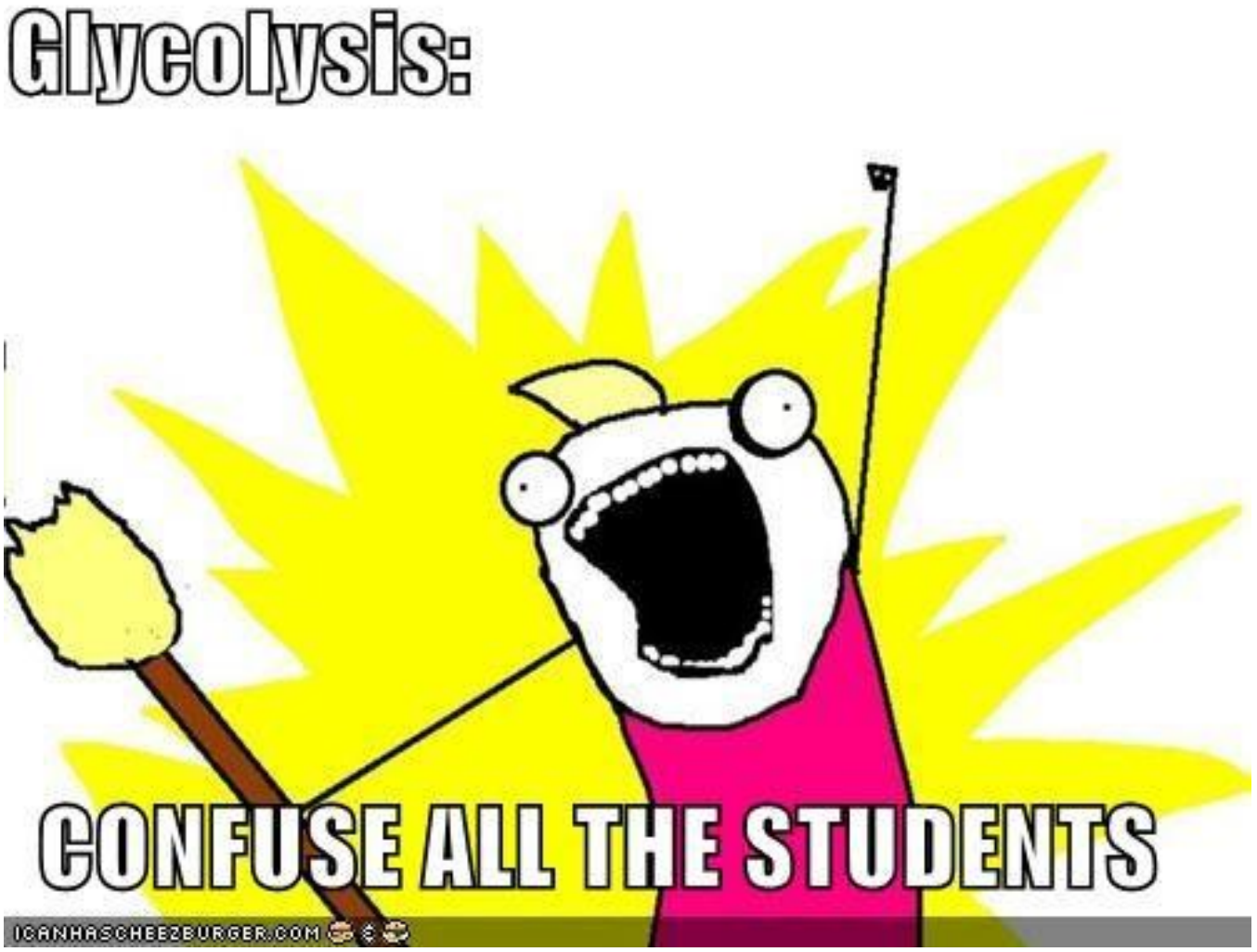
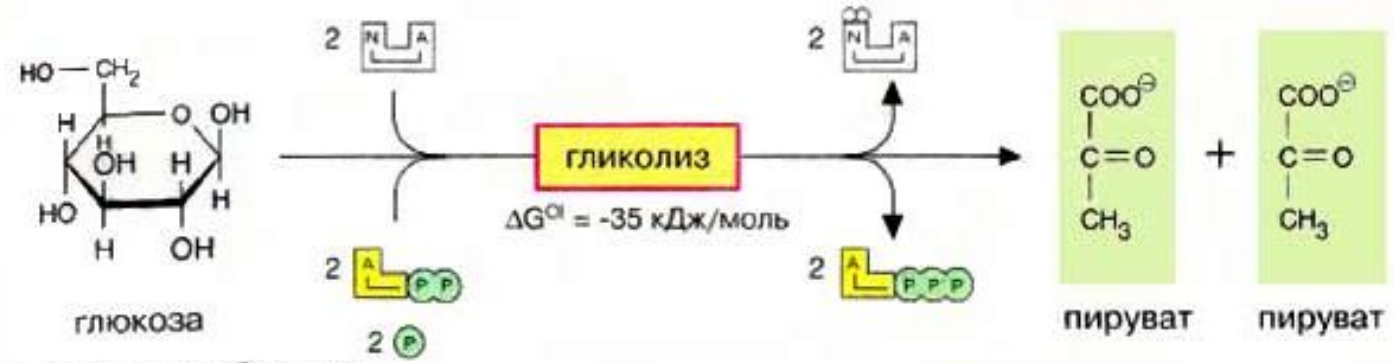
Гликолиз.

Глюконеогенез.

Пентозофосфатный путь.

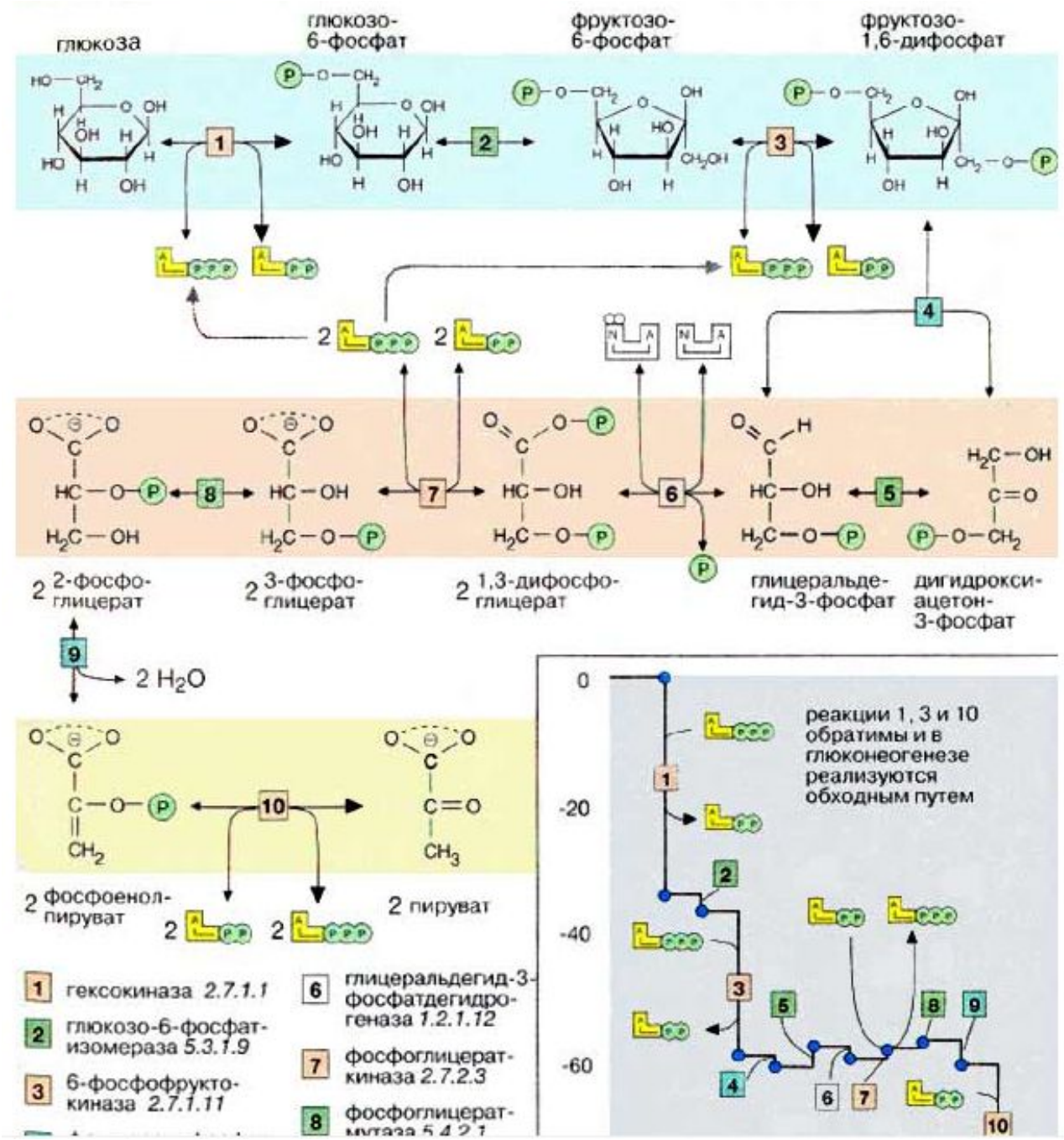

Glycolysis:
CONFUSE ALL THE STUDENTS
ICANHASCHEEZBURGER.COM

Гликолиз



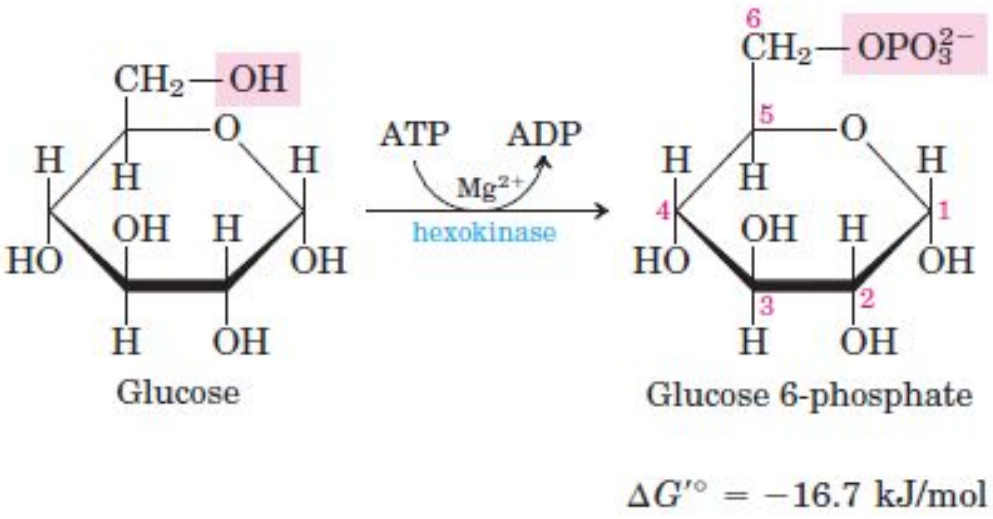
А. Гликолиз: баланс

Гликолиз


глюкоза
глюкозо-6-фосфат
фруктозо-6-фосфат
фруктозо-1,6-дифосфат
2 2-фосфо-глицерат
2 3-фосфо-глицерат
2 1,3-дифосфо-глицерат
глицеральдегид-3-фосфат
дигидроксиацетон-3-фосфат
2 H2O
2 фосфоенол-пируват
2 пируват
1 гексокиназа 2.7.1.1
2 глюкозо-6-фосфат-изомераза 5.3.1.9
3 6-фосфофруктокиназа 2.7.1.11
6 глицеральдегид-3-фосфатдегидрогеназа 1.2.1.12
7 фосфоглицераткиназа 2.7.2.3
8 фосфоглицератмутаза 5.4.2.1
0
-20
-40
-60
реакции 1, 3 и 10 обратимы и в глюконеогенезе реализуются обходным путем

Подготовительный этап

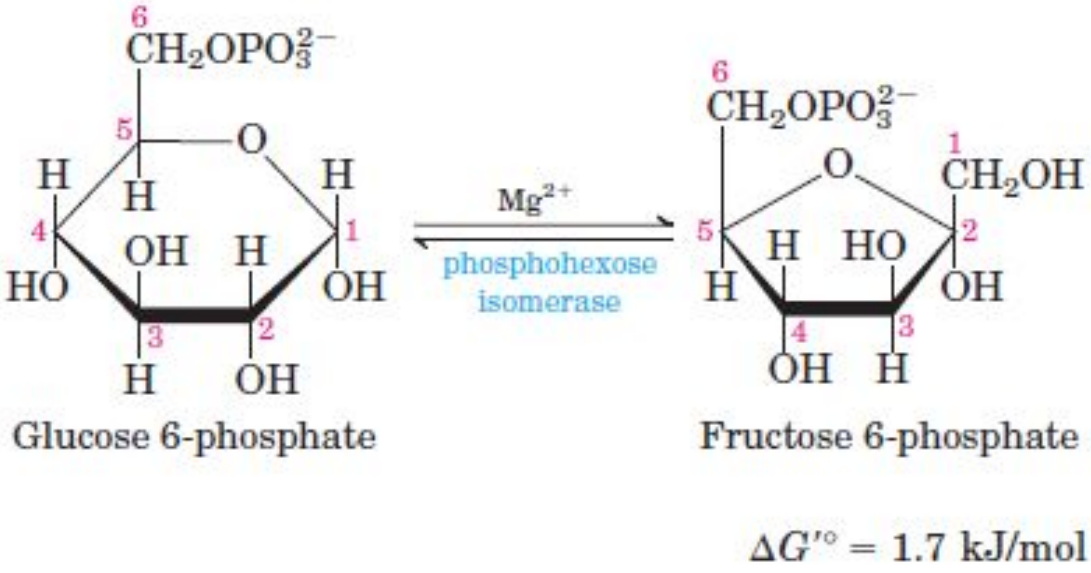
1

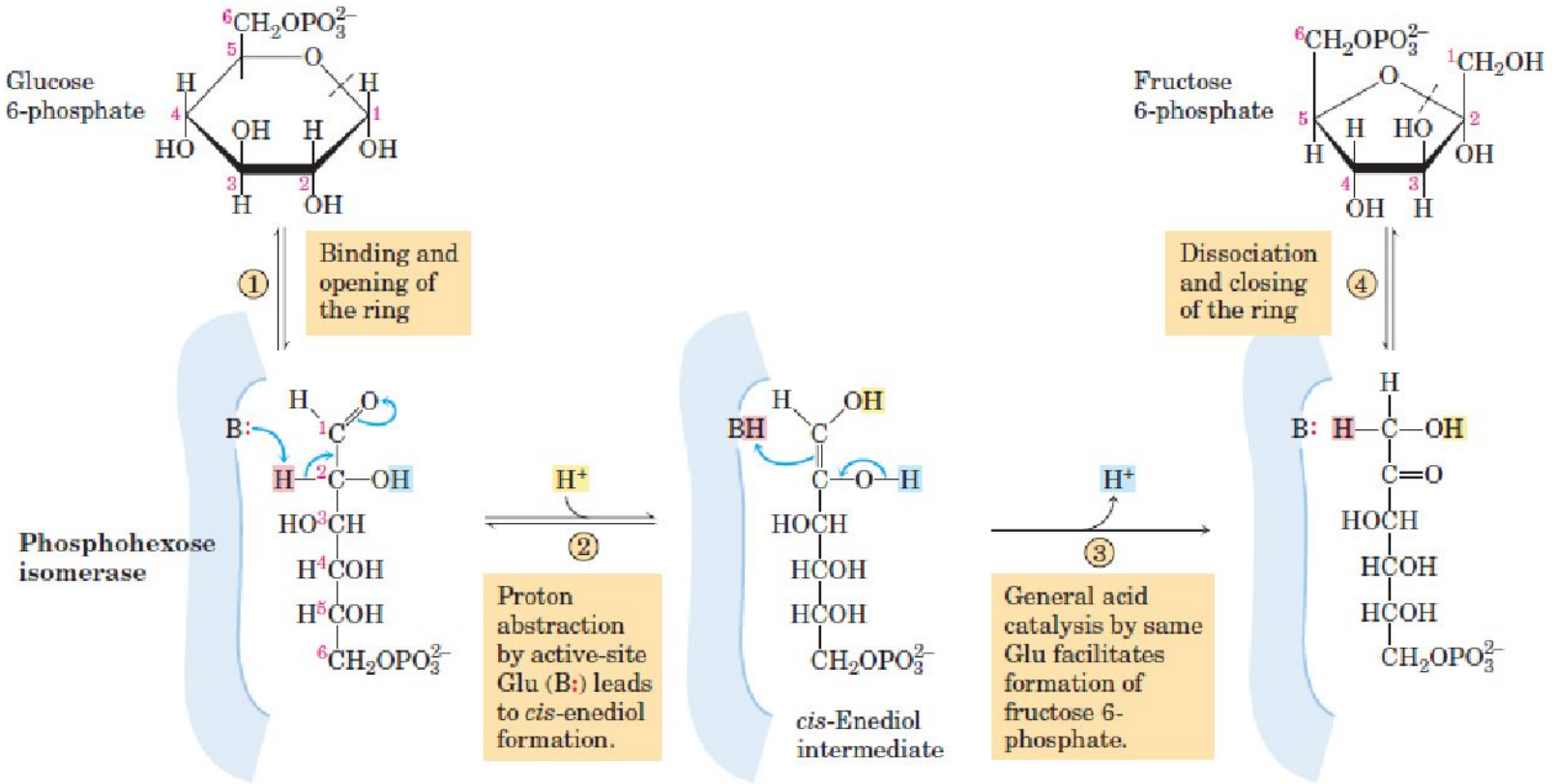


$\Delta G'^{\circ} = -16.7$ kJ/mol

Подготовительный этап

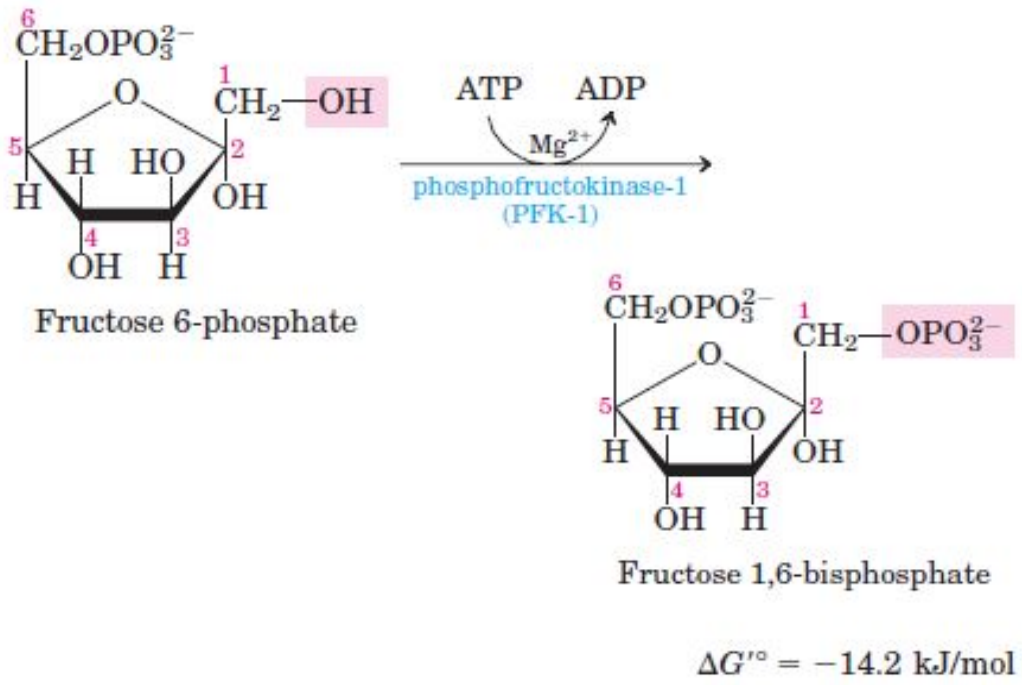
2




Glucose 6-phosphate
Fructose 6-phosphate
Phosphohexose isomerase
① Binding and opening of the ring
② Proton abstraction by active-site Glu (B:) leads to *cis*-enediol formation.
③ General acid catalysis by same Glu facilitates formation of fructose 6-phosphate.
④ Dissociation and closing of the ring
cis-Enediol intermediate

Подготовительный этап

3

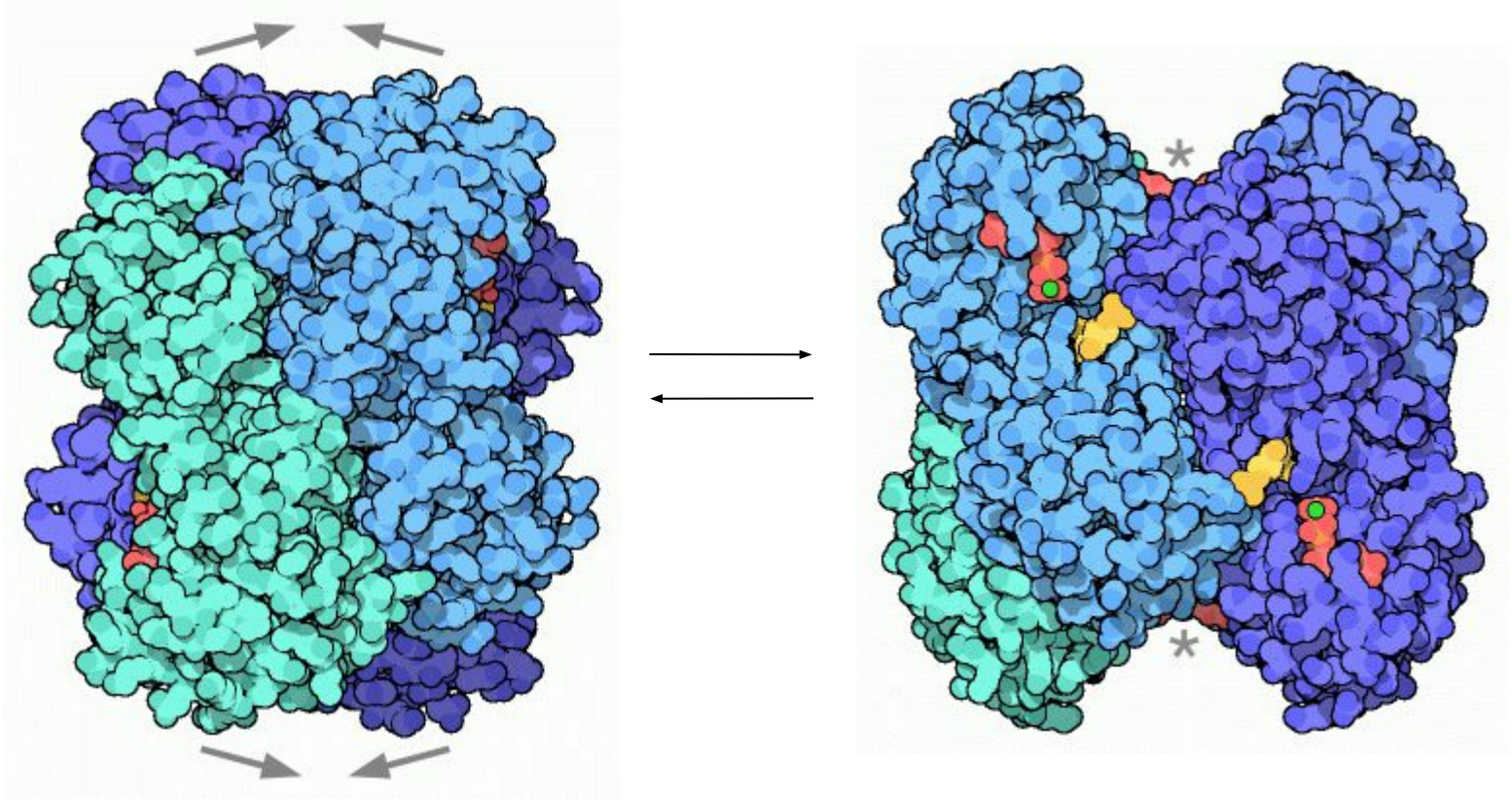


Fructose 6-phosphate

Fructose 1,6-bisphosphate

$\Delta G'^{\circ} = -14.2$ kJ/mol

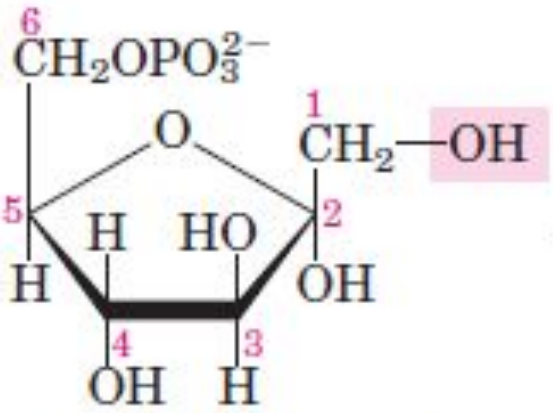
Фосфофруктокиназа-1 (PFK1) (2.7.1.11)



T

R

Положительная обратная связь в работе PFK1



Fructose 6-phosphate

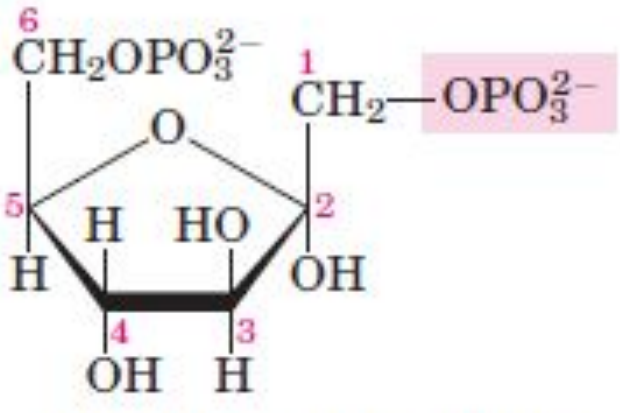
+

ATP

PFK1

Ингибирование

Активация



Fructose 1,6-bisphosphate

+

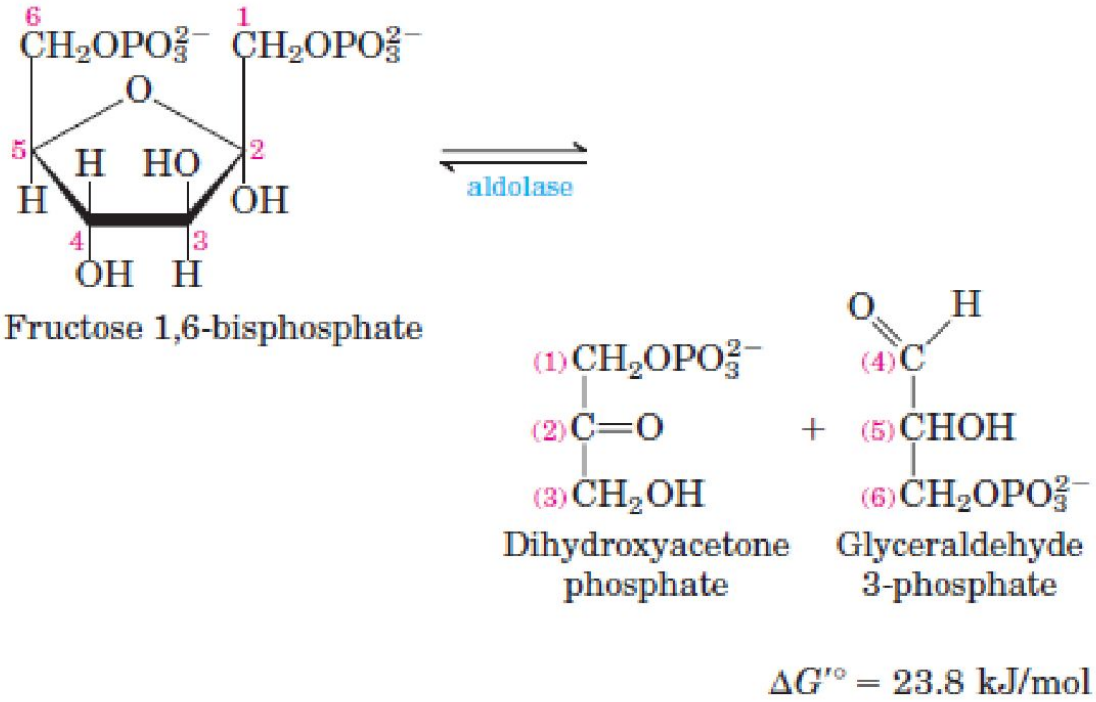
ADP

аденилаткиназа

2ADP ⟶ ATP + AMP

Подготовительный этап

4

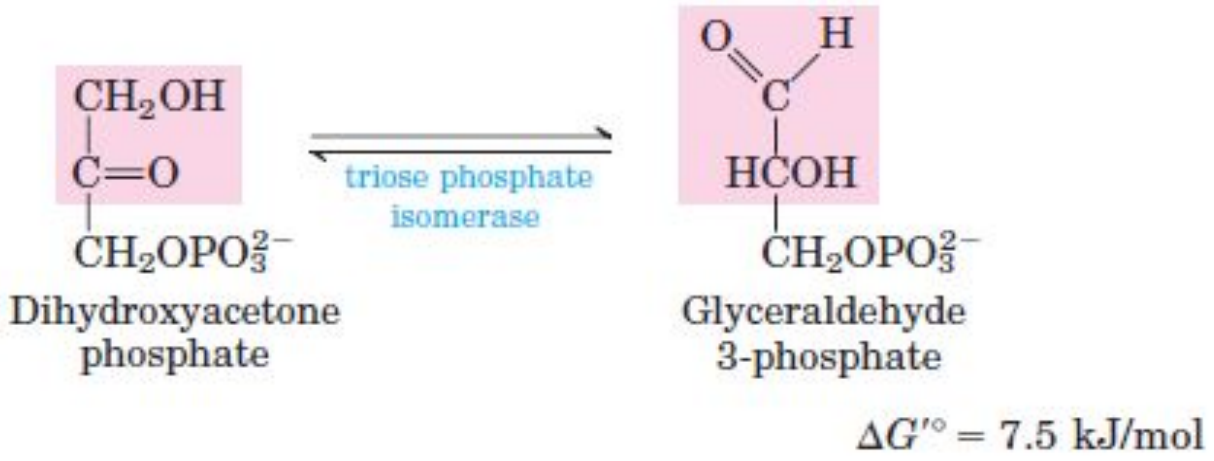


Fructose 1,6-bisphosphate

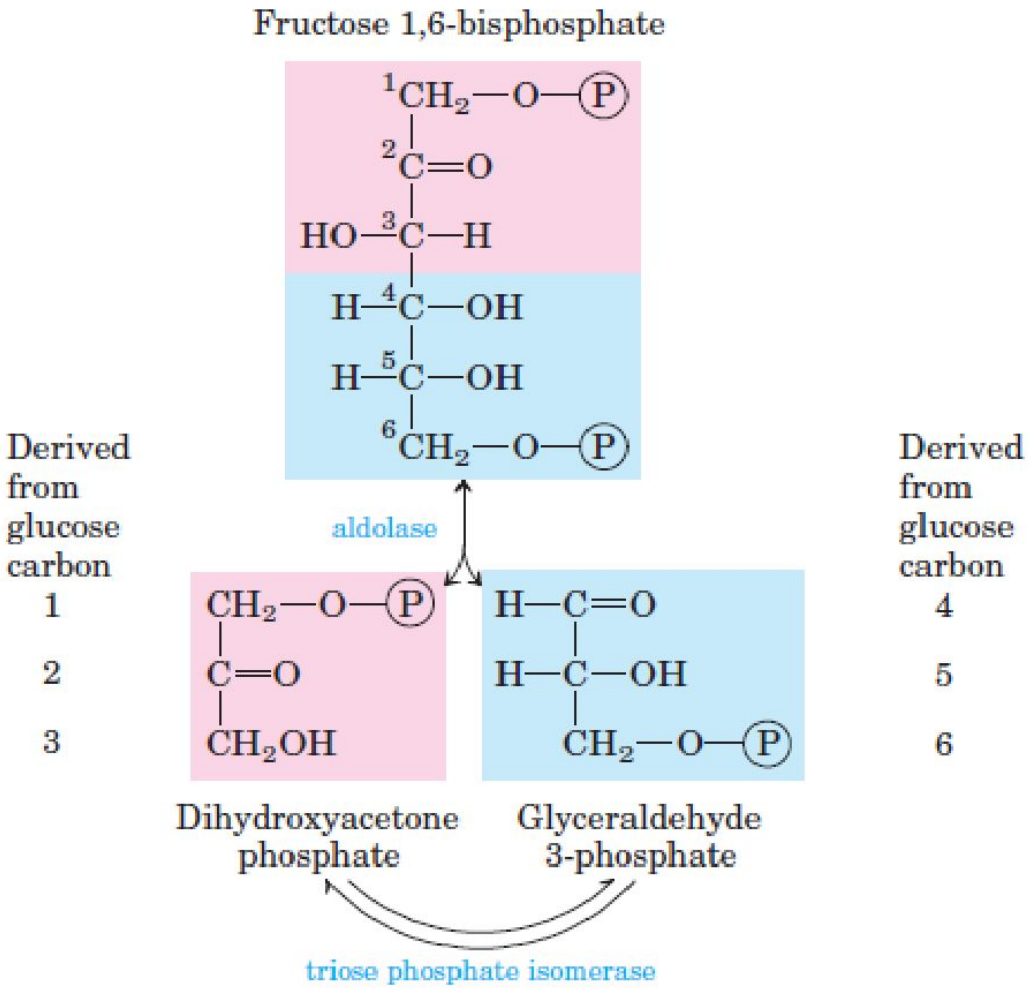
$\Delta G'^{\circ} = 23.8$ kJ/mol

Подготовительный этап

5

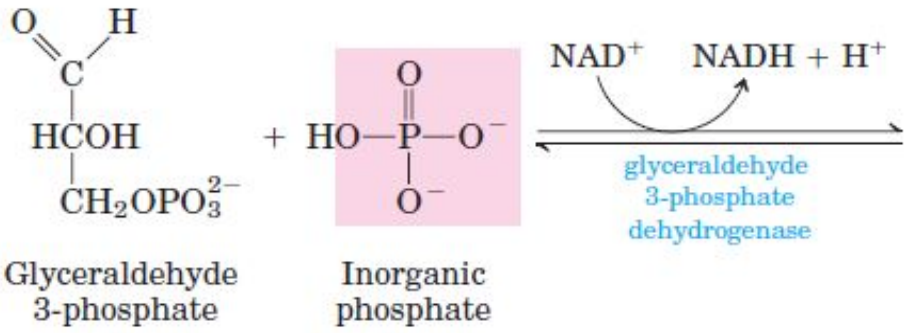


$\Delta G'^{\circ} = 7.5$ kJ/mol


Fructose 1,6-bisphosphate
Derived from glucose carbon
1
2
3
aldolase
Derived from glucose carbon
4
5
6
Dihydroxyacetone phosphate
Glyceraldehyde 3-phosphate
triose phosphate isomerase

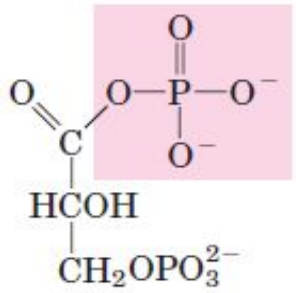
Основной этап

6



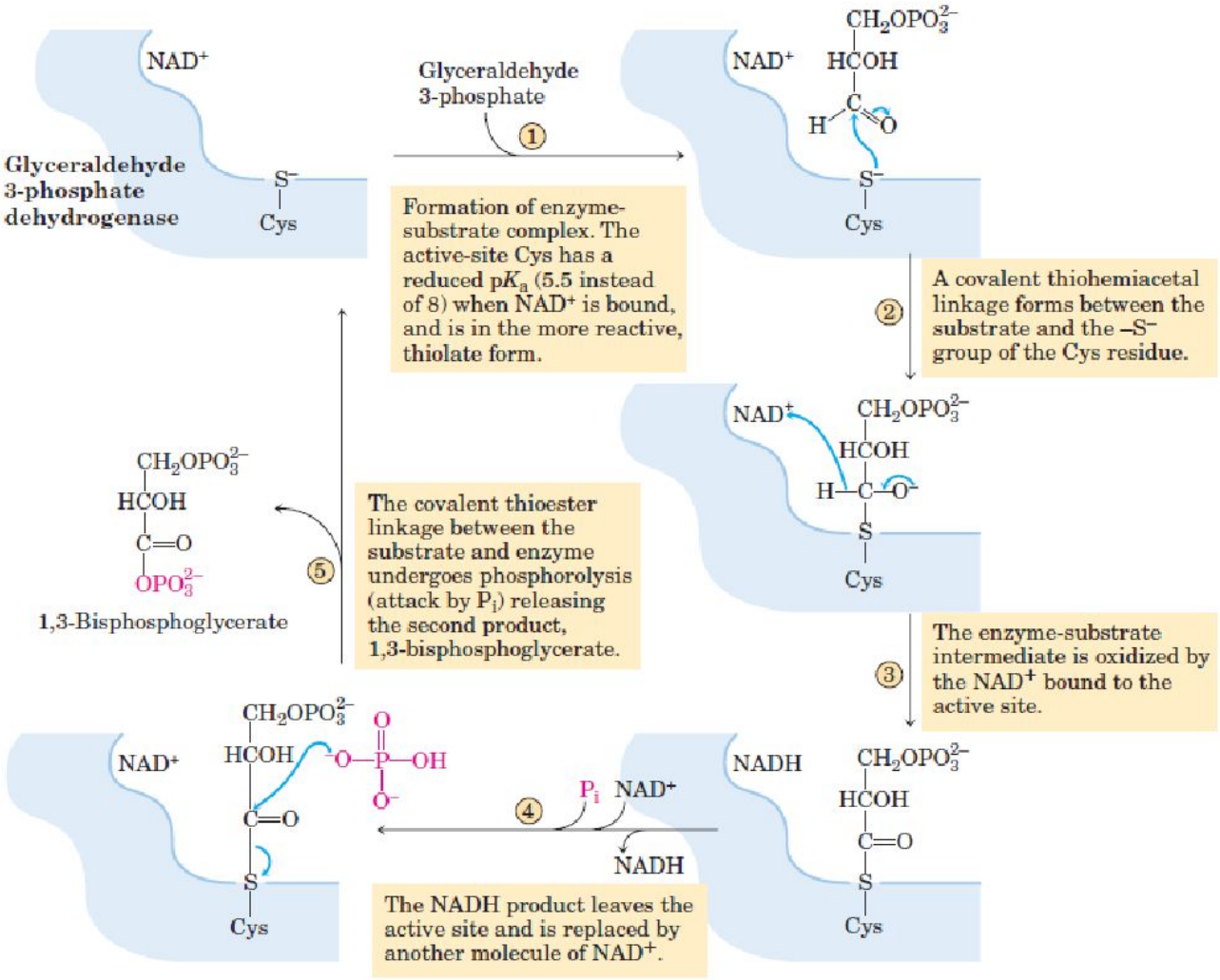
Glyceraldehyde 3-phosphate

Inorganic phosphate



1,3-Bisphosphoglycerate

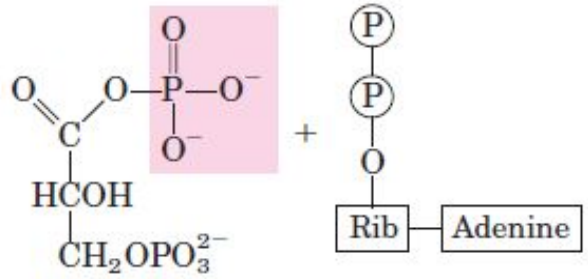
$\Delta G'^{\circ} = 6.3$ kJ/mol



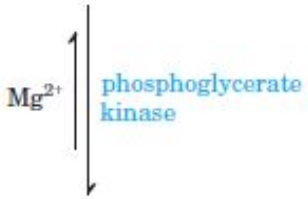
HANISM FIGURE 14–7 The glyceraldehyde 3-phosphate dehydrogenase reaction.

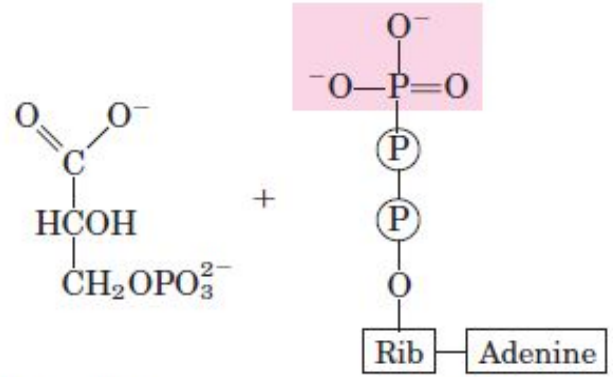
Основной этап

7



1,3-Bisphosphoglycerate ADP



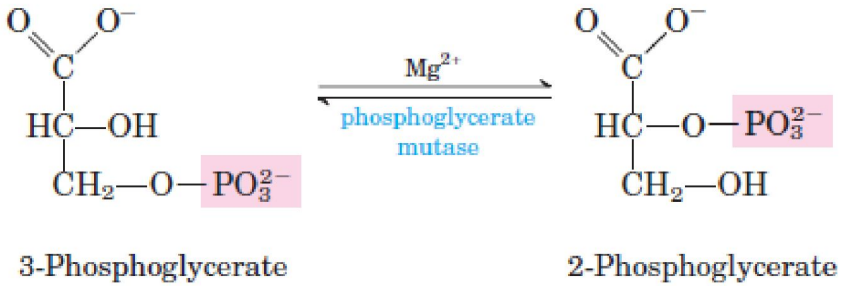


3-Phosphoglycerate ATP

$\Delta G'^{\circ} = -18.5$ kJ/mol

Основной этап

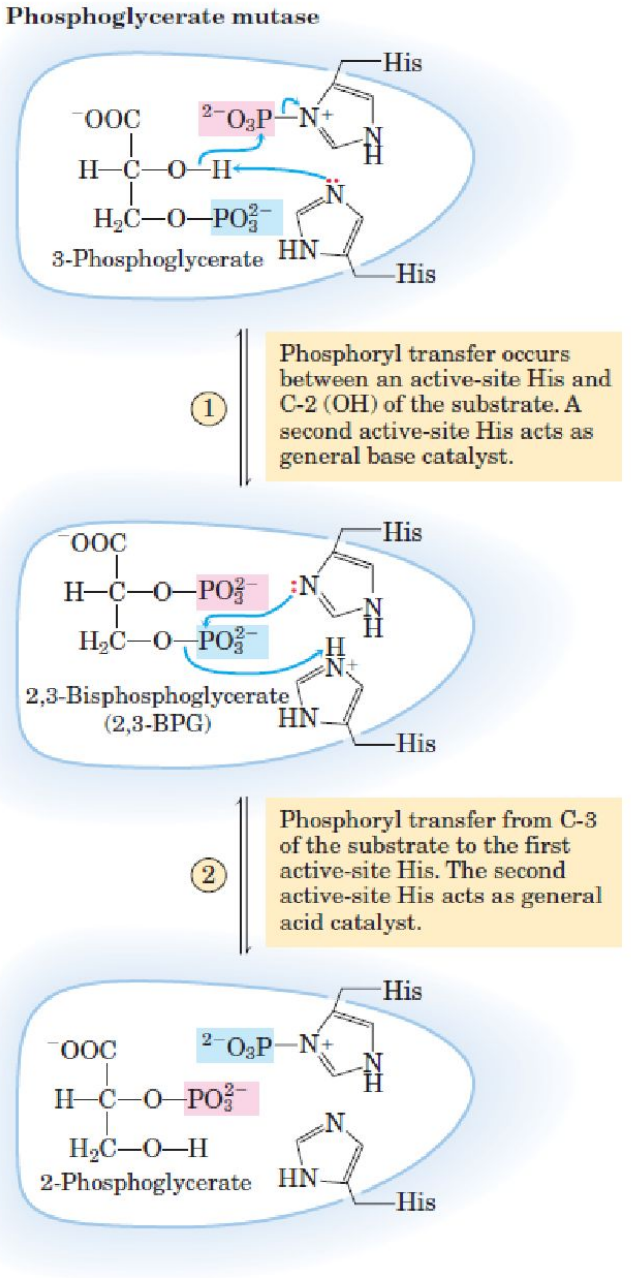
8



3-Phosphoglycerate

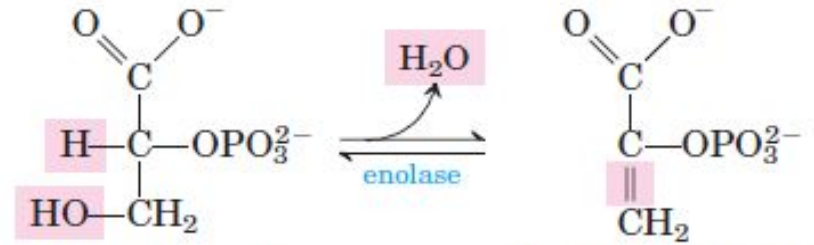
2-Phosphoglycerate

$\Delta G'^{\circ} = 4.4$ kJ/mol



Основной этап

9



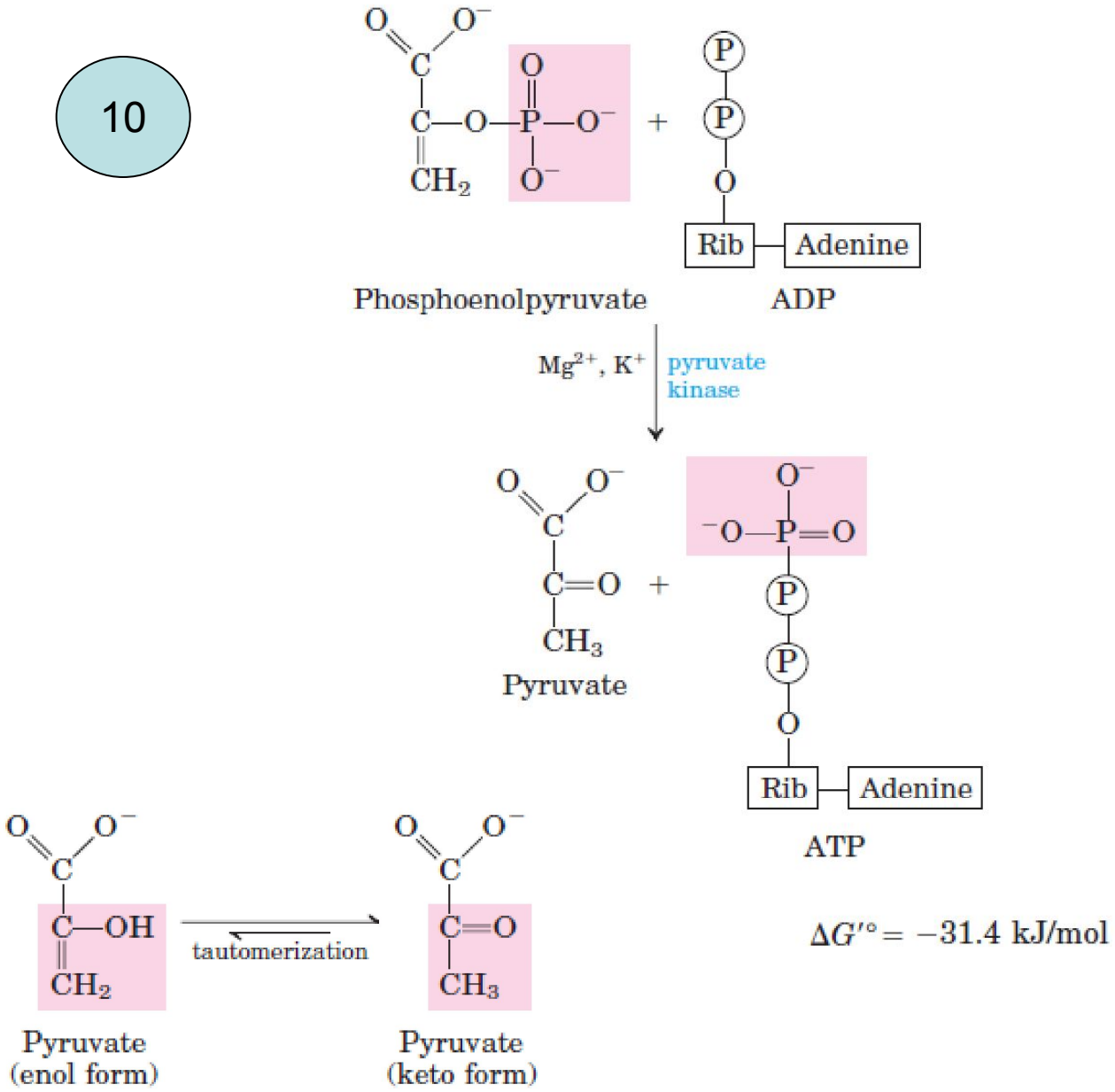
2-Phosphoglycerate

Phosphoenolpyruvate

$\Delta G'^{\circ} = 7.5$ kJ/mol

Основной этап

10



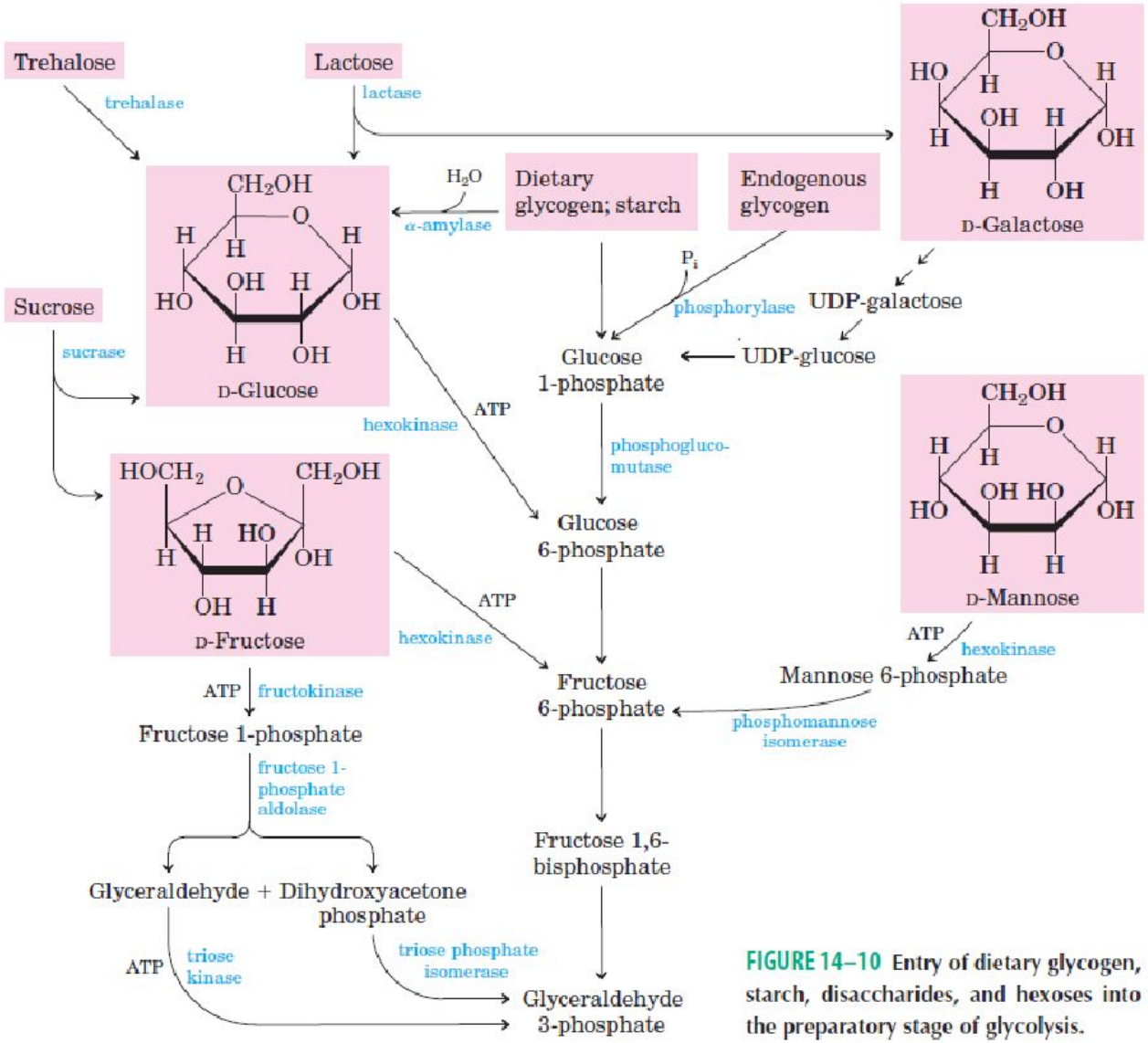
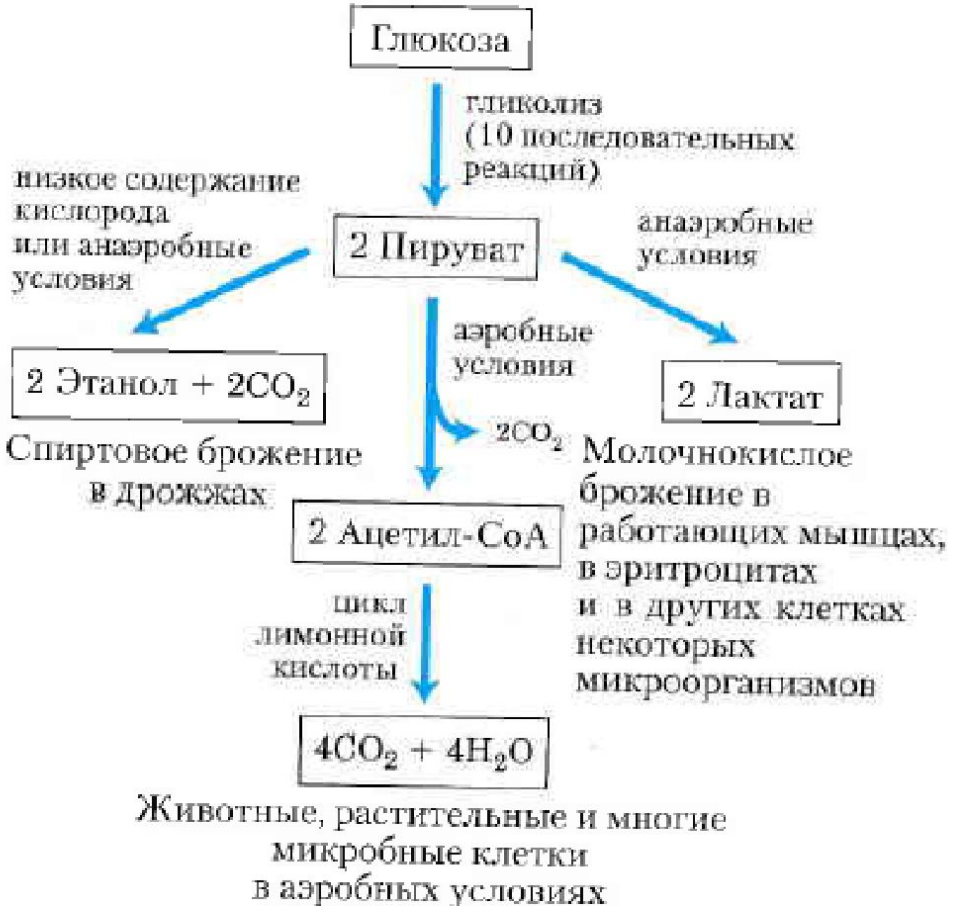
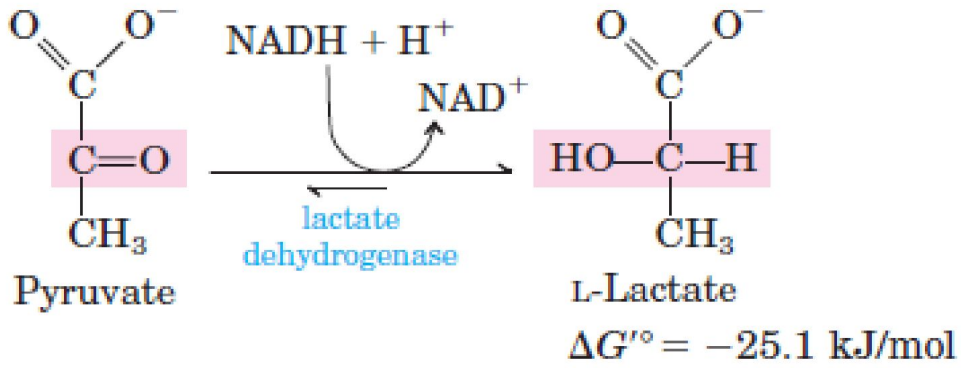


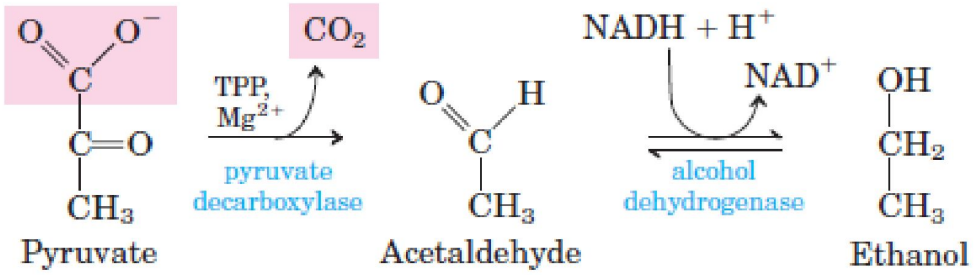
FIGURE 14–10 Entry of dietary glycogen, starch, disaccharides, and hexoses into the preparatory stage of glycolysis.


Глюкоза
гликолиз
(10 последовательных
реакций)
низкое содержание
кислорода
или анаэробные
условия
2 Пируват
анаэробные
условия
аэробные
условия
2 Этанол + 2CO2
2 Лактат
2CO2
Спиртовое брожение
в дрожжах
2 Ацетил-CoA
Молочнокислое
брожение в
работающих мышцах,
в эритроцитах
и в других клетках
некоторых
микроорганизмов
цикл
лимонной
кислоты
4CO2 + 4H2O
Животные, растительные и многие
микробные клетки
в аэробных условиях

Молочнокислое брожение



Спиртовое брожение



Ацетобутановое брожение *Clostridium*

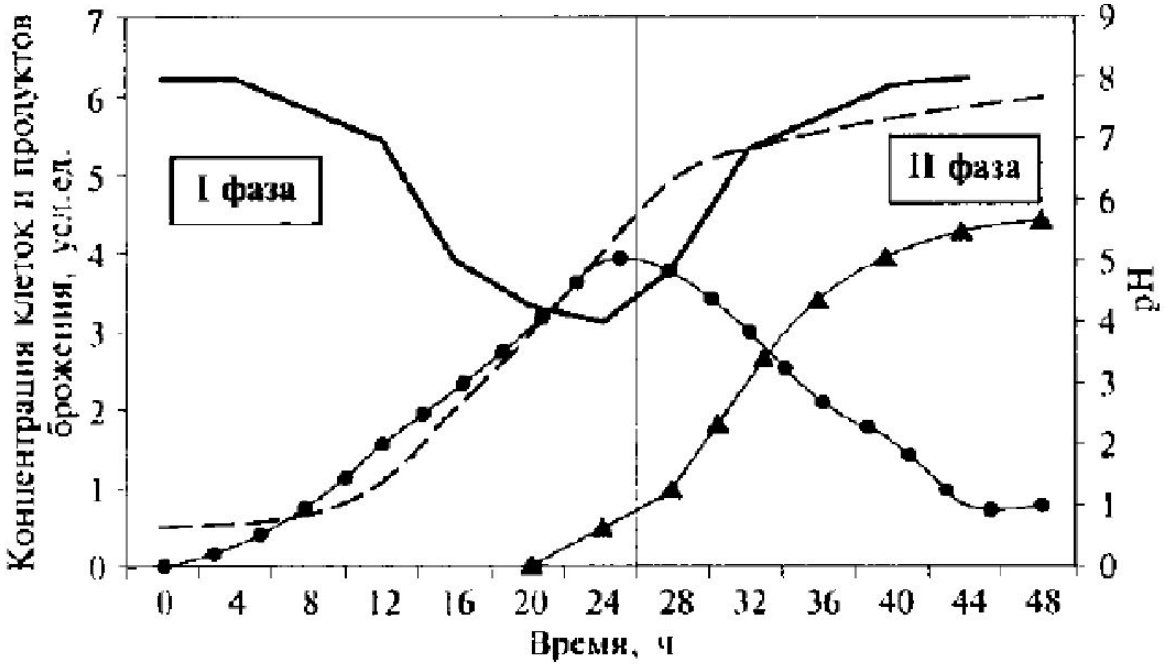
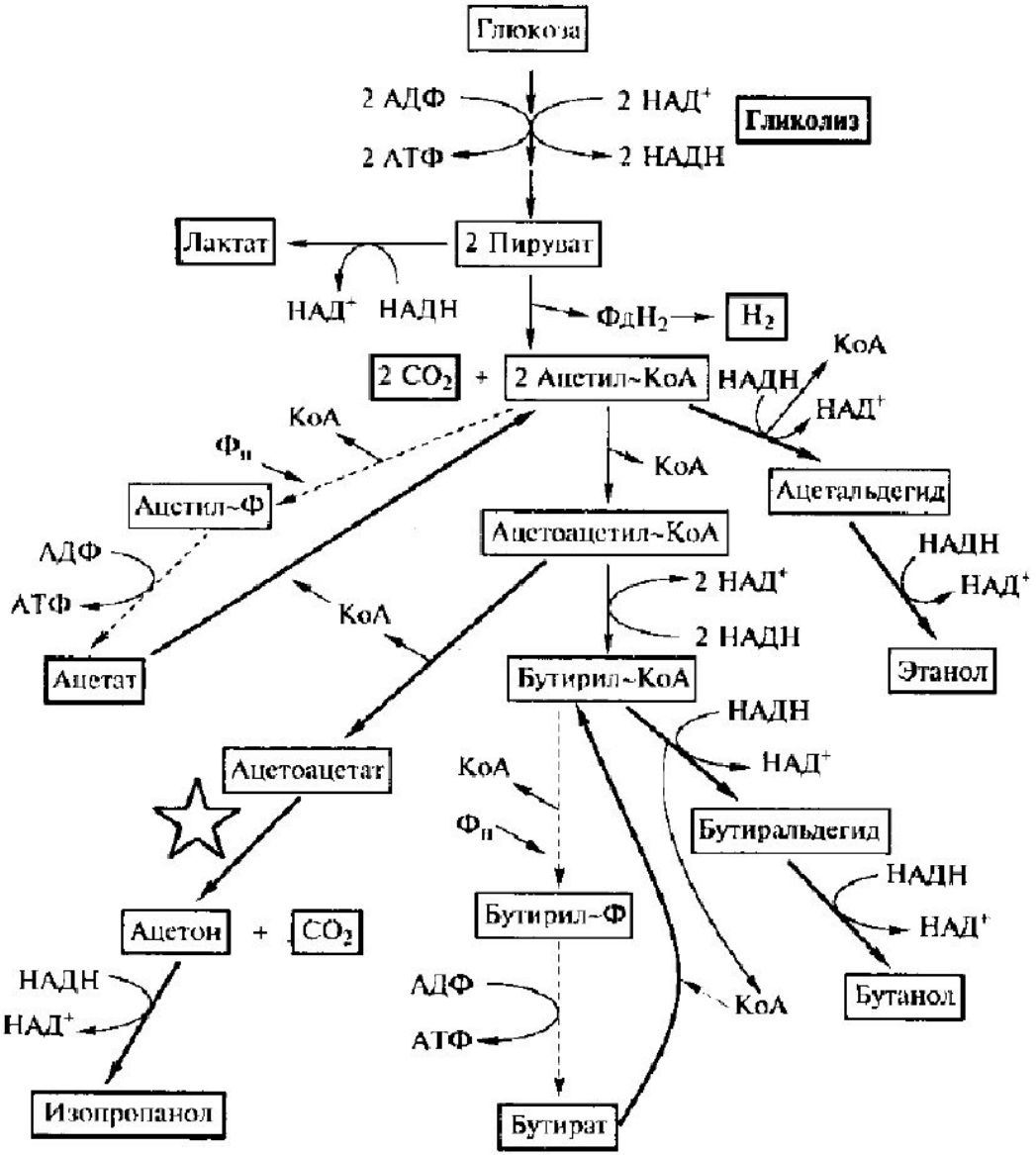
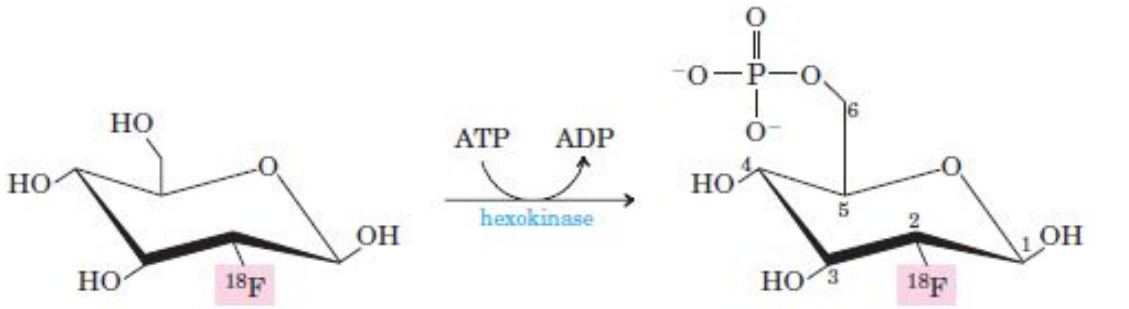


Рис. 95. Двухфазное маслянокислое и ацетонобутиловое брожение клостридий (— — — биомасса; -▲-▲- — нейтральные продукты; -●-●- — кислоты; ——— — pH)

Ацетобутановое брожение *Clostridium*

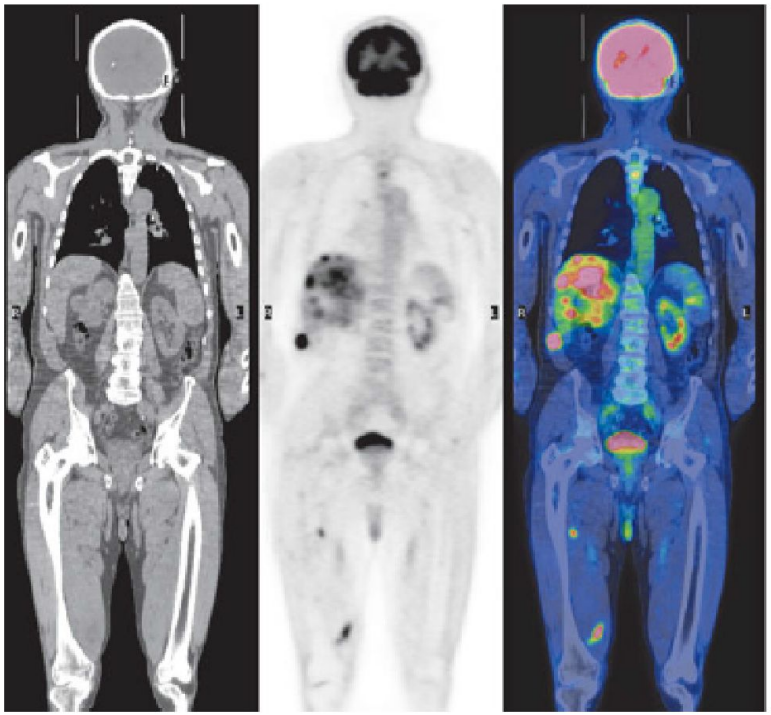




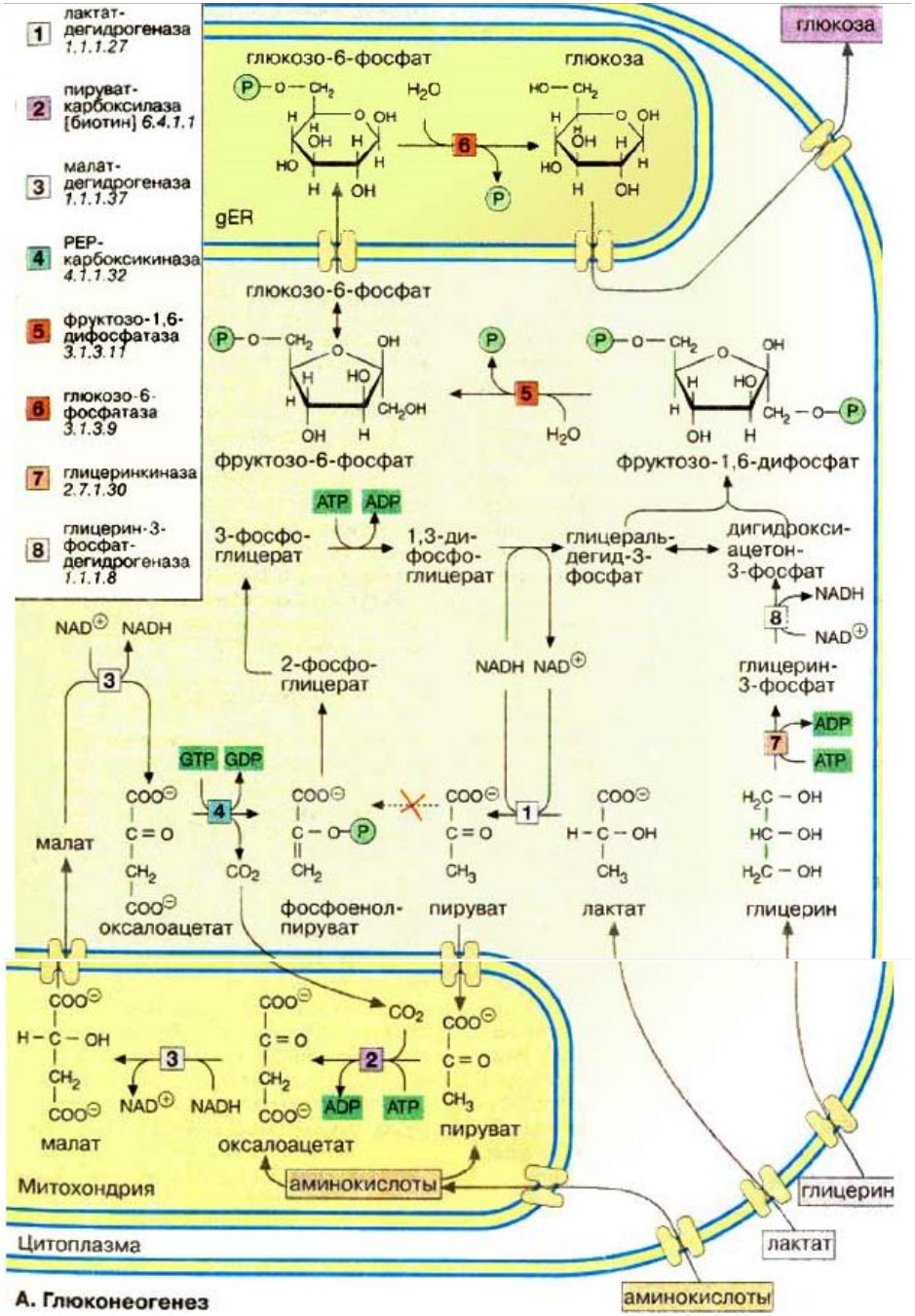
[18F]2-Fluoro-2-deoxyglucose (FdG)

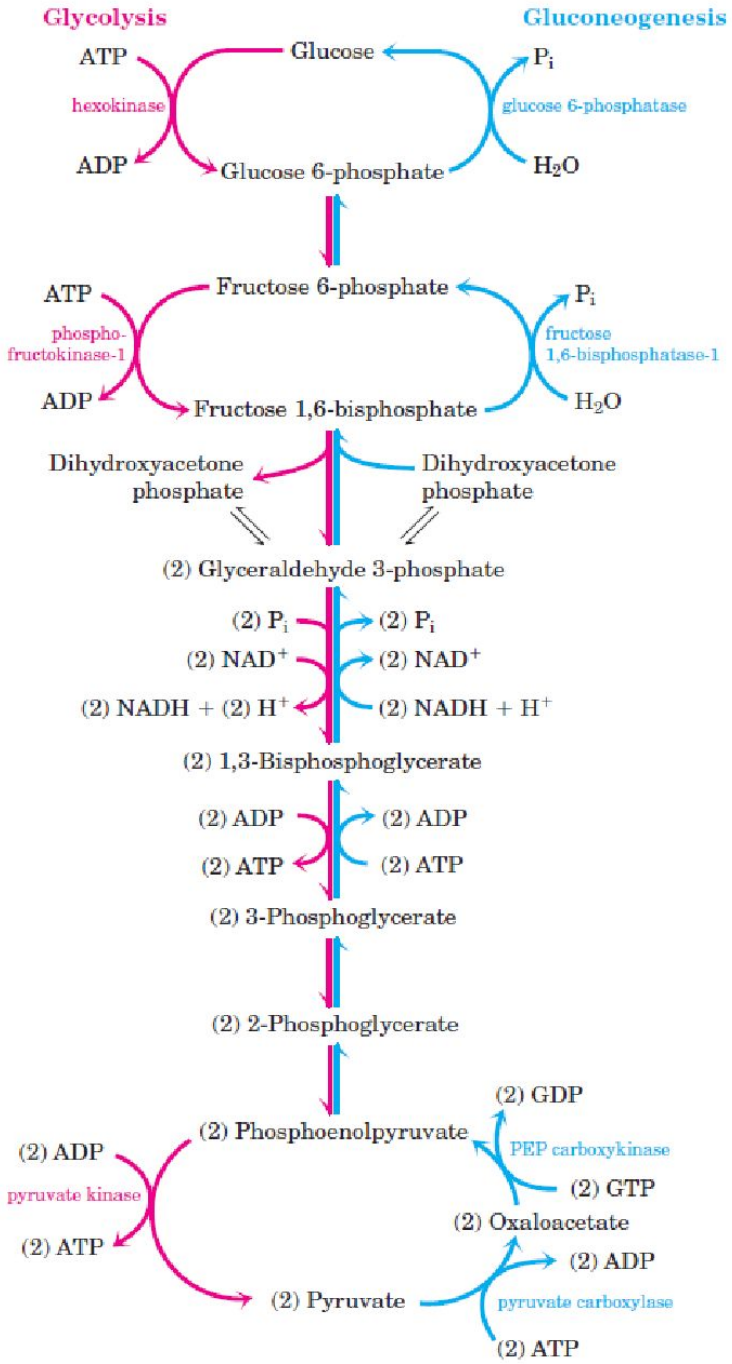
[18F]6-Phospho-2-fluoro-2-deoxyglucose (6-Phospho-FdG)

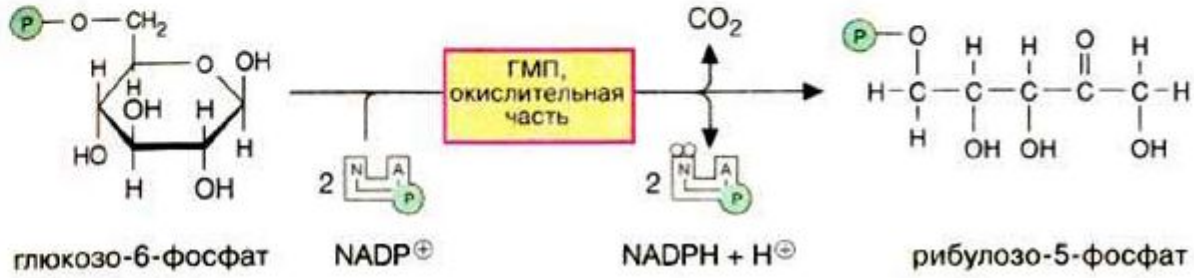
FIGURE 2 Phosphorylation of ^{18}F-labeled 2-fluoro-2-deoxyglucose by hexokinase traps the FdG in cells (as 6-phospho-FdG), where its presence can be detected by positron emission from ^{18}F.



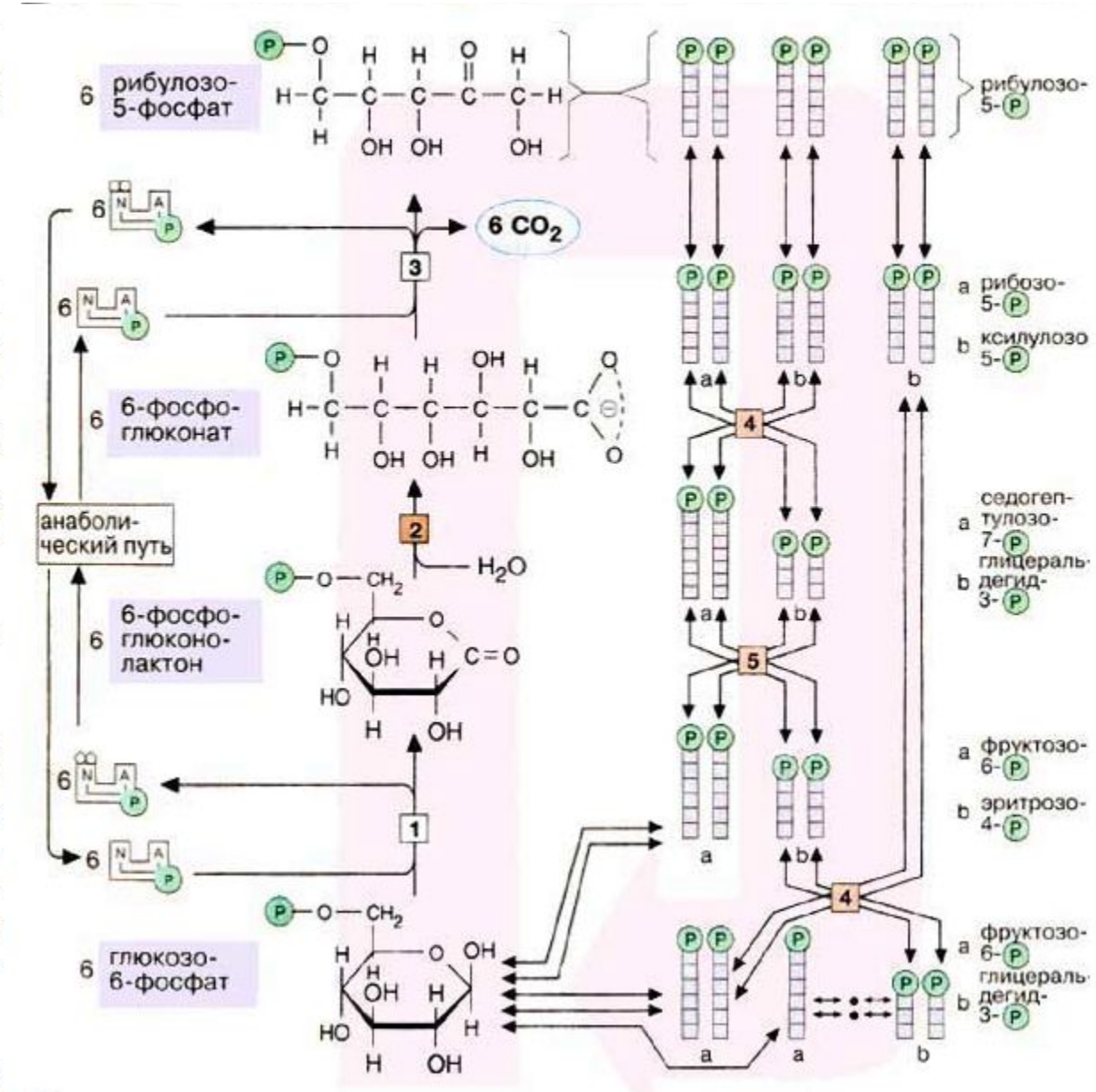
Глюконеогенез

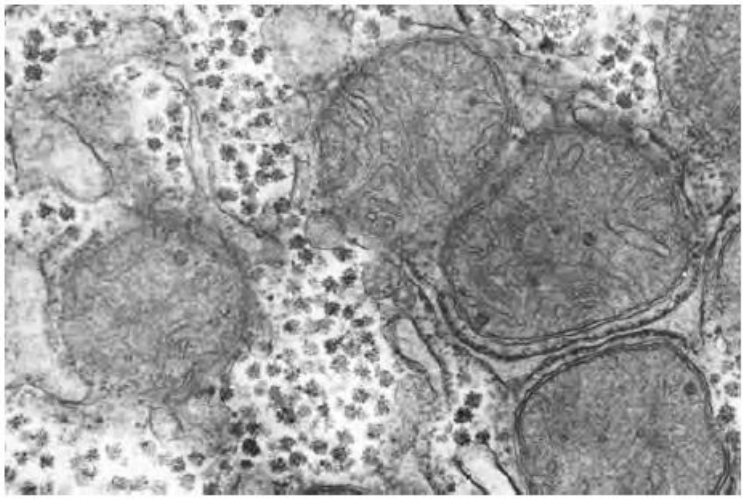


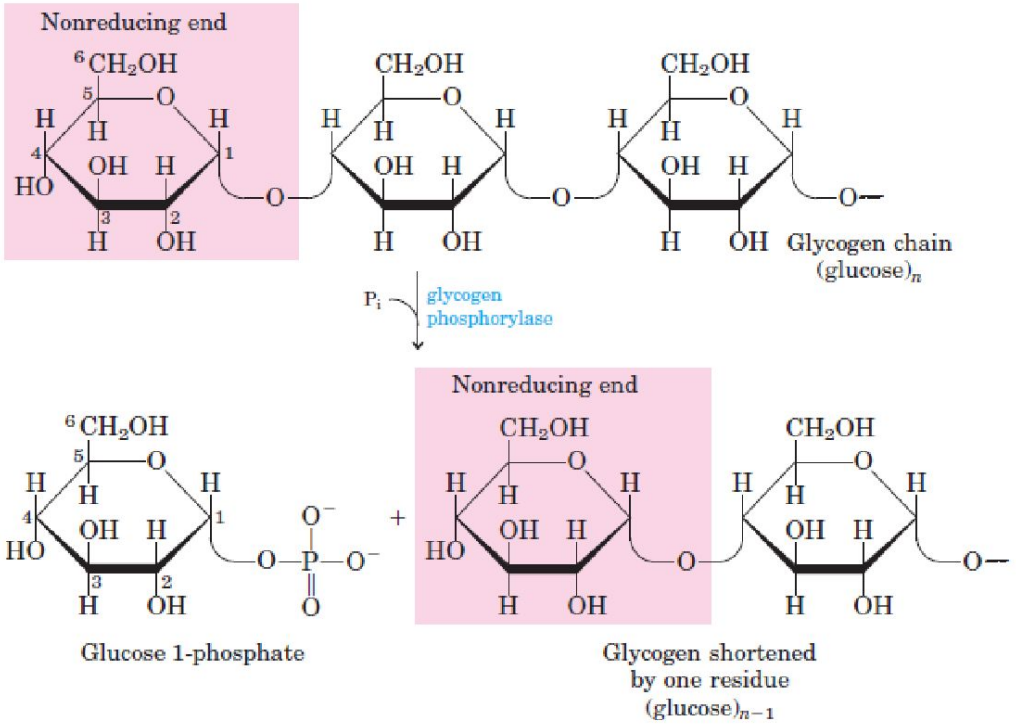

Glycolysis
Gluconeogenesis
ATP
Glucose
P_i
hexokinase
glucose 6-phosphatase
ADP
Glucose 6-phosphate
H_2O
ATP
Fructose 6-phosphate
P_i
phospho-fructokinase-1
fructose 1,6-bisphosphatase-1
ADP
Fructose 1,6-bisphosphate
H_2O
Dihydroxyacetone phosphate
Dihydroxyacetone phosphate
(2) Glyceraldehyde 3-phosphate
(2) P_i
(2) P_i
(2) NAD^+
(2) NAD^+
(2) NADH + (2) H^+
(2) NADH + H^+
(2) 1,3-Bisphosphoglycerate
(2) ADP
(2) ADP
(2) ATP
(2) ATP
(2) 3-Phosphoglycerate
(2) 2-Phosphoglycerate
(2) Phosphoenolpyruvate
(2) GDP
PEP carboxykinase
(2) GTP
(2) ADP
pyruvate kinase
(2) ATP
(2) Oxaloacetate
(2) ADP
(2) Pyruvate
pyruvate carboxylase
(2) ATP

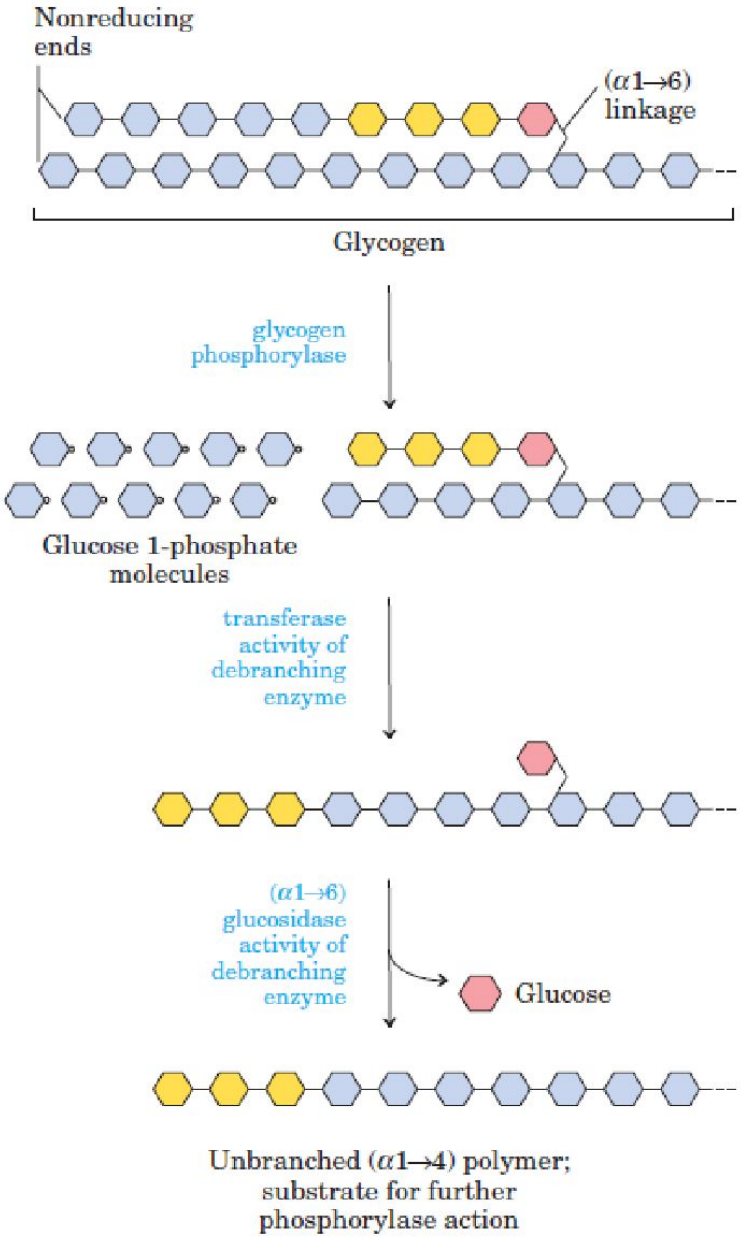


А. Гексозомонофосфатный путь: окисление


6 рибулозо-5-фосфат
рибулозо-5-P
6 NAP
6 CO2
3
6 NAP
a рибозо-5-P
b ксилулозо 5-P
6 6-фосфо-глюконат
4
анаболи-ческий путь
2
H2O
седогеп-тулозо-7-P
b глицераль-дегид-3-P
6 6-фосфо-глюконо-лактон
5
6 NAP
a фруктозо-6-P
b эритрозо-4-P
1
6 NAP
4
6 глюкозо-6-фосфат
a фруктозо-6-P
b глицераль-дегид-3-P




Nonreducing end
Glycogen chain
(glucose)$_n$
P$_i$
glycogen
phosphorylase
Nonreducing end
Glucose 1-phosphate
Glycogen shortened
by one residue
(glucose)$_{n-1}$


Nonreducing ends
(α1→6) linkage
Glycogen
glycogen phosphorylase
Glucose 1-phosphate molecules
transferase activity of debranching enzyme
(α1→6) glucosidase activity of debranching enzyme
Glucose
Unbranched (α1→4) polymer; substrate for further phosphorylase action