Preparation for class on October 30 in BSCI 2520-01

Part 1

1. Using your text (18-3B or this website (https://microbiochem.weebly.com/structure-and-mechanism-of-atp-synthase.html), sketch a depiction of ATP synthase and label these components:

- α/β dimers; c subunits; a subunit; δ subunit; b subunits; γ and ε subunits.

2. Which of the subunits has the catalytic site that synthesizes ATP from ADP and P_i? How many catalytic sites are there in the synthase complex?
   beta

3. In your sketch, label the intermembrane space side of the membrane and the matrix side of the membrane, and indicate which has high $[H^+]$ and which has low $[H^+]$.

Part 2

The flow of H^+ from an area of high concentration to an area of low concentration is exergonic, and this exergonic reaction drives the endergonic synthesis of ATP from ADP and P_i. The following questions ask you to consider the physical mechanism that allows this coupling. Section 18-3B in your text is a useful resource.

1. As a H^+ enters a hydrophilic channel between the a subunit and the transmembrane ring, how does it interact with the transmembrane ring? Specifically, to what amino acid does it bind, and within which subunit?

2. When a H^+ binds to this amino acid, it causes two changes in the subunit. What are they?

3. What is the consequence of the two changes in the subunit?

4. This process is repeated as the next c subunit becomes accessible to the hydrophilic channel. Does this rotation cause any change in the γ/ε subunits?

5. As the γ/ε subunits rotate, we also see changes in the α/β dimers within the catalytic knob.
    a. Does the catalytic knob rotate? Why or why not?

    b. When the transmembrane ring makes a full circuit, each catalytic site will have gone through three conformations. What are they called, and what happens during each one?
6. How many ATP are produced from a full rotation of the transmembrane ring?

7. After a c subunit has undergone a full rotation, where does the H^+ go?