HW5: 1, 2, 8, 15

Chapter 5

① $K_D = \frac{1}{K_A}$

If a protein has a very small K_D then it has a high affinity for the ligand since the reaction:

Association Enzyme + Ligand $\rightleftharpoons$ Bound Ligand

Dissociation Bound Ligand $\rightleftharpoons$ Enzyme + Ligand

$$K_A = \frac{[\text{Bound}]}{[\text{Ligand}][\text{Enzyme}]}$$

$$K_D = \frac{[\text{Enzyme}][\text{Ligand}]}{[\text{Bound Ligand}]}$$

Protein B has a lower K_D, so it has a higher affinity for the ligand.

② A value of the Hill Coefficient that is less than 1 indicates negative cooperativity. Anything that decreases the affinity of a subunit for a ligand will have a low Hill Coefficient.

a) yes, $n_H < 1$

b) Single polypeptide and the binding sites are not said to communicate. $n_H \leq 1$

c) The denatured protein molecules would affect the observed rate negatively so $n_H \leq 1$.

Neither b) nor c) are true examples of

negative cooperativity though. Their Hill coefficients may be less than 1 but they are not displaying negative cooperativity.

(8) a) The Memphis variant substitutes a charged residue for another charged residue on the surface. This is a conservative mutation with no likely effect

b) Anything that changes the side chain pKA will change the pI
HbS, Hb Milwaukee and Hb Providence

c) BPG binds to the central cavity of hemoglobin Hb Providence alters that.

(15) a) Chain L = Light Chain of Antibody
Chain H = Heavy Chain of Antibody
Chain Y = lysozyme

b) β-sheet secondary structures are predominant

c) Chain H has 218 amino acids
Chain L has 214 amino acids
Chain Y has 129 amino acids

10-15% of lysozyme's surface is bound by the FAb

d) This is more exploratory and.