1. The glyoxylate cycle is related to the citric acid cycle and is found only in bacteria and plants, not animals. It uses the same enzymes as the citric acid cycle except it has two additional ones. These include isocitrate lyase (cleaves isocitrate to yield glyoxylate and succinate) and malate synthase (combines acetyl-CoA with glyoxylate to make malate). After the succinate and malate are both converted to oxaloacetate, there are two oxaloacetates at the end of the cycle, instead of one in the citric acid cycle.

2. Thus, the glyoxylate cycle can produce oxaloacetate for gluconeogenesis from acetyl-CoA, but the citric acid cycle can't.

Highlights Electron Transport/Oxidative Phosphorylation

1. Electron transport (ETS) occurs in the inner membrane of the mitochondrion.

2. In ETS, electrons from NADH move to complex I and from FADH2, they move into complex II. Losing electrons like this converts them to NAD+ and FAD.

3. Electrons move through the complexes as follows

Complex I - Coenzyme Q - Complex III - Cytochrome C - Complex IV - Oxygen. When oxygen gains electrons, it creates water.

4. Electrons from complex II are passed to Coenzyme II and then they take the same pathway.

5. As electrons flow through complexes I, III, and IV, protons are "pumped" out of the mitochondrion. This 'charges' the battery.

6. Note that electrons starting with NADH pump more protons that electrons starting with Complex II. This ultimately (in oxidative phosphorylation) results in production of more ATPs per NADH than per $FADH_2$.

7. Coenzyme Q acts as a "traffic cop", accepting electrons in pairs and passing them on individually.

8. As electrons flow through complexes I, III, and IV, protons are "pumped" out of the mitochondrion.

9. Note that electrons starting with NADH pump more protons that electrons starting with Complex II. This ultimately (in oxidative phosphorylation) results in production of more ATPs per NADH than per $FADH_2$.

10. Oxidative phosphorylation occurs when protons move BACK into the mitochondrion (after being pumped out) through a complex commonly called Complex V. Complex V has the mushroom-like shape, as shown in class. This complex ROTATEs as protons pass through it. Rotation of the complex creates ATP.

11. Complex V has three sets of subunits in the F1 domain that make the ATP. They do this by flipping between states labeled L, T, and O. Flipping is controlled by the 'rotor' described in class that is attached to the rotating F0 subunit. Rotation is caused by movement of protons through the complex. L is the state that

binds ADP and Pi. T is the state that compresses them together to make ATP. O is the state that releases the ATP.