Glycolysis from Green Word' glyks" " sweet or sugar" and lysis means "splitting". A molecule of glucose is degraded in a series of enzyme catalyzed reactions to yield two molecules of 3 carbon compound pyruvate. During the sequential reactions of glycolysis some of the free energy released from glucose is conserved in the form of ATP and NADH.

Glycolysis is an almost Universal Central pathway of glucose metabolism, the pathway with the largest flux of carbon in most cells. Glycolytic breakdown of glucose is the sole source of metabolic energy in some mammalian tissues and cell types. Glycolysis differs among the species only in the details of its regulation and the subsequent metabolic fate of the pyruvate formed. The thermodynamics principles and the types of regulatory mechanisms that govern glycolysis are common to all the pathways of cell metabolism.

Glycolysis has two phases.

a).The breakdown of the 6- carbon glucose into 2 molecules of the three carbon pyruvate occurs in 10 steps.The first 5 of which constitute the preparatory phases.
In these reactions glucose is phosphorylated at the hydroxyl group on C- 6.

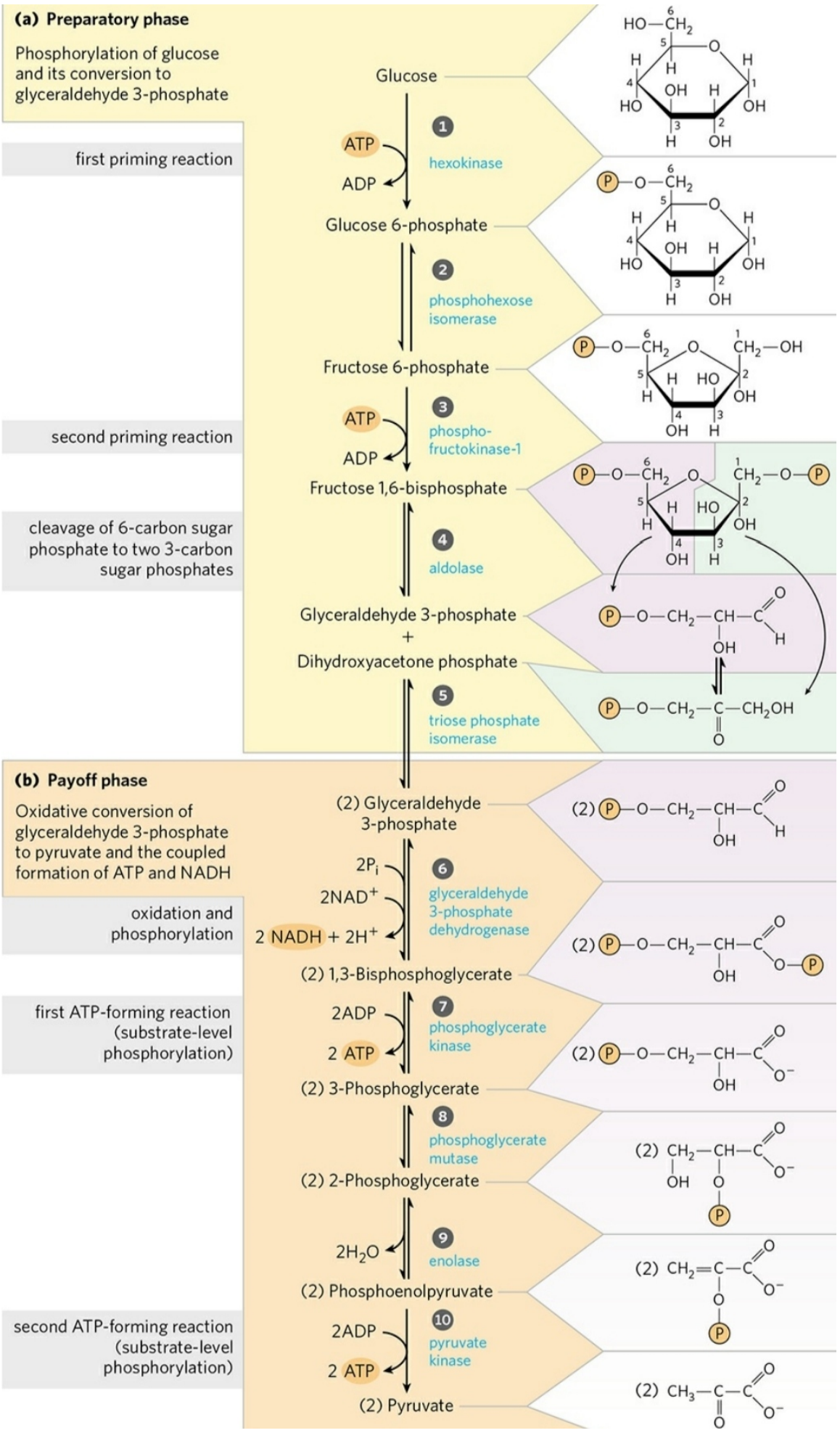
b)Glucose- 6- phosphate is converted into the Fructose -6 -phosphate. which is again phosphorylated at C- 1 to fructose -1,6- bisphosphate. For both phosphorylation ATP is the phosphorlygroup donor .

c)Fructose-1,6- bisphosphate is split to yield two 3- carbon molecules, dihydroxyAcetone phosphate and glyceraldehyde-3-phosphate.This is the lysis step that gives the pathway its name.

d) DihydroxyAcetone phosphate is isomerized to a second molecule of glyceraldehyde 3 phosphate ending the first phase of glycolysis. In the preparatory phase of glycolysis the energy of ATP invested, raising the free energy content of the intermediates and the carbon chains of all the metabolic hexoses are converted to a common product glyceraldehyde 3 phosphate

e)The energy gain comes in the payoff phase of glycolysis. Each molecule of glyceraldehyd 3- phosphate is oxidized and phosphorylated by inorganic phosphate to form 1,3-biphosphoglycerate .

f) Energy is then released as two molecules of 1,3-biphosphoglycerate are converted to two molecules of pyruvate .Much of this energy is conserved by the coupled phosphorylation of molecules of ADP to ATP.


(a) Preparatory phase
Phosphorylation of glucose and its conversion to glyceraldehyde 3-phosphate
first priming reaction
second priming reaction
cleavage of 6-carbon sugar phosphate to two 3-carbon sugar phosphates
Glucose
ATP
ADP
1
hexokinase
Glucose 6-phosphate
2
phosphohexose isomerase
Fructose 6-phosphate
ATP
ADP
3
phospho-fructokinase-1
Fructose 1,6-bisphosphate
4
aldolase
Glyceraldehyde 3-phosphate
+
Dihydroxyacetone phosphate
5
triose phosphate isomerase
(b) Payoff phase
Oxidative conversion of glyceraldehyde 3-phosphate to pyruvate and the coupled formation of ATP and NADH
oxidation and phosphorylation
first ATP-forming reaction (substrate-level phosphorylation)
second ATP-forming reaction (substrate-level phosphorylation)
(2) Glyceraldehyde 3-phosphate
2Pi
2NAD+
2 NADH + 2H+
6
glyceraldehyde 3-phosphate dehydrogenase
(2) 1,3-Bisphosphoglycerate
2ADP
2 ATP
7
phosphoglycerate kinase
(2) 3-Phosphoglycerate
8
phosphoglycerate mutase
(2) 2-Phosphoglycerate
2H2O
9
enolase
(2) Phosphoenolpyruvate
2ADP
2 ATP
10
pyruvate kinase
(2) Pyruvate