

Figure 19.1
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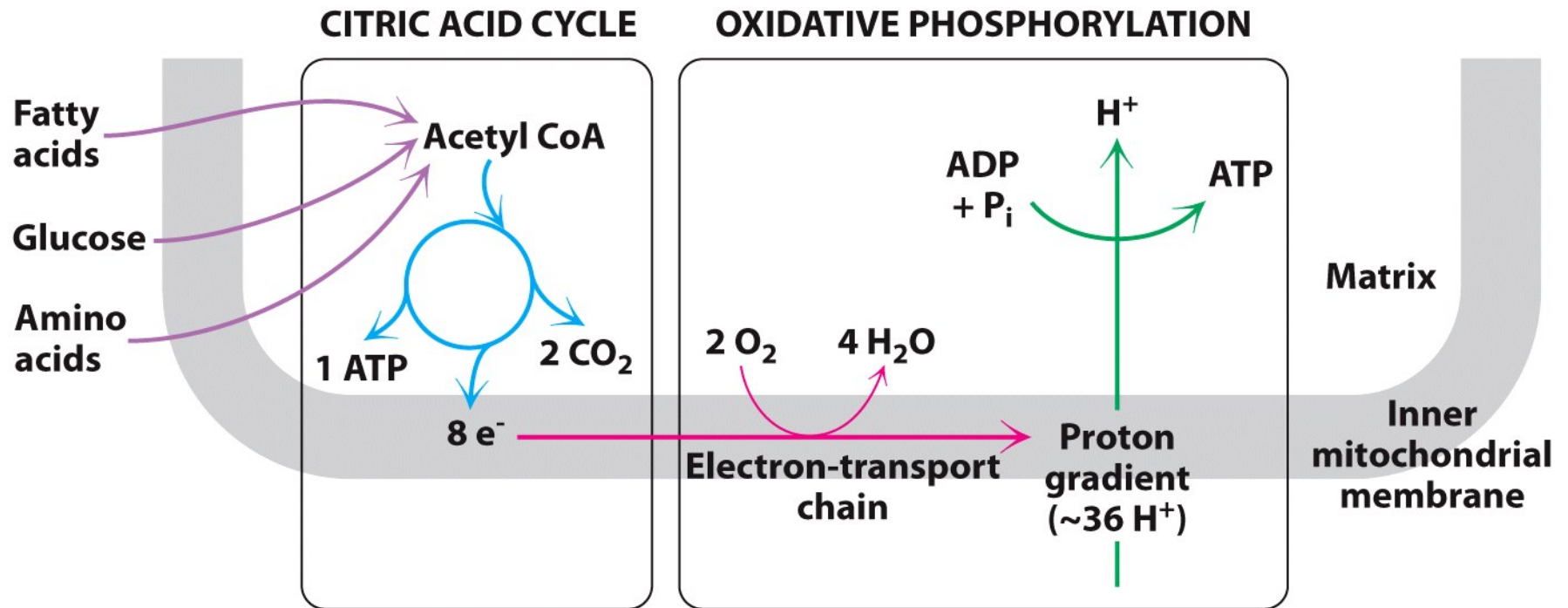
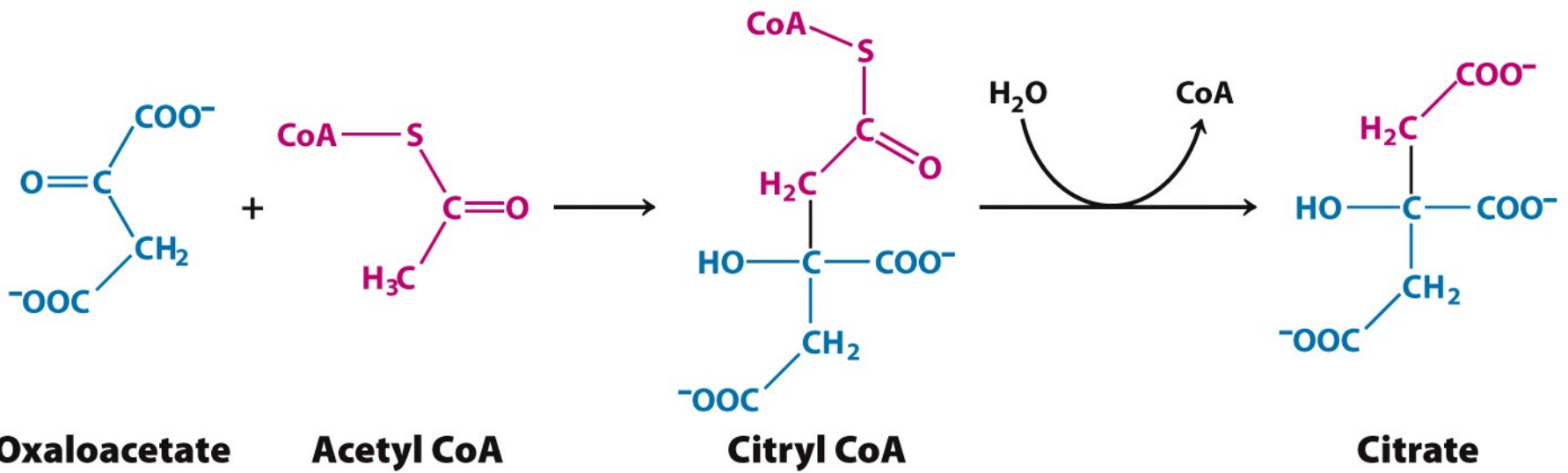


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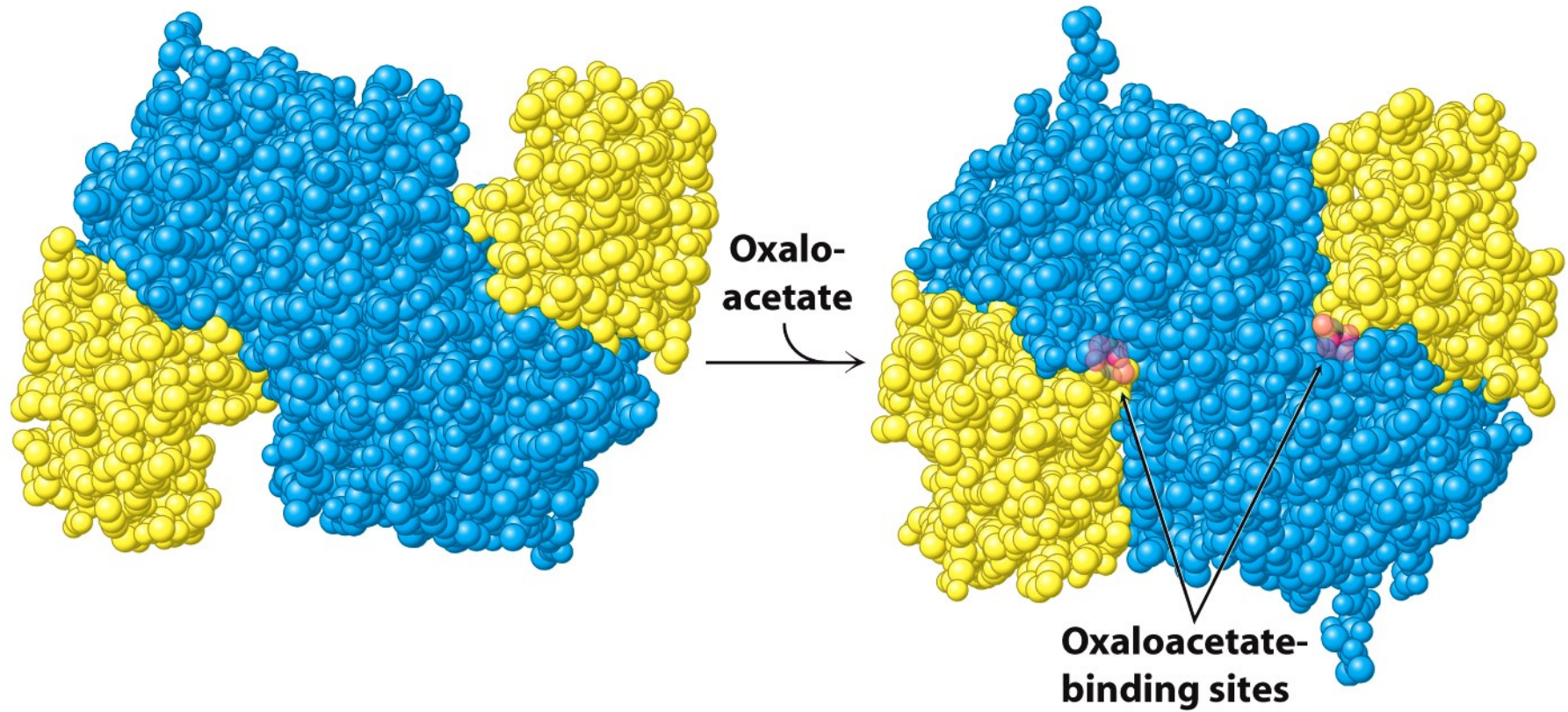
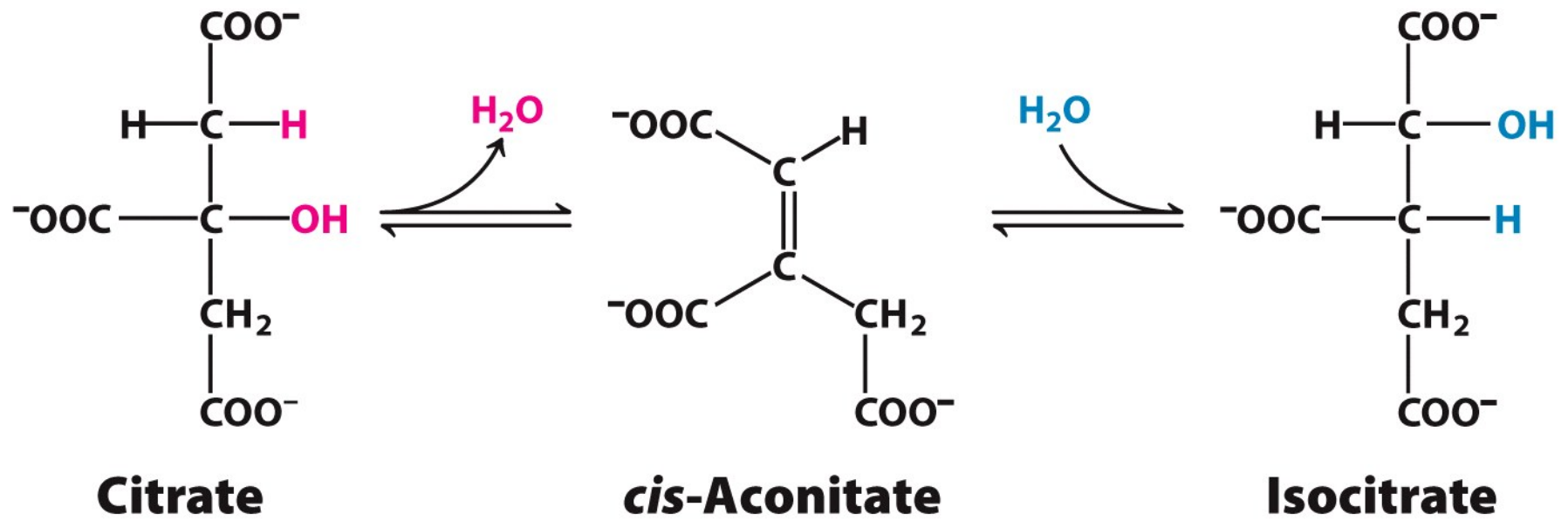
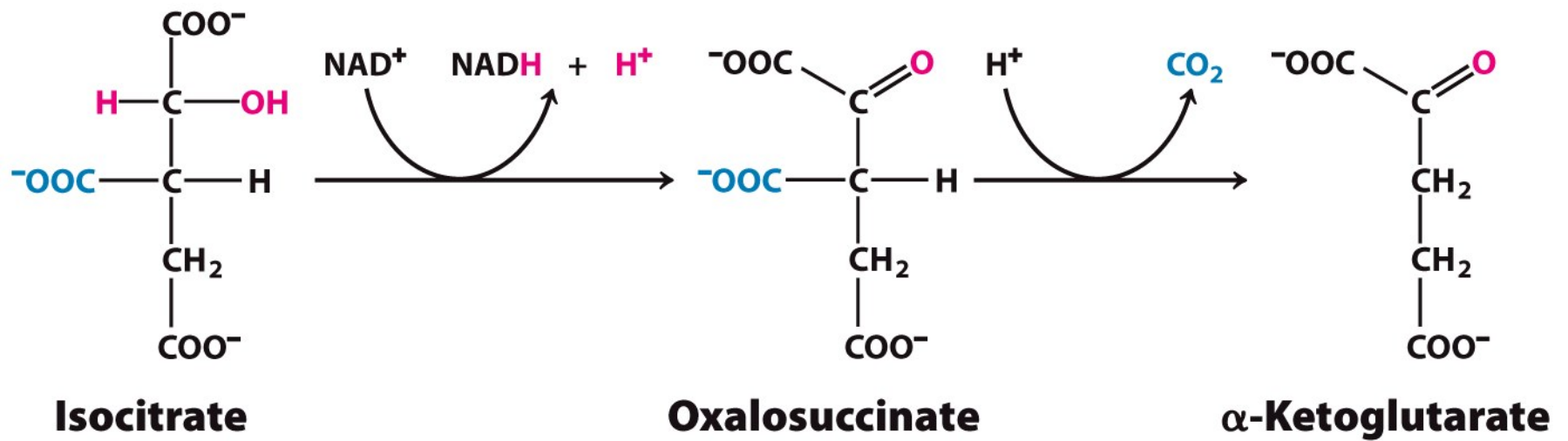


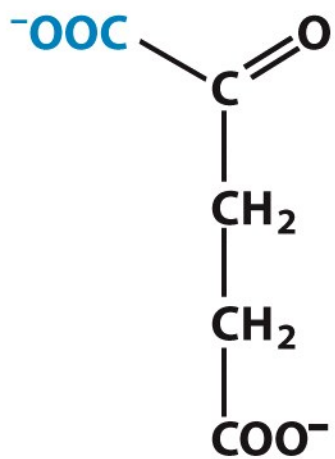
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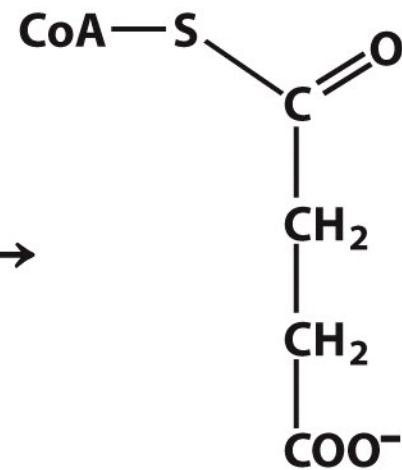
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α -Ketoglutarate



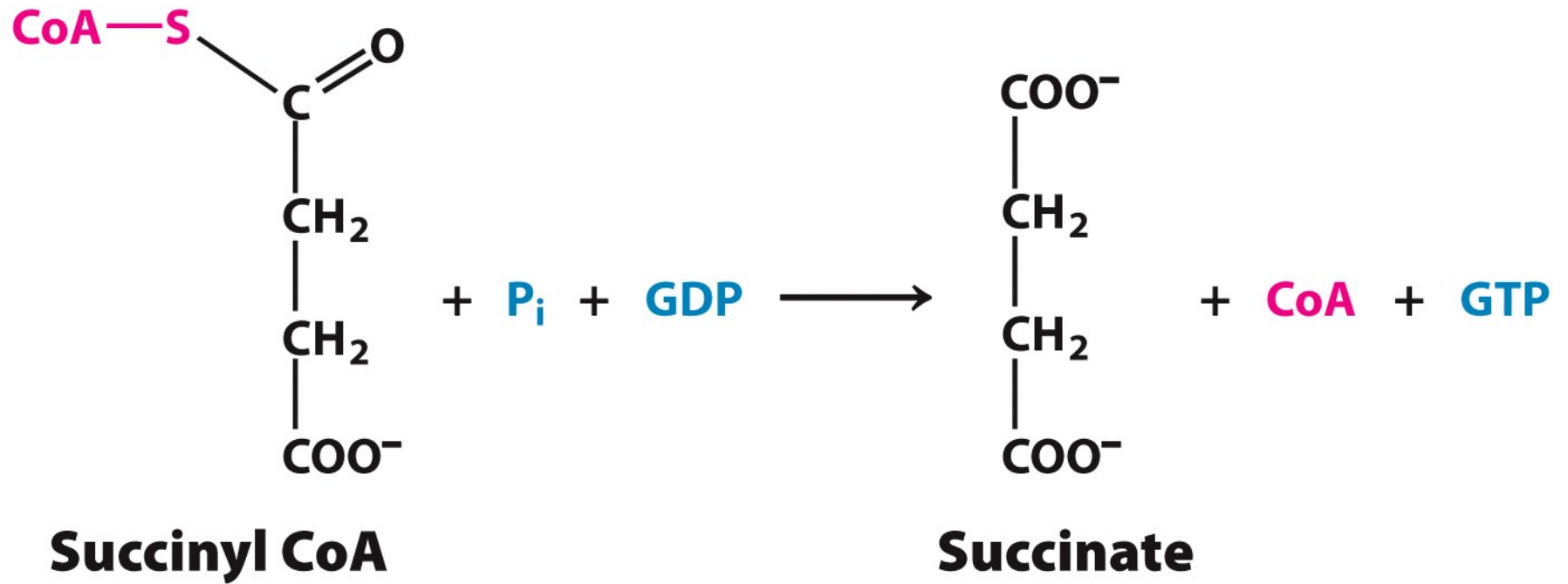
Succinyl CoA



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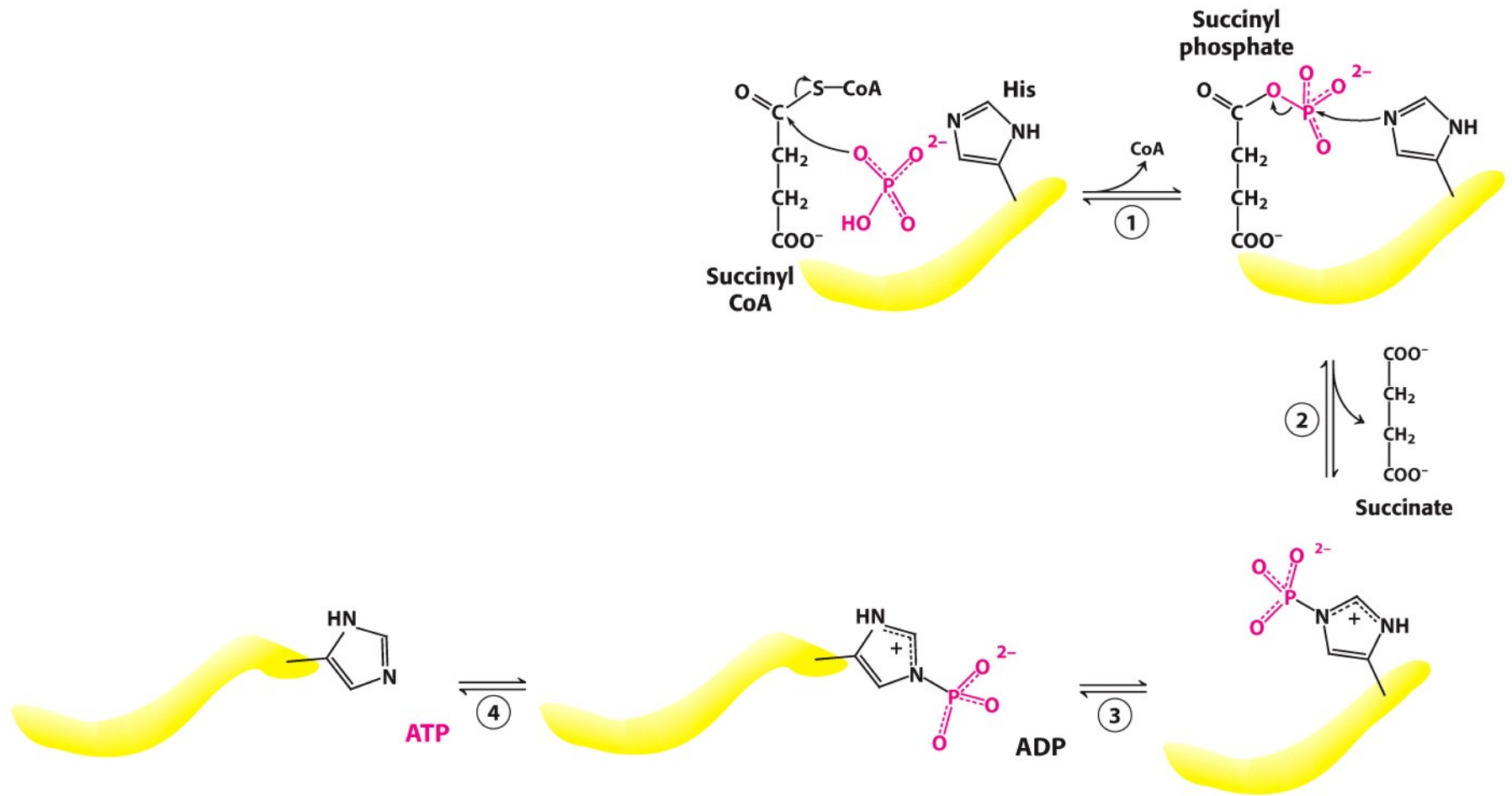
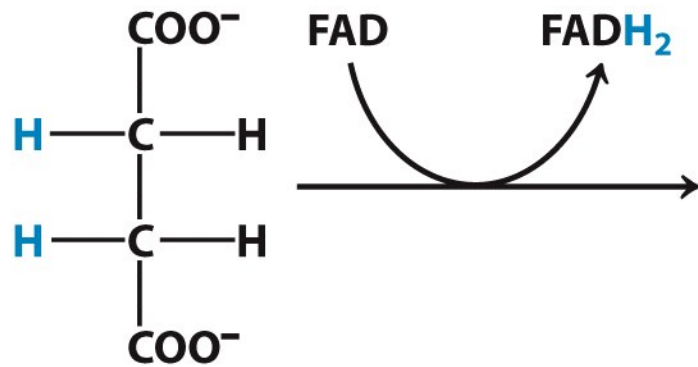
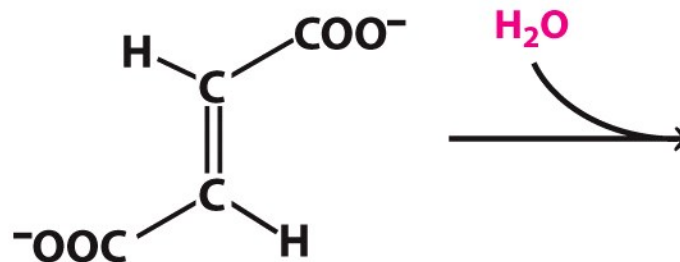


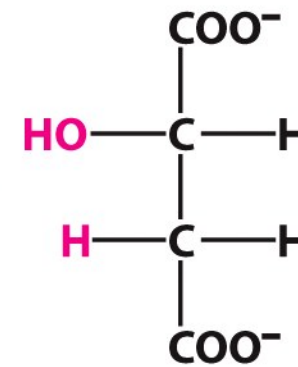
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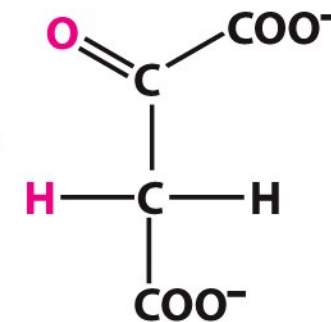
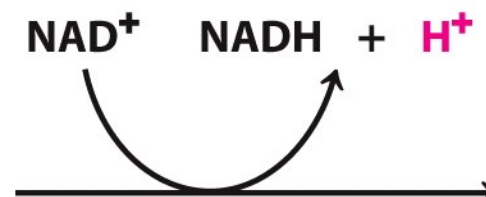
Succinate



Fumarate



Malate



Oxaloacetate

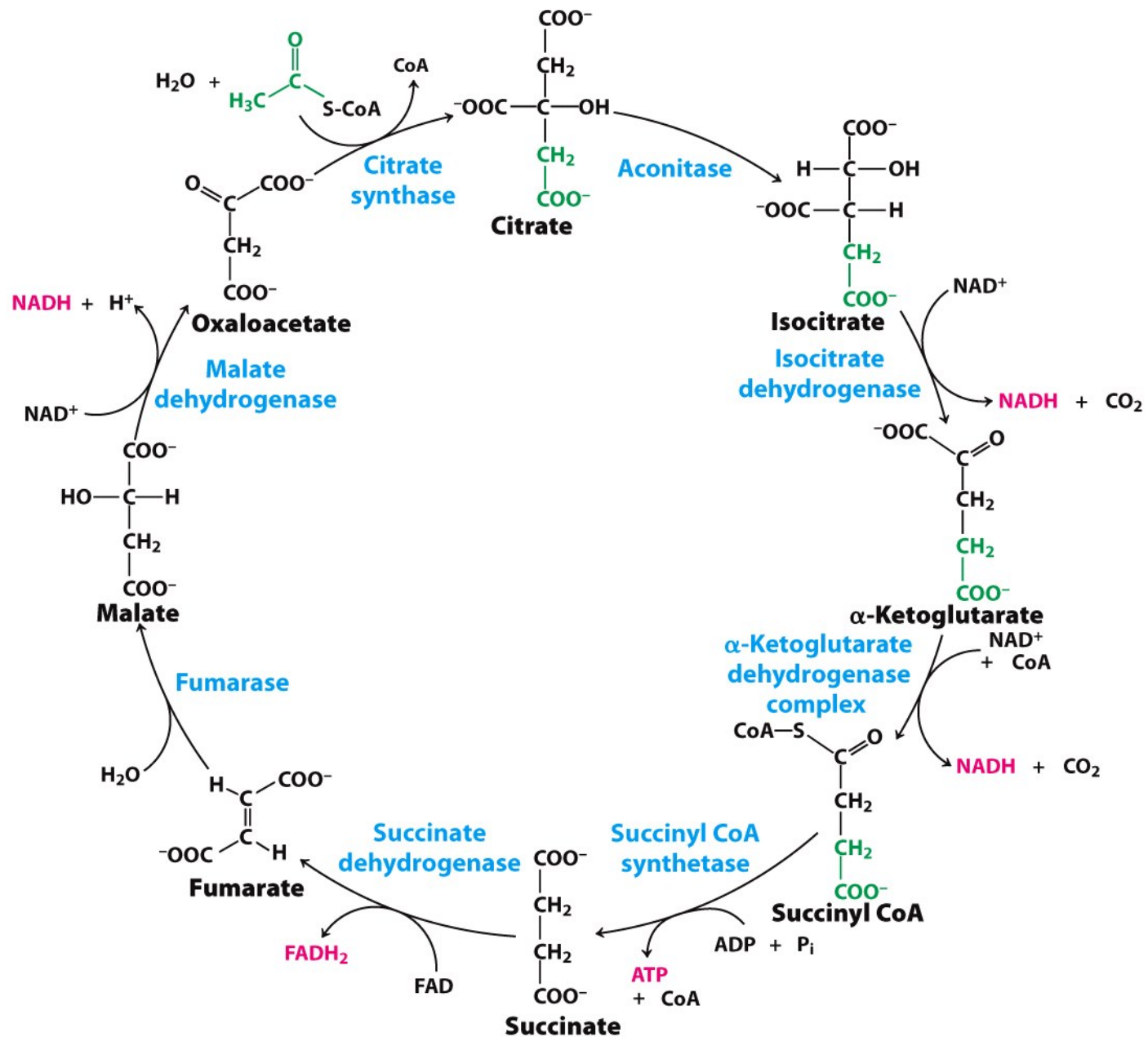


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Table 19.1 Citric acid cycle

| Step | Reaction | Enzyme | Prosthetic group | Type* | ΔG° | |
|------|---|---|--------------------------|-------|----------------------|----------------------|
| | | | | | kJ mol ⁻¹ | kJ mol ⁻¹ |
| 1 | Acetyl CoA + oxaloacetate + H ₂ O → citrate + CoA + H ⁺ | Citrate synthase | | a | -31.4 | -7.5 |
| 2a | Citrate ⇌ <i>cis</i> -aconitate + H ₂ O | Aconitase | Fe-S | b | +8.4 | +2.0 |
| 2b | <i>cis</i> -Aconitate + H ₂ O ⇌ isocitrate | Aconitase | Fe-S | c | -2.1 | -0.5 |
| 3 | Isocitrate + NAD ⁺ ⇌ α-ketoglutarate + CO ₂ + NADH | Isocitrate dehydrogenase | | d + e | -8.4 | -2.0 |
| 4 | α-Ketoglutarate + NAD ⁺ + CoA ⇌ succinyl CoA + CO ₂ + NADH | α-Ketoglutarate dehydrogenase complex | Lipoic acid, FAD, TPP | d + e | -30.1 | -7.2 |
| 5 | Succinyl CoA + P _i + ADP ⇌ succinate + ATP + CoA | Succinyl CoA synthetase | | f | -3.3 | -0.8 |
| 6 | Succinate + FAD (enzyme-bound) ⇌ fumarate + FADH ₂ (enzyme-bound) | Succinate dehydrogenase | FAD, Fe-S | e | 0 | 0 |
| 7 | Fumarate + H ₂ O ⇌ L-malate | Fumarase | | e | -3.8 | -0.9 |
| 8 | L-Malate + NAD ⁺ ⇌ oxaloacetate + NADH + H ⁺ | Malate dehydrogenase | | e | +29.7 | +7.1 |

*Reaction type: a, condensation; b, dehydration; c, hydration; d, decarboxylation; e, oxidation; f, substrate-level phosphorylation.

Table 19.1

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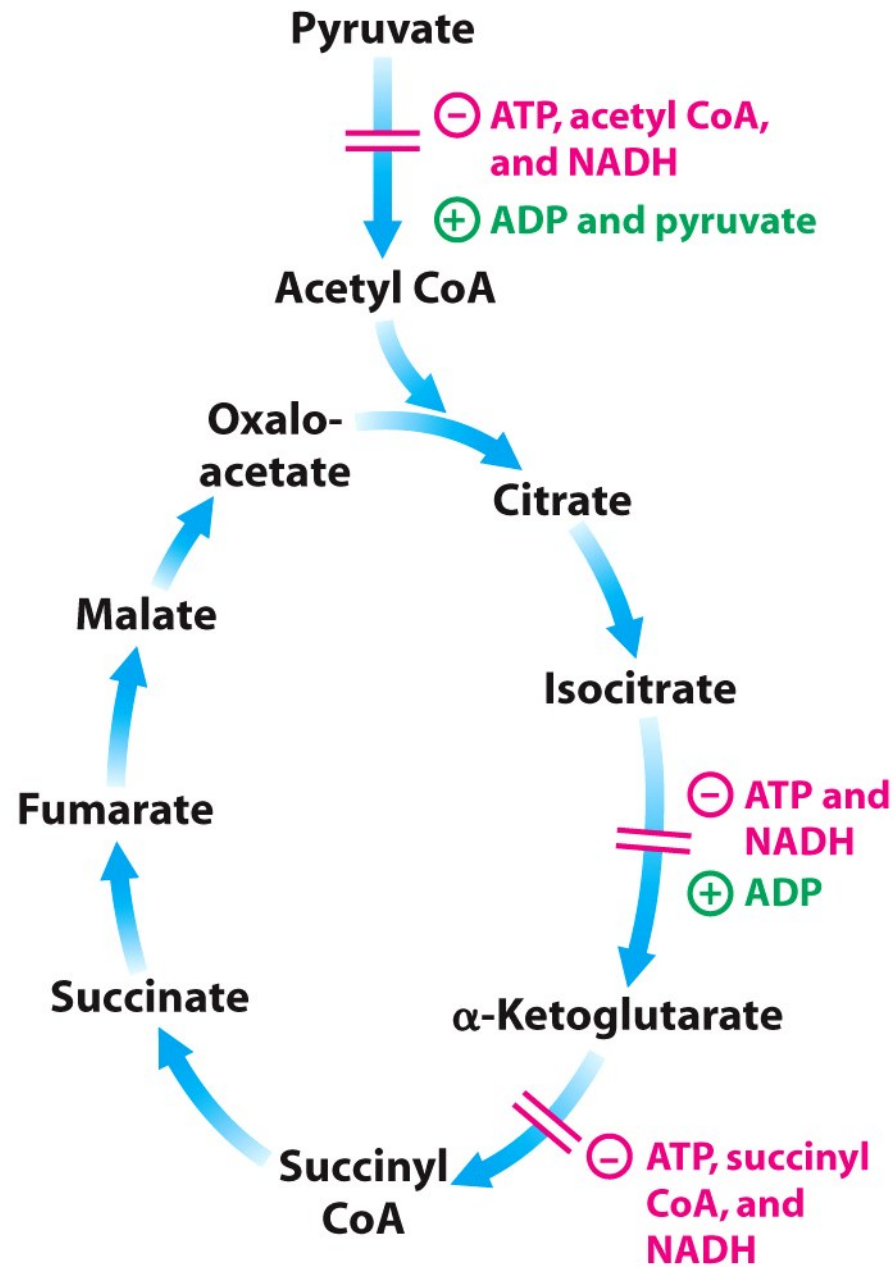


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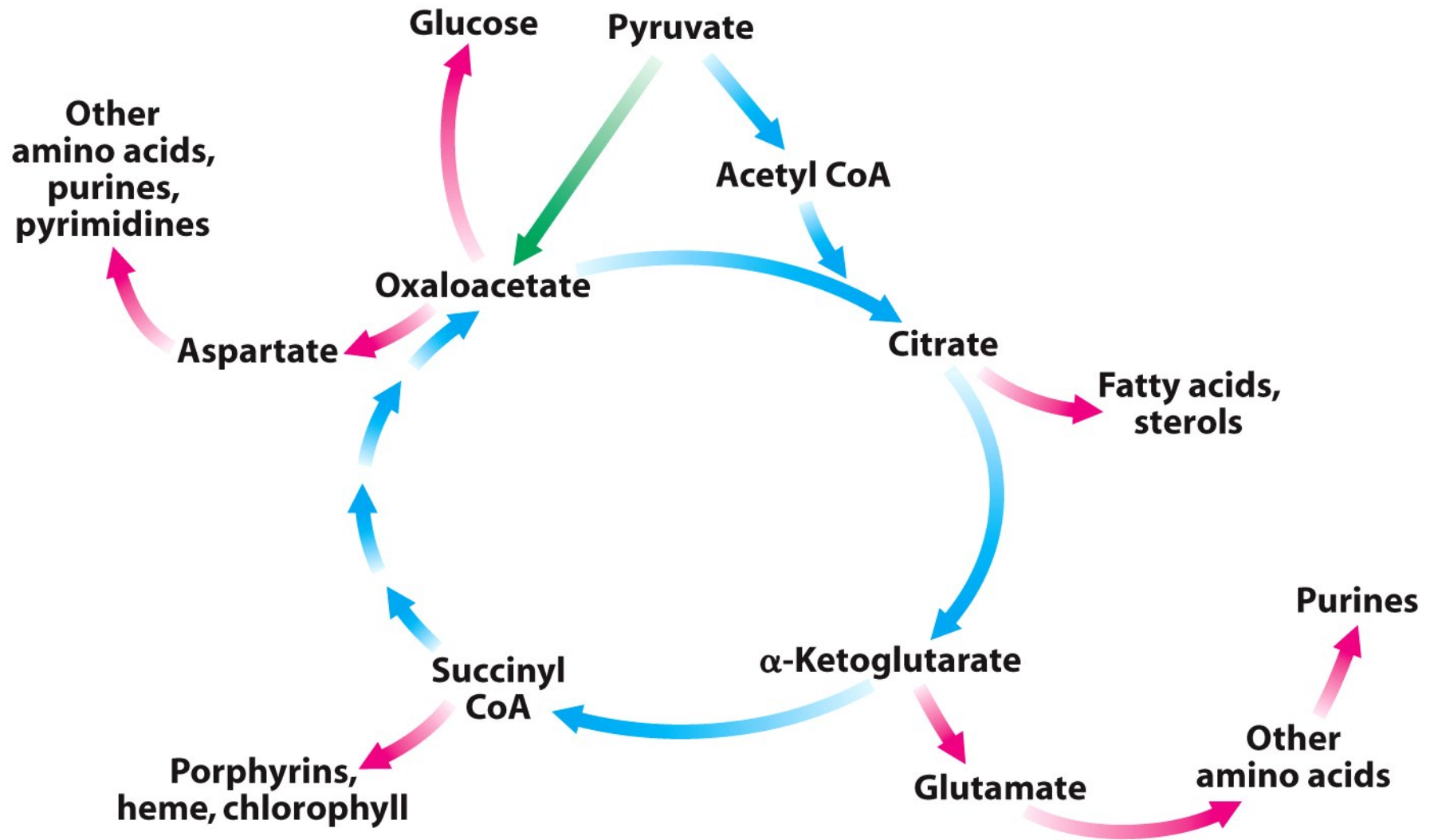


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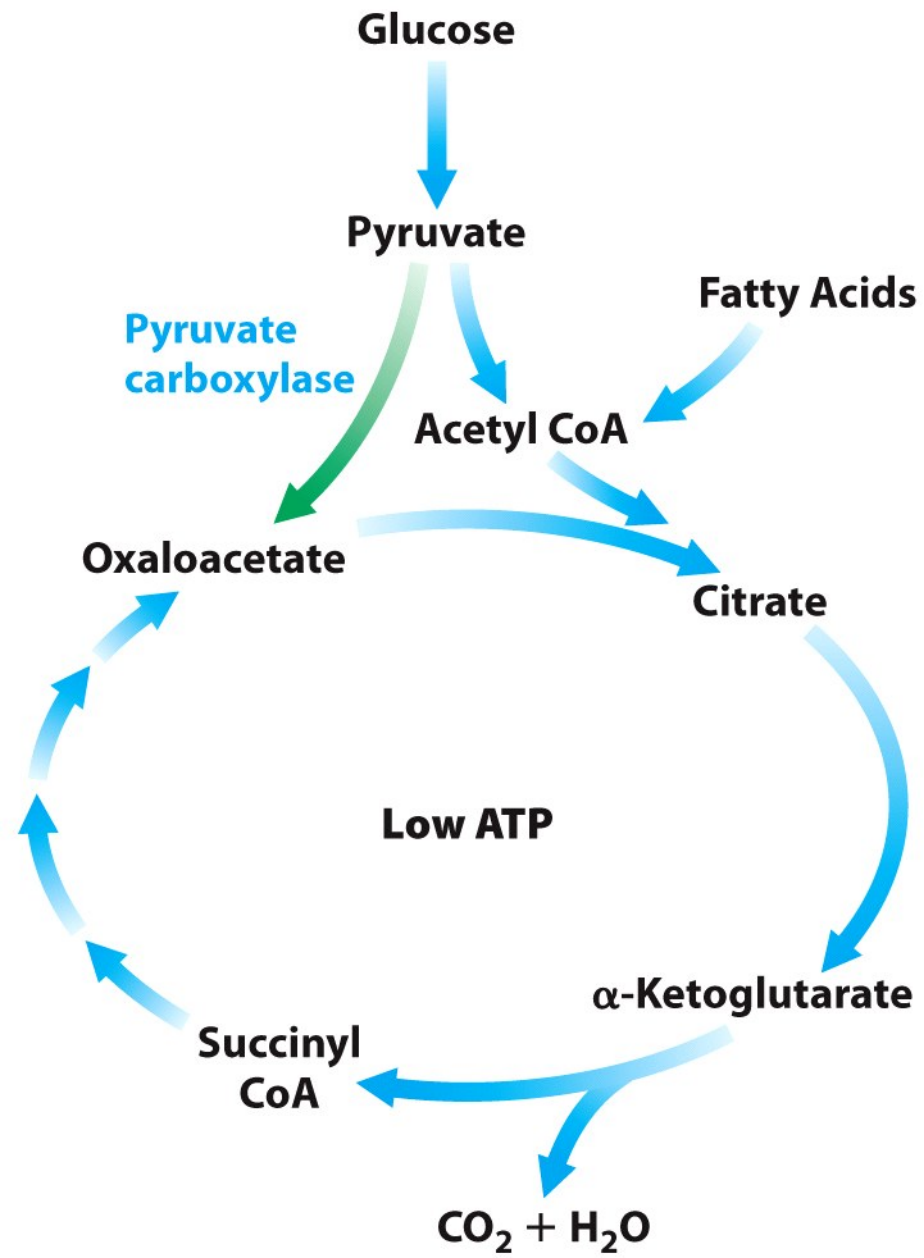


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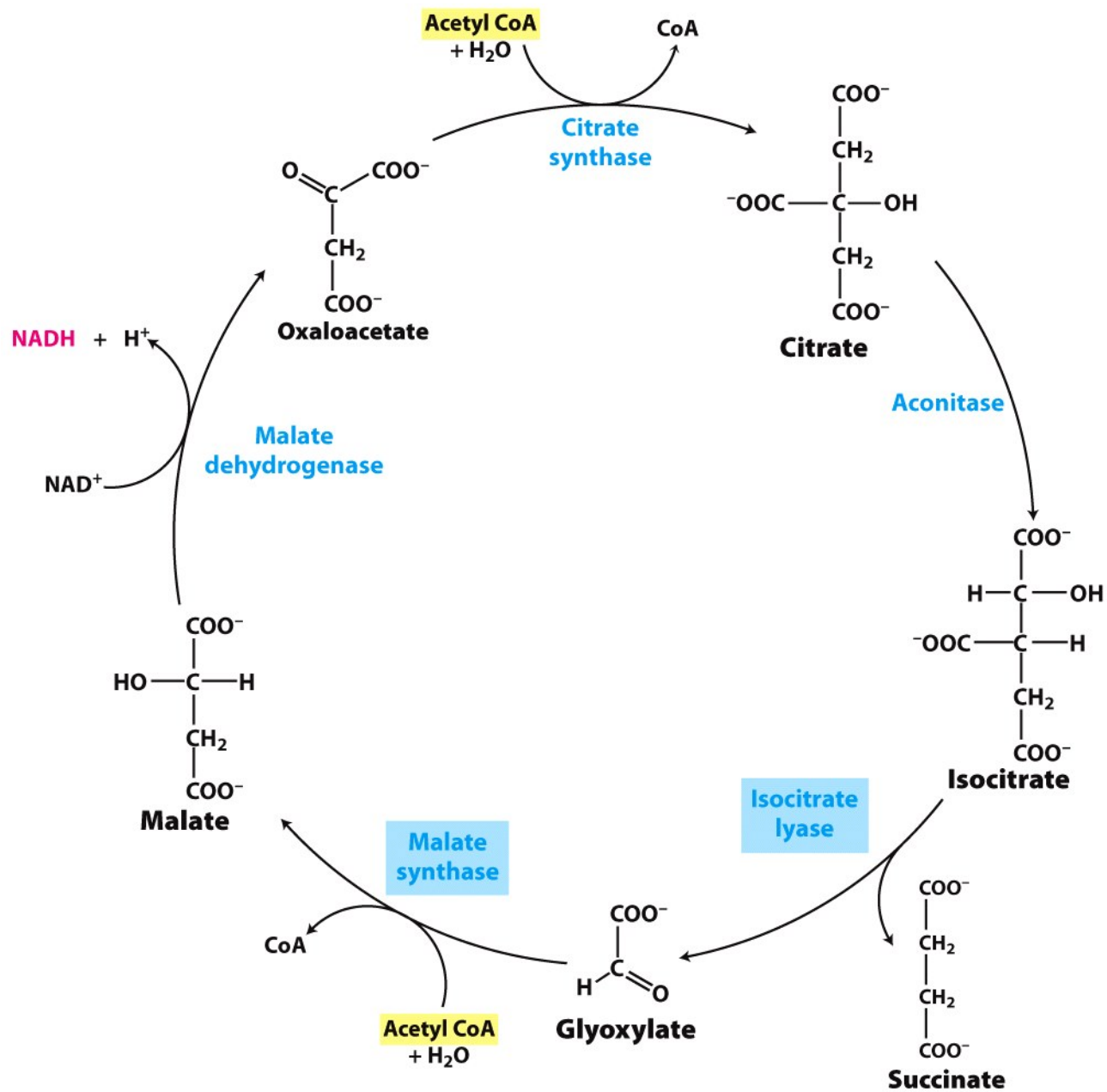


Figure 19.10
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