Problem set 10, chem 108, W-01

Formulate a mechanism for each step. How do these processes relate to the thymidylate synthase/tetrahydrofolate chemistry discussed in class?

Illustrate the 1,2-addition of cysteine to 2'-deoxyuracil monophosphate (dUMP). Now illustrate the 1,4-addition (also referred to as a conjugate addition). How is the 1,4-addition related to the problem shown above? Formulate the product and provide a mechanism.

Provide a mechanism for the following transformation. It is a general process, and goes by the name β-elimination. As you can see, the leaving group is positioned beta to the carbonyl. Notice how the process establishes conjugation between the C-C and the C-O double bonds ... that is, it creates an α,β-unsaturated carbonyl unit. How does this process relate to the final stages of the thymidylate synthase/tetrahydrofolate promoted conversion of dUMP to dTMP?

Assuming the availability of the requisite enzyme, what cofactor could be used to affect the following transformations. Draw the structure of each cofactor that you specify.

Complete the following:

How do these transformations relate to transamination? Formulate a mechanism for one of the transformations.