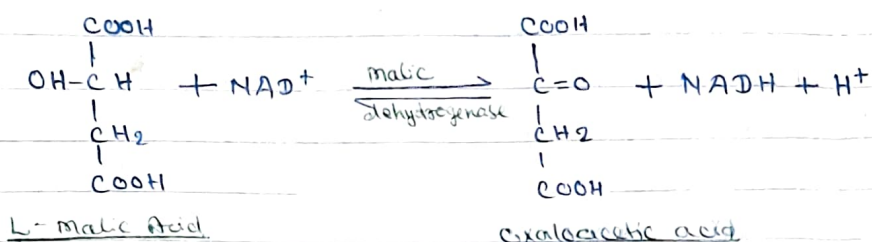


1. OXIDATION OF L-MALIC ACID - REGENERATION OF OXALOACETIC ACID

L-malic acid is oxidized by malic dehydrogenase and NAD^+ , forming $NADH$ and oxaloacetic acid again. The pair of hydrogen atoms is passed down the hydrogen transport system and 3 ATP are generated.



Now this oxaloacetic acid is made available for Condensation with another molecule of acetyl-CoA and thus the cycle is repeated again.

ENERGETICS OF TCA CYCLE

① Oxidation of pyruvate to acetyl CoA
via NAD^+ = 3 ATP

② Oxidation of Isocitric acid
via NAD^+ = 3 ATP

③ Oxidation of α -Ketoglutaric acid
via NAD^+ = 3 ATP

④ Oxidation of succinic acid
via FAD = 2 ATP

⑤ Oxidation of malic acid
via NAD^+ = 3 ATP

⑥ Conversion of succinyl CoA to
succinic acid (substrate level) = $\frac{1 \text{ ATP}}{= 15 \text{ ATP}}$

$\therefore$ 1 molecule of glucose forms two molecules of pyruvic acid,

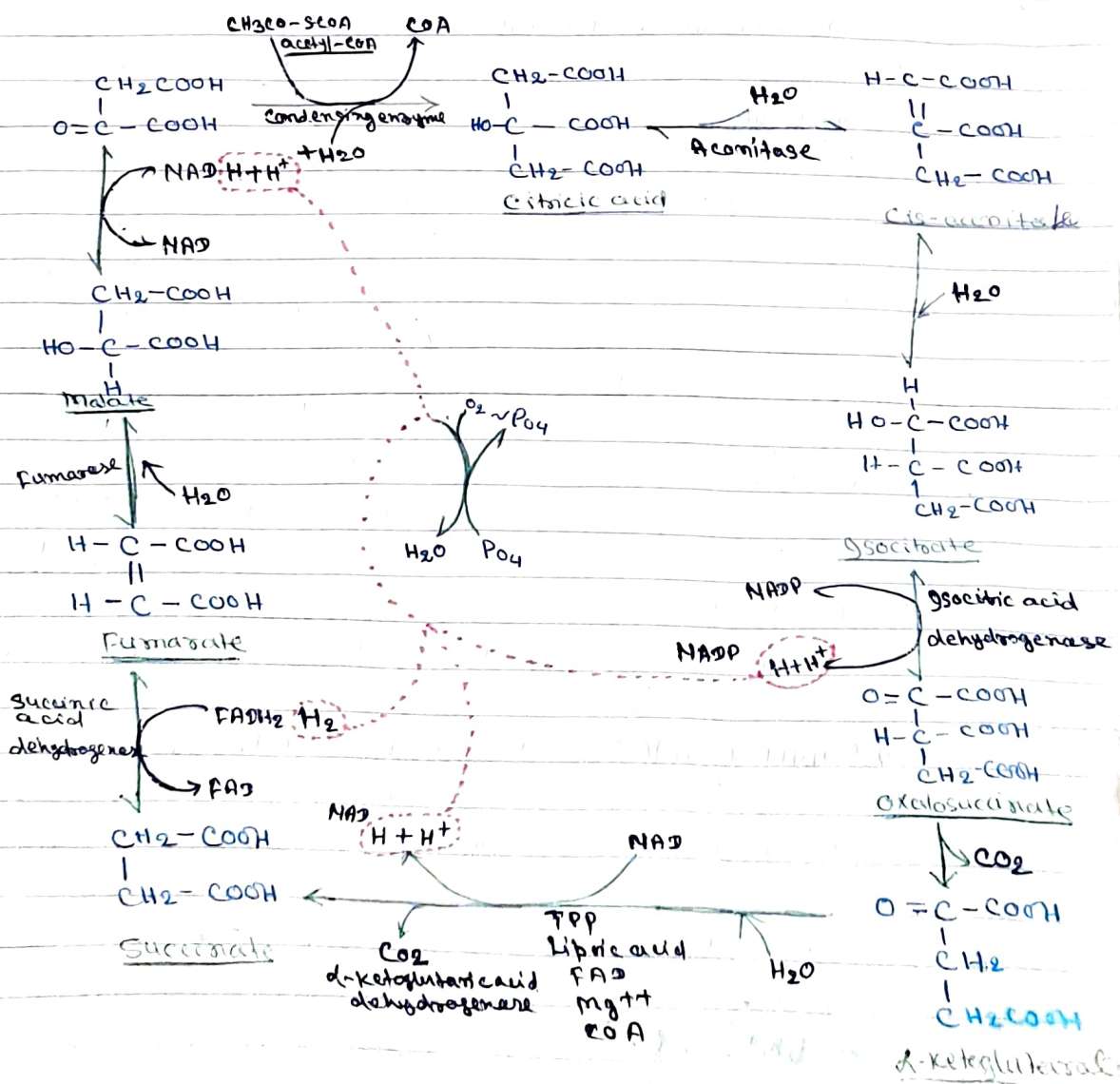
$\therefore$ Total ATP generated will be $= 15 \times 2 = 30 \text{ ATP}$

SIGNIFICANCE OF TCA CYCLE : $\rightarrow$

① The cycle is responsible for the oxidation of substrate and generation of useful energy in the form of ATP and reduced coenzyme $NADH$.

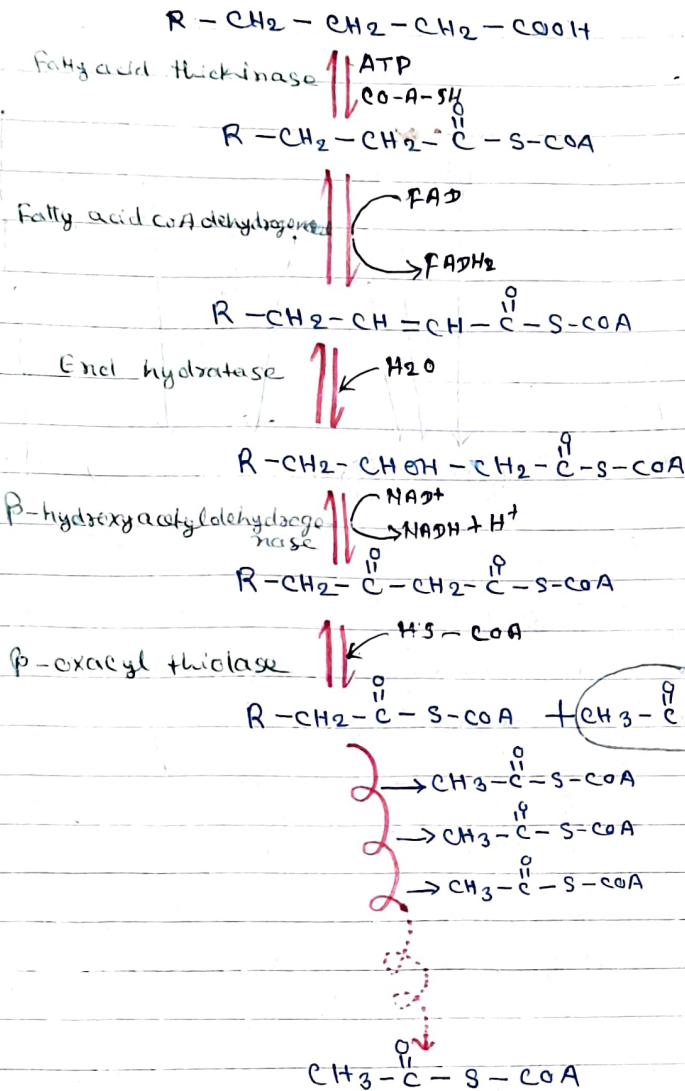
② TCA cycle is important not only because it provides energy for the cell but also because a variety of amino acid or lipid can enter the cycle to provide energy or can be formed from TCA cycle intermediates.

- ③ The TCA cycle is also important because it provides reactions by which carbohydrate materials can be converted to other classes of biological molecules such as amino acids or lipids. It also permits these types of molecules to enter energy yielding metabolism if the cell is short in glucose supply.
- ④ It also supplies essential carbon skeleton for the cellular biosynthesis of cell-constituents.
- ⑤ The reactions of TCA cycles are reversible. This means that several different carbon skeleton maintains its structure.
- ⑥ The reversibility of reactions also suggest that CO_2 may be used directly to increase the length of the Carbon chain.



KREB'S CYCLE

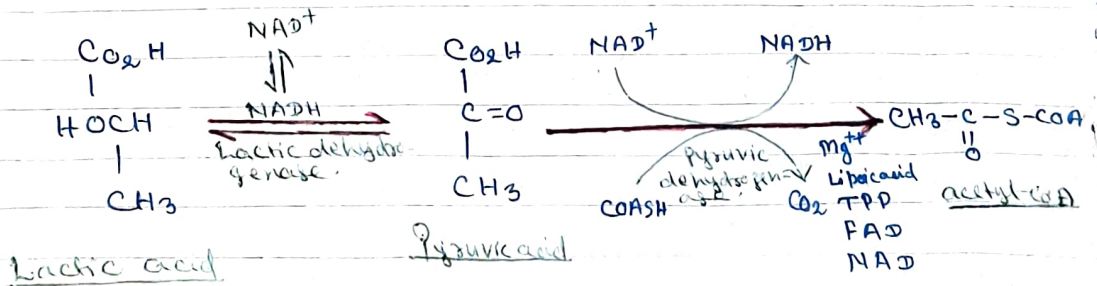
UTILIZATION OF LIPID IN KREB'S CYCLES



The lipids on hydrolysis are converted into fatty acid & glycerol. The fatty acid through β -oxidation pathway can be converted into acetyl-CoA, can enter into TCA cycle. The glycerol can also be converted into dihydroxyacetone-1-Phosphate and can thus enter into TCA cycle through EM pathway.

Kreb's cycle

UTILIZATION OF LACTIC ACID :-



P.T.O.

INCORPORATION OF AMINO ACIDS : →

The amino acid by simple conversions can be converted into one of the substrate of TCA cycle, as shown below.

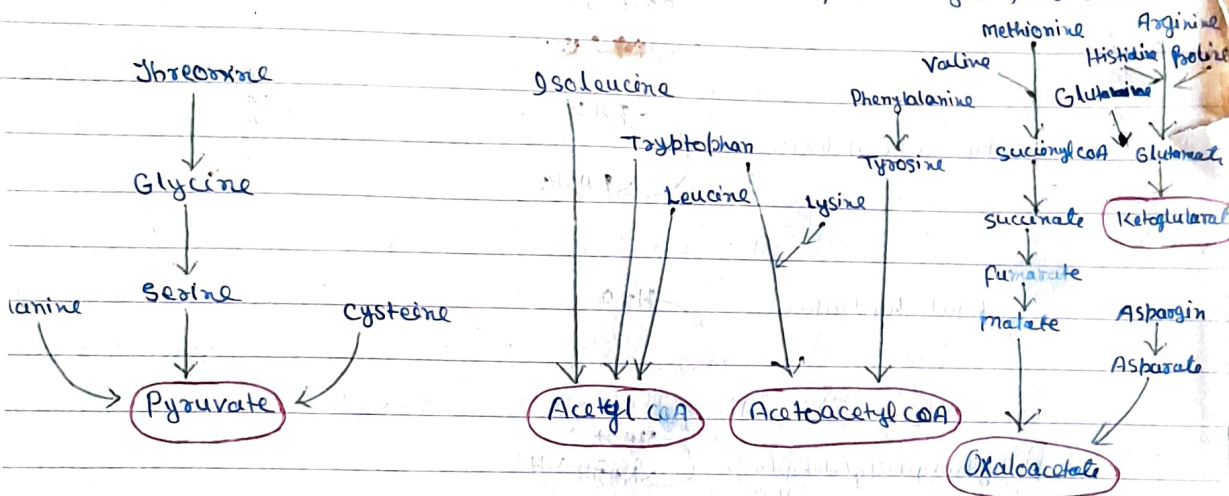


FIG :- Summary of the major end products of catabolism of common amino-acids. The substrate of the TCA cycle are underlined.