HOMEWORK # 3

BIOL/CHEM 5312

due Friday, February 20, 2015

van Holde et al. , Chapter 3, p.161-163, problems **3.1, 3.2ab, 3.3, 3.6, 3.8, 3.9**

3.0 Using the Base-stacking energies of Table 3.10, determine the most stable dinucleotide triplet (a duplex of 3 base pairs). What is the least stable triplet?

Notes:

3.1 use $\kappa\varepsilon_o = 4\pi\ 8.85 \times 10^{-12}\ C^2\ J^{-1}\ m^{-1}$ to evaluate D (lect 6, page 17)

3.2 number the dipoles 1 and 2, r is the vector from the center of 1 to the center of 2. Angles are determined by rotating one vector until it is parallel with another (in the same direction)

3.3 hint is in the book (Answer to 3.3b is -15.0)

3.6 use Table 1.7 to estimate separation of charges

3.8 use Table 3.15. In the Table in the problem, N should be called a base atom. Those values are the surface areas for all atoms of a particular type. (Recommendation: use a spread sheet to calculate)

3.9 In actual proteins |r| appears to be around 0.5-0.6 nm, but for this problem you can use |r| = 0.5 nm To get the length of μ use the length of the CO bond and the length of the NHO hydrogen bond. Both can be found in Ch. 1. Assume the dipoles are aligned ($\theta = 0$) (My answers are -169 J/mol and -3.79 kJ/mol The answer in my book is clearly wrong, since it gives the same value for each, and they certainly must differ by the ratio of the dielectric constants)