CSO 203

Tutorial 2

1. Describe the structural differences, oxygen-binding affinities, and functional roles of hemoglobin and myoglobin. In what ways do these two proteins complement each other in oxygen transport and storage?

2. In what structural ways do metalloenzymes enhance their catalytic performance and achieve substrate selectivity? Give examples to illustrate your answer.

3. What happens to cytochrome c oxidase (CcO) during cyanide poisoning, and what are the physiological outcomes of this inhibition?

4. List the metal centers found in CcO and discuss the specific function(s) each metal fulfills in the enzyme's catalytic cycle.

5. Why are metal-superoxo and metal-peroxo intermediates generally less reactive than their metal-oxo cunterparts? Discuss the underlying chemical reasons.

6. Discuss how secondary coordination sphere interactions influence catalysis in enzymatic systems. Provide examples where applicable.

7. What is the "push-pull" effect in cytochrome P450 enzymes, and how does it influence oxygen activation and substrate oxidation?

8. Explain how nature's strategies in biological systems guide the development of bio-mimetic catalytic systems.

9. Describe an experimental approach to determine whether the oxygen atom incorporated into an enzymatic reaction product originates from molecular oxygen or water.

10. What mechanisms does the human body employ to neutralize or eliminate excess reactive oxygen species (ROS) and maintain cellular health?