ISLAMIC UNIVERSITY

College of Medical Technology

Department of Medical Laboratory Technology

GlycoLysis

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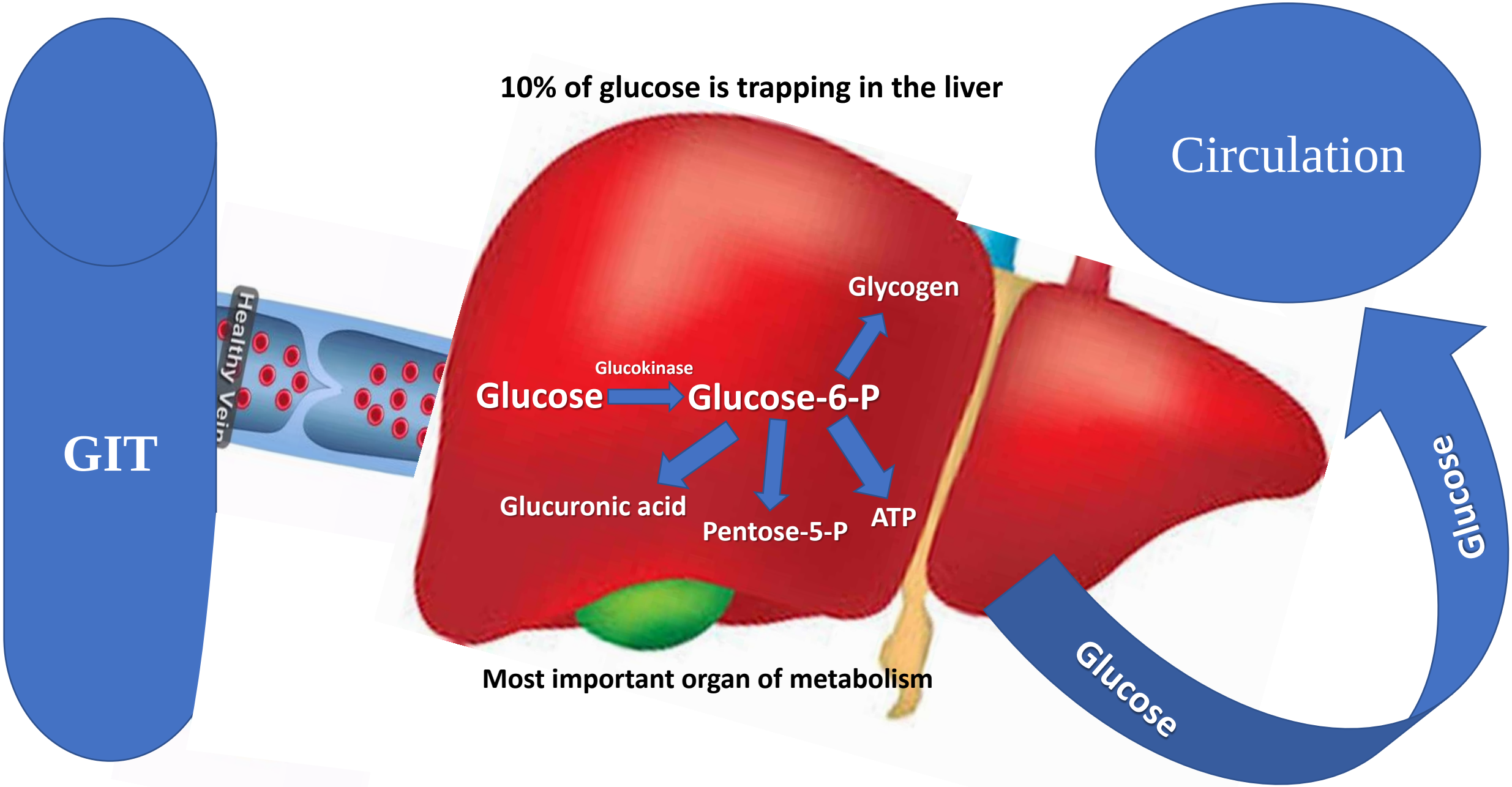
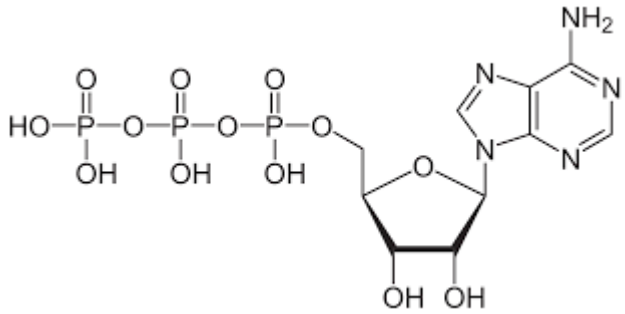
Ph.D. clinical biochemistry


10% of glucose is trapping in the liver
Circulation
GIT
Healthy Vein
Glycogen
Glucokinase
Glucose
Glucose-6-P
Glucuronic acid
Pentose-5-P
ATP
Glucose
Glucose
Most important organ of metabolism

GLYCOLYSIS: Pathway include 10 steps for convert glucose in two molecules of pyruvate and produce energy.

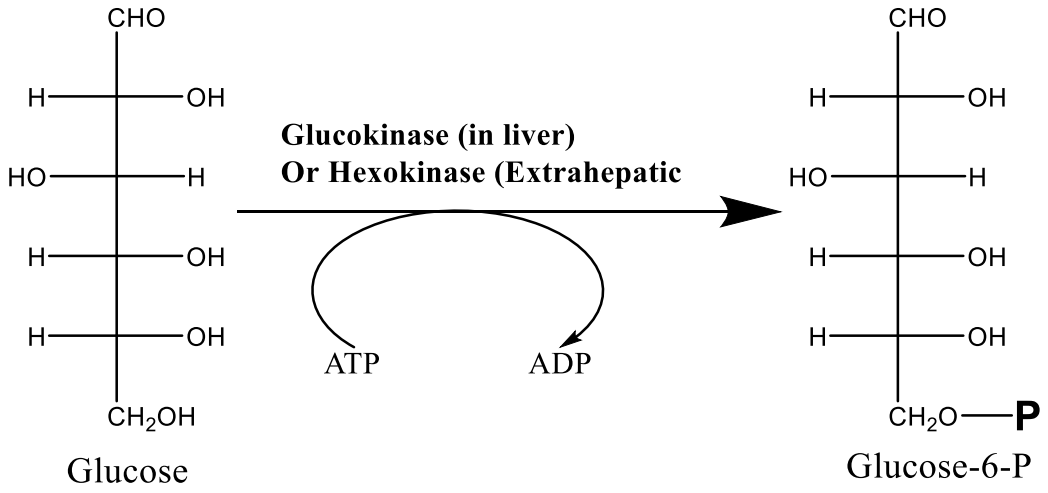
OCCUR in the cytoplasm of cells



Adenosine triphosphate (ATP)

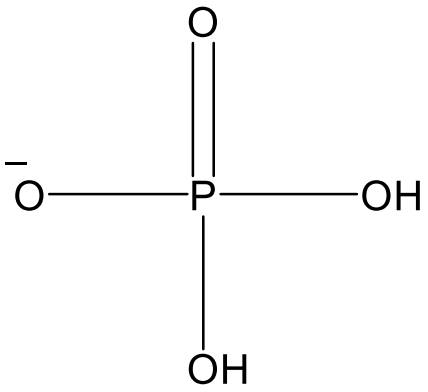
**Steps of Glycolysis

STEP 1: Phosphorylation of glucose



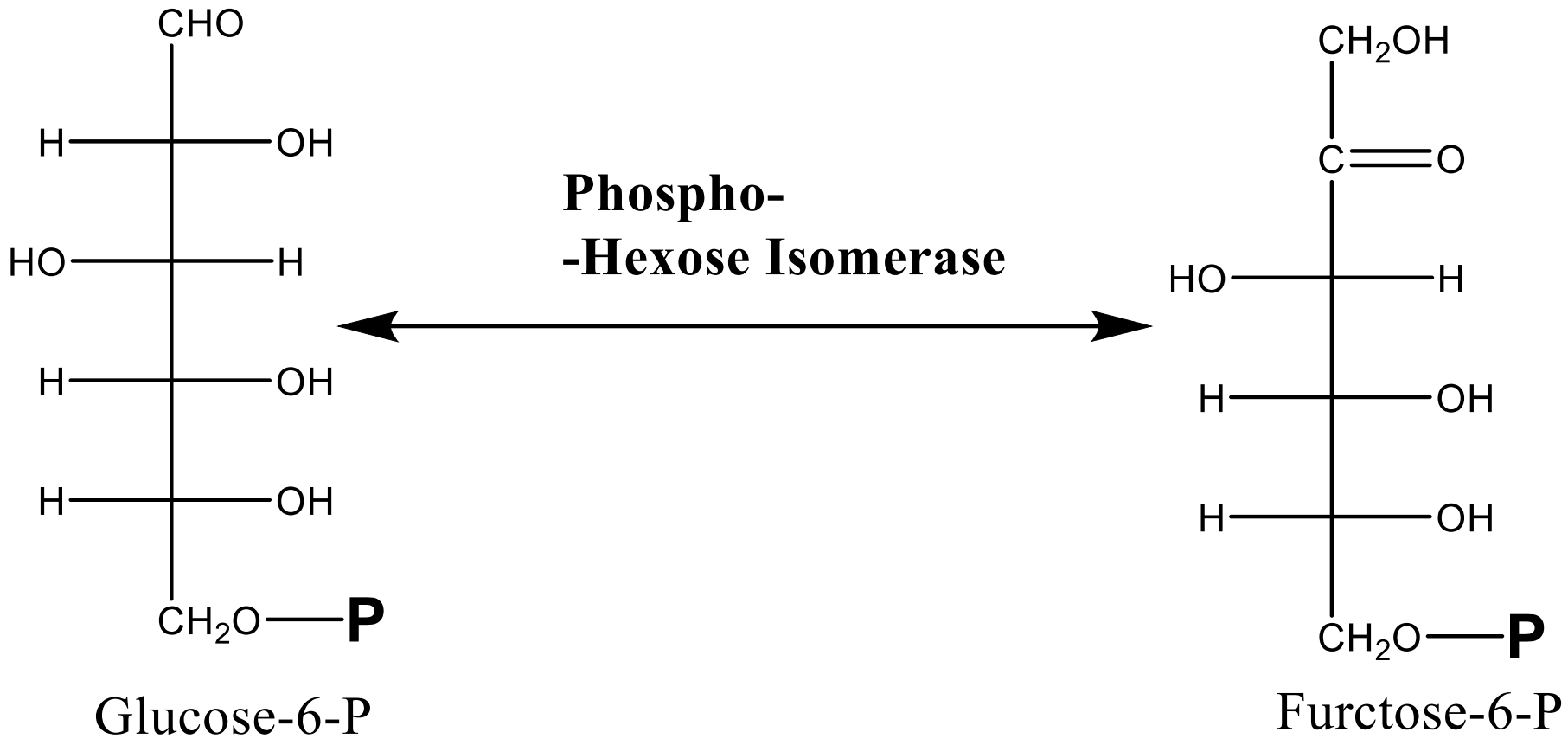
Glucose

Glucose-6-P



Phosphate group

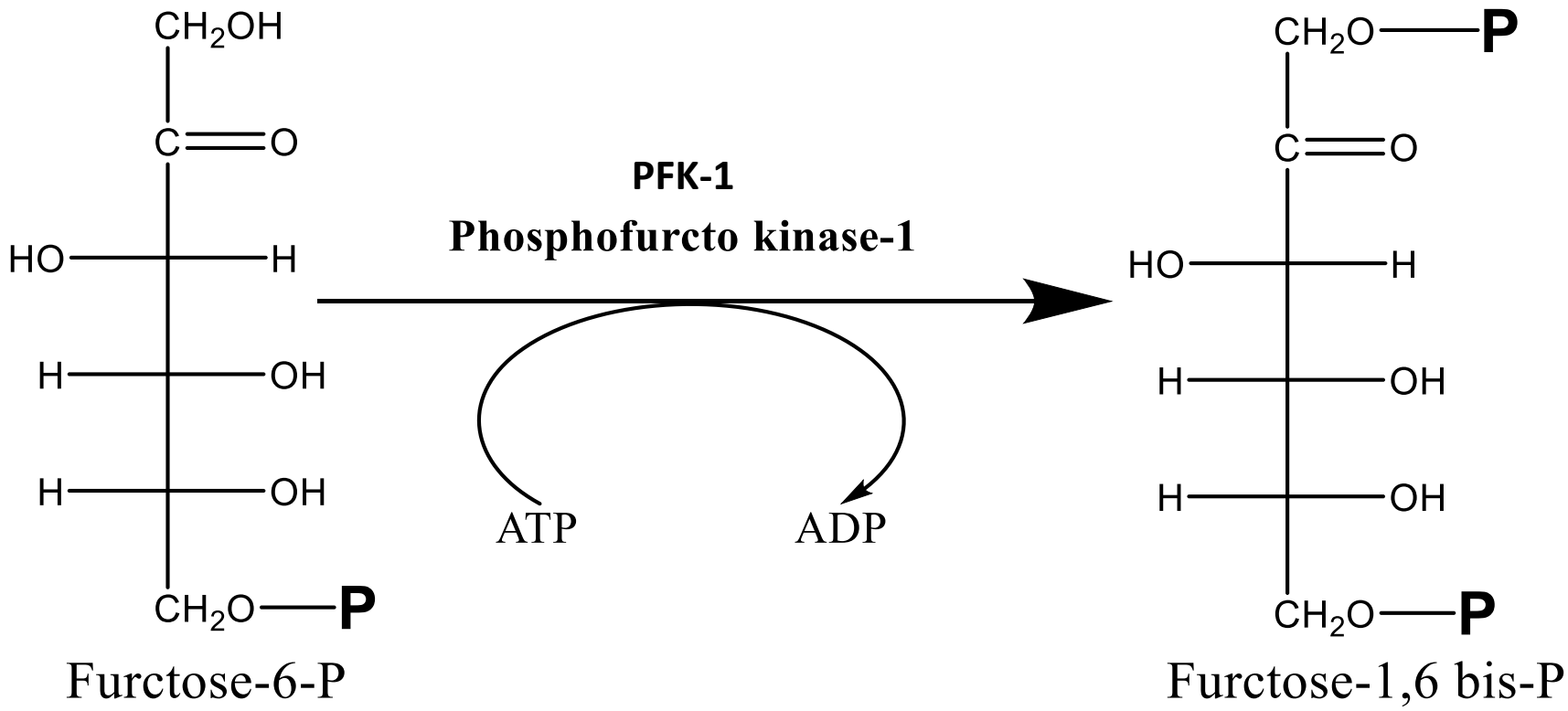
STEP 2: ISOMERIZATION



Glucose-6-P

Furctose-6-P

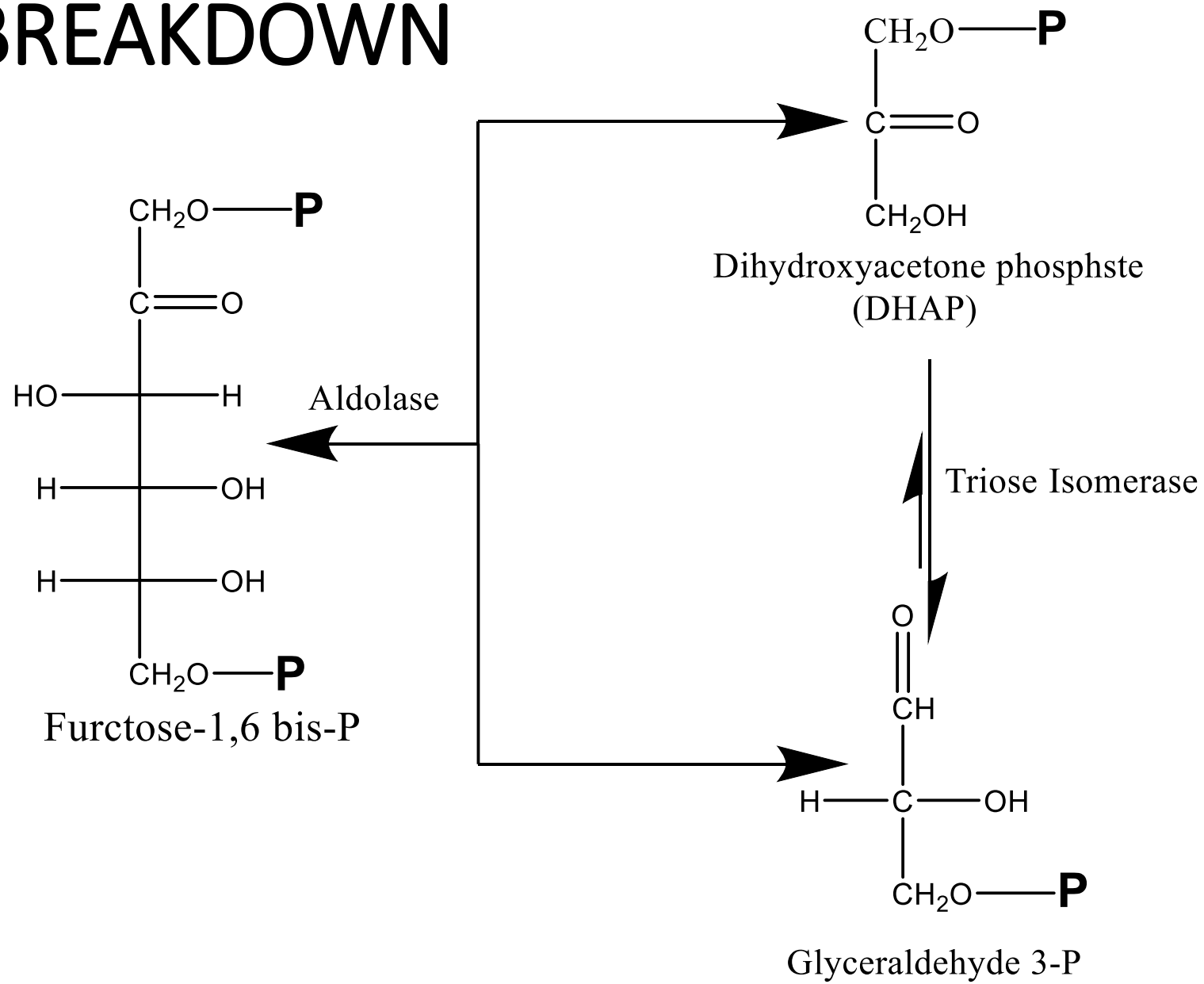
STEP 3: PHOSPHORYLATION



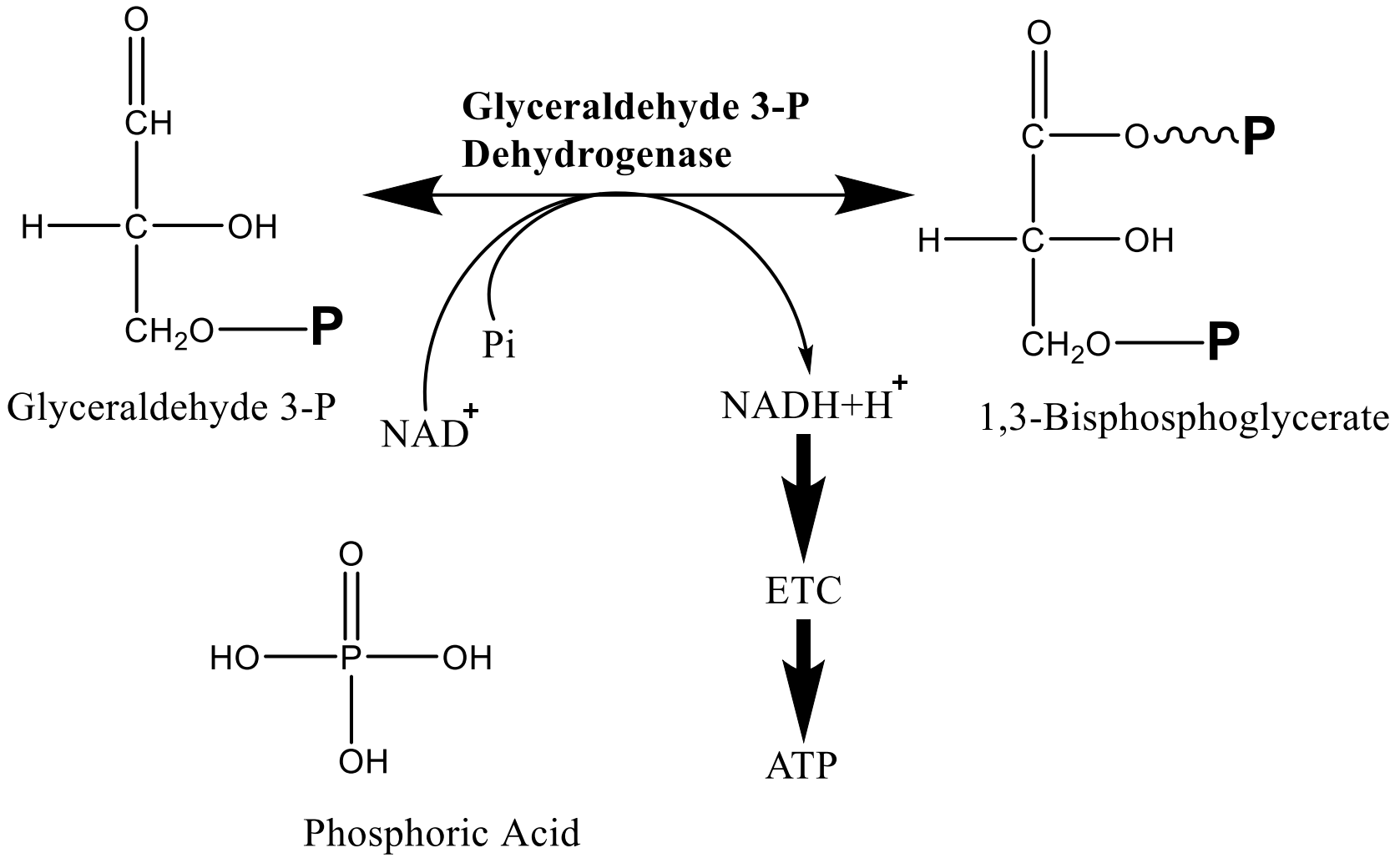
Furctose-6-P

Furctose-1,6 bis-P

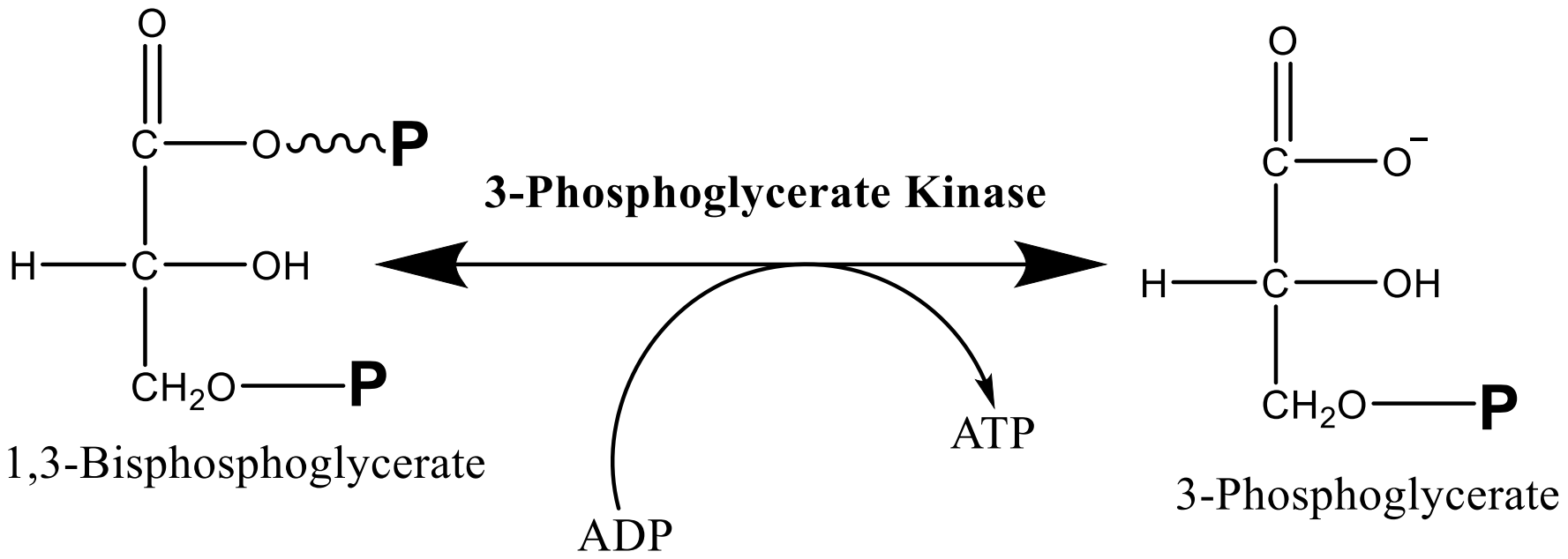
STEP 4: BREAKDOWN



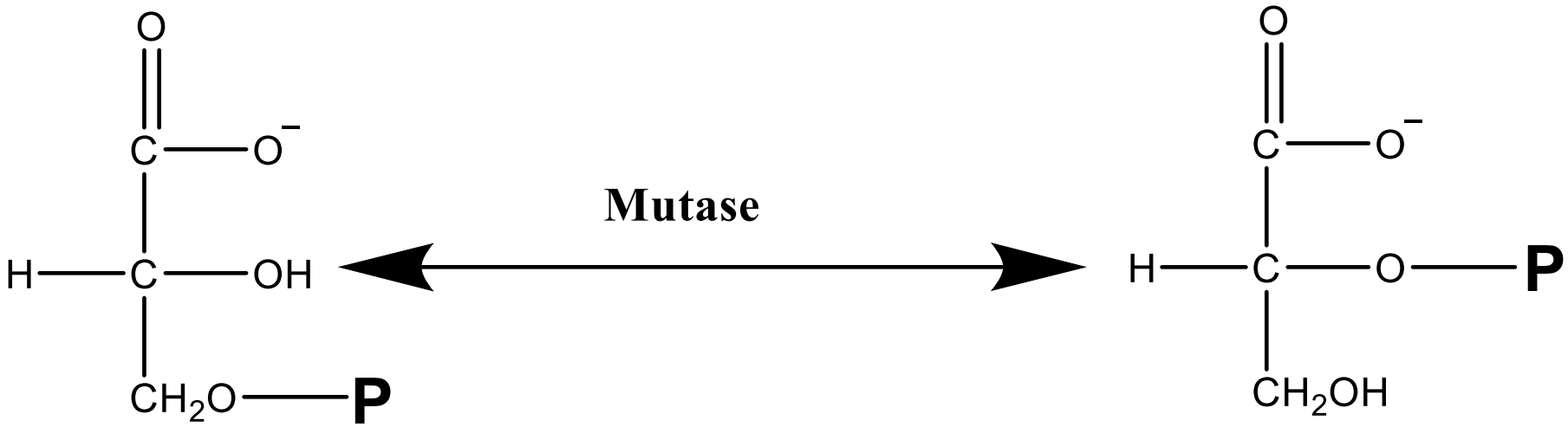
STEP 6: Oxidative-Phosphorylation



STEP 7: Substrate level-phosphorylation



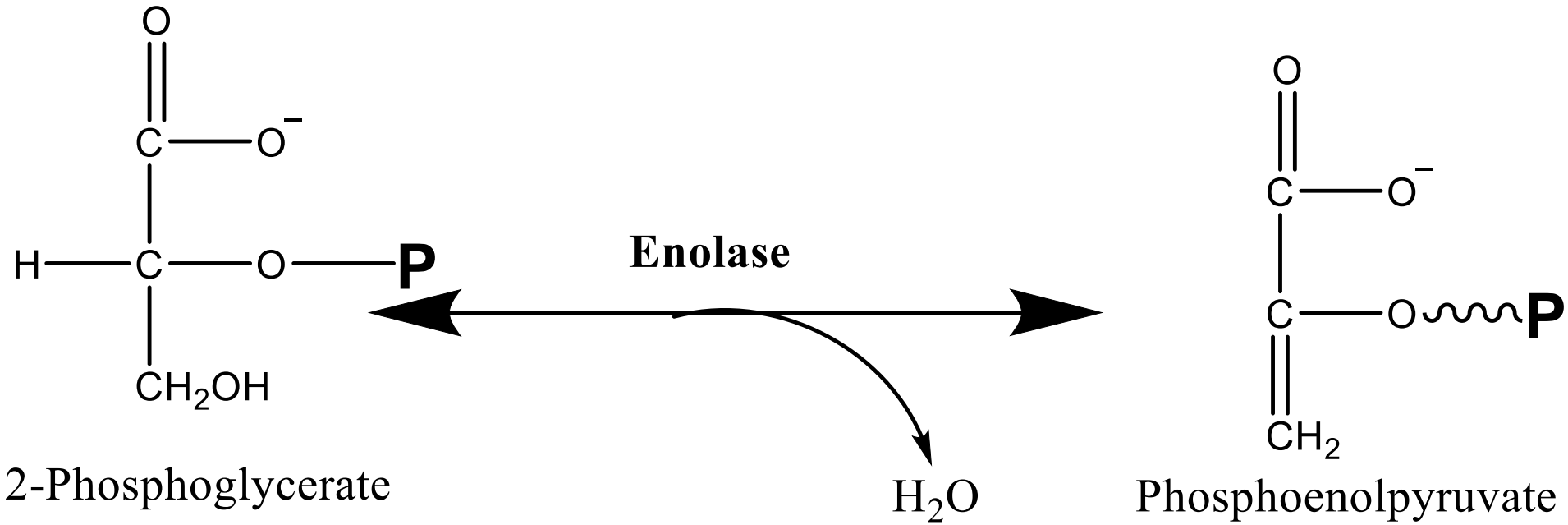
STEP 8: Transfer phosphate group From 3 to 2



3-Phosphoglycerate

2-Phosphoglycerate

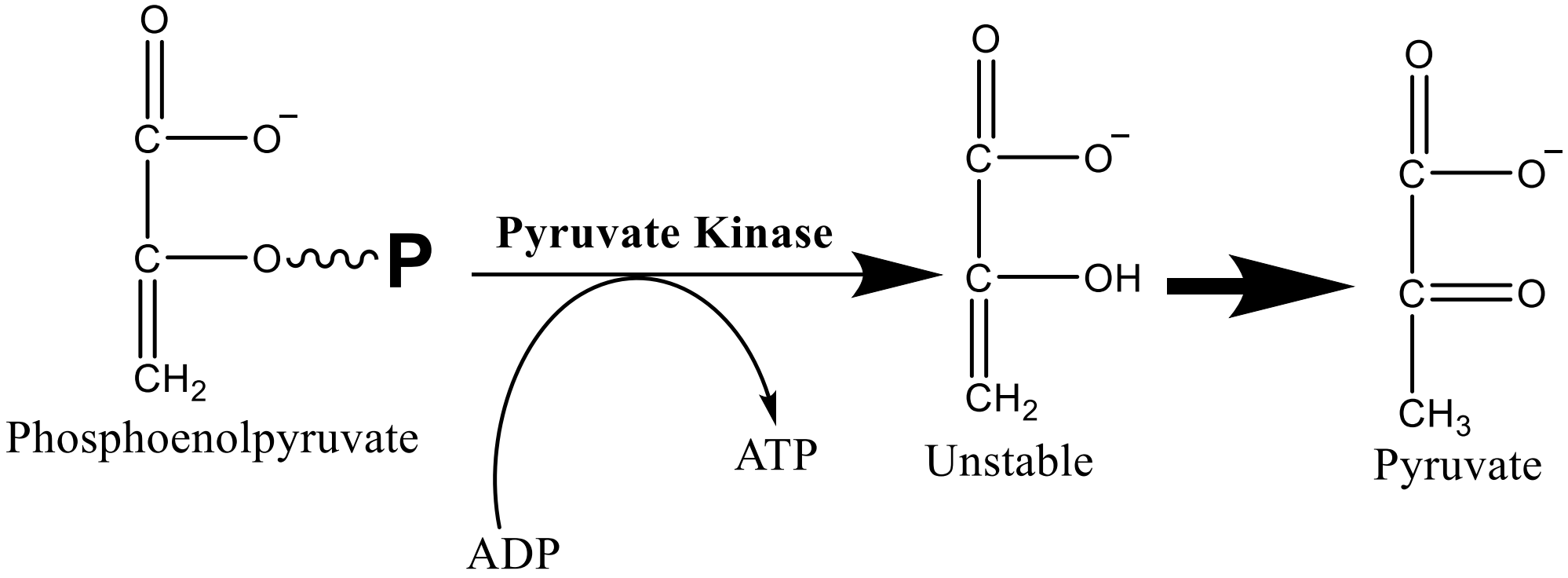
STEP 9: DEHYDRATION



2-Phosphoglycerate

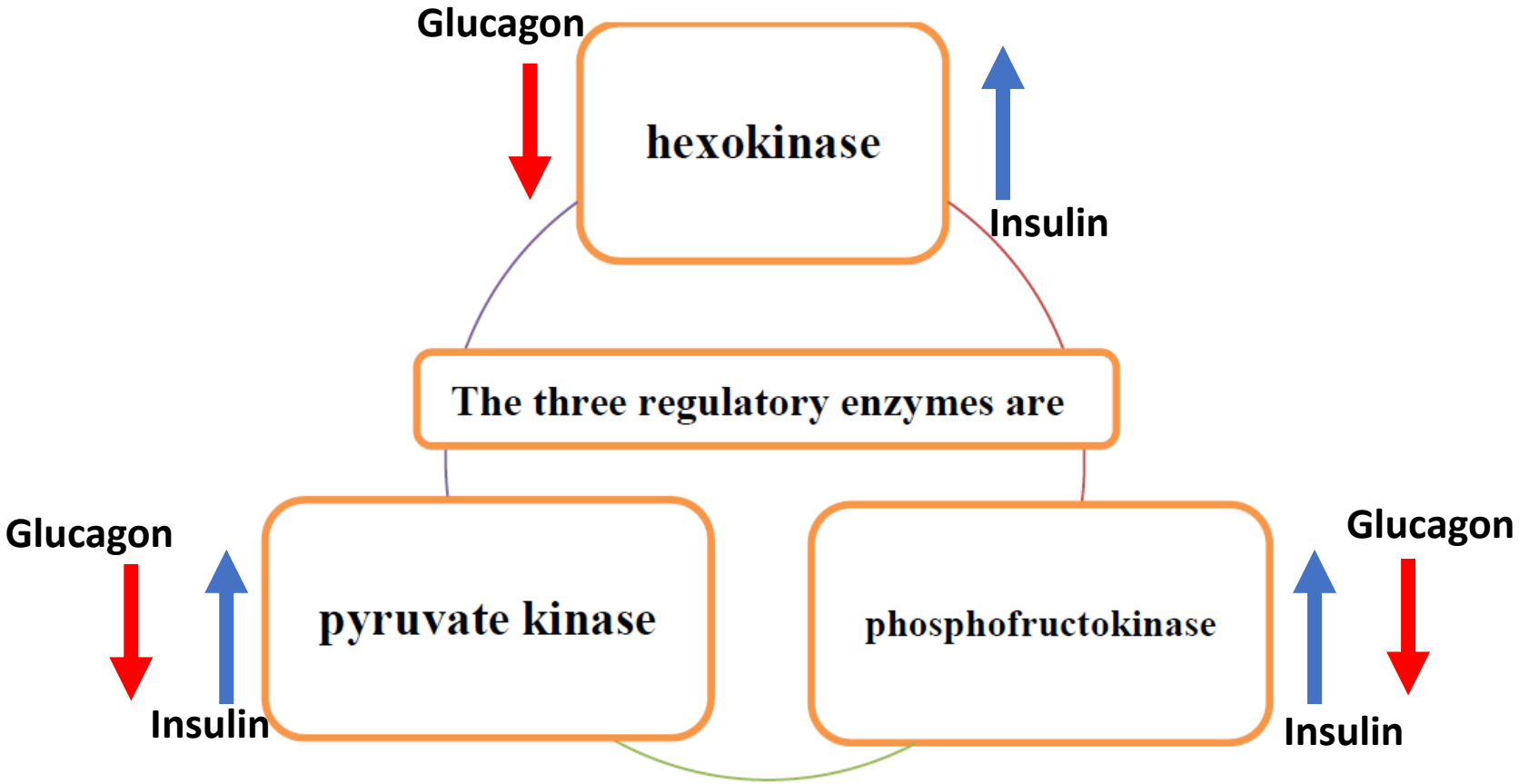
Phosphoenolpyruvate

STEP 10: Substrate level-phosphorylation



Regulation of Glycolysis

Regulation of Glycolysis is done by ***slowing down*** or ***speeding up*** steps in the glycolytic pathway. The regulation is accomplished by the enzymes that are involved, that are inhibiting or activating enzymes.



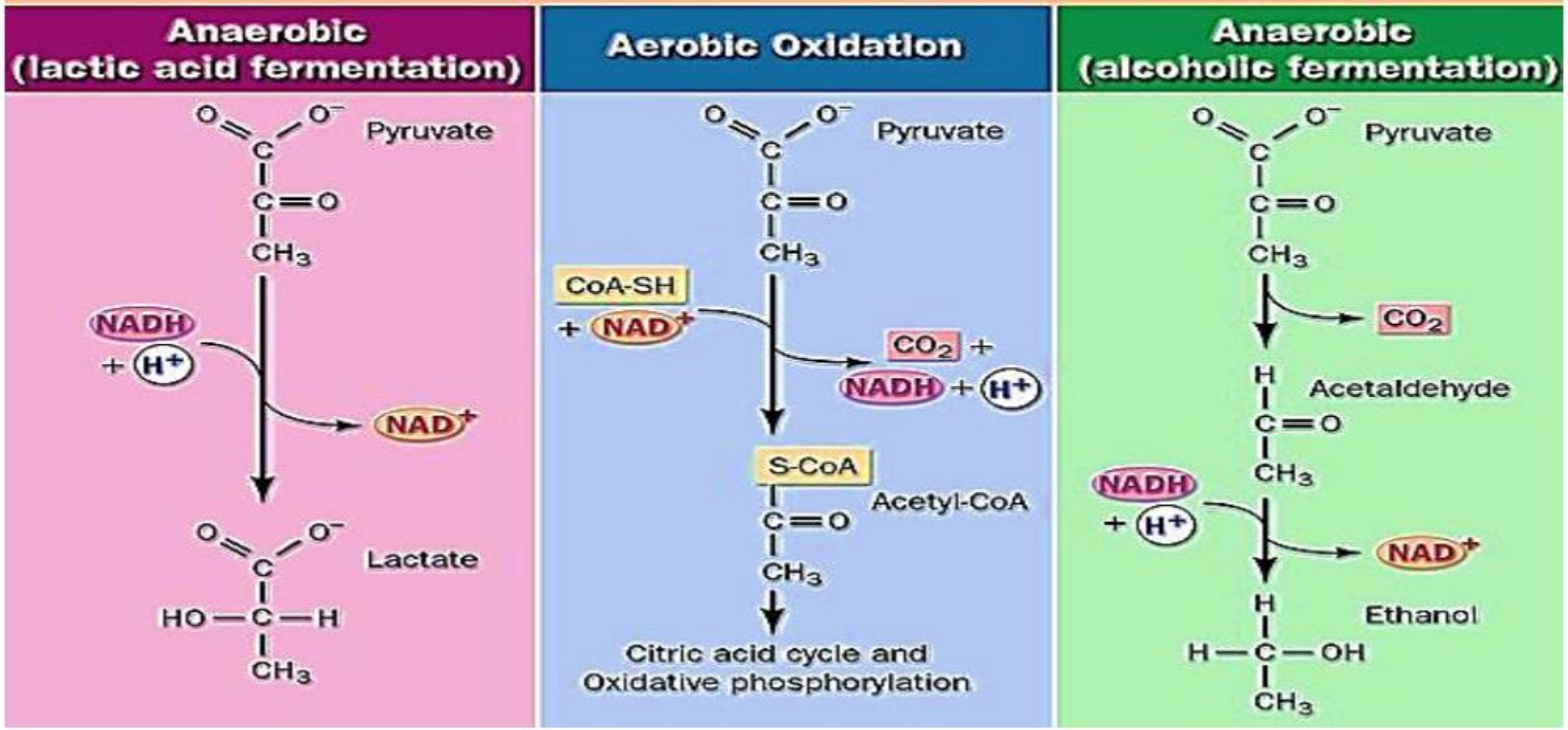
Hexokinase enzyme is inhibited by glucose-6-phosphate. The product of the first reaction inhibits the first reaction og glycolysis. Glucose and ATP are not committed to glycolysis unless the need of glycolysis.

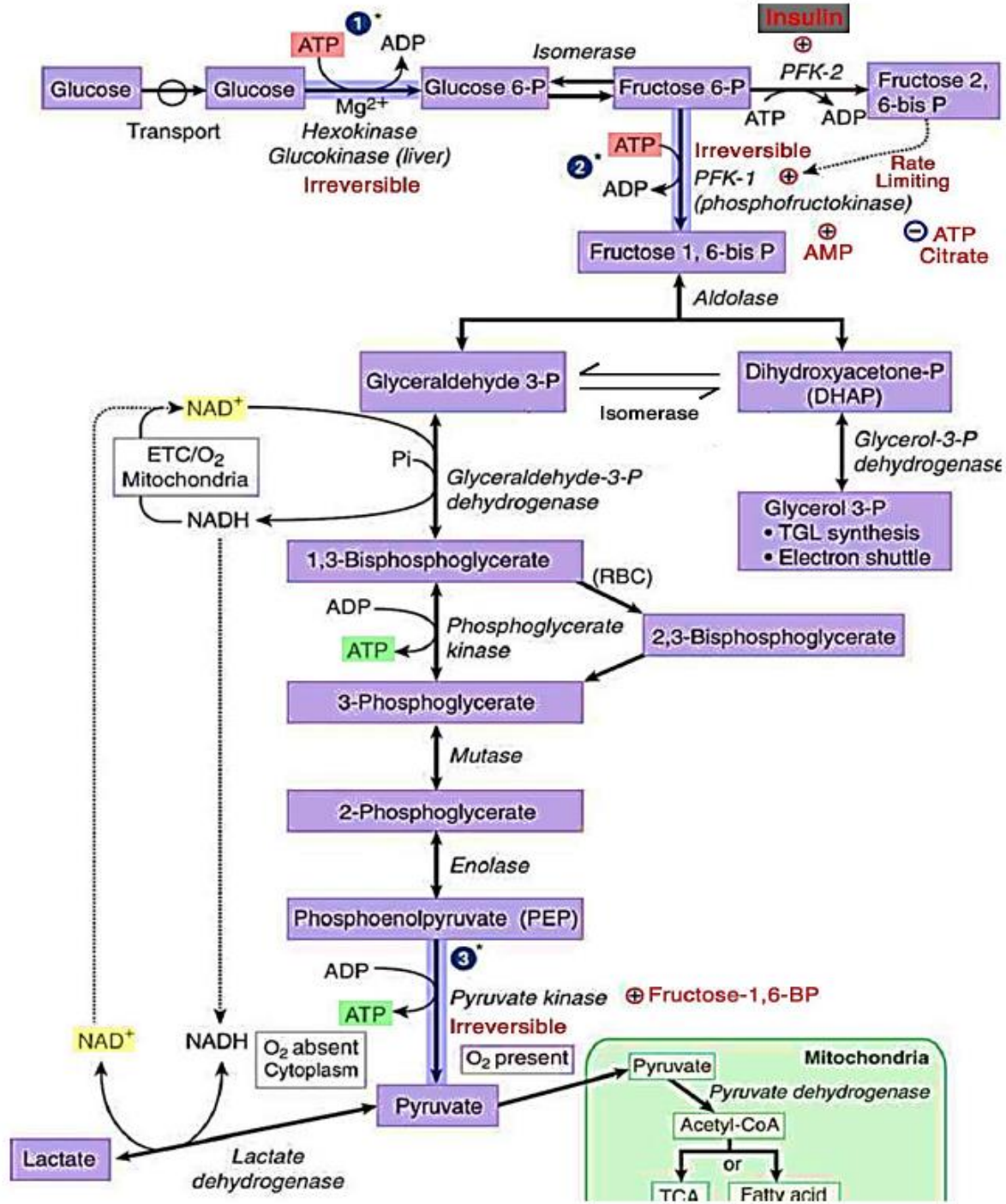
Phosphofructokinase: This is the major control point for glycolysis process. The PFK is inhibited by ATP and citrate and is activated by AMP, ADP and fructose 2,6-bisphosphate

Pyruvate Kinase is inhibited by acteyl-CoA, ATP and alanine. This enzyme is activated by fructose 1,6-bisphosphate. The enzyme is inhibited by cAMP dependent phosphorylation.

Aerobic respiration	Anaerobic respiration
1) It takes place in the presence of oxygen.	1) It takes place in the absence of oxygen.
2) In aerobic respiration, complete oxidation of glucose takes place.	2) In anaerobic respiration, the glucose molecule is incompletely oxidised.
3) End products are CO_2 and water.	3) End products are either ethyl alcohol or lactic acid and CO_2.
4) Lot of energy is liberated (38 ATP).	4) Relatively small energy is liberated (2 ATP).
5) It occurs in plant's and animal's cells.	5) Occurs in many anaerobic bacteria and human muscle cells.
6) $C_6H_{12}O_6 + 6O_2 \rightarrow 6\,CO_2 + 6H_2O + 686$ K.cal	6) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 56$ K.cal

Three fates of pyruvate produced by glycolysis




Insulin
ATP
ADP
Isomerase
PFK-2
Glucose
Glucose
Glucose 6-P
Fructose 6-P
Fructose 2, 6-bis P
ATP
ADP
Transport
Mg2+
Hexokinase
Glucokinase (liver)
Irreversible
ATP
Irreversible
ADP
PFK-1
(phosphofructokinase)
Rate Limiting
Fructose 1, 6-bis P
AMP
ATP
Citrate
Aldolase
Glyceraldehyde 3-P
Dihydroxyacetone-P (DHAP)
Isomerase
NAD+
ETC/O2 Mitochondria
Pi
Glyceraldehyde-3-P dehydrogenase
Glycerol-3-P dehydrogenase
NADH
Glycerol 3-P
• TGL synthesis
• Electron shuttle
1,3-Bisphosphoglycerate
(RBC)
ADP
ATP
Phosphoglycerate kinase
2,3-Bisphosphoglycerate
3-Phosphoglycerate
Mutase
2-Phosphoglycerate
Enolase
Phosphoenolpyruvate (PEP)
ADP
ATP
Pyruvate kinase
Fructose-1,6-BP
Irreversible
NAD+
NADH
O2 absent
Cytoplasm
O2 present
Mitochondria
Pyruvate
Pyruvate dehydrogenase
Acetyl-CoA
or
Pyruvate
Lactate
Lactate dehydrogenase
TCA
Fatty acid