**CHEM524 Oral Final Exam Questions**

**Zach Curry**

1. Cryocrystallography has only become the standard method for x-ray diffraction data collection since the 1980s. What advantages do you think the technique provides over the older room temperature crystallography? Use all relevant mathematical equations to explain your answer.
2. What is meant by the term ‘constraints’ in NMR spectroscopy?
3. Many cell surface proteins have what on them? How do you think the protein that removes these groups works? I want to know about the overall topology and how these groups are removed.
4. Draw the reaction mechanism for a cysteine protease that degrades glycyl-glycine. (chymotrypsin like with sulfhydryl in lieu of serine hydroxyl)

**Amy Deng**

1. Why do you think bacteria would have the petal death protein?
2. If you could perform a paleobiochemistry experiment, what protein would you analyze and why? What might you expect to see?
3. Mechanism of Thrombin activateable fibrinolysis Inhibitor: Why does the bond between C-N and C-O break and not vice versa?
4. Draw the reaction mechanism for lipase. (chymotrypsin-like mechanism: Ser, His and Asp)
5. Answer question 10 from the final exam.

**Katie Bolling**

1. (Slide 8) What is a hydrophobic pocket and how does it relate to the concept of a microenvironment?
2. (Slide 12) Structural alignment of luciferase and acetyl-CoA synthetase. You said that this shows convergent evolution. How so? What does this mean? (More likely divergent evolution after gene duplication)
3. (Slide 20) What are the changes present between the *H sapiens* and *T. maritime* enzymes? Think about where each organism lives. (Mutations deal with thermal tolerance.)
   1. Follow up with: What is thermal tolerance in a protein?
4. (Slide 45) Cathepsin H. What role does Asn175 play in the mechanism?
5. Why did you dock a sugar residue into the active site?
   1. Go ahead and try to draw the reaction mechanism with this substrate.

**Christine Harvey**

1. (Slide 32) Active site tyrosine acts as a nucleophile?
2. Go ahead and draw the cis and trans isomers of glycyl-proline.
3. How do proteins gain new function? In other words, how do they evolve? Contrast this with the differences between convergent and divergent evolution.
4. Answer question 10 on the final exam.

**Jarod Fincher**

1. DNA ligases seal nicks in the phosphodiester backbone of single or double stranded DNA molecules. They have 4 distinct domains. Based upon the function of the protein, what are these domains?
   1. What job does the protein need to do? (Adenylation, OB fild, zinc finger, BRCT)
2. How does a protein evolve? What genetic mechanism allow a protein to acquire new functions?
   1. What is the difference between convergent and divergent evolution?
3. You are a manager of a facility that develops protein therapeutics. You want to solve the structure of a 75 kDa protein in order to develop drugs to inhibit it. What is your research outline?
4. What role does the microenvironment play in the active site of a protein?
5. What two terms are needed to calculate the electron density function, rho? What do each represent?
6. Answer question 10 from the written part of the exam.