

Study Guide  
Chapter 19  
Oxidative Phosphorylation

1. What is Ubiquinone and how is it used. What are the three different forms, compare and contrast Ubiquinone with  $\text{NAD}^+$  and FAD. Name the different enzymes in this chapter that used Ubiquinone as a substrate or intermediate.
2. What is a cytochrom, ab Iron Sulfur protein?
3. What are the net reactions carried out by the 4 enzyme complexes involved in Mitochondrial Electron Transfer. What is the net reaction for electron transfer in mitochondria, starting with NADH? with  $\text{FADH}_2$ ? Why do we say that NADH generate 2.5 ATP's and FAD only 1.5 ATP's?
4. What is the Chemiosmotic model?
5. Describe, in as much detail as possible, the structure of the mitochondrial ATP synthase. How does this enzyme work?
6. How many protons have to cross the mitochondrial membrane to make an ATP?
7. What is the Malate-Aspartate shuttle, and why is it needed?
8. What is adenine nucleotide translocase and phosphate translocase and why are they needed in a cell?
9. Discuss the regulation of oxidative phosphorylation.