

### Sums of Small Forces

1) What's the free energy ( $\Delta G^\circ$ ) for a formation of urea dimers in water if the association constant is 0.005 M.

2) If a reaction effective concentration changes is  $1.9 \times 10^8$ . How much more favorable is this reaction than it is for the untethered molecules (in kcal/mole)? How much does the equilibrium constant change? How much does the free energy change?

3) Give an explanation of cause of the effective concentration increase as more bonds are made (you can use an analogy from life if that helps or a more technical explanation).

In figure 4.14. Which state (with what number of simultaneous interactions) is most populated and why.

4) If you have a  $K_{eq}$  of  $0.001 \text{ M}^{-1}$  and each connection increases the affinity by  $-2.78 \text{ kcal/mol}$ . What is the effective concentration increase for each connection? How many connections are needed so that the next one becomes favorable? Show the free energy of binding and the  $K_d$  for 1 through 8 connections.