

Question #46404 – Biology – Other

**Question:**

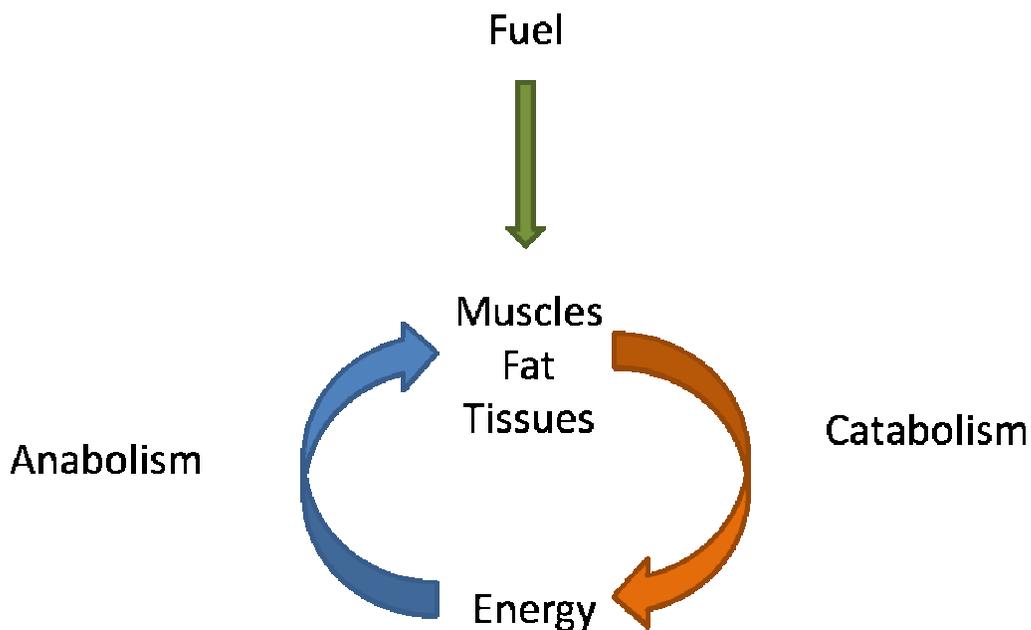
Differentiate between anabolism and catabolism.  
Write the mechanism of the reaction of conversion of glyceraldehyde-3-phosphate to pyruvate.

**Answer:**

Anabolism – the process of synthesis of specific biomolecules in the body of living organism using the energy of ATP.

Catabolism – set of processes of disintegration of biomolecules to release energy in the body of living beings.

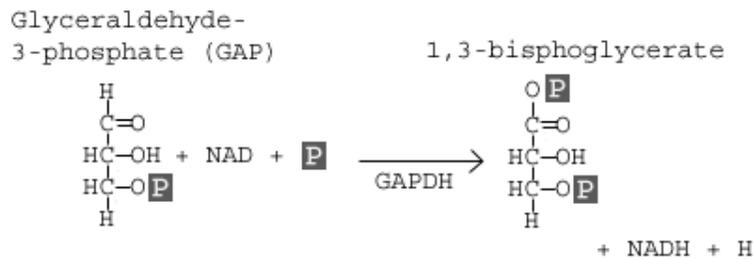
These two processes are opposite each other. In vivo, they are balanced and collectively called metabolism.



Conversion of glyceraldehyde-3-phosphate to pyruvate:

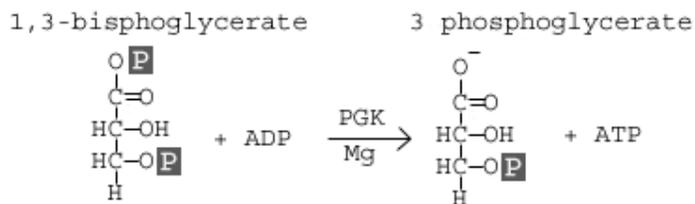
This conversion occurs in five stages:

First stage:



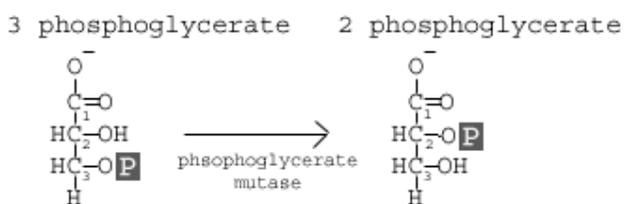
In this stage, the NAD oxidizes glyceraldehyde-3-phosphate, and the free phosphate group phosphorylates the molecule. The enzyme that catalyzes this reaction is glyceraldehyde-3-phosphate dehydrogenase (GAPDH). Formed molecule is called 1,3-bisphoglycerate.

Second stage:



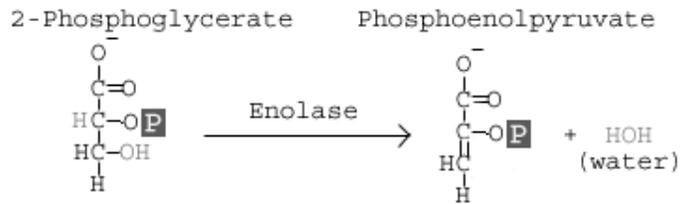
In this step, 1,3-bisphoglycerate is converted to 3-phosphoglycerate by the enzyme phosphoglycerate kinase (PGK). Molecule loses one phosphate group in this reaction, which allows producing one molecule of ATP. Moreover, as two same reactions take place (glucose is a 6-carbon molecule which was split into two 3-carbon molecules) it will produce two molecules of ATP.

Third stage:



In this stage, phosphate group changes position under the influence of phosphoglyceratemutase (PGM) – enzyme that catalyzes this reaction.

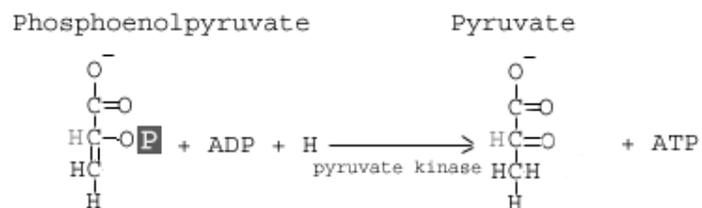
Fourth stage:



The eighth step involves the conversion of 2 phosphoglycerate to phosphoenolpyruvate (PEP).

The reaction is catalyzed by the enzyme enolase. Enolase works by removing a water group, or *dehydrating* the 2 phosphoglycerate.

Fifth stage:



Finally, phosphoenolpyruvate converts into pyruvate by removing the phosphate group to ATP molecule and adding one atom of hydrogen. Enzyme, which catalyzes this stage, is pyruvate kinase.