

Case Study 8: Hemoglobin - Structure/Function Relationships

Please submit your answers on your own paper. This assignment is due Monday, October 20.

1. Sketch oxygen binding curves for myoglobin and hemoglobin. Be sure to label axes. Try talking through a strategy for the sketch before looking at the book. In what ways do the binding curves of myoglobin and hemoglobin correlate with their respective functions?
2. Explain why Y_{O_2} ranges from 0 to 1. What does $Y_{O_2} = 0.5$ mean at the molecular level? How does it relate to affinity?
3. What specific amino acid residues are most involved in the function of oxygen binding in hemoglobin? What are their functions?
4. What is the sequence of molecular level changes that occur upon binding of O_2 to the low affinity conformer of hemoglobin that result in the high affinity conformer? Be succinct, but do include the major details. For instance, start with O_2 . To what does it bind? Does that have an effect on the rest of the molecule? And so forth, until the T state is stabilized.
5. At the molecular level, how do H^+ , CO_2 , and bisphosphoglycerate act as allosteric effectors of hemoglobin? Draw binding curves for hemoglobin in the presence of each individually.