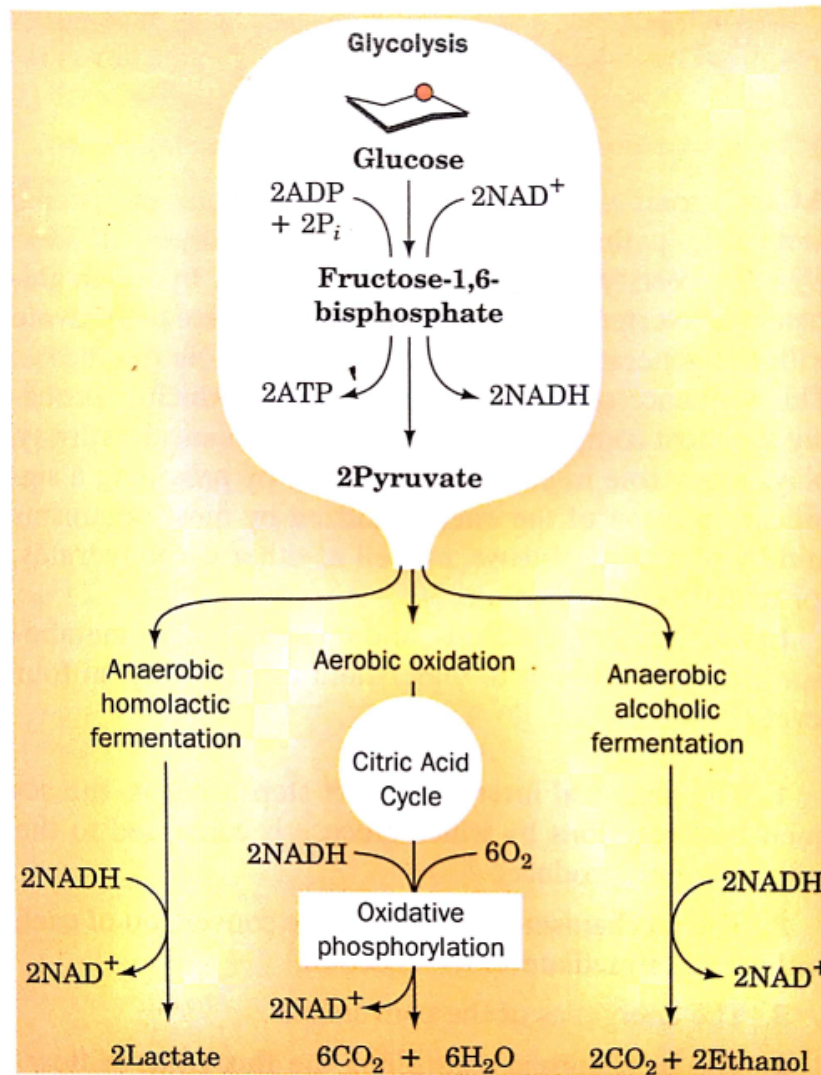
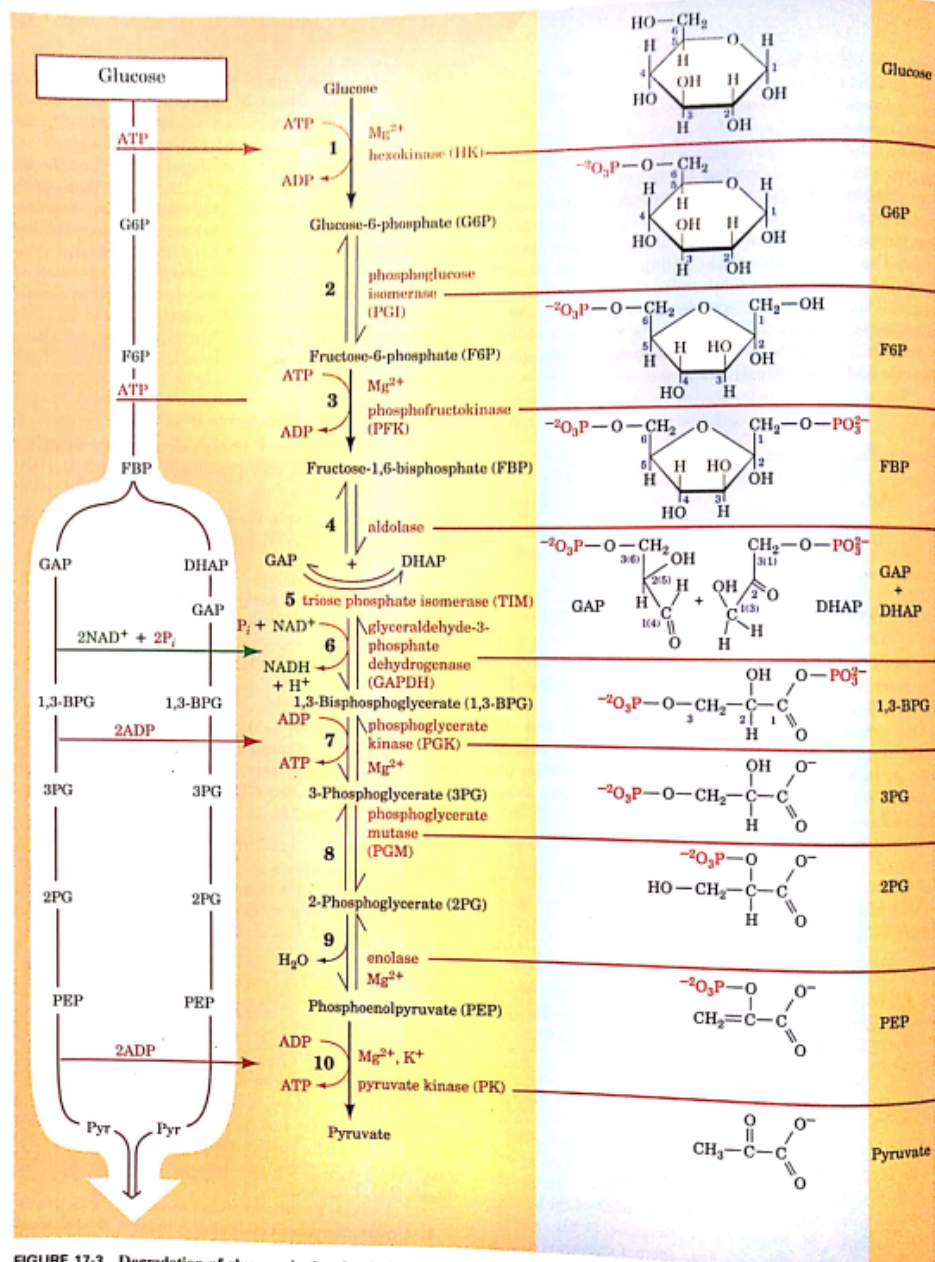


# **Carbohydrates**

**Metabolism: Glycolysis**

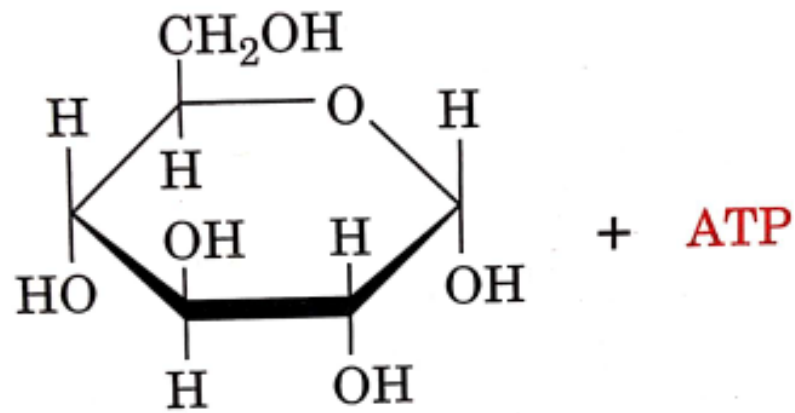


**FIGURE 17-1 Glycolysis.** Glycolysis converts glucose to pyruvate while generating two ATPs. Under anaerobic conditions, alcoholic fermentation of pyruvate occurs in yeast, whereas homolactic fermentation occurs in muscle. Under aerobic conditions, pyruvate is oxidized to H<sub>2</sub>O and CO<sub>2</sub> via the citric acid cycle (Chapter 21) and oxidative phosphorylation (Chapter 22).

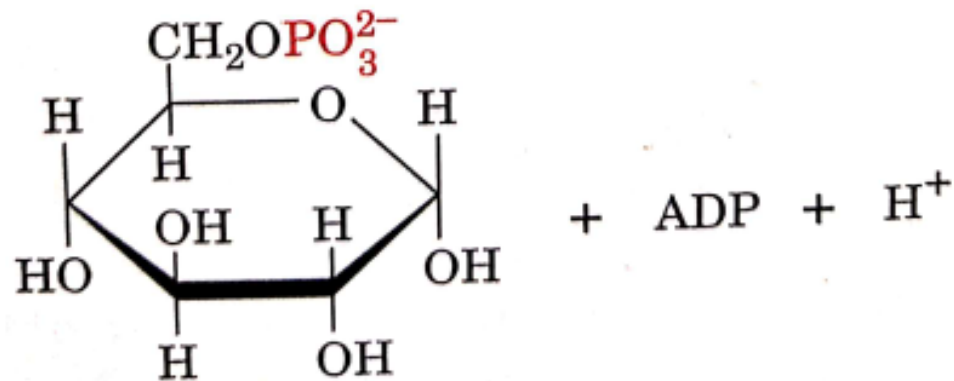
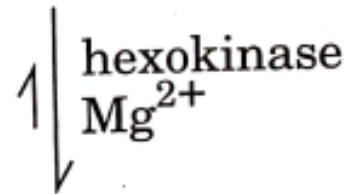


**FIGURE 17-3 Degradation of glucose via the glycolytic pathway.** Glycolysis may be considered to occur in two stages. Stage I (Reactions 1–5): Glucose is phosphorylated and cleaved to form two molecules of the triose glyceraldehyde-3-phosphate. This requires the expenditure of two ATPs in an

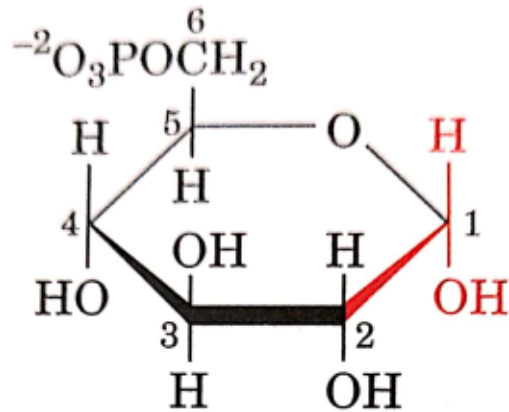
“energy investment” (Reactions 1 and 3). Stage II (Reactions 6–10): The two molecules of glyceraldehyde-3-phosphate are converted to pyruvate with the concomitant generation of four ATPs (Reactions 7 and 10). See the Animated Figures



**Glucose**



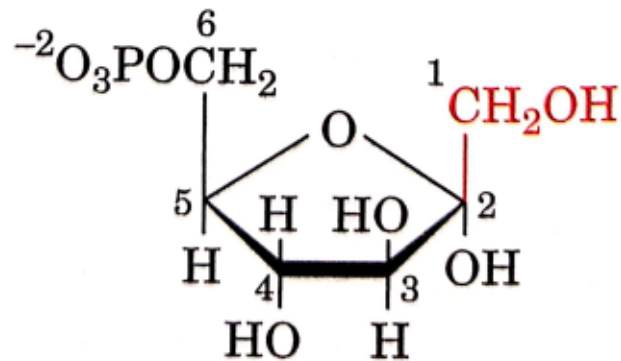
**Glucose-6-phosphate  
(G6P)**



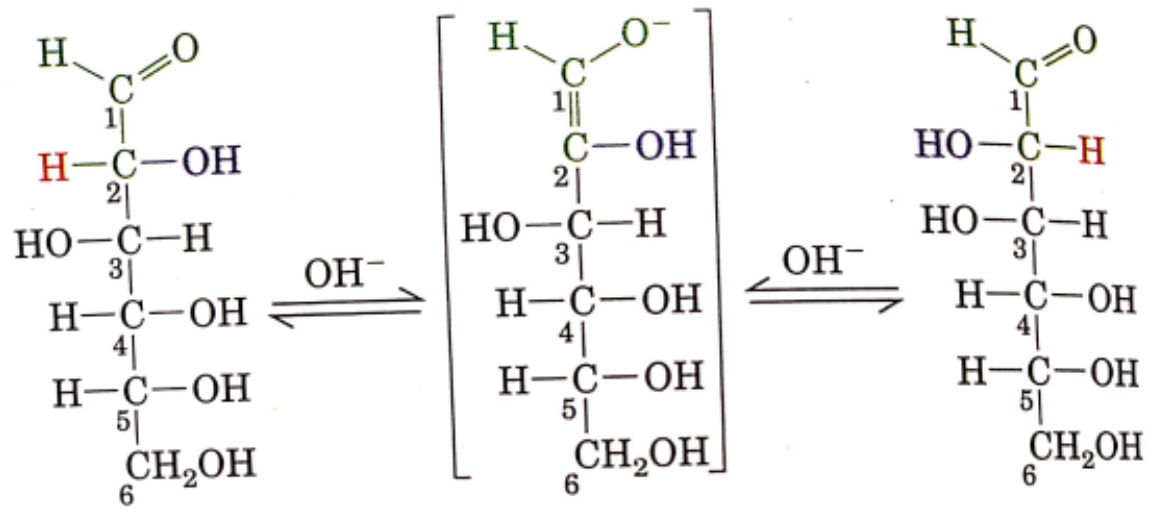
**Glucose-6-phosphate (G6P)**



phosphoglucose  
isomerase (PGI)



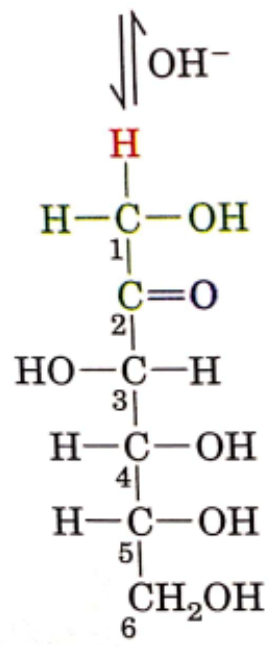
**Fructose-6-phosphate (F6P)**



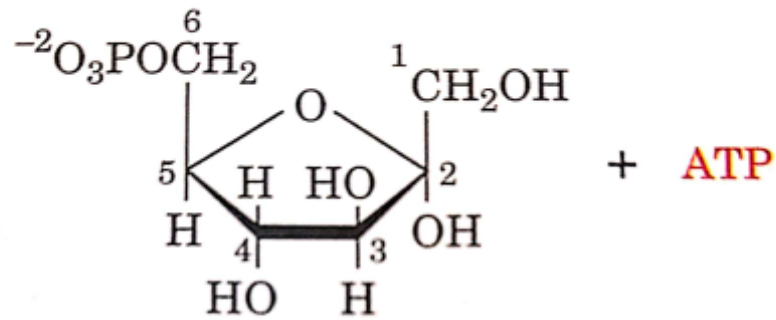
**Glucose**

***cis*-Enediolate intermediate**

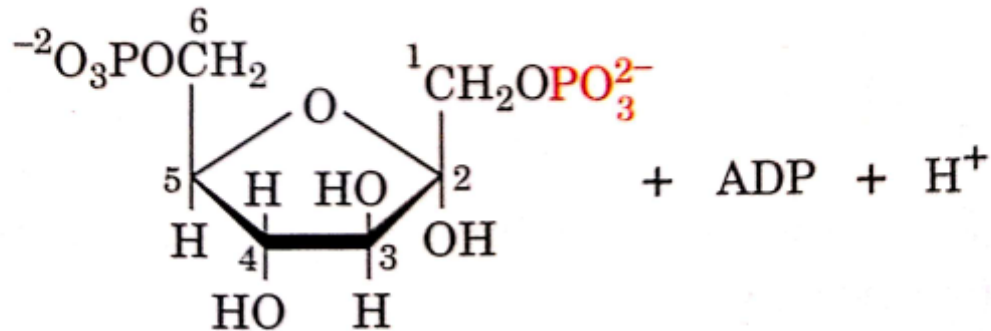
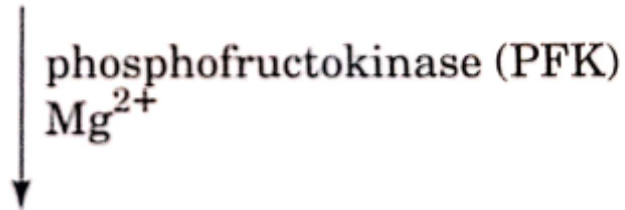
**Mannose**



**Fructose**



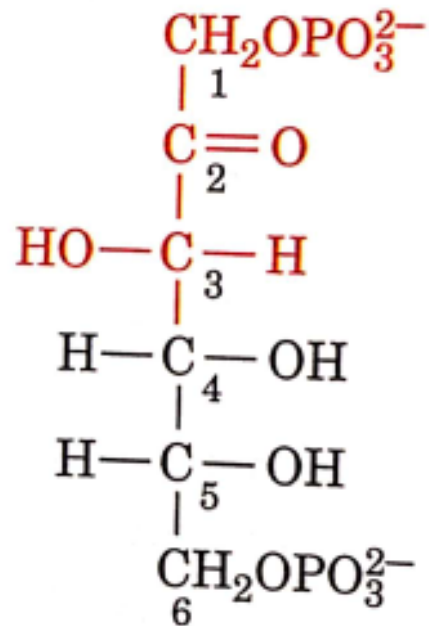
**Fructose-6-phosphate  
(F6P)**



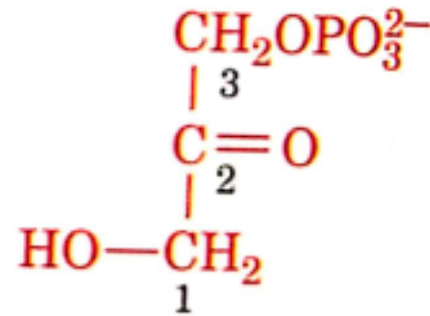
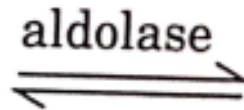
**Fructose-1,6-bisphosphate  
(FBP)**



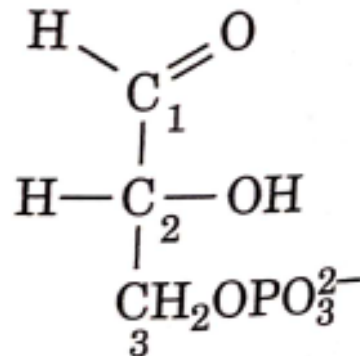
# Dihydroxyacetone phosphate (DHAP)



**Fructose-1,6-bisphosphate (FBP)**

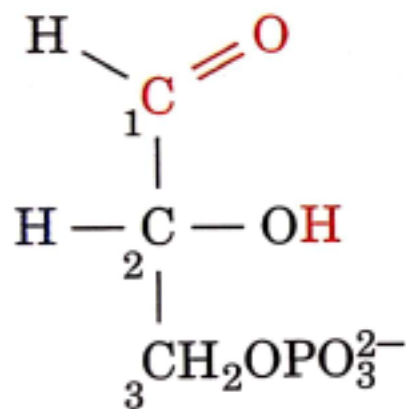


+

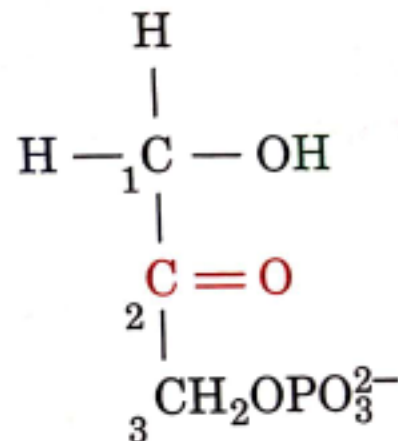


**Glyceraldehyde-3-phosphate (GAP)**

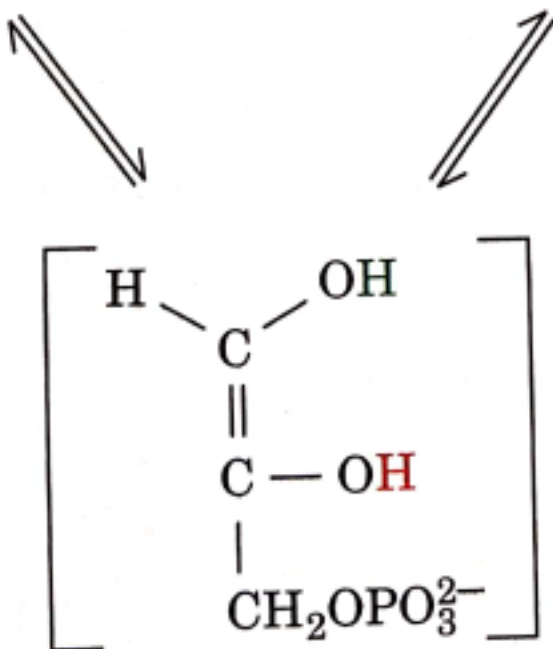




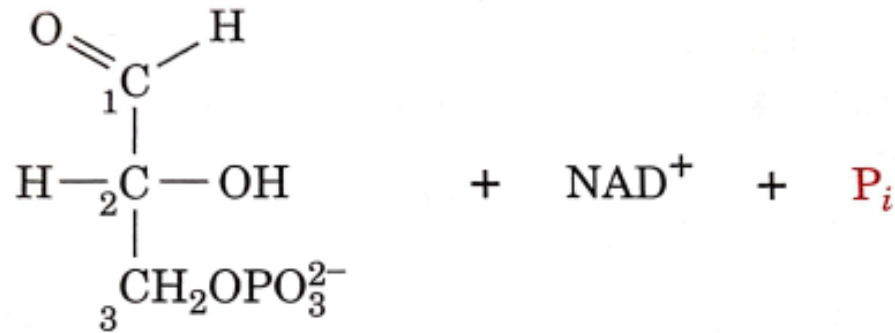
**Glyceraldehyde-3-phosphate**  
(an aldose)



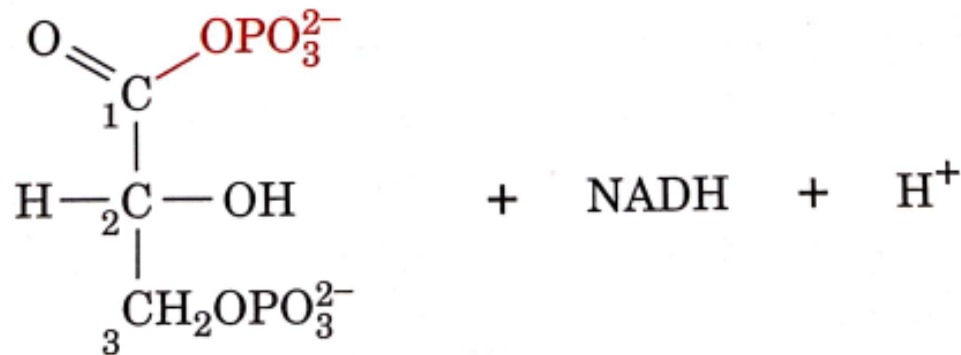
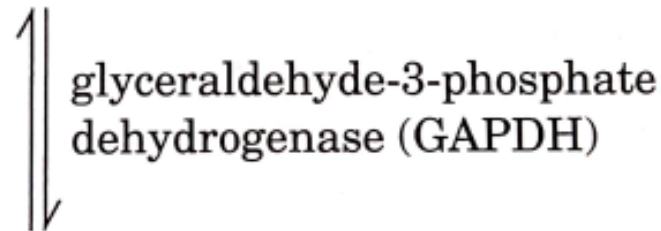
**Dihydroxyacetone phosphate**  
(a ketose)



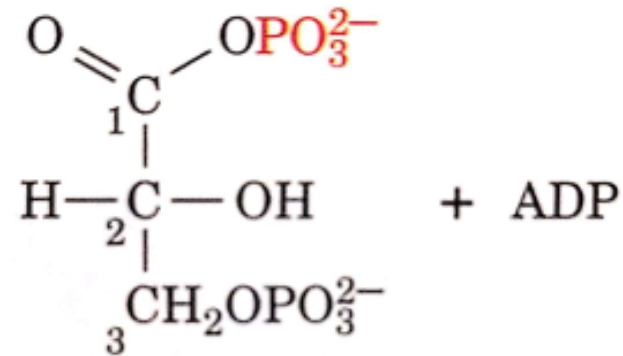
**Enediol intermediate**



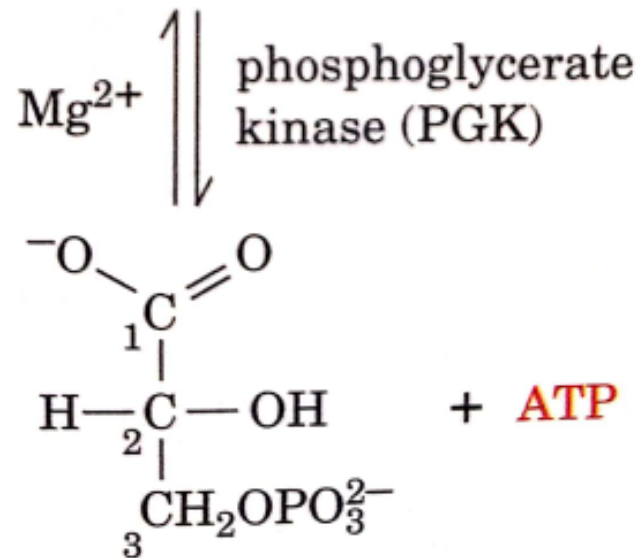
**Glyceraldehyde-3-phosphate (GAP)**



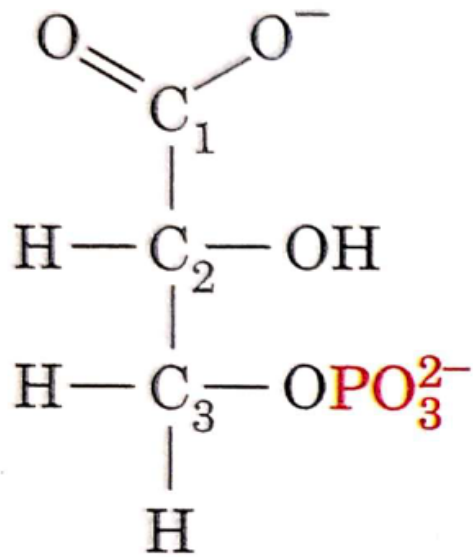
**1,3-Bisphosphoglycerate (1,3-BPG)**



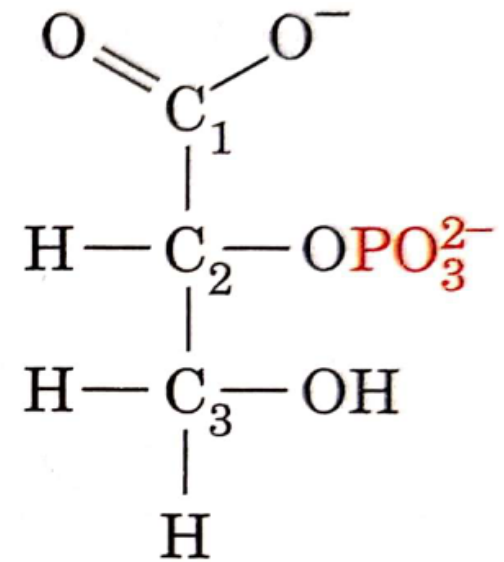
**1,3-Bisphosphoglycerate  
(1,3-BPG)**



**3-Phosphoglycerate  
(3PG)**

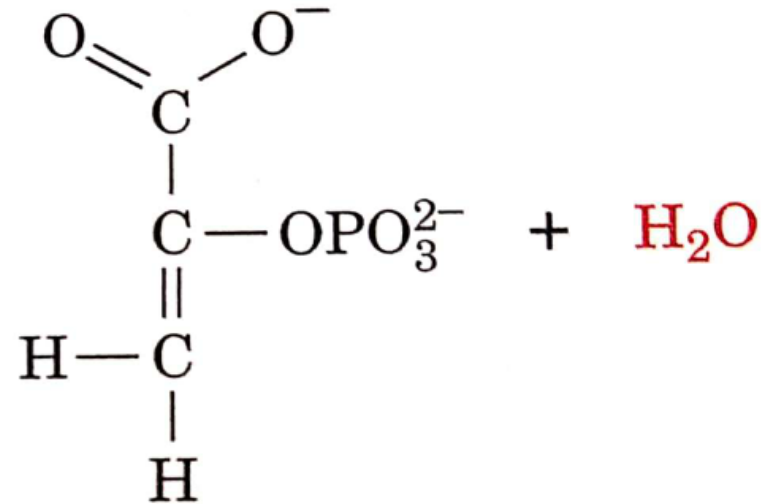
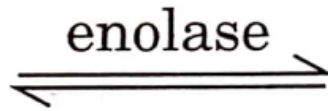
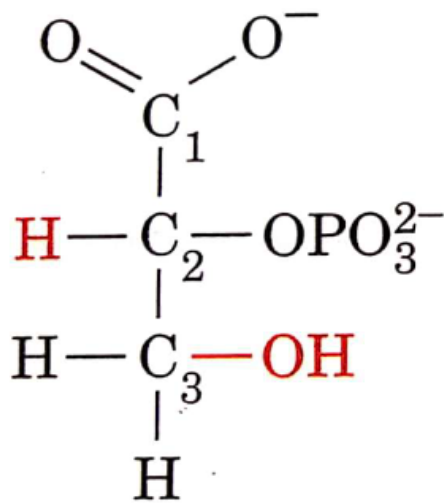


phosphoglycerate  
mutase (PGM)



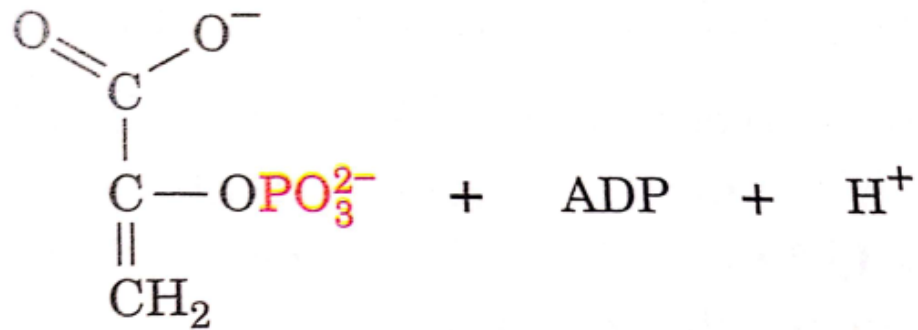
**3-Phosphoglycerate  
(3PG)**

**2-Phosphoglycerate  
(2PG)**



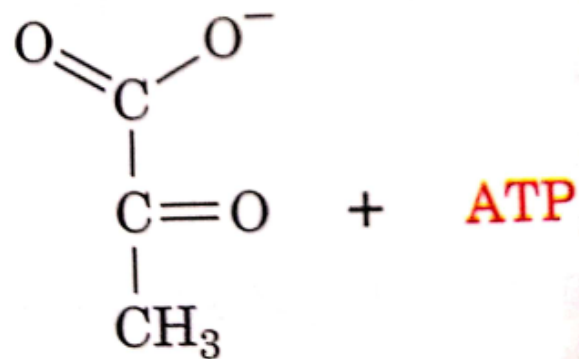
**2-Phosphoglycerate  
(2PG)**

**Phosphoenolpyruvate  
(PEP)**



**Phosphoenolpyruvate  
(PEP)**

↓  
pyruvate  
kinase (PK)



**Pyruvate**

