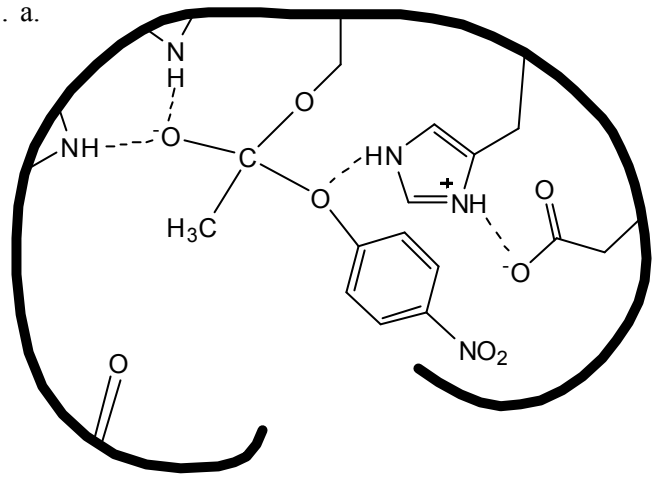
Chemistry and Biochemistry 153A, Winter 2010

Exam 2 Answers

1. False
2. True
3. True
4. False
5. True
6. a, c
7. b
8. Coordinates heme iron (proximal his)
   H-bonds to oxygen (distal his)
   Reduces binding affinity of CO (distal his)
   Stabilizes BPG binding to T-state (through salt bridges with His2 and His143 of β-chains)
   Forms (stabilizing) salt bridges in T-state (His146 of β-chains)
   (Additional answers may also be correct)
9. Myoglobin facilitates diffusion of O_2 through muscle
10. Mb p50 is <u>*lower than*</u> Hb p50. Myoglobin must be able to pick up (bind) O_2 at partial pressures where hemoglobin is releasing O_2, so it must have a higher O_2 affinity (and lower p50).
11. False
12. True
13. True
14. True
15. True
16. False
17. a, (d), g
18. a.



18. b. The catalytic efficiency would be greater for hydrolysis of the peptide, because the peptide would bind the enzyme more tightly (in the specificity pocket and elsewhere – *p*-nitrophenylacetate doesn't bind in the specificity pocket). This would lower Km and thus increase catalytic efficiency.
19. a
20. $V = k_3[A] - k_4[B][C]$
21. $M^{-1}s^{-1}$
22. Lyase
23. Here, $Q = [B][C]/[A] = 0.1M[C]/[A]$
    For a spontaneous reaction, $Q < K_{eq}$, or $0.1M[C]/[A] < 100M$, or $[C]/[A] < 1000$.
24. Yes. In the derivation we assume that [product]=0 at early time points, so any expressions that contain [B] or [C] would drop out (just as expressions with [P] drop out in the usual derivation).
25. $k_{-1}[EA] + k_2[EA] = k_1[E][A] + k_{-2}[E][B][C]$
    (Rate of formation of E = rate of breakdown of E)
26. True
27. 6. Oxidoreductase
    7. Transferase
    8. Isomerase
    9. Lyase
28. Lys229: Covalent; Preferential binding of TS
    Glu187: General base
    Lys107: Electrostatic; Proximity & orientation effects
    Asp33: General base; General acid
29. The Schiff base is more electrophilic than the carbonyl of the substrate, and so it is better at accepting electrons from the broken bond. (It is better at promoting formation of a carbanion transition state at C3.)
30. Greater $[H^+]$ favors the protonation of groups (α-chain N-termini and β-chain His sidechains) on hemoglobin that must be protonated to form T-state salt bridges. So increased $[H^+]$ favors salt bridge formation, which stabilizes the T-state, which is less likely to re-bind O_2 released in the capillaries.