Name of Subject – Botany

Semester ——— B.Sc. II

Topic — Respiration contd. (Plant Physiology)

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Lecture No. 07

Krebs' cycle

In aerobic respiration the end product of glycolysis, the Pyruvic acid is oxidised through Krebs' cycle. The cycle of reaction involved in the oxidation of Pyruvic acid has been traced out by H.A. Krebs, thus in his honour it is called Krebs' cycle.

It is also known as tri carboxylic acid cycle because a no. of tri carboxylic acid is formed during Krebs' cycle.

This Krebs' cycle occurs inside the mitochondria of the cell.

The following are the steps involved in the Krebs' cycle.

I. Formation of acetyl CoA.

Formation of acetyl CoA occurs by the oxidative decarboxylation of Pyruvic acid. This is a very complex reaction and requires several enzymes and co-factors to occur.

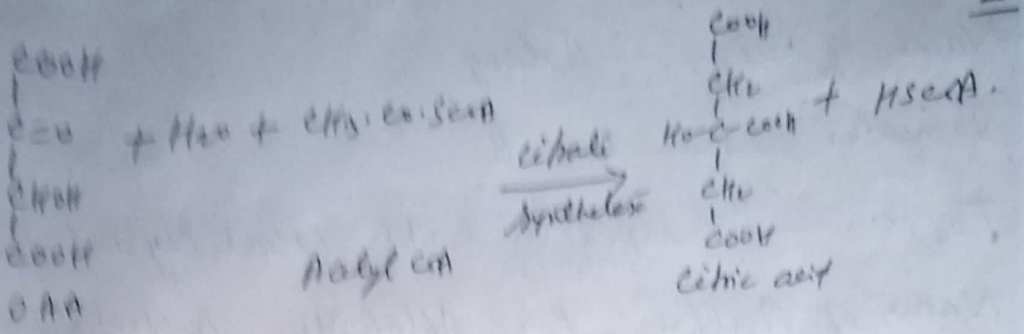
Enzymes are dehydrogenase and decarboxylase – and co-factors are TPP, Lipoic acid and HSCoA.

$$CH_3 \cdot CO \cdot COOH + TPP + \text{Lipoic acid} + NAD + HSCoA$$

$$\text{Acetyl CoA} \xrightarrow{\text{dehydrogenase}} \underset{CO \cdot SCoA}{CH_3} + NADH_2 + TPP + \text{Lipoic acid} + CO_2$$

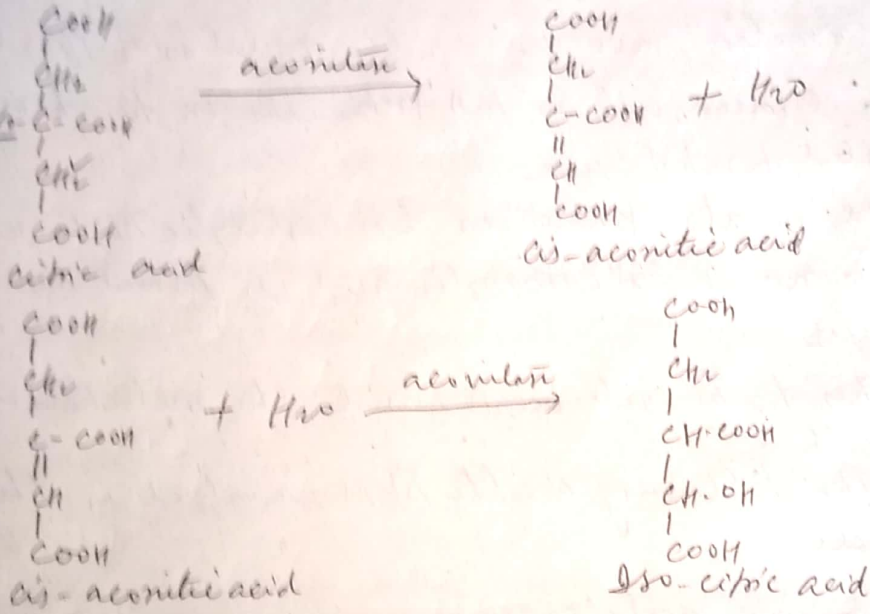
II. Condensation of acetyl CoA into citric acid :–

This reaction is brought about by the catalytic activity of enzyme citrate synthetase. A water molecule is also consumed in this reaction. The reaction results into the formation of citric acid. →



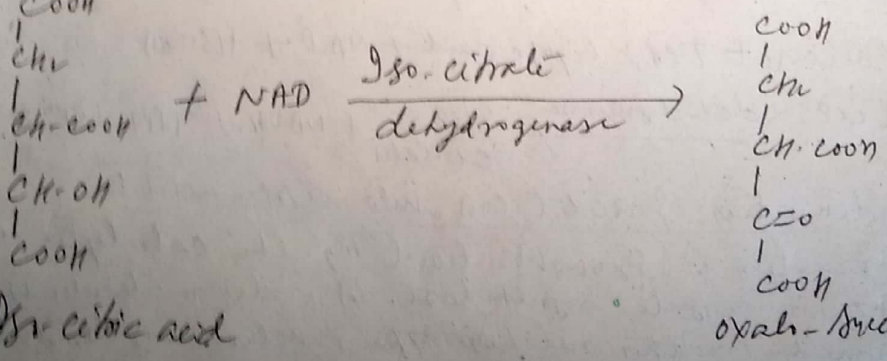
III. Conversion of citric acid into iso citric acid :-

During the conversion of citric acid into iso citric acid, first citric acid looses a molecule of water by the influence of enzyme aconitase to form cis-aconitic acid (6C). Then this cis-aconitic acid takes back a molecule of water by the influence of the same enzyme aconitase to form iso citric acid.



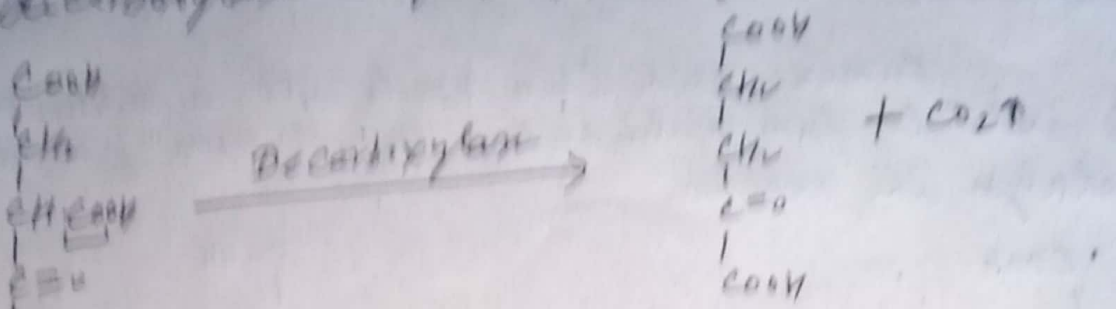
IV. Oxidation of Iso citric acid into oxalo-succinic acid.

Now the iso citric acid is oxidised by loosing 2 — molecule of hydrogen under the influence of enzyme iso-citrate dehydrogenase to form oxalo succinic acid. Here NAD functions as hydrogen acceptor.



V. Formation of α-Ketoglutaric acid :-

During this reaction oxalo-succinic acid undergoes decarboxylation reaction under the influence of enzyme decarboxylase to form α-Keto glutaric acid.

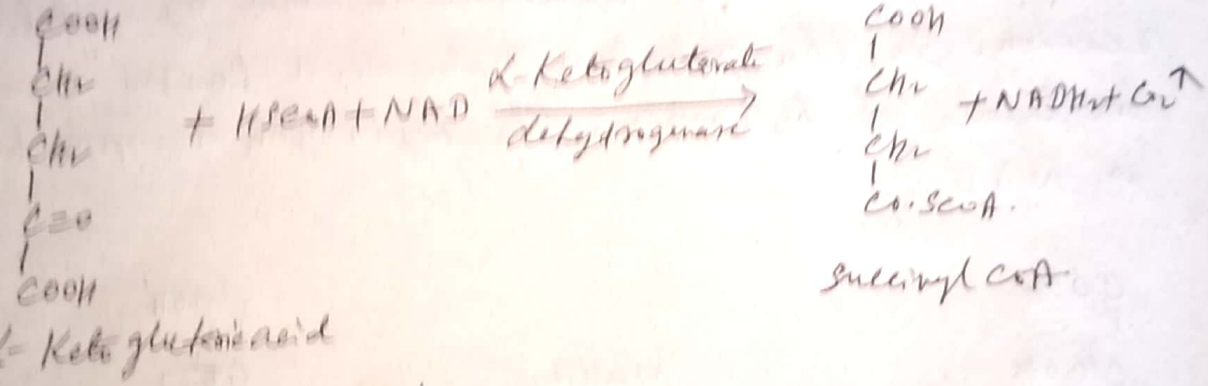


oxalo-succinic acid

α-Keto glutaric acid

VI. Oxidative-decarboxylation of α-Ketoglutaric acid

Now α-Keto glutaric acid undergoes oxidation as well as decarboxylation by the influence of enzyme α-Keto glutarate dehydrogenase + NAD + HSCoA and gets converted into Succinyl CoA.

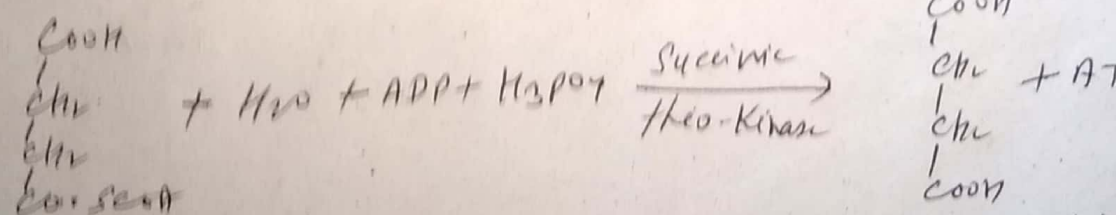


α-Keto glutaric acid

Succinyl CoA

VII. Formation of Succinic acid :-

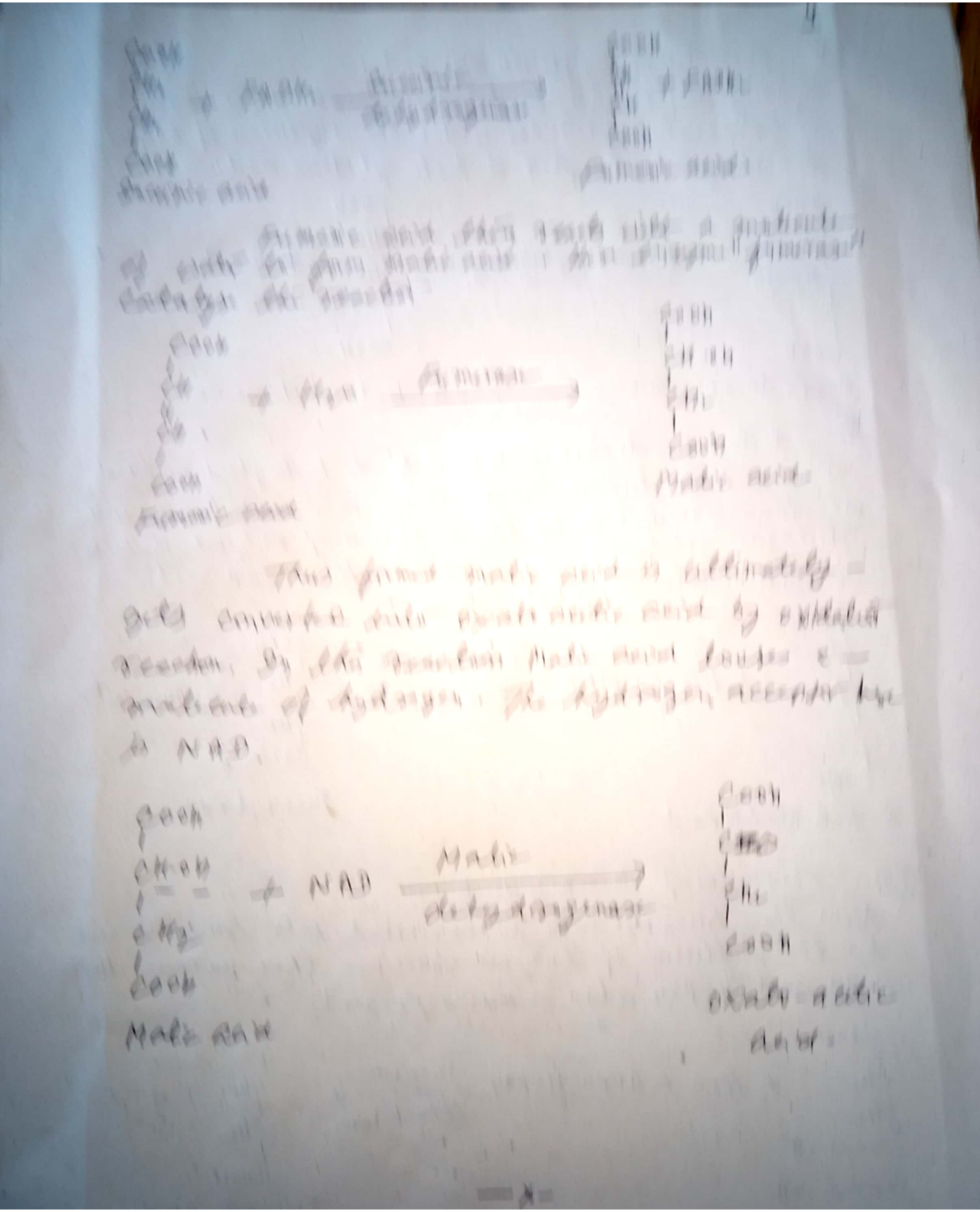
Now the Succinyl CoA is converted into Succinic acid by the influence of enzyme Succinic thio Kinase. Here ADP and H_3PO_4 also remains present.



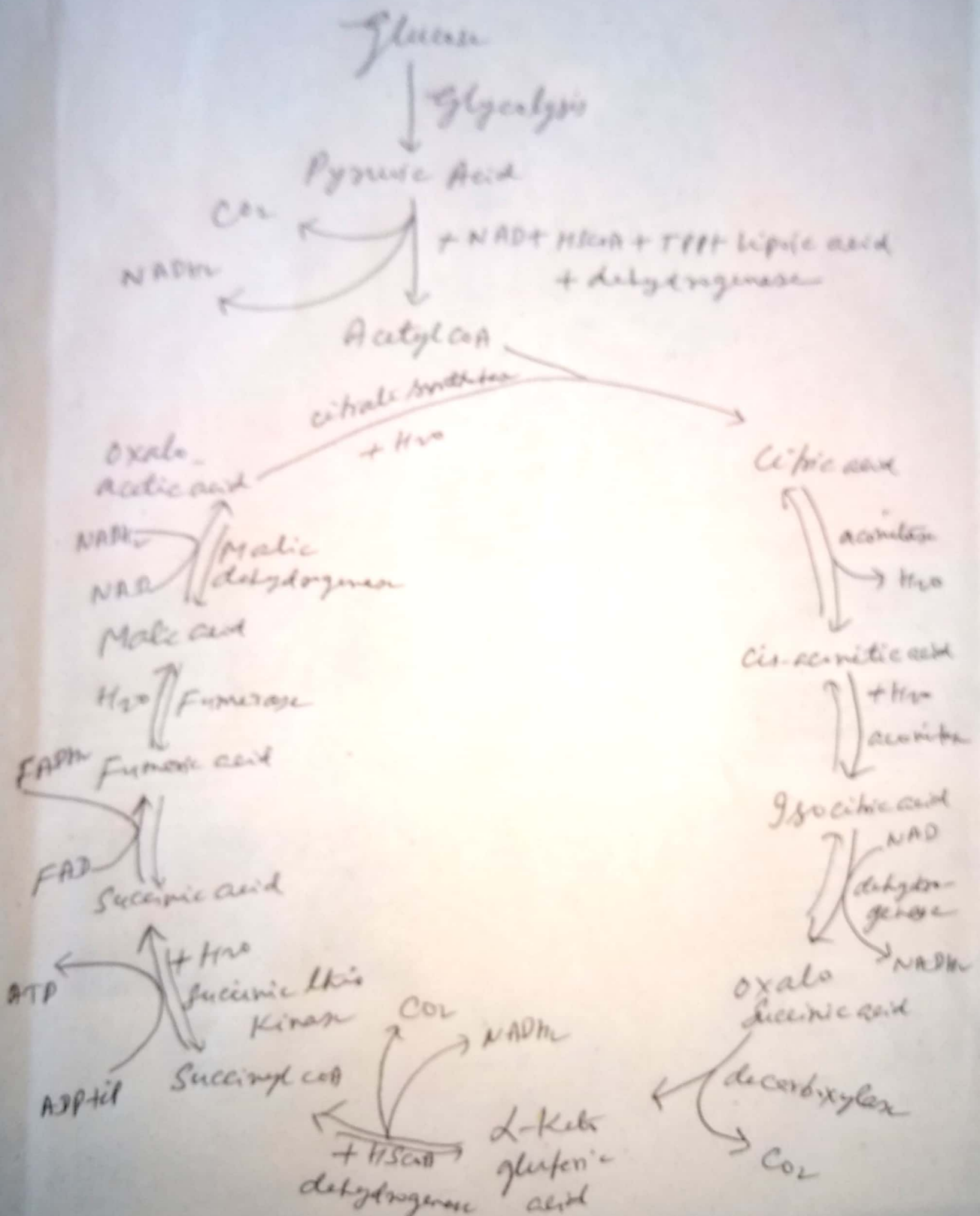
Succinyl CoA

Succinic acid

VIII. Regeneration of oxalo-acetic acid :-



Summary of Krebs' cycle



KREBS' CYCLE