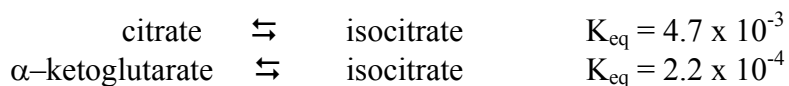


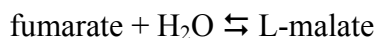
1. Given the following data at 298 K for the two balanced reactions from the citric acid cycle, answer the questions below.



- (a) Calculate  $\Delta G^\circ$  (at 298 K) for the overall conversion of citrate to  $\alpha$ -ketoglutarate. Is this reaction spontaneous?
- (b) If  $\Delta G$  is less than  $\Delta G^\circ$ , what can you infer about the relative concentrations of citrate and  $\alpha$ -ketoglutarate in a cell? Support your answer with any relevant equation(s).

2. (This is Hammes, Ch 2, #2-3 abc)

The equilibrium constant under standard conditions (1 atm, 298 K, pH 7.0) for the reaction catalyzed by fumarase,



is 4.00. At 310 K, the equilibrium constant is 8.00.

- a) What is the standard free energy change,  $\Delta G^\circ$ , for this reaction?
- b) What is the standard enthalpy change,  $\Delta H^\circ$ , for this reaction? Assume the standard enthalpy change is independent of temperature.
- c) What is the standard entropy change,  $\Delta S^\circ$ , at 298K for this reaction?