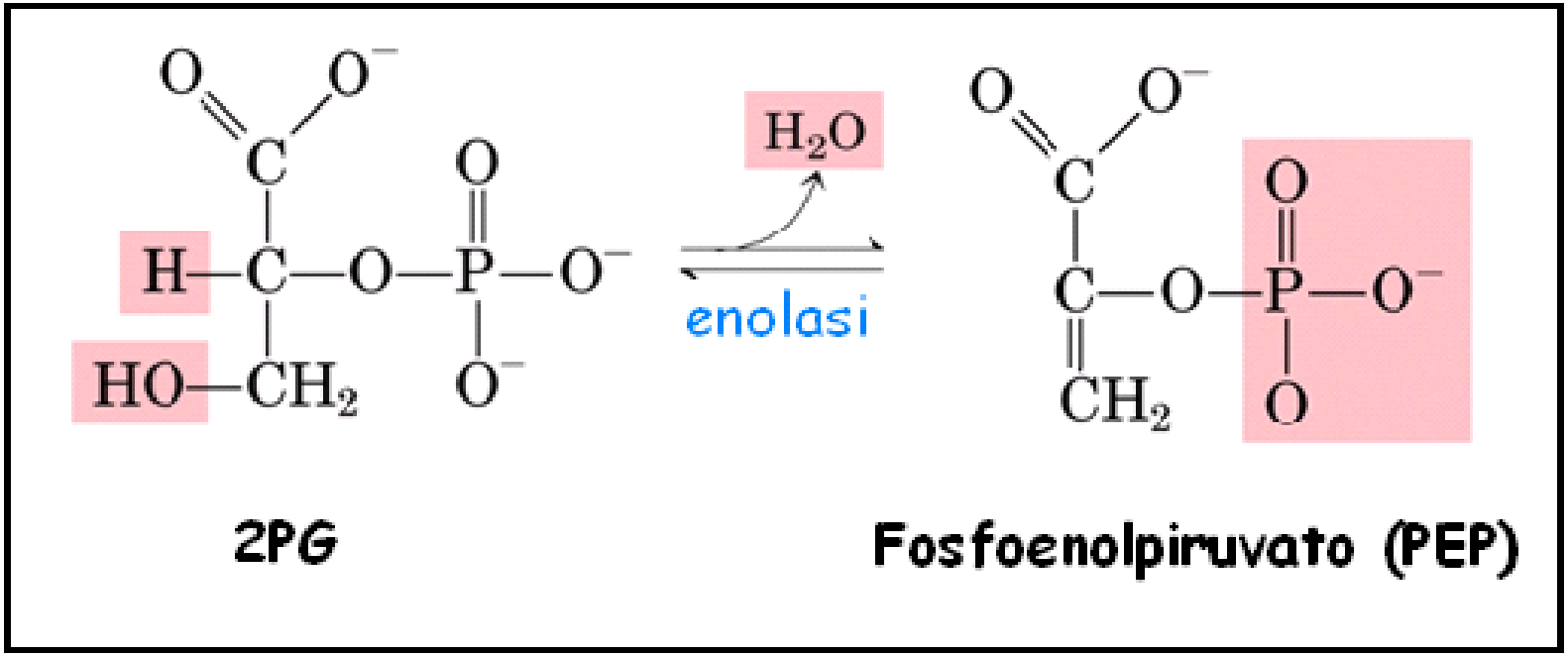
+ ATP

$\Delta G'^{0}$ = -4.5 kcal/mole

I tappa di fosforilazione a livello del substrato

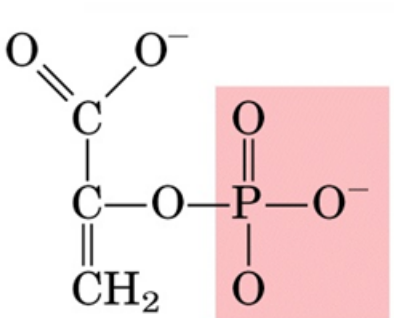

Fosfoglicerato
mutasi
3PG
2PG


3-PG
$^{2-}O_3P$
N
NH
Fosfoglicerato mutasi
1
2,3-BPG
HN
NH
2
2-PG
$^{2-}O_3P$
N
NH


H2O
enolasi
2PG
Fosfoenolpiruvato (PEP)

Il PEP è il composto fosforilato con il più elevato potenziale di trasferimento del (P)

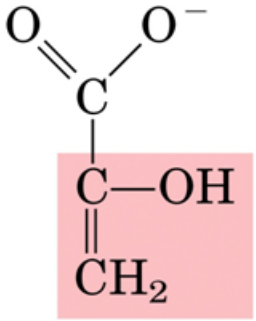
$\Delta G'^{0} = -14.8$ kcal/mole



PEP

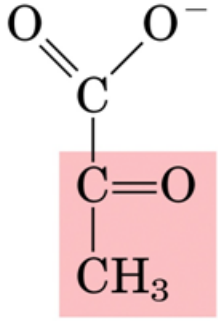
ADP ATP

piruvato chinasi (PK)



PIRUVATO (FORMA ENOLICA)

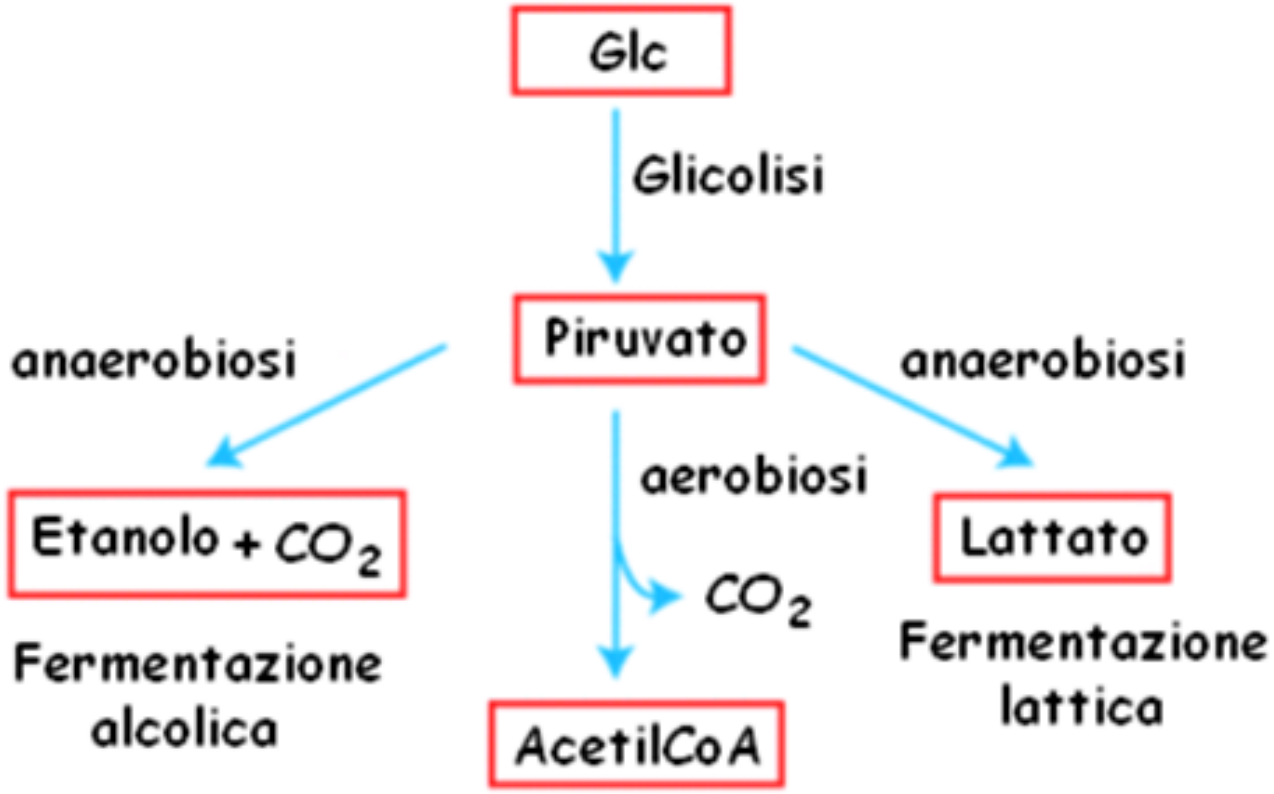
spontanea tautomerizzazione



PIRUVATO (FORMA CHETONICA)

$\Delta G'^{\circ} = -7.5$ kcal/mole

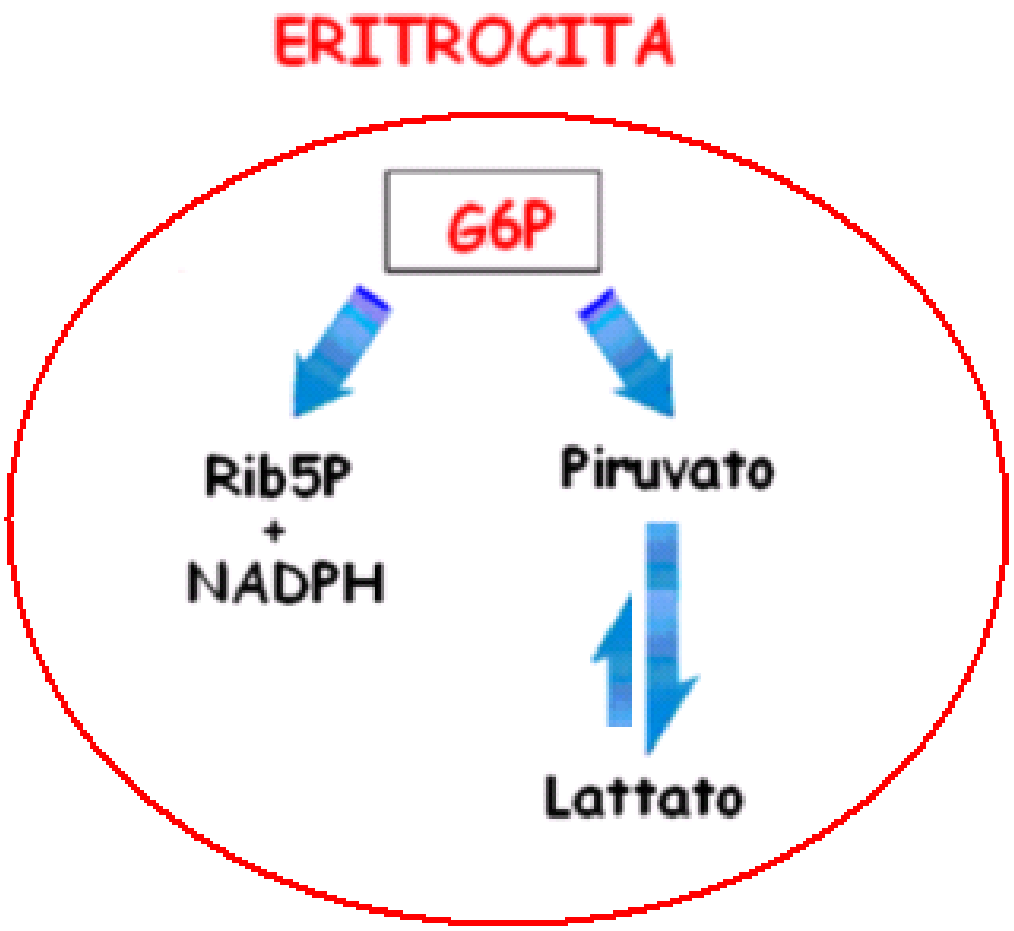
II tappa di fosforilazione a livello del substrato

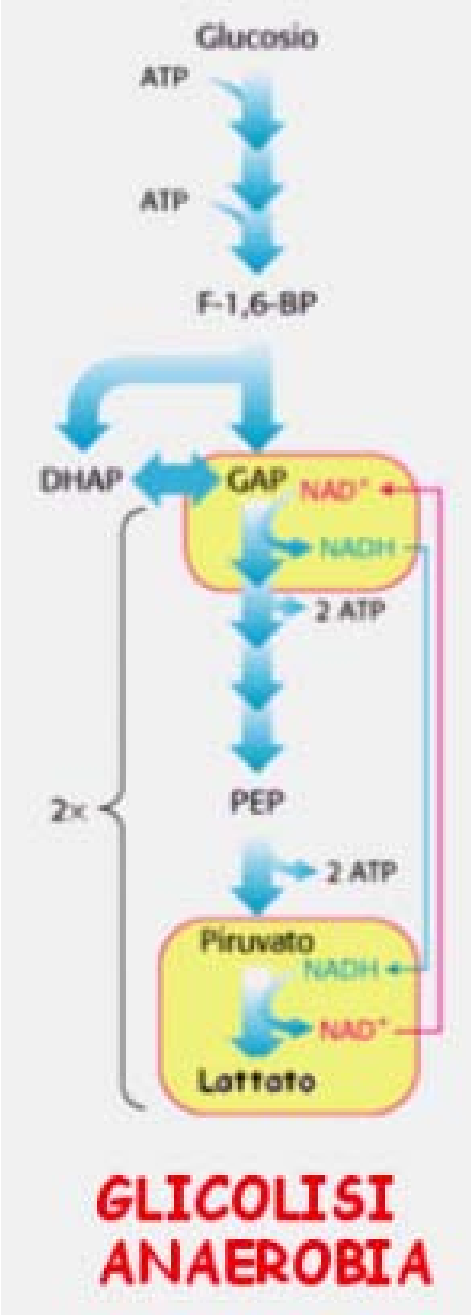

Glc
Glicolisi
Piruvato
anaerobiosi
anaerobiosi
aerobiosi
Etanolo + CO_2
CO_2
Lattato
Fermentazione alcolica
Fermentazione lattica
AcetilCoA

La glicolisi anaerobia avviene

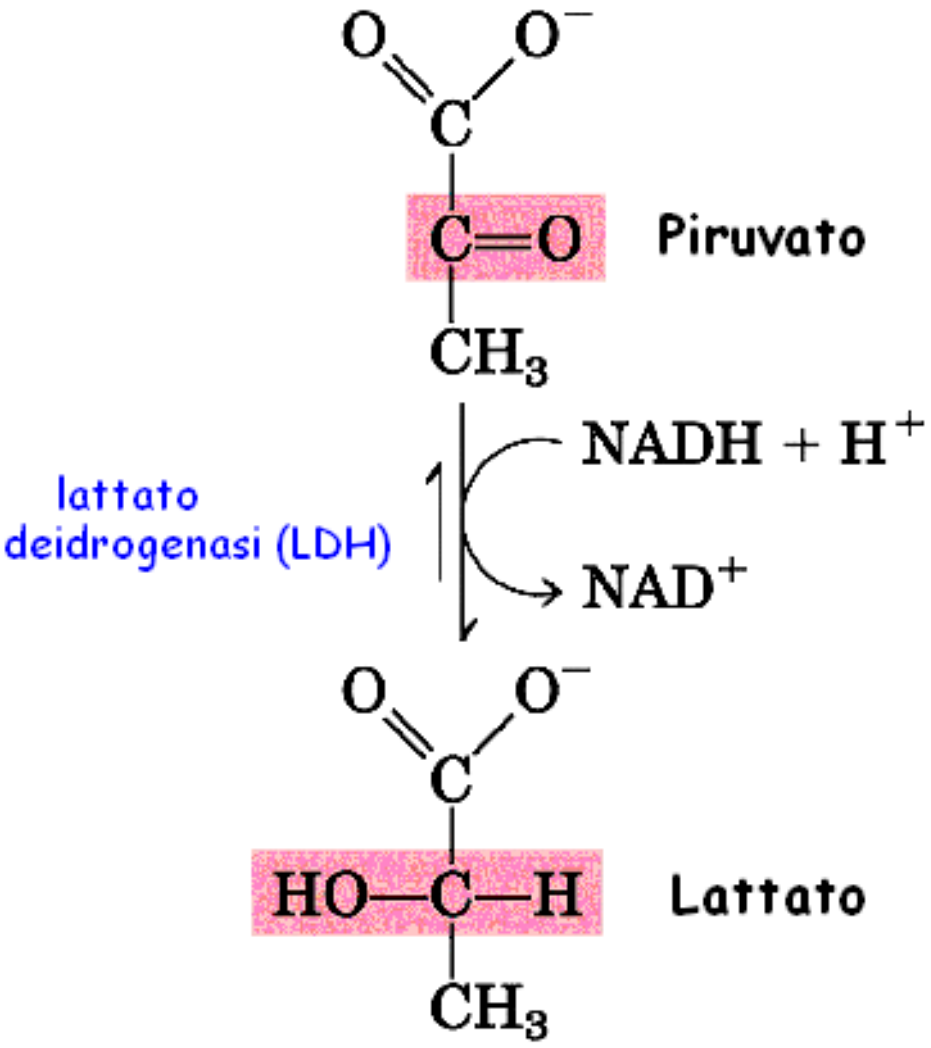
- sempre negli eritrociti

- nei muscoli in intensa attività


ERITROCITA
G6P
Rib5P
+
NADPH
Piruvato
Lattato

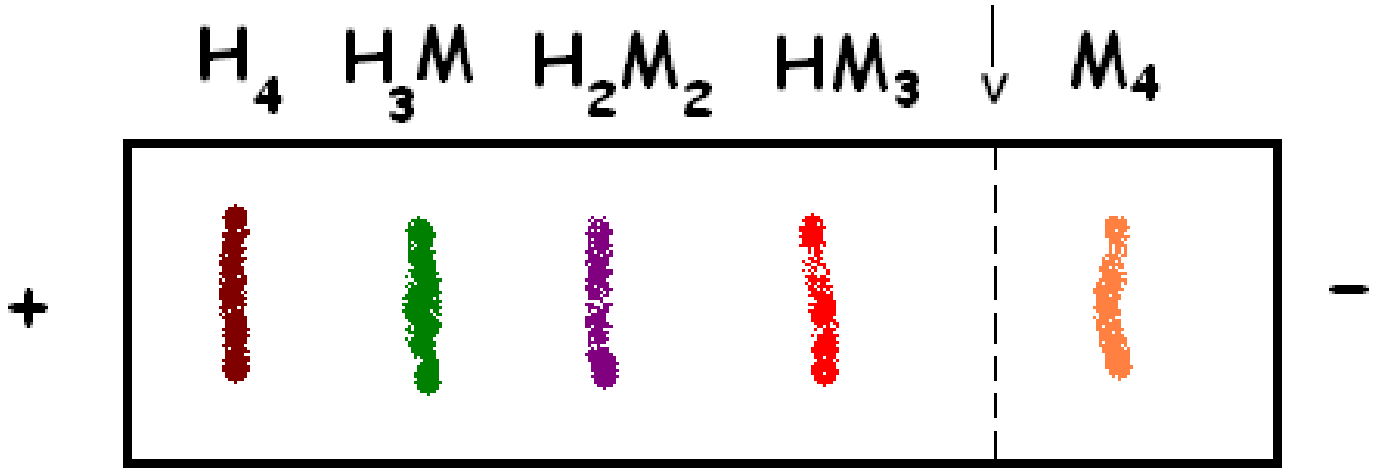


La riduzione del piruvato a lattato consente la riossidazione del NADH prodotto dalla GAP deidrogenasi


Piruvato
NADH + H+
lattato
deidrogenasi (LDH)
NAD+
Lattato

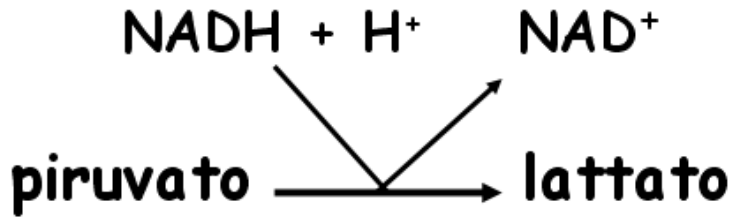
LDH

tetramero di due tipi
di subunità H e M



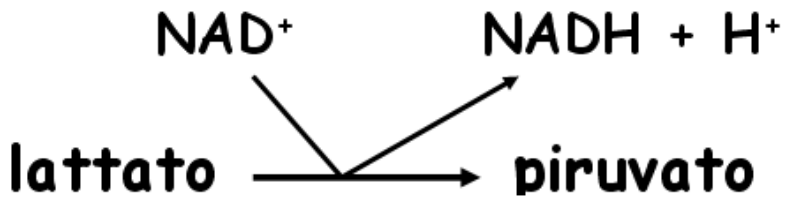
M_4

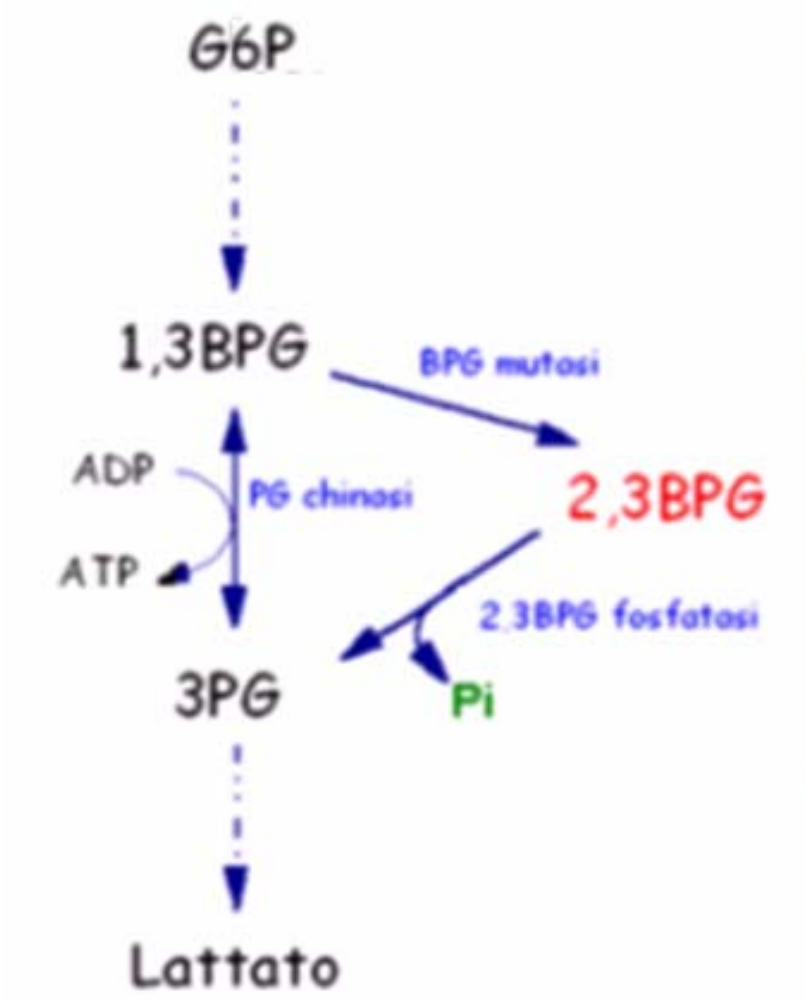
Bassa Km per il piruvato: favorisce la riduzione



H_4

Alta Km per il piruvato: favorisce la ossidazione



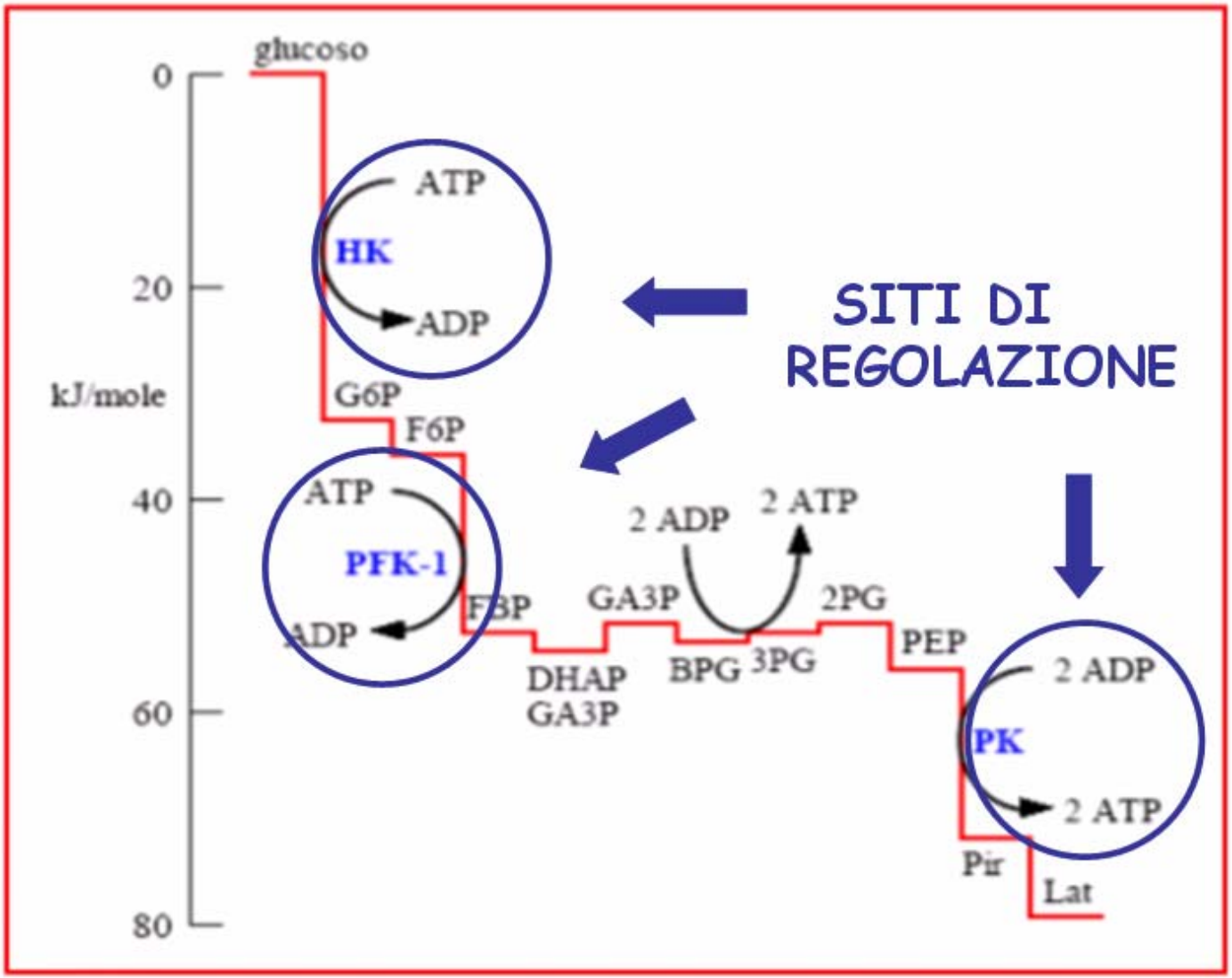


NEGLI ERITROCITI QUESTE

REAZIONI COLLATERALI

PORTANO ALLA SINTESI

DEL 2,3-BPG


glucoso
0
20
40
60
80
kJ/mole
ATP
HK
ADP
G6P
F6P
ATP
PFK-1
ADP
FBP
DHAP
GA3P
GA3P
2 ADP
2 ATP
BPG
3PG
2PG
PEP
2 ADP
PK
2 ATP
Pir
Lat
SITI DI
REGOLAZIONE

Esochinasi

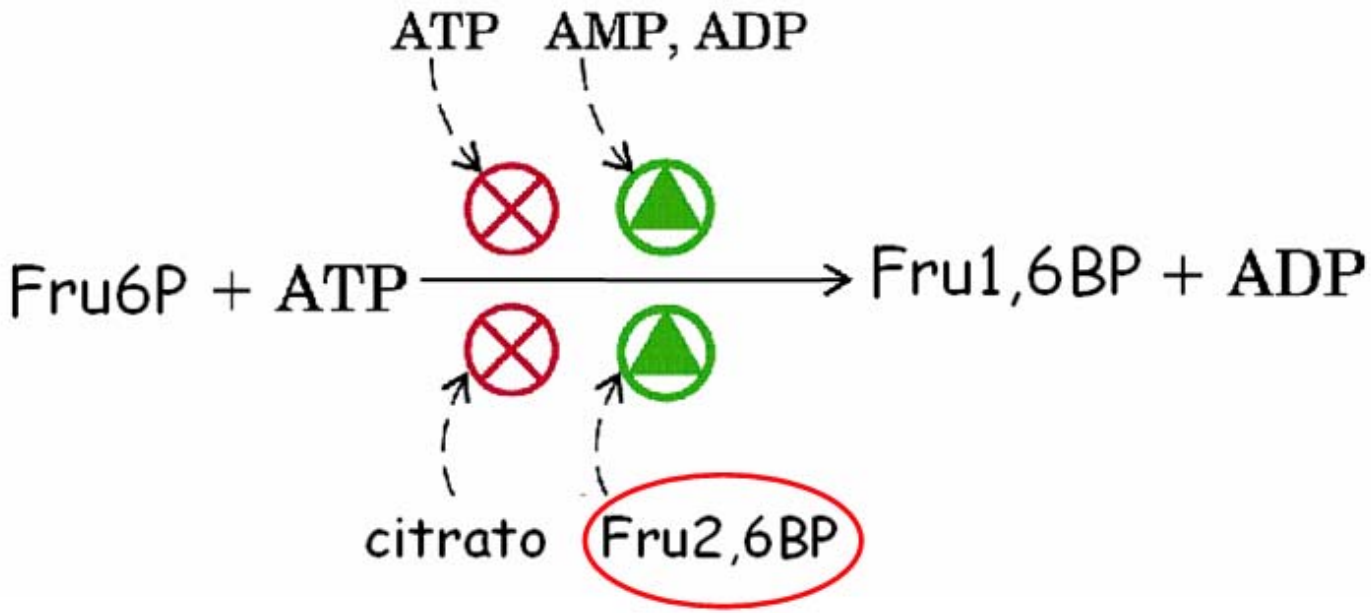
- tutti i tessuti
- Km 0.1 mM
- inibita da Glc6P

Glucochinasi

- fegato
- Km 10 mM
- inibita da Fru6P

PFK1

- catalizza la tappa limitante
- costituisce il sito principale di regolazione

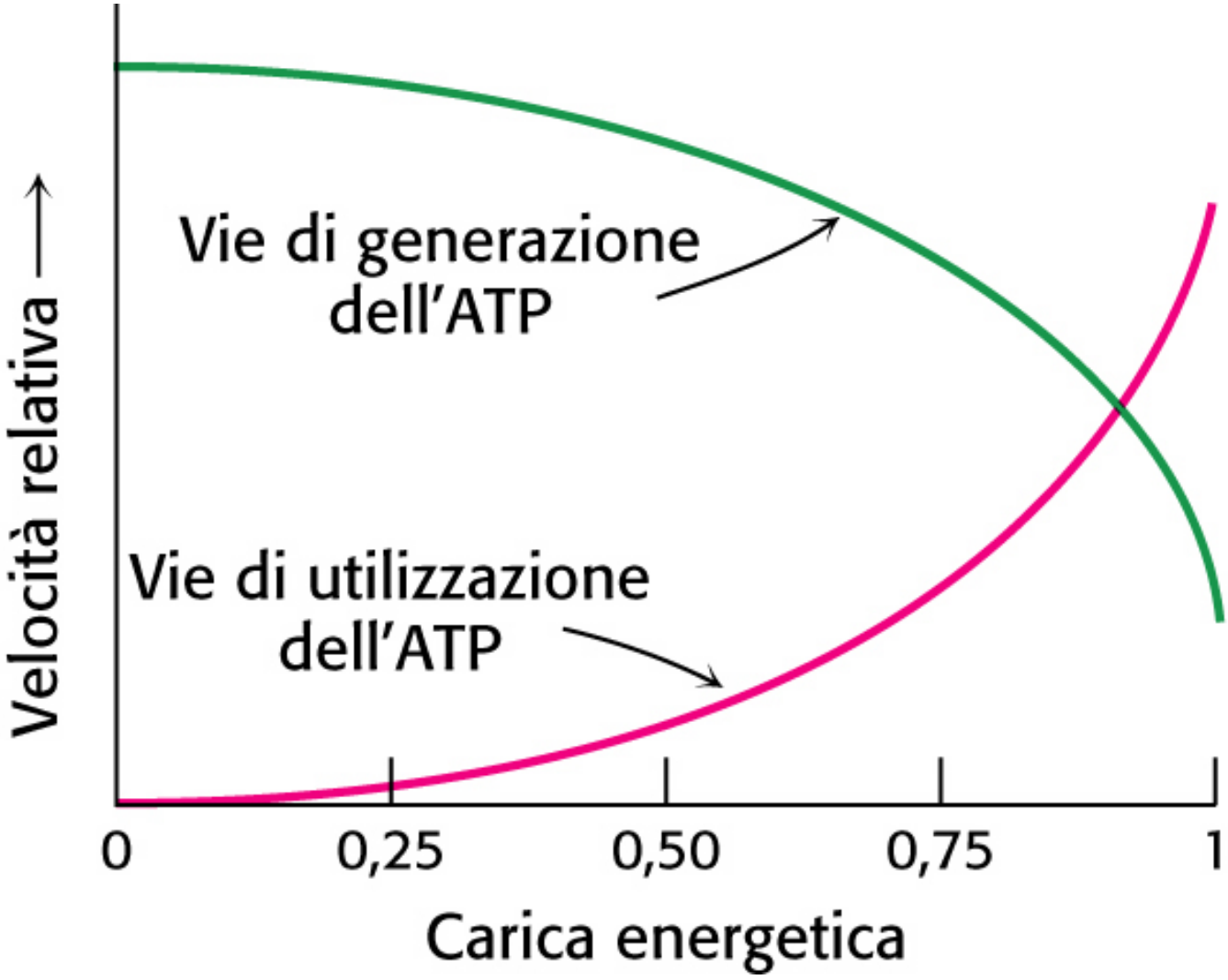

ATP
AMP, ADP
Fru6P + ATP
Fru1,6BP + ADP
citrato
Fru2,6BP

CARICA ENERGETICA

$$\frac{[ATP]+\frac{1}{2}[ADP]}{[ATP]+[ADP]+[AMP]}$$

Varia da 0 (tutto AMP)

a 1 (tutto ATP)


Velocità relativa
Vie di generazione dell'ATP
Vie di utilizzazione dell'ATP
0
0,25
0,50
0,75
1
Carica energetica

Un'alta carica energetica

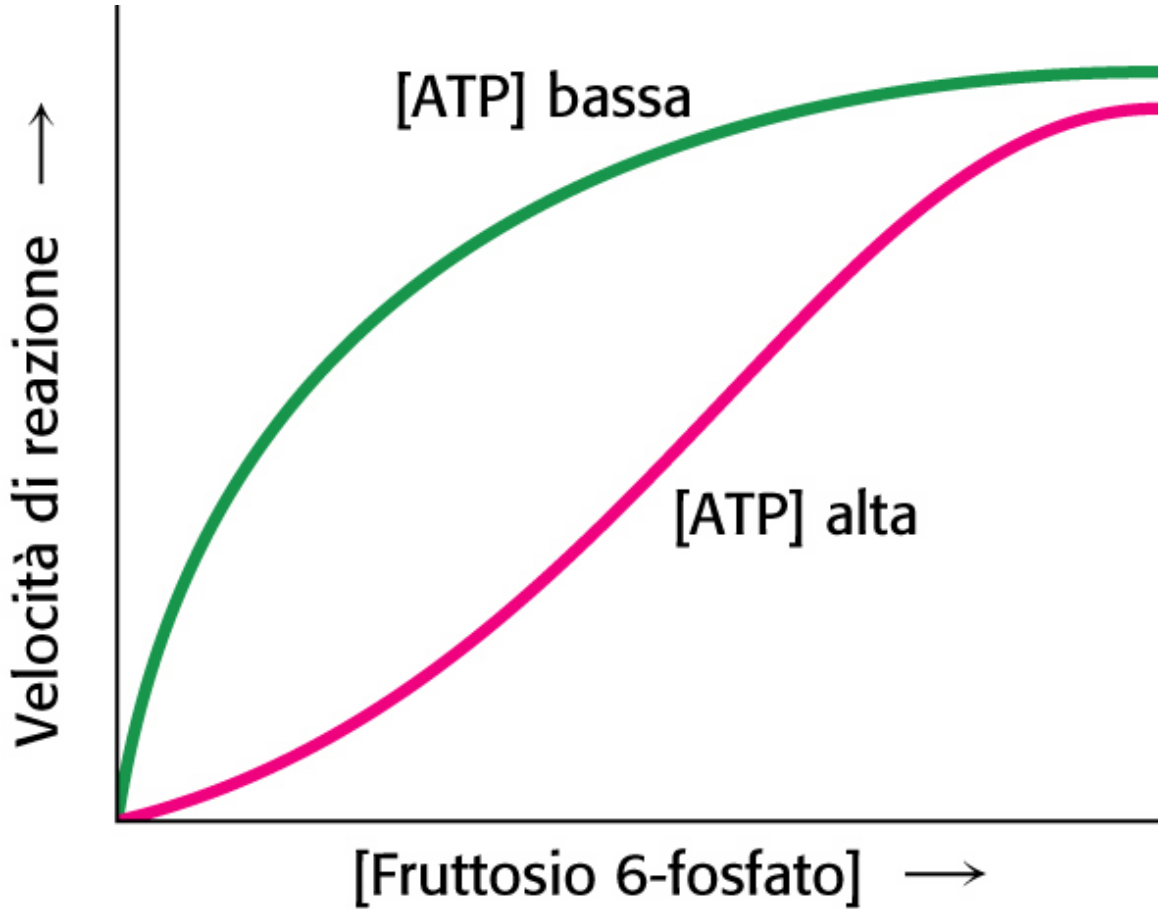
inibisce la glicolisi

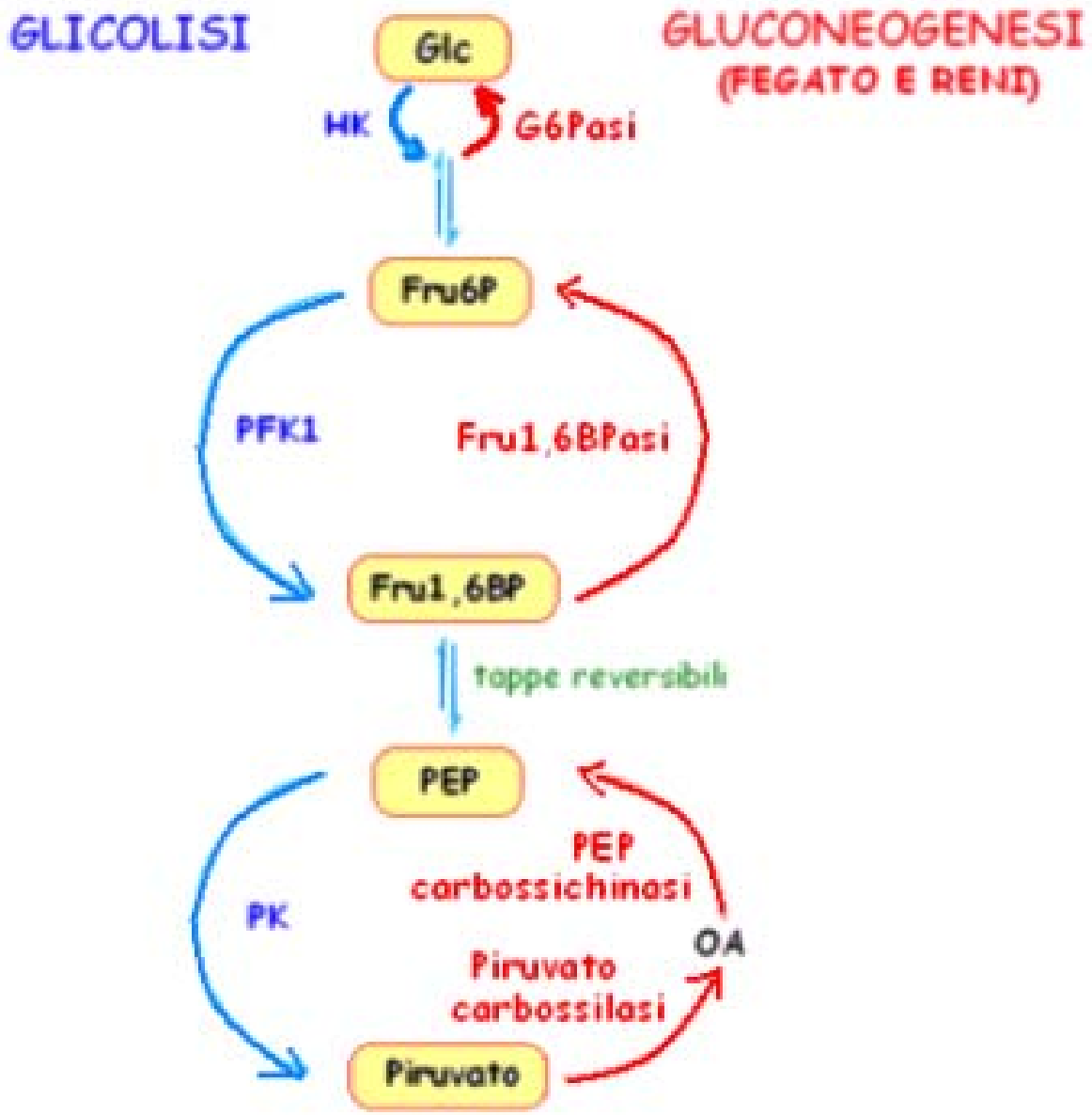
Una bassa carica energetica

stimola la glicolisi

L'ATP

- a bassa concentrazione
  funge da substrato
- ad alta concentrazione funge
  da modulatore negativo


[ATP] bassa
[ATP] alta
Velocità di reazione ⟶
[Fruttosio 6-fosfato] ⟶


GLICOLISI
GLUCONEOGENESI
(FEGATO E RENI)
Glc
HK
G6Pasi
Fru6P
PFK1
Fru1,6BPasi
Fru1,6BP
tappe reversibili
PEP
PEP
carbossichinasi
PK
OA
Piruvato
carbossilasi
Piruvato