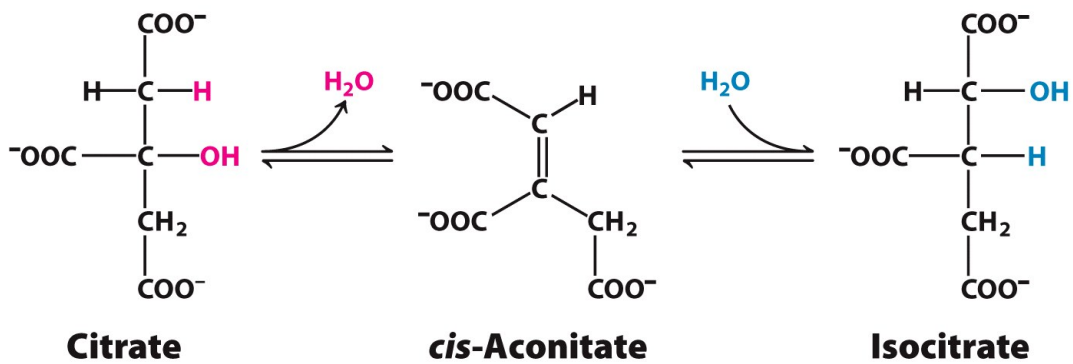
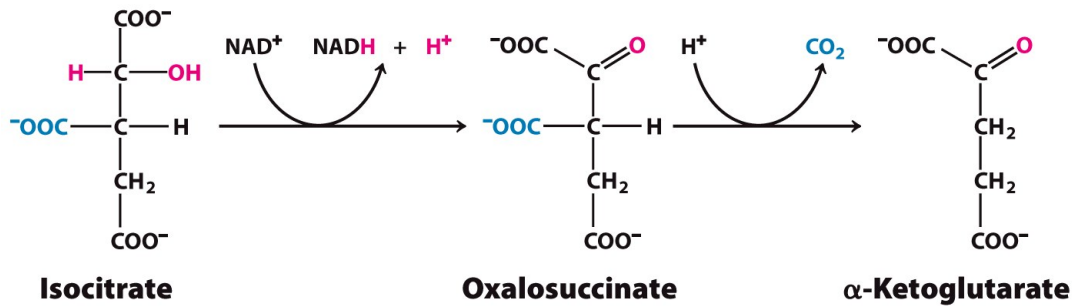


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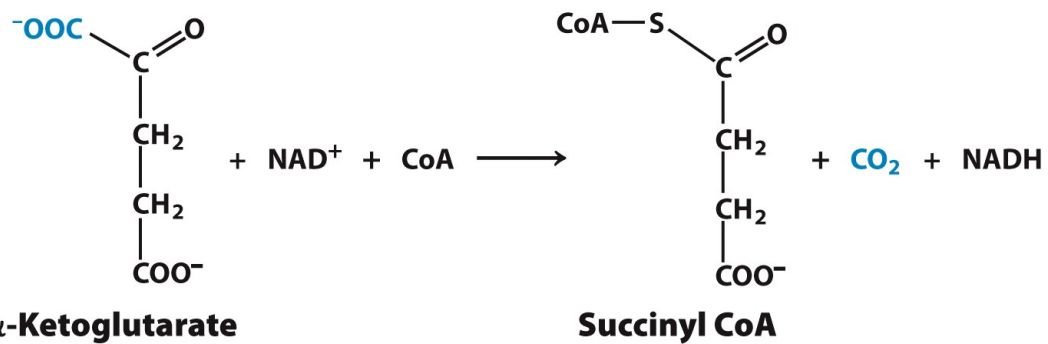


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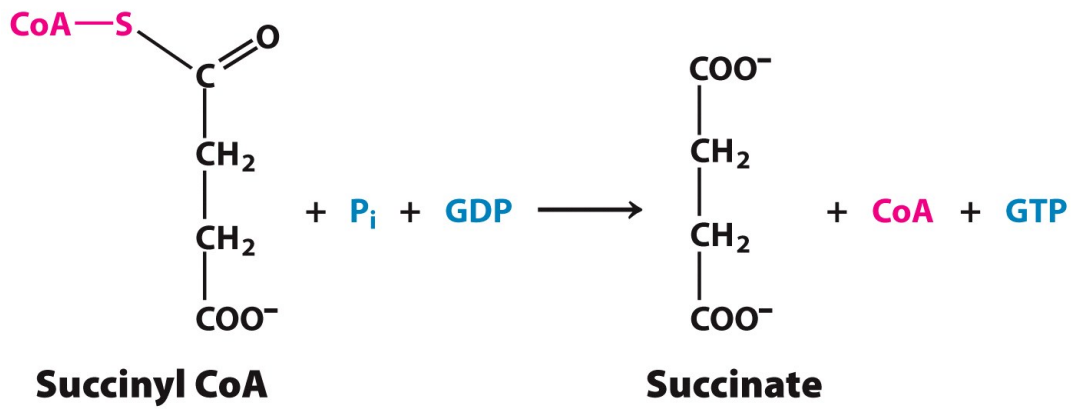
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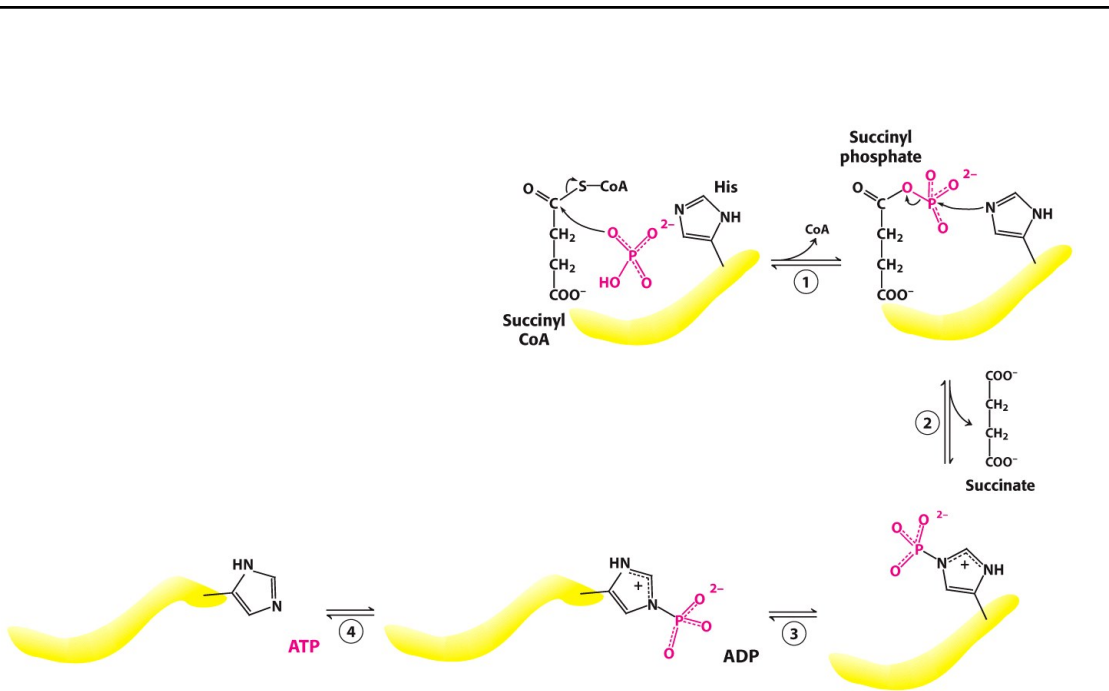
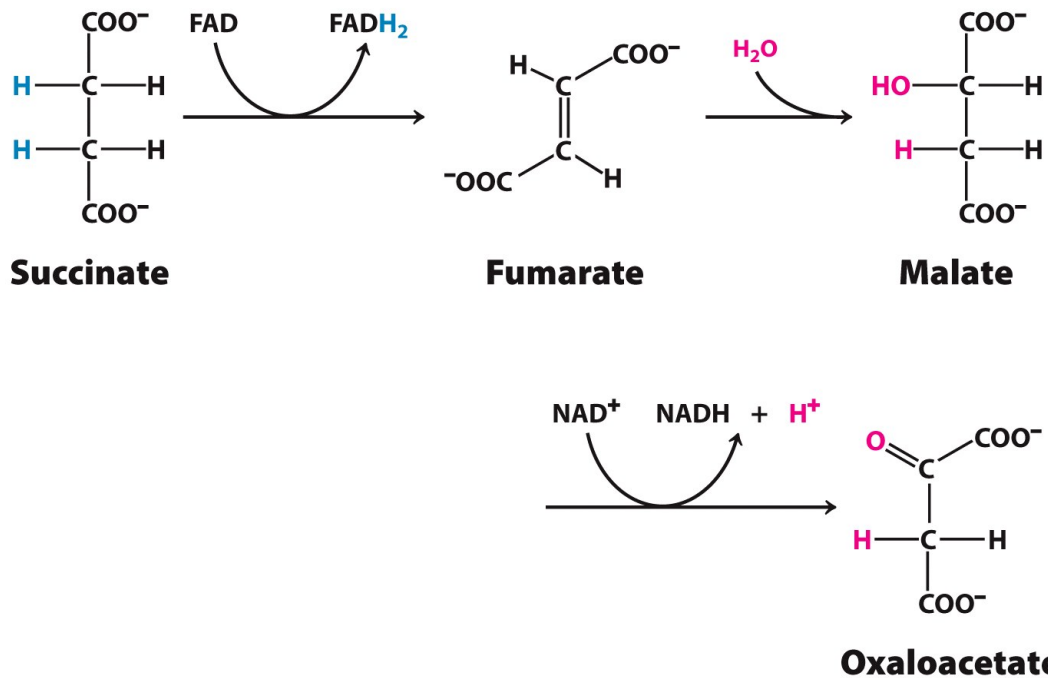


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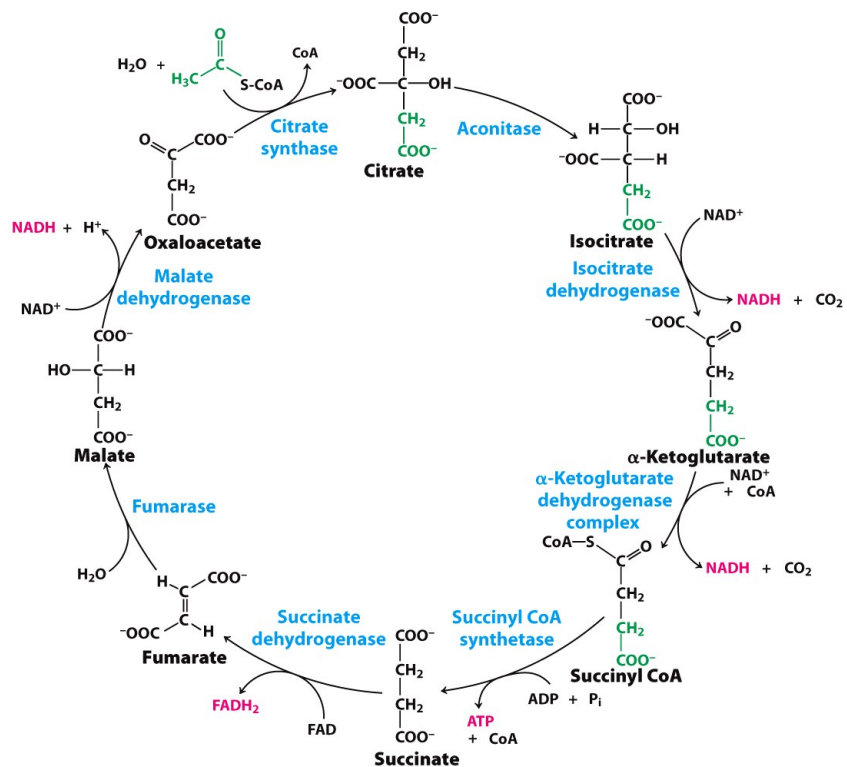


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Table 19.1 Citric acid cycle

Step	Reaction	Enzyme	Prosthetic group	Type*	ΔG°	
					kJ mol^{-1}	kJ mol^{-1}
1	$\text{Acetyl CoA} + \text{oxaloacetate} + \text{H}_2\text{O} \rightarrow \text{citrate} + \text{CoA} + \text{H}^+$	Citrate synthase		a	-31.4	-7.5
2a	$\text{Citrate} \rightleftharpoons \text{cis-aconitate} + \text{H}_2\text{O}$	Aconitase	Fe-S	b	+8.4	+2.0
2b	$\text{cis-Aconitate} + \text{H}_2\text{O} \rightleftharpoons \text{isocitrate}$	Aconitase	Fe-S	c	-2.1	-0.5
3	$\text{Isocitrate} + \text{NAD}^+ \rightleftharpoons \alpha\text{-ketoglutarate} + \text{CO}_2 + \text{NADH}$	Isocitrate dehydrogenase		d + e	-8.4	-2.0
4	$\alpha\text{-Ketoglutarate} + \text{NAD}^+ + \text{CoA} \rightleftharpoons \text{succinyl CoA} + \text{CO}_2 + \text{NADH}$	α -Ketoglutarate dehydrogenase complex	Lipoic acid, FAD, TPP	d + e	-30.1	-7.2
5	$\text{Succinyl CoA} + \text{P}_i + \text{ADP} \rightleftharpoons \text{succinate} + \text{ATP} + \text{CoA}$	Succinyl CoA synthetase		f	-3.3	-0.8
6	$\text{Succinate} + \text{FAD (enzyme-bound)} \rightleftharpoons \text{fumarate} + \text{FADH}_2 \text{ (enzyme-bound)}$	Succinate dehydrogenase	FAD, Fe-S	e	0	0
7	$\text{Fumarate} + \text{H}_2\text{O} \rightleftharpoons \text{L-malate}$	Fumarase		e	-3.8	-0.9
8	$\text{L-Malate} + \text{NAD}^+ \rightleftharpoons \text{oxaloacetate} + \text{NADH} + \text{H}^+$	Malate dehydrogenase		e	+29.7	+7.1

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

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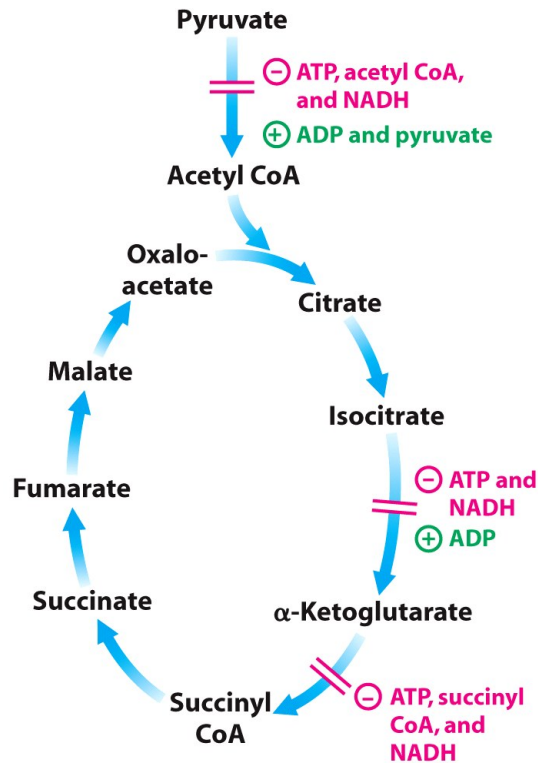
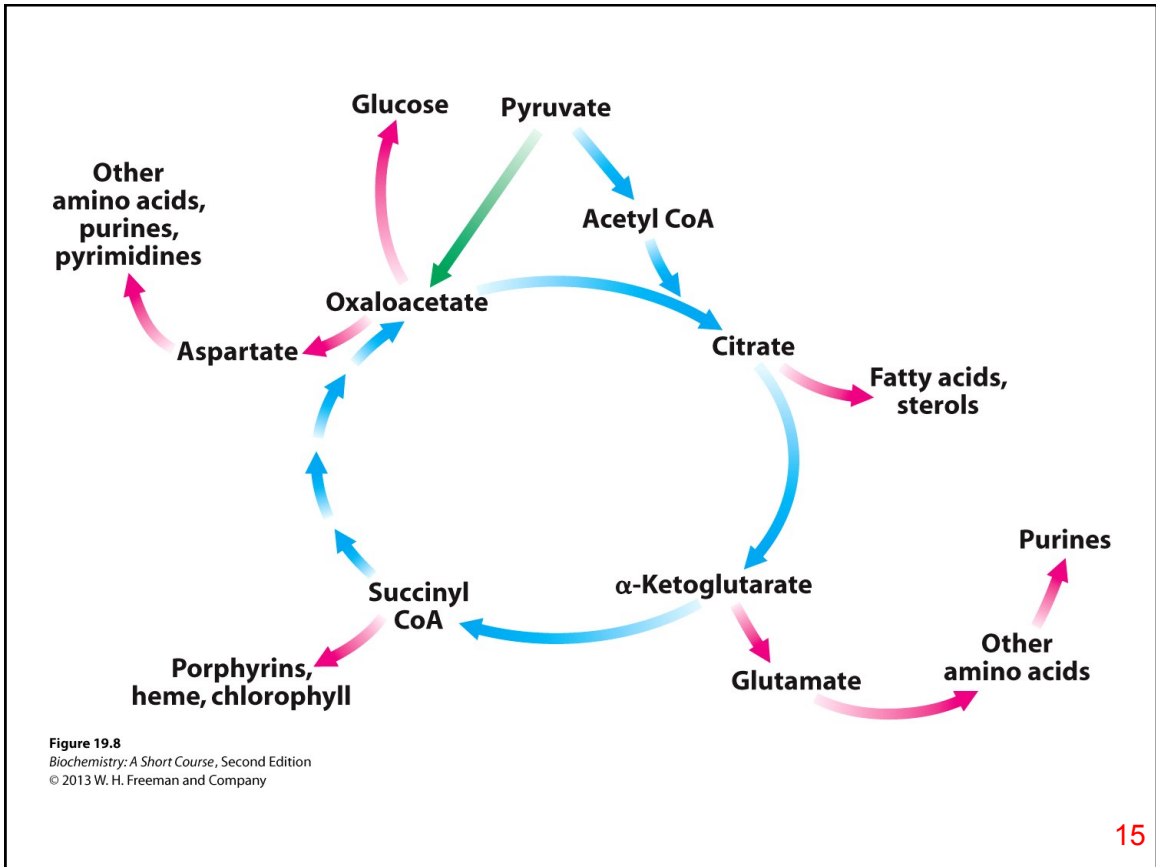
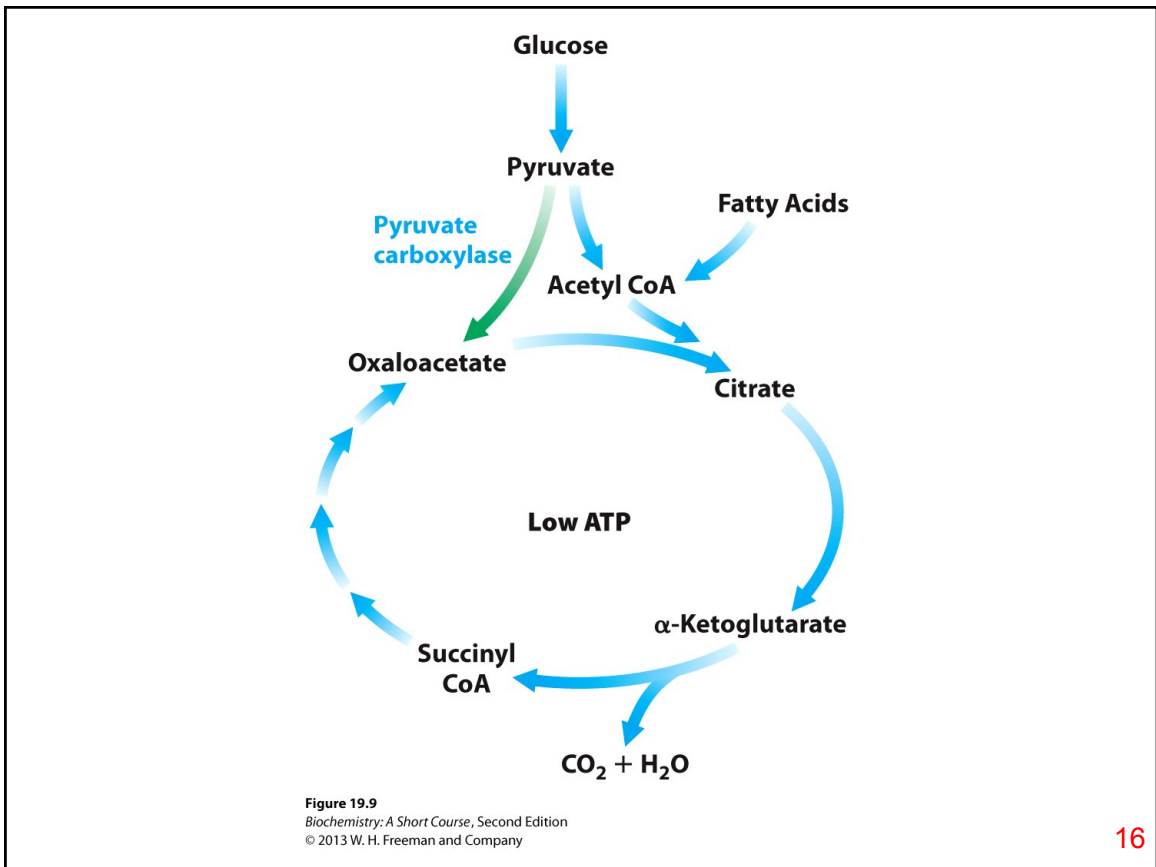


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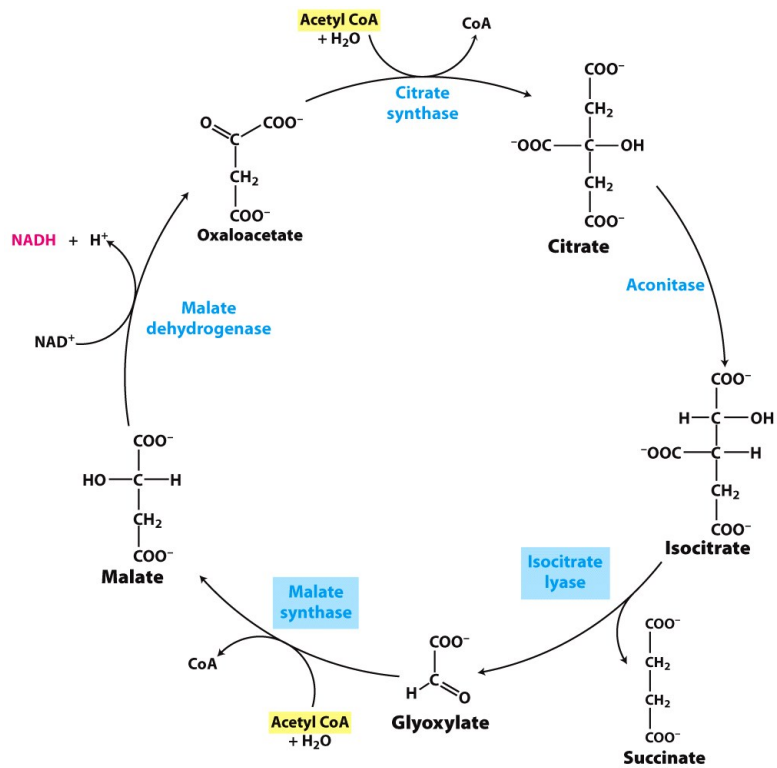


Figure 19.10
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