



HEMATOPOIETIC & LYMPHATIC SYSTEM

-HACHAT BATCH-

SUBJECT : Biochemistry

LEC NO. : 1

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وَقُلْ رَبِّ زِدْنِي عِلْمًا

* There are two metabolic pathways for RBC

Glycolysis

Pentose phosphate pathway

- Aerobic → oxidation of glucose or glycogen
- **pyruvate is the end product**
- Anaerobic → which occur in cells that lack mitochondria like RBCs or in case of O₂ deprivation as in muscles during exercise
- **The lactic acid is the end product**

*Both occur in the cytosol

* Steps of glycolysis
Can be classified into
Two phases :

Phase one (investment stage)

Glucose is converted into **TWO** molecules of glyceraldehyde-3-phosphate

*بندفع فيها 2 ATP عن طريق :

A) Step 1



B) Step 3



Phase two (Yield stage)

TWO molecules of glyceraldehyde-3-phosphate are converted into **TWO** molecules of pyruvate (aerobic) , lactate (anaerobic)

*بنكسب 10 ATP عن طريق :

A) Step 6



B) Step 7



C) Step 10

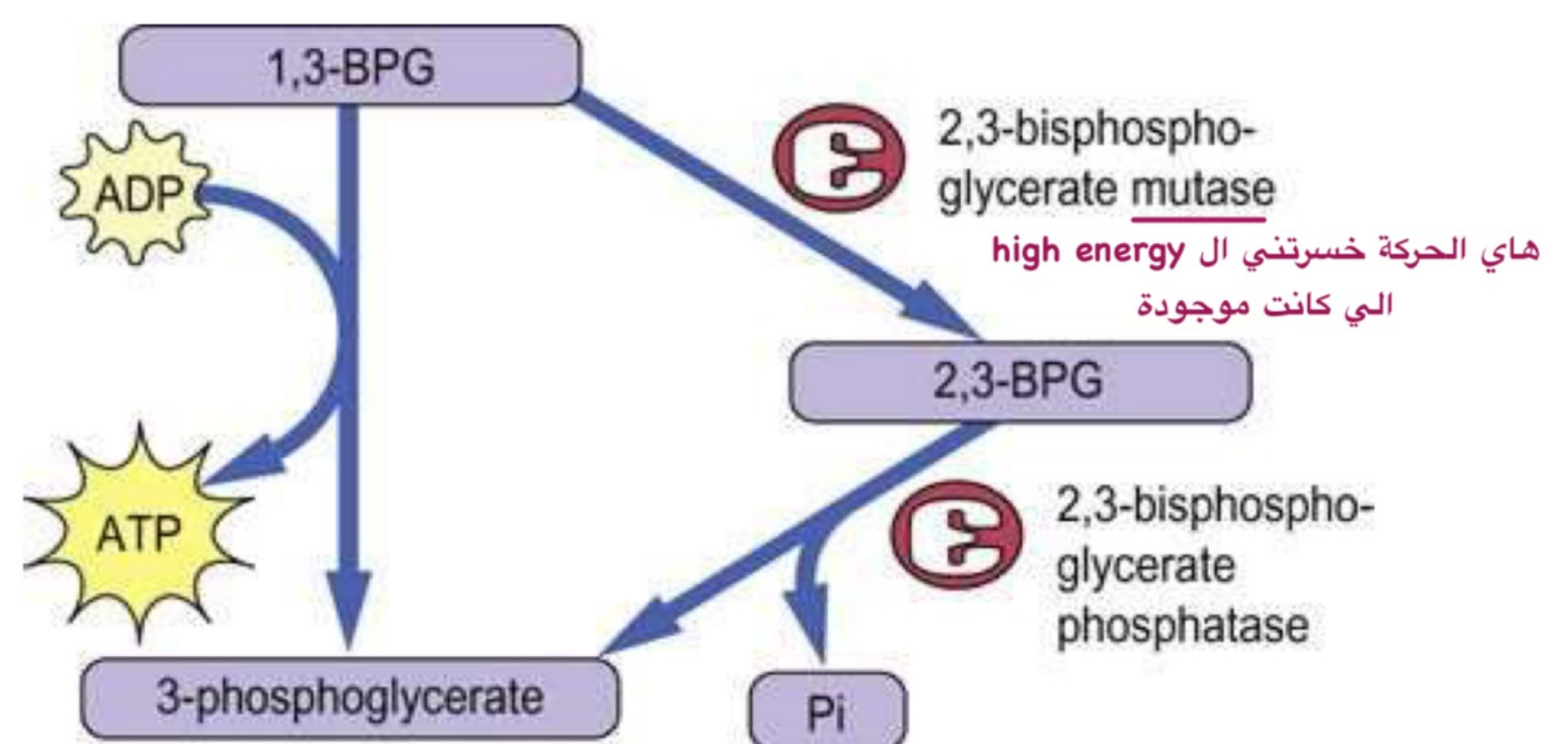


ال Total عنا 10 ATP لكن خسرنا 2 NADH ب 11 step يعني خسرنا 6 ATP ضل عنا 4 ATP
و خسرنا 2 ATP من phase one صفى عنا 2 ATP بتستخدمهم ال RBCs كمصدر للطاقة

Important notes :

- 1- kinase = add phosphate
- 2- phosphatase = remove phosphate
- 3- COOH (carboxylic group) + phosphate = high energy bond
- 4- Enol is an organic compound that contains a hydroxyl group bonded to a carbon atom having a double bond
- 5- ester bond = low energy bond
- 6- 1 NADH = 3 ATP

- Sometimes glycolysis in red blood cells gives no ATP this is due to the synthesis of 2,3-bisphosphoglycerate by mutase (step 7) as it's increased will decrease the oxygen affinity for Hb to oxygen and then the oxygen delivered to tissue , BPG found in chronic anemia and hypoxia in some patients to deliver O₂ to tissues



- Importance of glycolysis in Red cells :
 1. Energy production
 2. bisphosphoglycerate shunt
 3. reduction of methemoglobin
- Red blood cells possesses an effective system the NADH-cytochrome b5 methemoglobin reductase system , For reducing ferric to ferrous
- Pyruvate kinase deficiency accounts for the majority of all inherited defects in a glycolytic enzymes , Effects are restricted to RBCs and present as mild to severe chronic hemolytic anemia