

As always, answer each question on a separate page and type narrative answers.

1. For a given protein-ligand complex, use the following data set to calculate the equilibrium dissociation constant (feel free to staple an Excel spreadsheet/graph as part of your answer):

[L] (M)	θ
0.002	0.14
0.004	0.28
0.008	0.45
0.012	0.53
0.014	0.59
0.016	0.63
0.018	0.64
0.020	0.67
0.022	0.68
0.026	0.73
0.028	0.74
0.030	0.75
0.032	0.77
0.034	0.77
0.036	0.78
0.038	0.79
0.040	0.81

2. With the use of site-directed mutagenesis, hemoglobin can be made in which the proximal His residues are replaced with Gly. If this modified Hb was assayed for O₂ binding in the presence of imidazole, would you expect this system to bind O₂? If so, would it demonstrate cooperative binding? Explain.

3. The hemoglobin ortholog in soy, leghemoglobin, exist in root nodules of the plant and has a high affinity for oxygen. However, the role of this globin differs from that of human hemoglobin or myoglobin. Do some research into leghemoglobin and discuss its roll in soy root nodules. Your answer (300-500 words) should be cited and refer to the chemical processes unique to this system.

4. Using the Hill equation, plot an O₂ binding curve for a hypothetical 2-subunit Hb protein with $n=1.7$ and $P_{50}=18$ torr.