

Bio322- Assignment 4: Ligand Receptor Binding and Boltzmann Statistics

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16-Oct-2015

Each question carries 3 marks.

1. If you flip an unbiased coin 10 times, how many sequences of throws have 3 heads in them?
2. A protein may contain a number of cysteine amino acid residues, which can pair to form a disulphide bond (Figure 1). If an even number of n cysteines is present, the number of bonds formed is $n/2$. How many possible disulphide linkages are possible?
3. You are given a green and red coin, which are otherwise identical and both unbiased. If you flip the coins five times each, what is the probability of getting 4 red heads and 2 green tails?
4. Describe an expression for the probability of RNA Polymerases (RNAP) being bound to the promoter of T7 phage *in vivo* when all three DNA sequences are present: non-specific DNA binding sites, specific DNA binding sites with a *E. coli* lac P1 and a single T7 phage promoter.

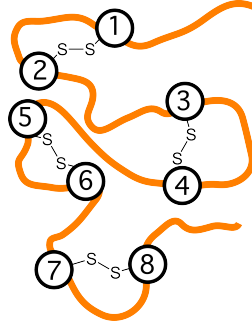


Figure 1: A schematic of disulphide linkages in a randomly coiled protein chain. Image modified from *SCHEMATISCHE Präsentation von Disulfidbrücken in einem Protein*, WikiMedia.

References

- [1] Phillips, Kondev and Theriot (2008) Physical Biology of the Cell. Garland Science, New York. Illustr. by Orme.