

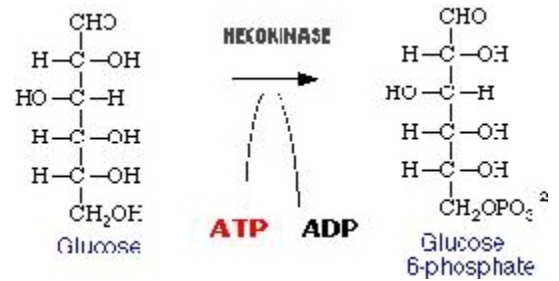
GLYCOLYSIS

10/30/91, rvsd 11/3/93, 11/8/94, 5 Nov 99, 6 Nov 00, 5 Nov 01, 7 Nov 03, 5 Nov 04, 27Oct08, 22Oct10
 BKH: pp. 382-401, BKH 5th: 378-393, bkhh 7th: PP229-246

Contrast **fermentation** with **respiration**. (Review table 9-1 for energy in bonds.)

Embden & Meyerhof in 1930s: Glycolysis generates ATP without any net oxidation.

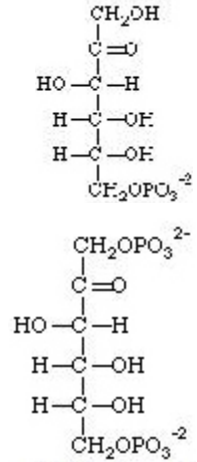
Glycolysis also called Embden-Meyerhof pathway. Overview: figure 9-6, p 232



PREPARATION AND CLEAVAGE

phosphorylation Hexokinase (p. 233)
isomerization Phosphoglucosomerase
phosphorylation Phosphofruktokinase
cleavage Aldolase

Glucose to Glucose-6-PO₄ (and other hexoses)
G-6-PO₄ to Fructose-6-PO₄ (easy interconversion)
F-6-PO₄ to fructose 1,6 bis PO₄ (allosterically regulated)
 F-1,6,-bis PO₄ split into two trioses:
glyceraldehyde-3-PO₄
dihydroxyacetone PO₄

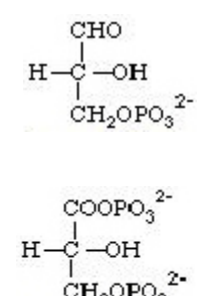


OXIDATION AND ATP GENERATION:

isomerization Triose phosphate isomerase dihydroxyacetone PO₄ converted to **glyceraldehyde-3-PO₄**
 (easy interconversion, as with G-6-P to F-6-P above)

oxidation (p 382) Glyceraldehyde-3-phosphate dehydrogenase G-3-PO₄ is oxidized via an enzyme-linked **thioester** (making NADH) and **phosphorylating** (add PO₄) to make a high energy (phosphoanhydride), yields **1,3-bisphosphoglycerate**

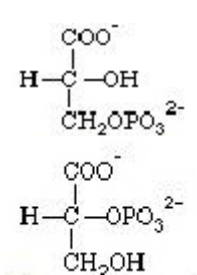
ATP generation Phosphoglycerokinase **Substrate-level phosphorylation:** High energy PO₄ transferred to ADP, makes **3 phosphoglycerate** and **ATP**



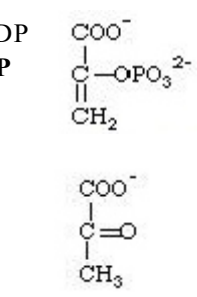
PYRUVATE FORMATION AND ATP GENERATION:

isomerization Phosphoglyceromutase **PO₄ transferred** to #2 carbon to make **2 phosphoglycerate**

dehydration Enolase produces **phosphoenolpyruvate:** energy rich, highly unstable, because not only **delocalization prevented**, but held in stressed **enol** form instead of relaxed **keto** form. I.e., **tautomerization** is prevented



ATP generation Pyruvate kinase **Substrate-level phosphorylation:** PEP transfers PO₄ to ADP producing **pyruvic acid** (tautomerization allowed) and **ATP**



Distinguishing feature of high energy bond in PEP: PO₄ adjacent to double bond

Here is a good YouTube video presenting the mechanism of the 10 steps:
<http://www.youtube.com/watch?v=DJrA64rBhSk>