

Name _____

4. (10 points) Calculate the free energy change for the reaction



in a system where the concentrations of the two molecules are held fixed at

$$[\alpha\text{-D-glucose}] = 10^{-4}\text{M} \quad \text{and} \quad [\alpha\text{-D-galactose}] = 0.1\text{M}$$

Use the standard free energies of formation

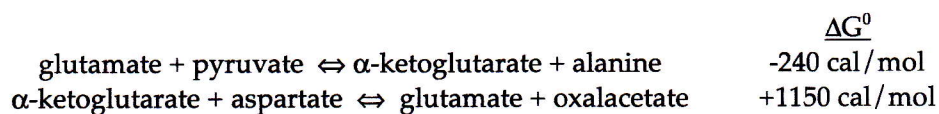
$$\begin{aligned} \Delta G_f^\circ (\alpha\text{-D-glucose}) &= -219.22 \text{ kcal/mol} \\ \Delta G_f^\circ (\alpha\text{-D-galactose}) &= -220.73 \text{ kcal/mol} \end{aligned}$$

5. (10 points) If the concentrations in the previous problem were held fixed at

$$[\alpha\text{-D-glucose}] = 0.01\text{M} \quad \text{and} \quad [\alpha\text{-D-galactose}] = 0.1\text{M}$$

what would the free energy change be? Explain the significance of this result, compared to that of problem 5.⁴

6. (10 points) Alanine and oxalacetate can be produced by the following pair of coupled reactions:



The reactants and products are held at the following concentrations:

$$\begin{aligned} [\text{pyruvate}] &= 0.01\text{M} & [\text{aspartate}] &= 0.01\text{M} \\ [\text{alanine}] &= 10^{-4}\text{M} & [\text{oxalacetate}] &= 10^{-5}\text{M} \end{aligned}$$

What is the free energy change under these conditions?