Biochemistry

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Paper - V

Paper-V B.

Glycolysis

Q.→ What is respiration? Describe the different steps of Glycolysis or (EMP Pathway).

Ans→ All the living organism require energy for their biological activity. This energy is obtain by the oxidation of various photosynthetic product by the process which known as respiration.

Generaly respiration define as intake of oxygen and liberation of CO_2 is called respiration. It may also define as 'It is a process which includes the intake of oxygen and chemicaly brings about the oxidation and decomposition of organic compound with the release of energy and it also convert the potential energy into Kinetic energy. The over all respiration process may be represented as - $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 686 Kcal$ and summery of this process would be represented as —

$C_6H_{12}O_6 + 6H_2O + 6O_2 \longrightarrow 6CO_2 + 12H_2O + energy$.

* Glycolysis → Glycolysis is a phase of respiration in which glucose is converted into pyruvic acid. It occurs in cytoplasm thus it is also known as cytoplasmic respiration. The glycolytic pathway was traced by three famous scientist named Embden, Meyerhof paranas Pathway (EMP Pathway).

It may be define as - The course of stepwise degradation from glucose to pyruvic acid is termed as Glycolysis.

This can be broadly represented as follow —

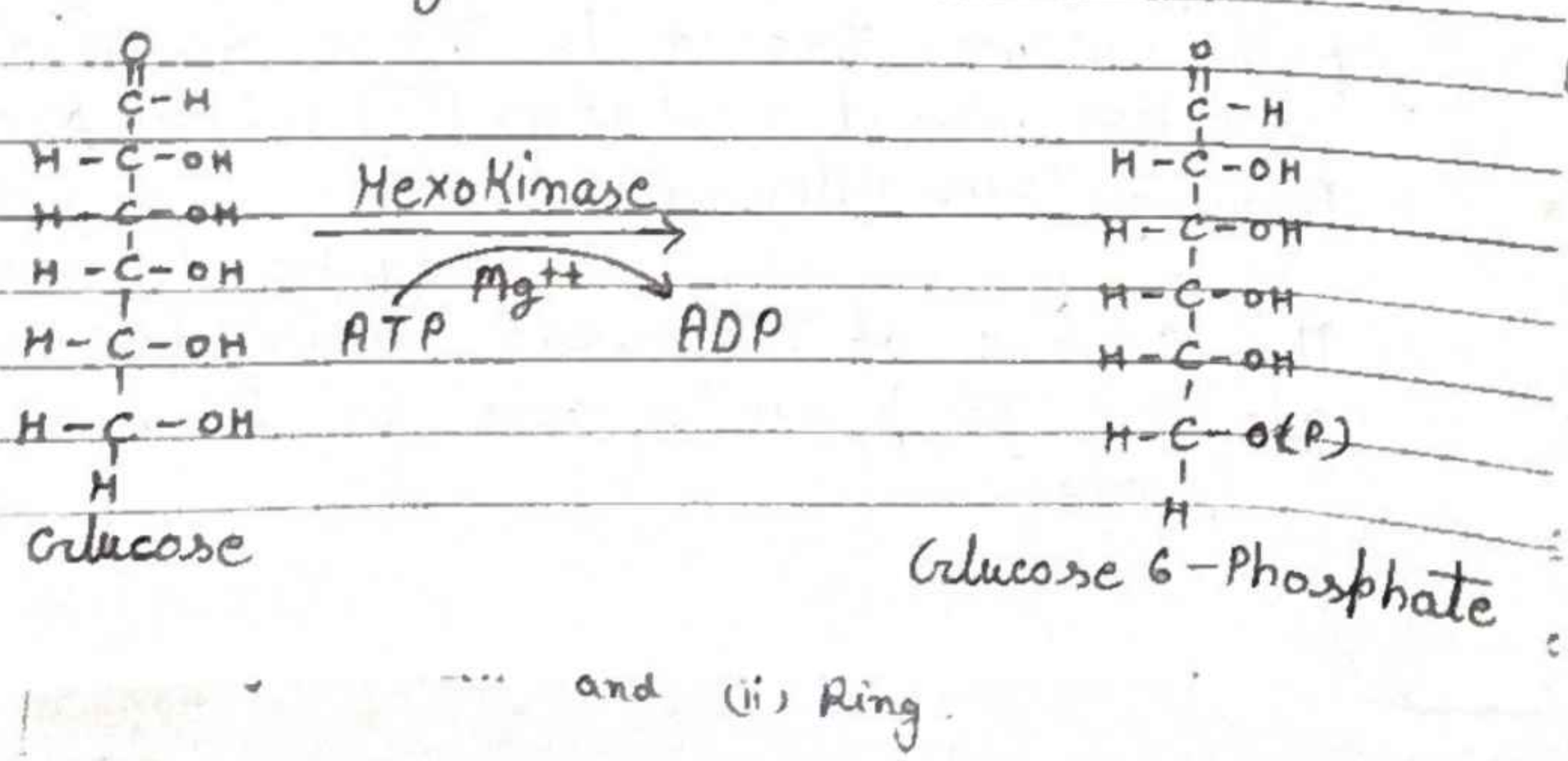
$C_6H_{12}O_6 \longrightarrow 2C_3H_4O_3 + 4H$

(Glucose) (Pyruvic acid)

Above eqation states that a molecule of glucose which is a six carbon compound is broken down in to two molecules of pyruvic acid, which is a three carbon compounds through a large number of step wise closely integrated reaction. It occurs in following three important phases —

* First phase → In this phase the glucose molecule is phosphorylated with the introduction of two phosphate group in to its structure for this phase two molecule of ATP are needed. Its various steps are discused below —

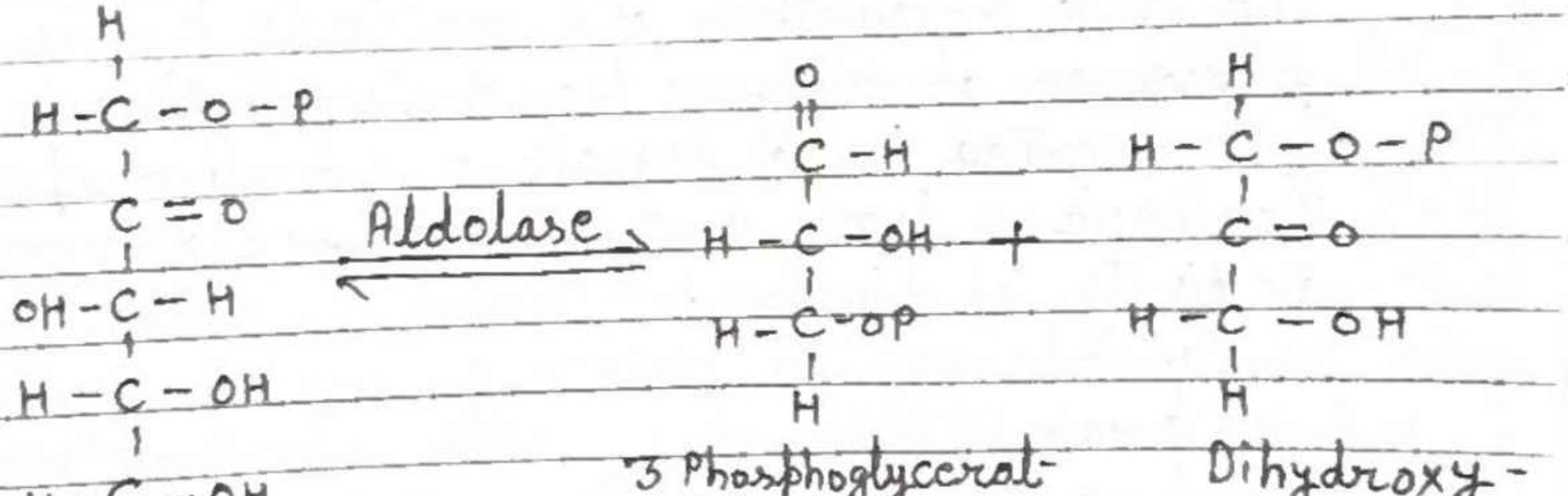
(i) In this stage glucose is converted in to glucose 6 Phosphate in the presence of enzyme hexokinase and with the help of one ATP molecule. The six carbon position of glucose molecule is phosphorylated and ATP is converted in to ADP. Its molecular reaction is given below.



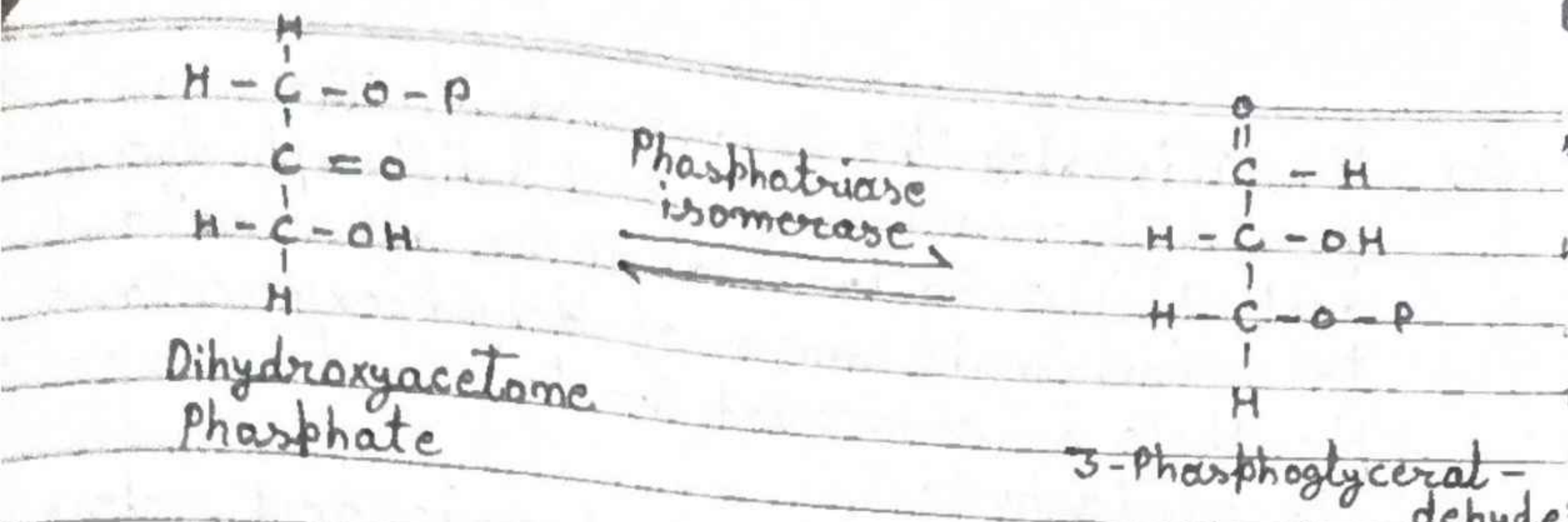
... and (ii) Ring.

* Second phase → In this phase 6-carbon compound fructose 1,6-diphosphate is breaking up into two molecules of three carbon compounds Known as 3-phosphoglyceraldehyde and dihydroxyacetone phosphate. Both are inter convertible. Its steps are given below.

(iv) In this step fructose 1,6 diphosphate breaks in to two molecules of three Carbon compound in the presence of enzyme Aldolase. This formed compounds are three phosphoglyceraldehyde and dihydroxyacetone phosphate. Both compounds are inter convertible and an equibellium is maintained between them. This inter conversion is catalysed by the enzyme phophotrioseisomerase.

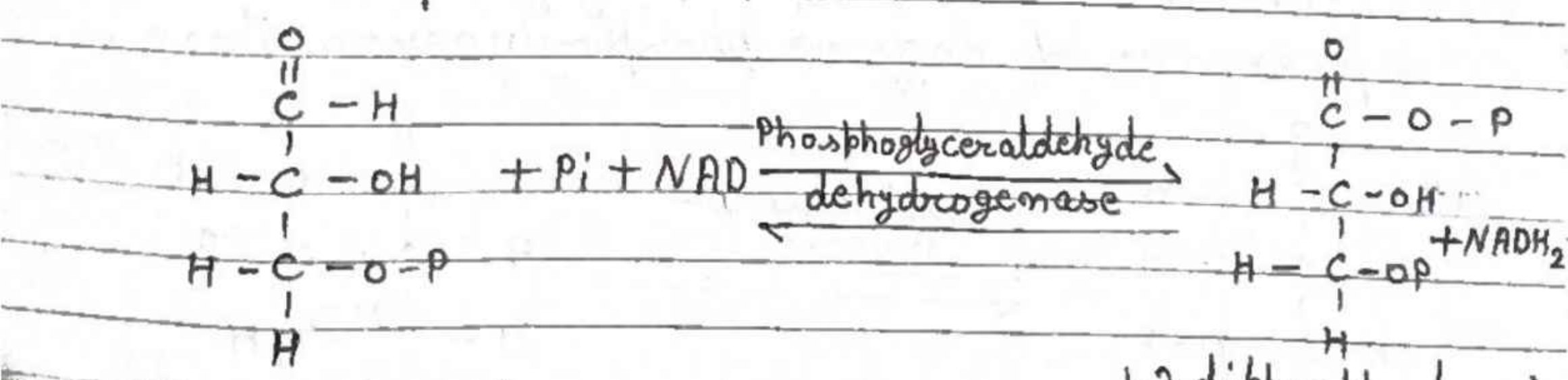


Fructose 1,6-diphosphate is converted into 3-Phosphoglyceraldehyde:



* Third phase → In this phase 3-phosphoglyceraldehyde is degraded in to pyruvic acid and produce 4 molecules of ATP and 2 molecules of $NADH_2$. Its various steps are given below —

(V) In this step 3-Phosphoglyceraldehyde is oxidise and inorganic phosphate H_3PO_4 attach to this molecule formed 1,3-diphospho-glyceric acid. This molecule is oxidise with the release of two electrons and two Protons. This steps of the reaction are coupled in the sense that the energy supply by one step is utilised by the other step. These steps infact serve to trap. Most of energy is liberated in oxidation which other wise would simple be dessipated as hit.



[Pi represents inorganic phosphate H_3PO_4]