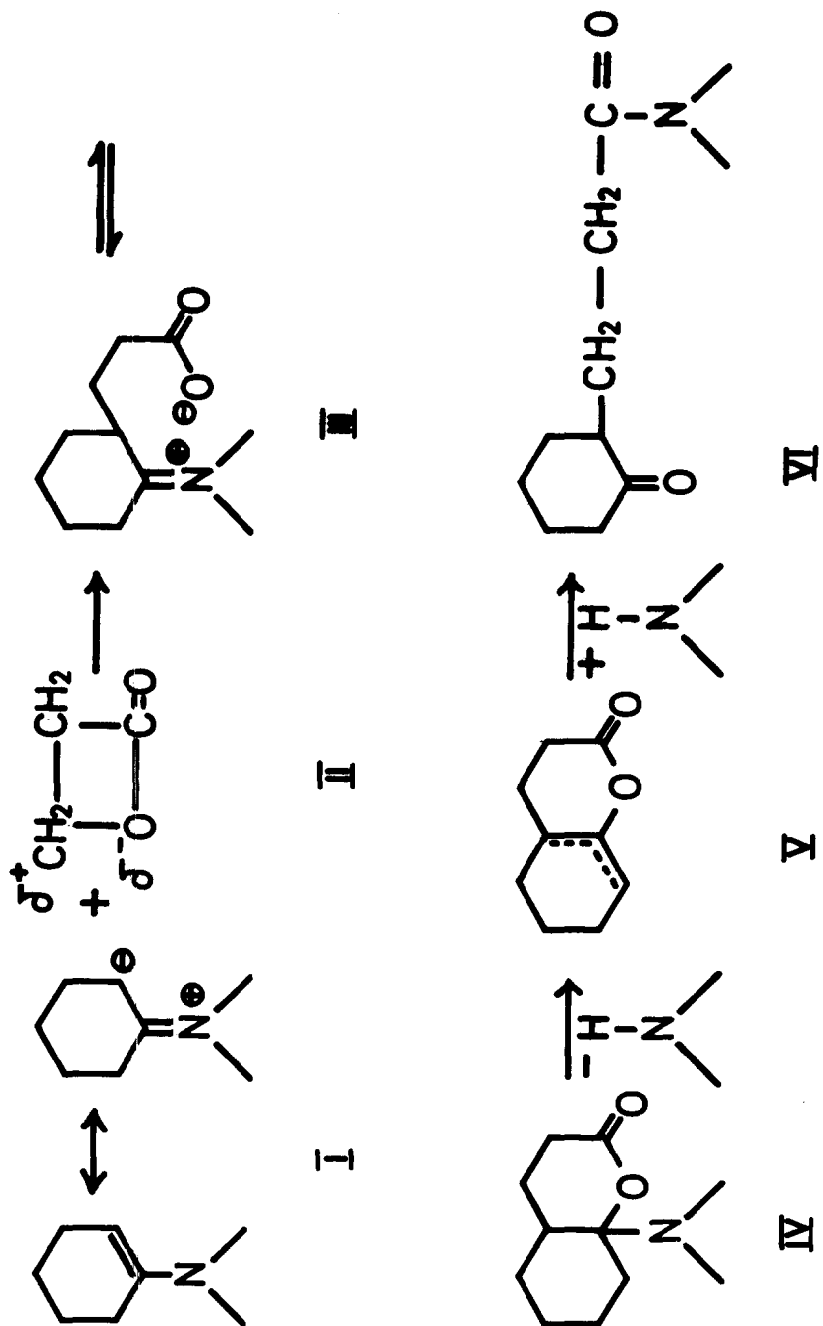


THE REACTION BETWEEN ENAMINES AND CARBOXYLIC ACIDS (1)

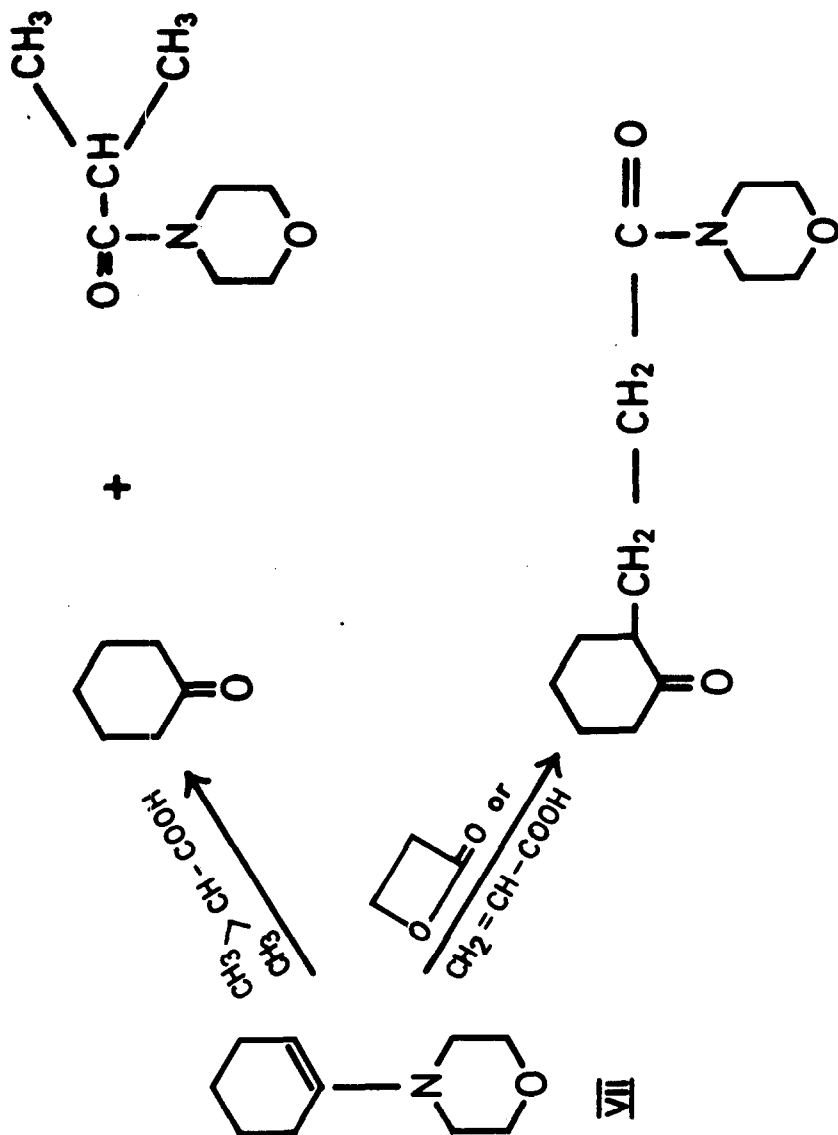
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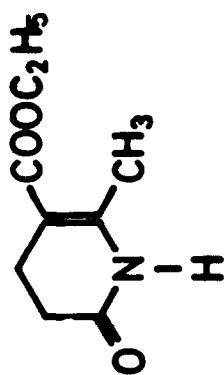
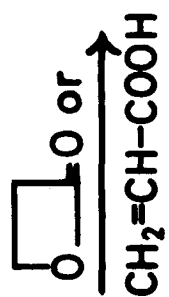
(Received 28 June 1965)

It was recently shown (2) that enamines, I, and  $\beta$ -propiolactone, II, when heated to about 150°C for 6 hours, produce  $\delta$ -ketoacid amides in the absence of water. It is proposed that the first step is a nucleophilic attack on the propiolactone to form the zwitterion, III, and then the  $\delta$ -lactone, IV. The subsequent elimination of the secondary amine from IV leads to V, which in the presence of the free amine would give VI.

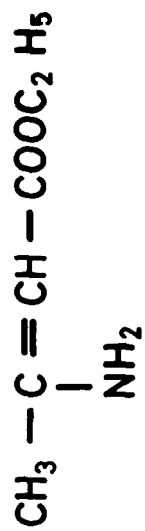


To test the validity of this postulate the reaction between enamines and carboxylic acids was studied and it was found that, for instance, from 1-morpholinocyclohexene, VII, and isobutyric acid, cyclohexanone and N-isobutyrylmorpholine were isolated without any water being added to the reaction mixture. Extension of this study to  $\alpha,\beta$ -unsaturated acids showed that VII and acrylic acid produced VIII i. e., the same compound as from VII and  $\beta$ -propiolactone (2). Furthermore, ethyl  $\beta$ -aminocrotonate, IX, and acrylic acid (or  $\beta$ -propiolactone) gave 1,2,3,4-tetrahydro-2-oxo-5-carbethoxy-6-methylpyridine, X (3) a ring closure having taken place.





IX



IX

The new reactions between enamines and  $\alpha,\beta$ -unsaturated acids open up a new route to different types of organic structures. By varying the enamines as well as the acids the reaction has been shown to be quite general.

#### References

1. 6th paper by this laboratory on enamine chemistry.
2. Schroll, G., Klemmensen, P. and Lawesson, S.-O., Acta Chem. Scand. 18 (1964) 2201.
3. Becker, H. G. O., J. prakt. Chem. 12 (1961) 294.