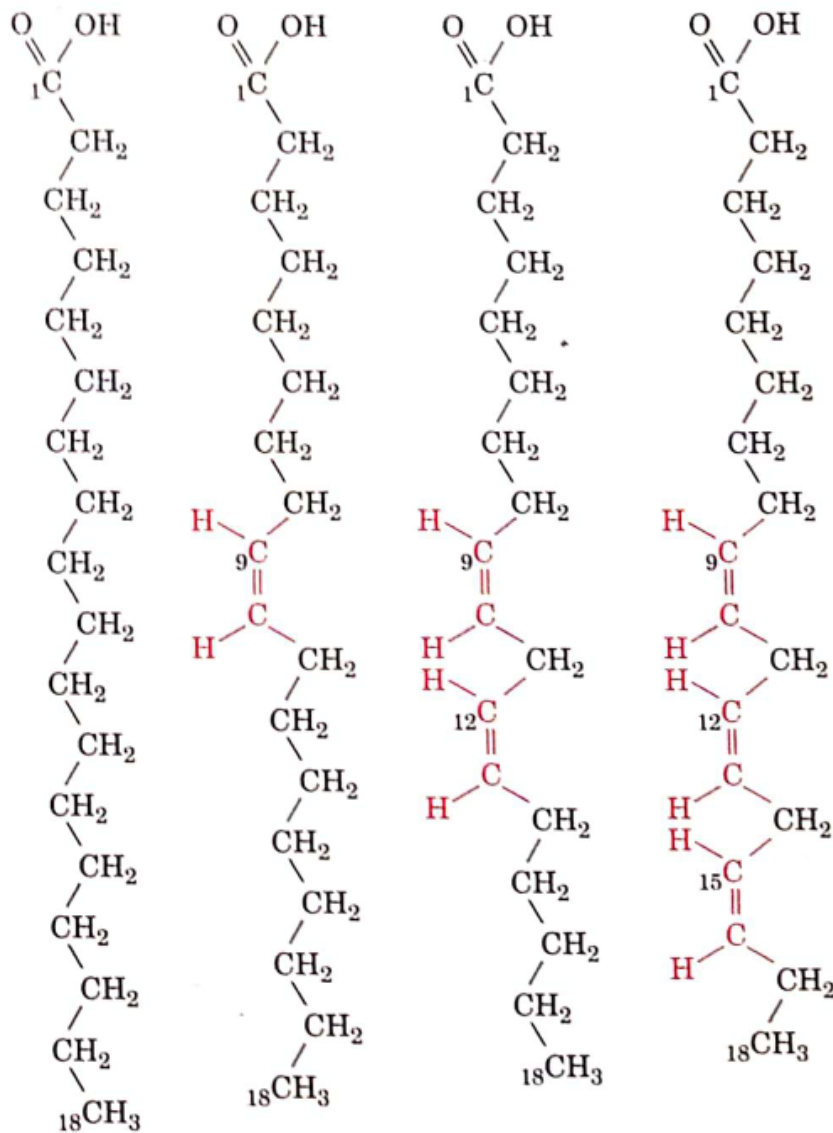


Lipids

Metabolism: Beta Oxidation of Fatty Acids



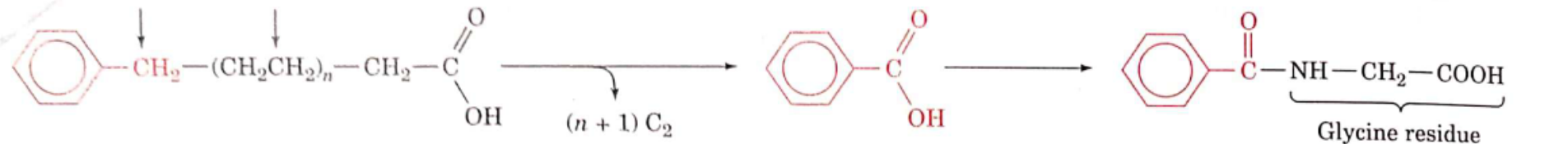
Stearic acid Oleic acid Linoleic acid α-Linolenic acid

FIGURE 12-1 Structural formulas of some C₁₈ fatty acids. The double bonds all have the cis configuration.

Fatty acid fed

Breakdown product

Excretion product

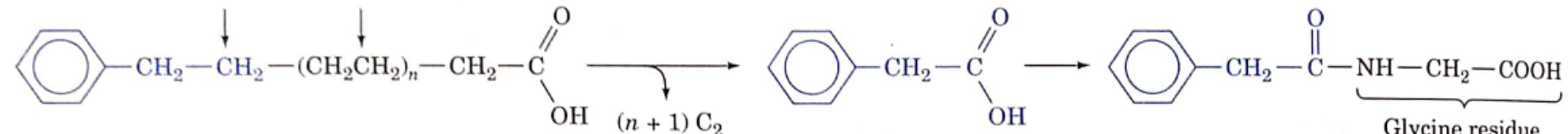


Odd-chain fatty acid

Benzoic acid

Hippuric acid

Glycine residue

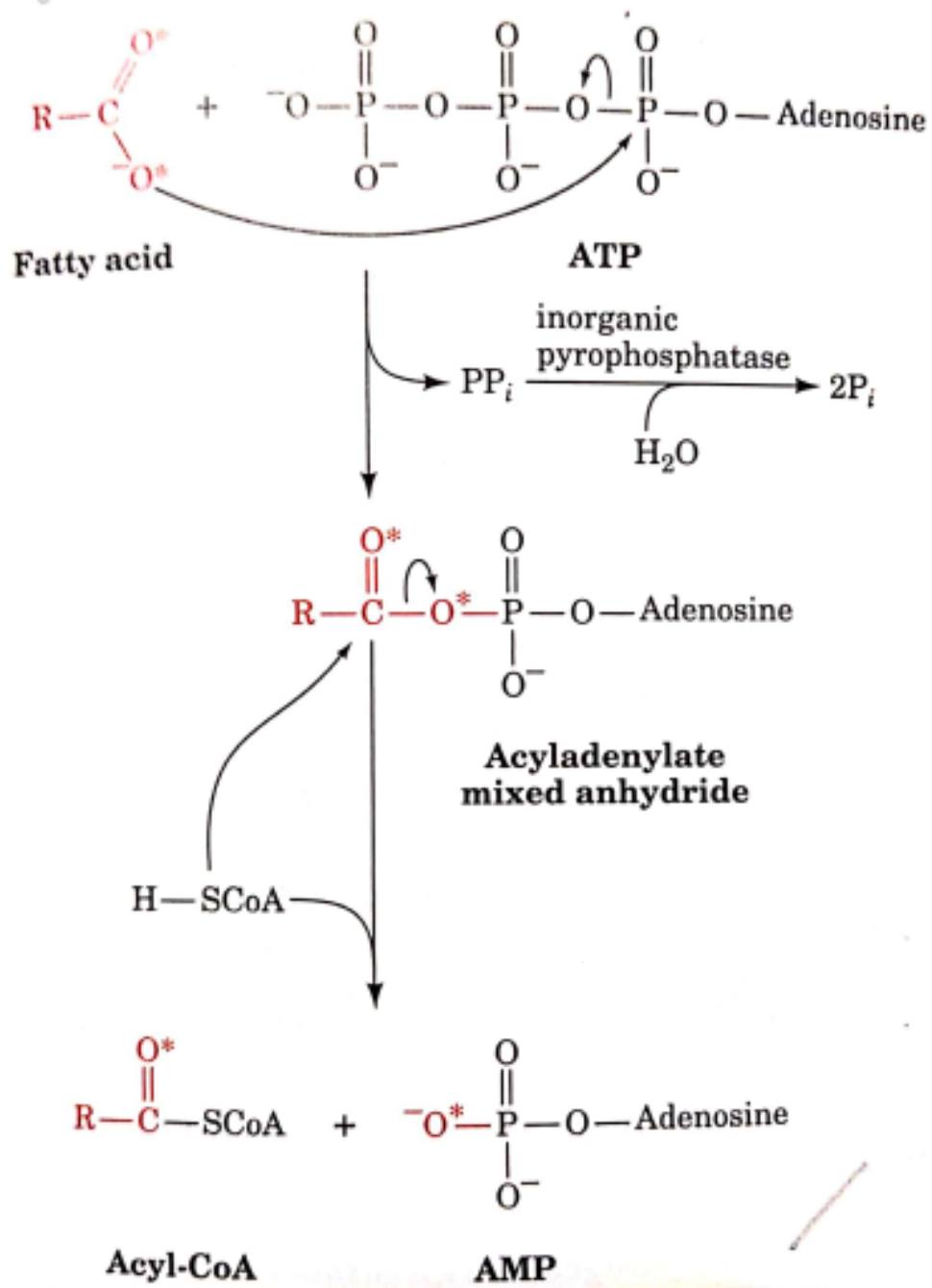


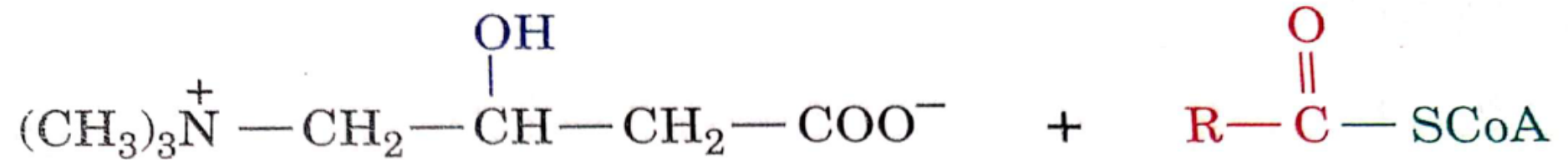
Even-chain fatty acid

Phenylacetic acid

Phenylaceturic acid

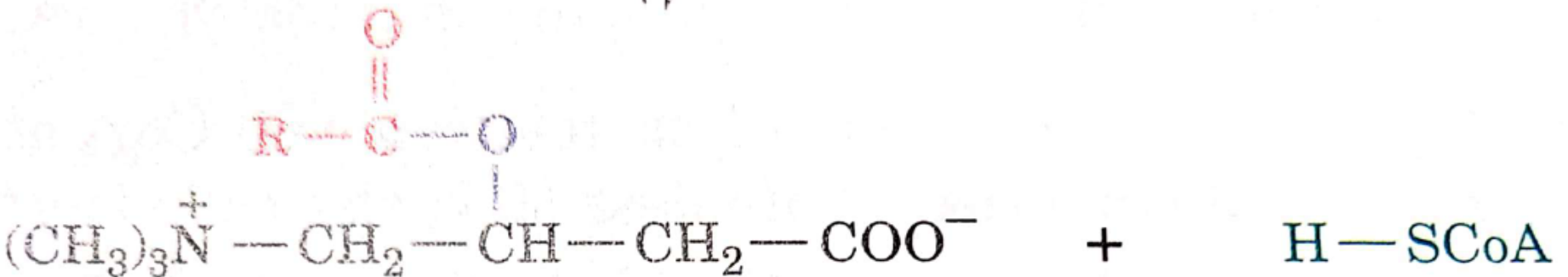
Glycine residue



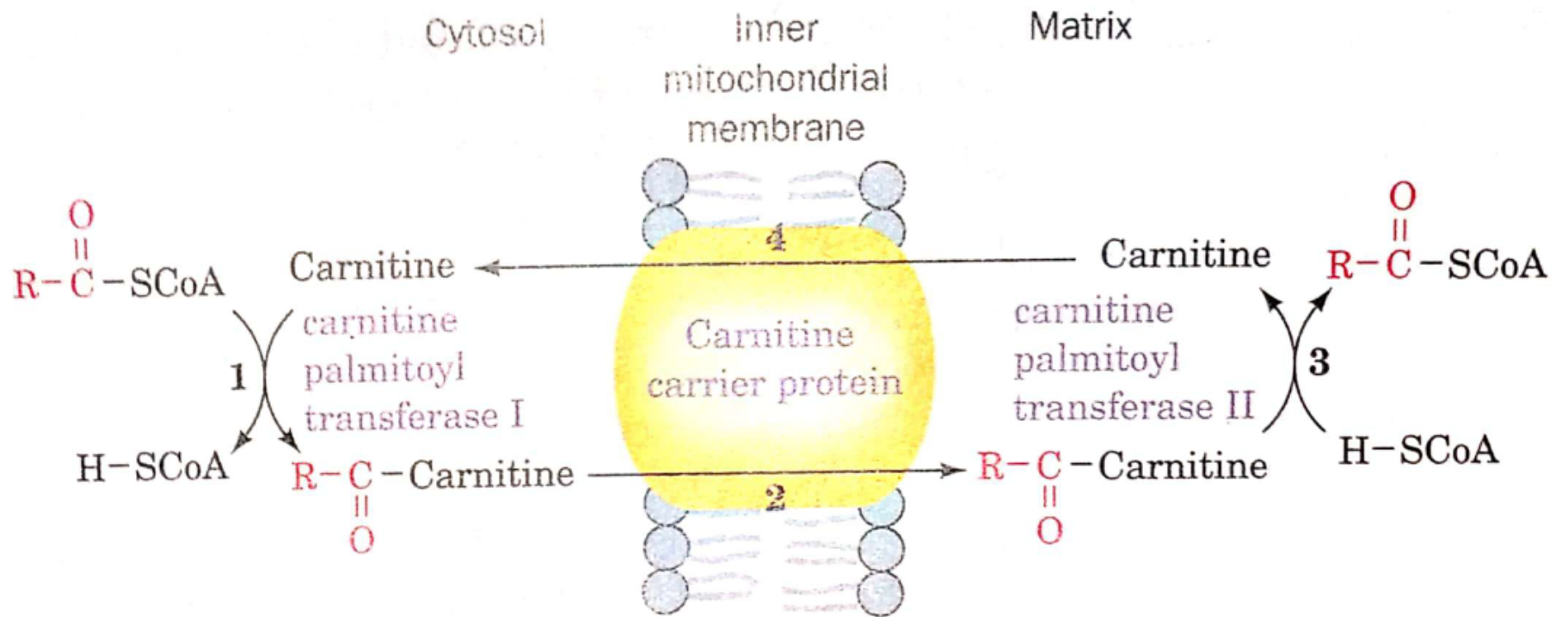


Carnitine (4-trimethylamino-3-hydroxybutyrate)

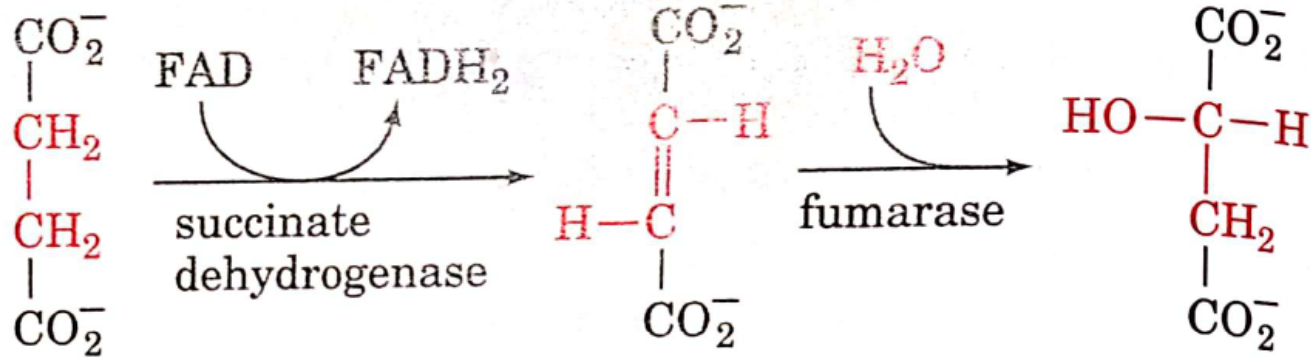
⇌ carnitine palmitoyltransferase



Acyl-carnitine



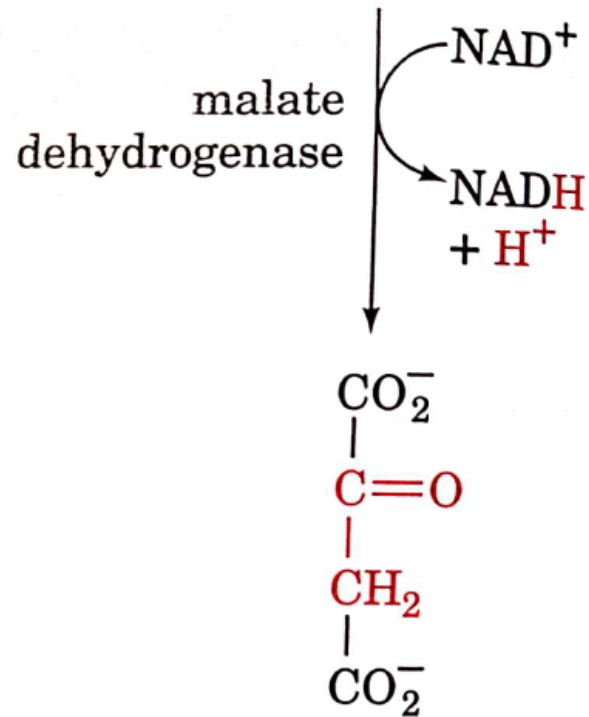
1. The acyl group of a cytosolic acyl-CoA is transferred to carnitine, thereby releasing the CoA to its cytosolic pool.
2. The resulting acyl-carnitine is transported into the mitochondrial matrix by the transport system.
3. The acyl group is transferred to a CoA molecule from the mitochondrial pool.
4. The product carnitine is returned to the cytosol.



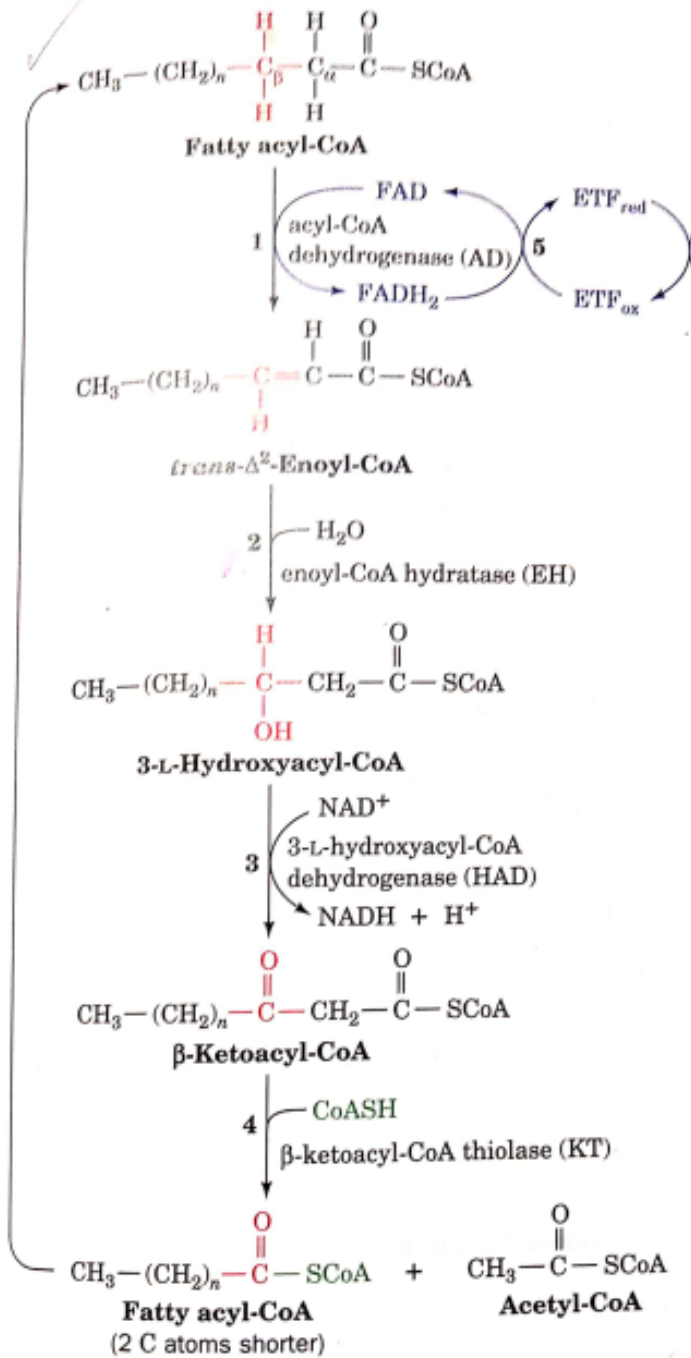
Succinate

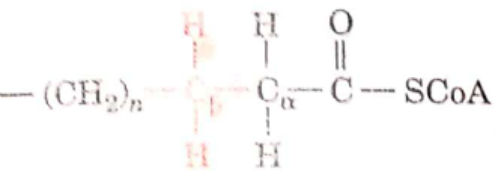
Fumarate

L-Malate

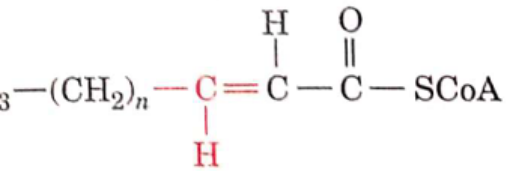
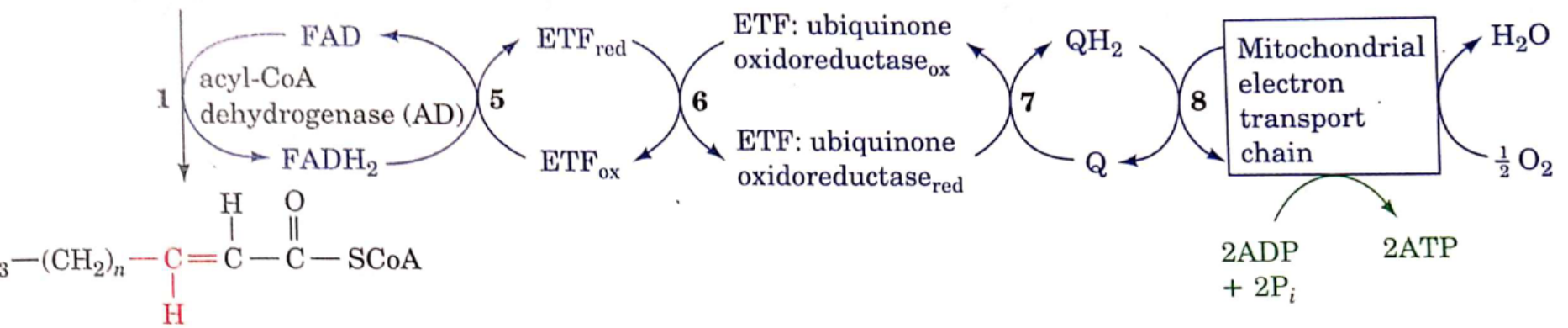


Oxaloacetate





Fatty acyl-CoA



trans-Δ²-Enoyl-CoA

1. Formation of a trans- α,β double bond through dehydrogenation by the flavoenzyme **acyl-CoA dehydrogenase (AD)**.

2. Hydration of the double bond by **enoyl-CoA hydratase (EH)** to form a **3-L-hydroxyacyl-CoA**.

3. NAD^+ -dependent dehydrogenation of this β -hydroxyacyl-CoA by **3-L-hydroxyacyl-CoA dehydrogenase (HAD)** to form the corresponding β -ketoacyl-CoA.

4. $\text{C}_\alpha\text{—C}_\beta$ cleavage in a thiolysis reaction with CoA as catalyzed by **β -ketoacyl-CoA thiolase (KT; also called just thiolase)** to form acetyl-CoA and a new acyl-CoA containing two less C atoms than the original one.