Chemistry 224
Bioorganic Chemistry
Exam 2

Name _____
Friday, Oct. 27, 2000
100 points

This Exam is closed book and closed notes

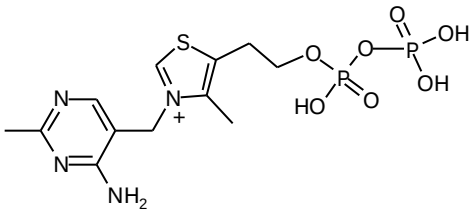
Please show all your work!

Stereochemistry counts as indicated!

Neatness counts!

Good Luck!!

1. Identify the following co-factors (15 pts)



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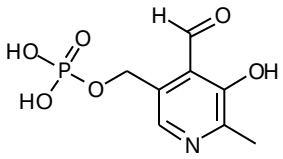

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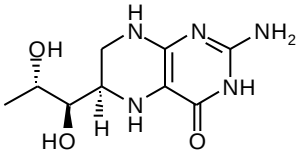

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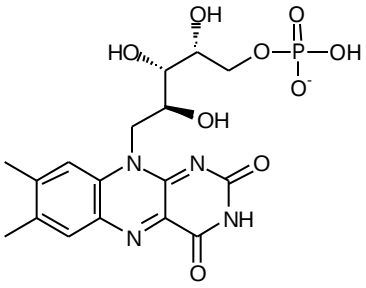

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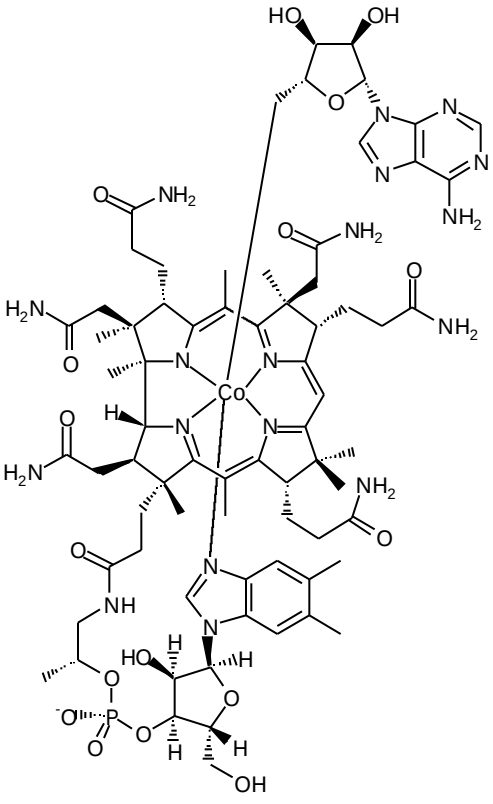

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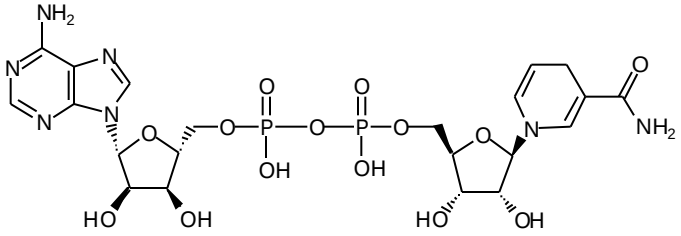

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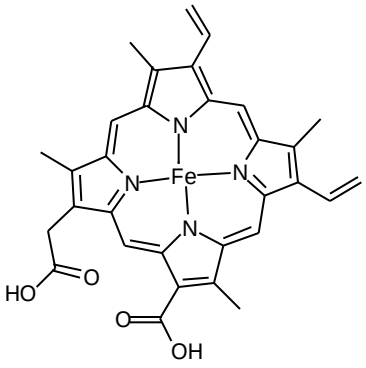

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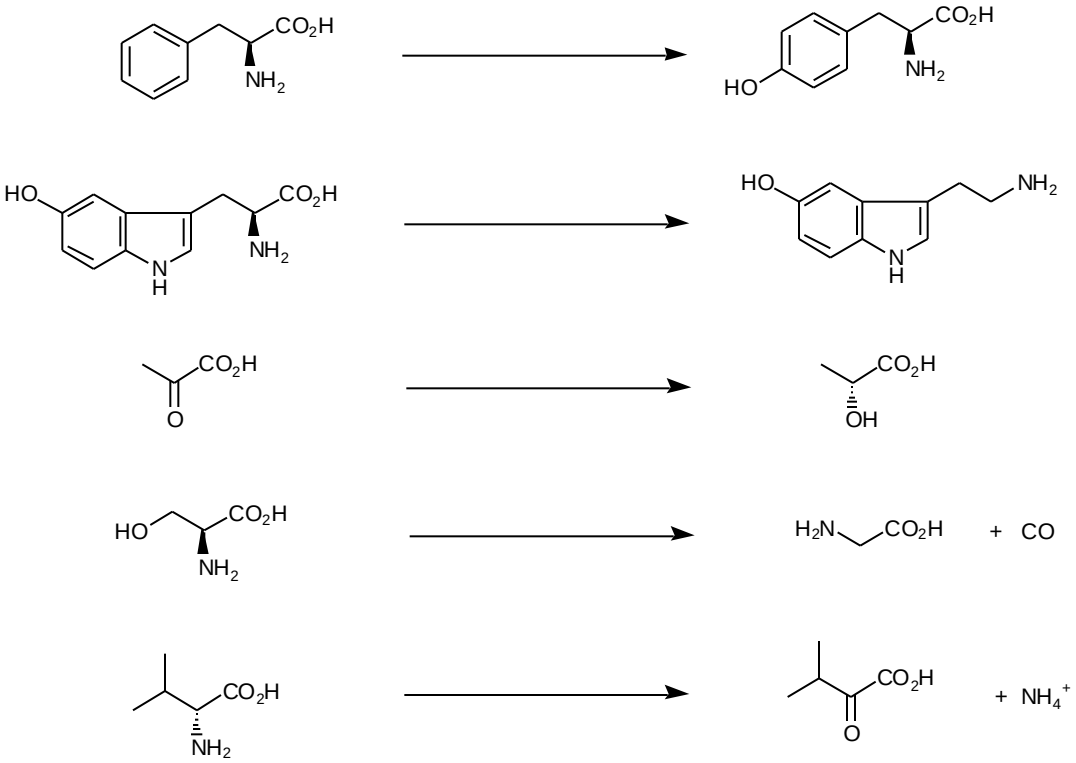
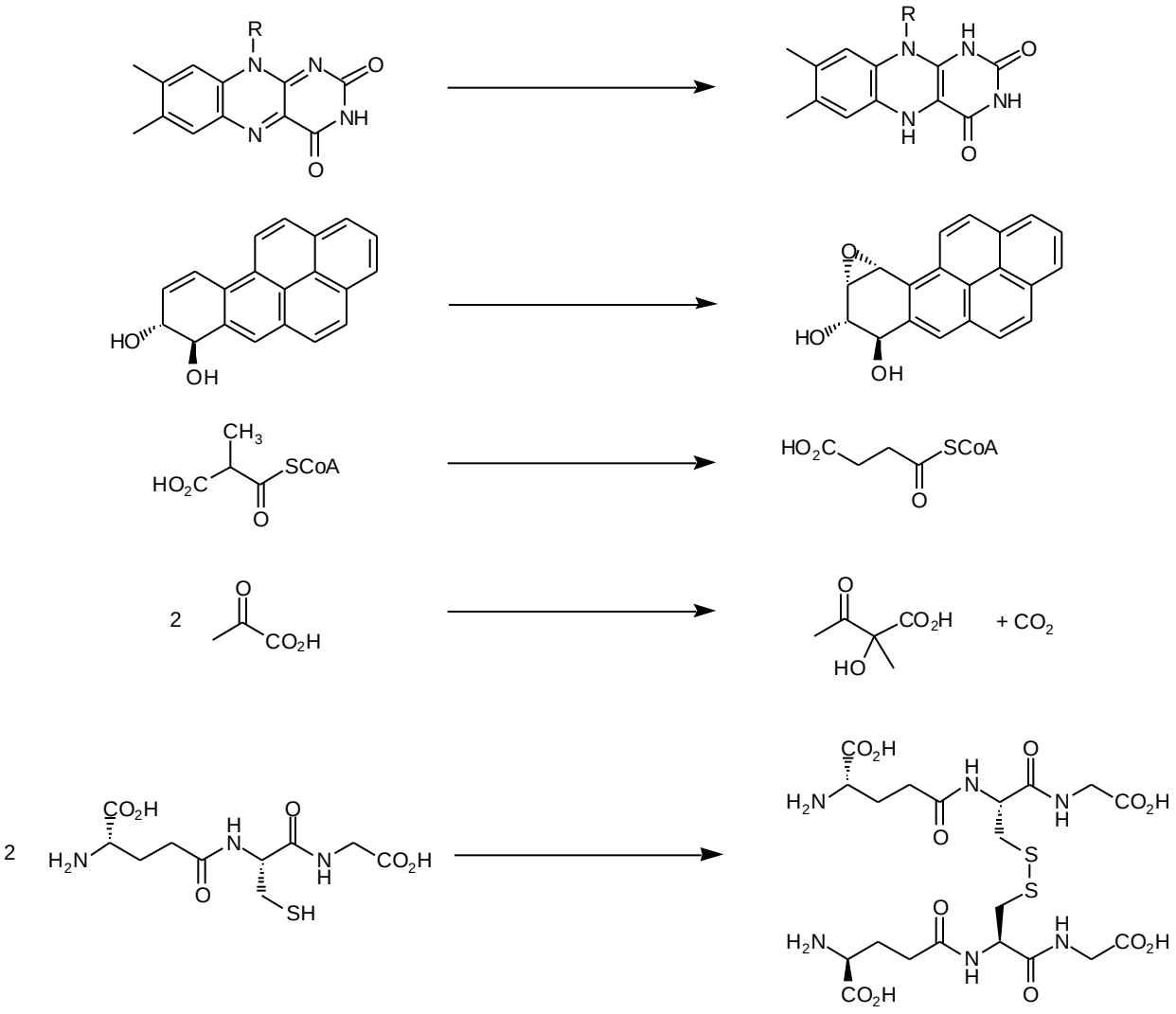
2. Serine proteases hydrolyze amide bonds. The reaction goes through an acyl-enzyme intermediate (part of the hydrolyzed substrate become covalently bonded to the enzyme through an ester linkage). Provide the mechanism for the formation of the acyl-enzyme intermediate. Show the catalytic triad consisting of an aspartate, histidine and serine residues as well as the oxy-anion hole. (10 pts)

3. Provide the cofactor required to carry out the following enzymatic reactions (30 pts).



3. (con't)



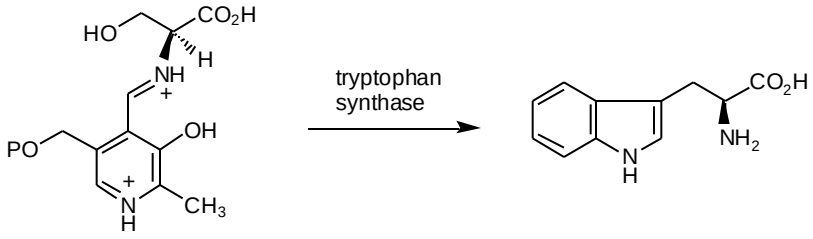
4. Answer the follow: (15 pts)
   a. Define a mixed function oxidase.

   b. Define a mutase enzyme.

   c. Draw a proper Lewis structure for molecular oxygen (O_2) in the triplet states (as it normally exists).

5. Give a detailed mechanism for one of the enzymatic reactions shown in Question 3. (10 pts)

6. Tryptophan synthase is an enzyme involved in the biosynthesis of tryptophan from serine and indole. An intermediate of the enzymatic reaction is shown below. Complete the mechanism. (10 pts)
P = phosphate group



7. Monoamine oxidase is a FAD dependent enzyme that oxidizes primary amines to imines (see below). One proposed mechanism involves hydrogen atom abstraction followed by electron-transfer to give the imine. Design a substrate analogue to test this proposed mechanism. If the mechanism is correct, what product would be expected from the reaction and show how it is formed. (10 pts)