Name (Print)_____

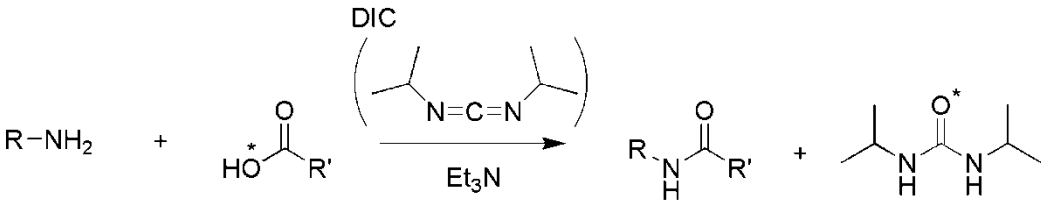
ID#_____

Group #_____

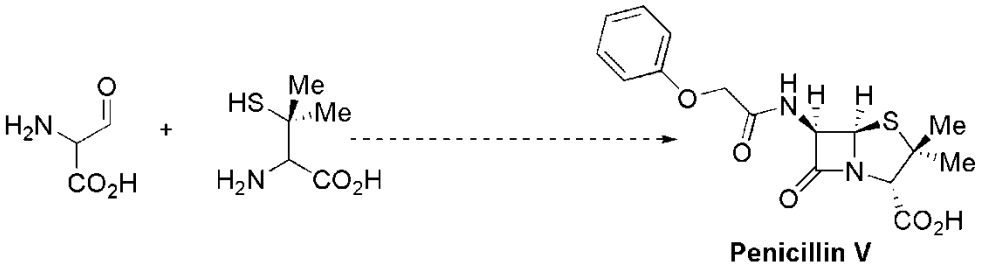
PS #3 - Amide Bond Formation Using DIC, and a Complex Synthesis Requiring Protecting Groups

Part A) Amides can be made by mixing an acid chloride with an amine, but the conditions for producing acid chlorides are harshly acidic. A milder coupling method for amines and carboxylic acids is treatment with a reagent such as DIC, pictured below. Propose a detailed mechanism for this transformation.

Hints: One equivalent of DIC is consumed and converted to the diisopropylurea shown at right. The oxygen atom indicated with an asterisk is transferred to the diisopropyl urea as shown. The attack of that oxygen atom onto the carbodiimide is a very early step in the mechanism.



Part B) Penicillin is a group of *β*-lactam antibiotics produced naturally from the mold *Penicillium notatum* and is commonly used in the treatment of bacterial infections. The term penicillin usually refers to the entire family of *β*-lactam antibiotics which differ only in the acyl group attached to the nitrogen that is α to the lactam carbonyl (got that?). The specific penicillin molecule examined here is penicillin V. It took Prof J. Sheehan and his group at MIT ten years to synthesize penicillin V; the synthesis was finally completed in 1957. As a group propose a reasonable synthetic scheme for the synthesis of penicillin V from oxidized serine and the dimethylated cysteine derivative shown below.



Penicillin V

Sheehan, 1957