

# Organic Chemistry IV

**Presented by:**

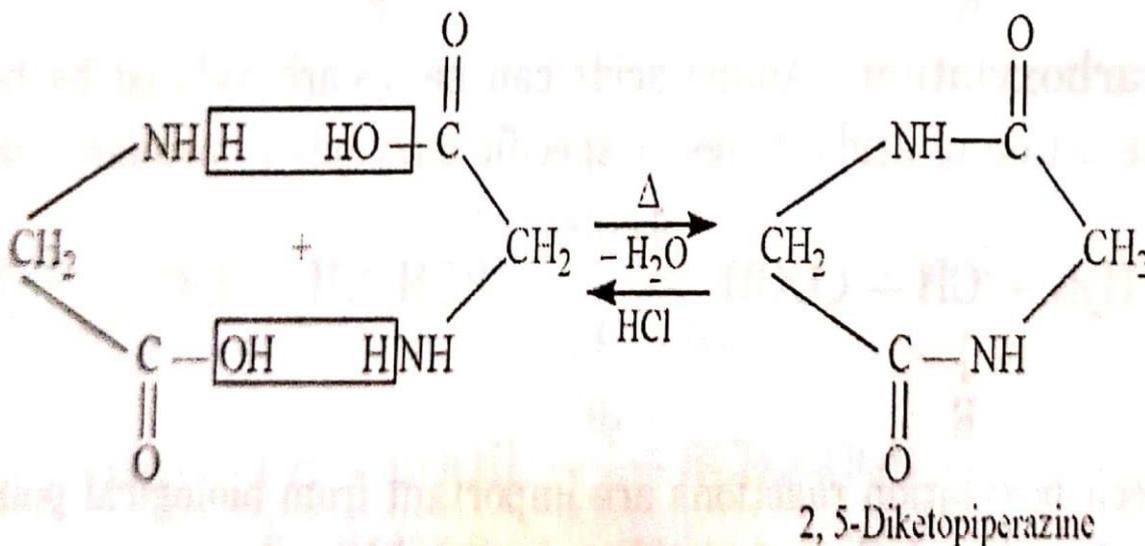
Dr. Neeraj Sharma

Assistant Professor

# Properties due to $\text{-NH}_2$ as well as $\text{-COOH}$ Group

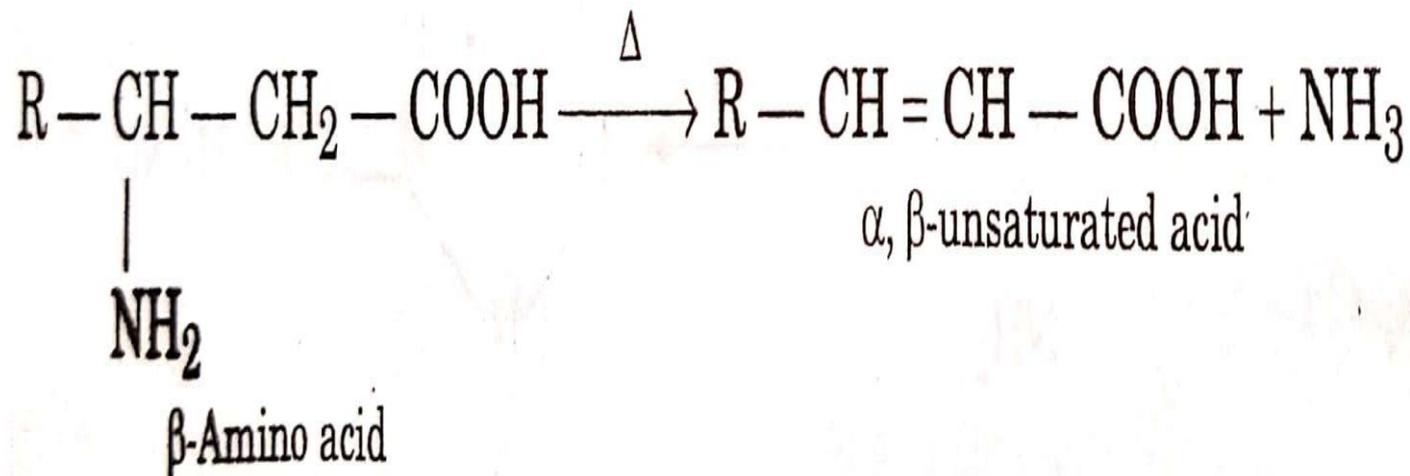
(1) **Effect of Heat** :  $\alpha$ -,  $\beta$ - and  $\gamma$ - as well as  $\delta$ -amino acids give different products upon heating. This reaction is used in distinguishing these amino acids from each other.

(a)  **$\alpha$ -Amino acids** : Upon heating give cyclic diamide as a result of condensation of two molecules of amino acid is such a way that  $\text{-NH}_2$  group of one amino acid combines with  $\text{-COOH}$  group of other and two molecules of water are lost. Products formed are 2, 5- diketopiperazine.



# Properties due to $\text{-NH}_2$ as well as $\text{-COOH}$ Group

(b)  $\beta$ -Amino acids : When heated undergo  $\beta$ -elimination and eliminate ammonia in the process to give  $\alpha, \beta$ -unsaturated carboxylic acids. For example,

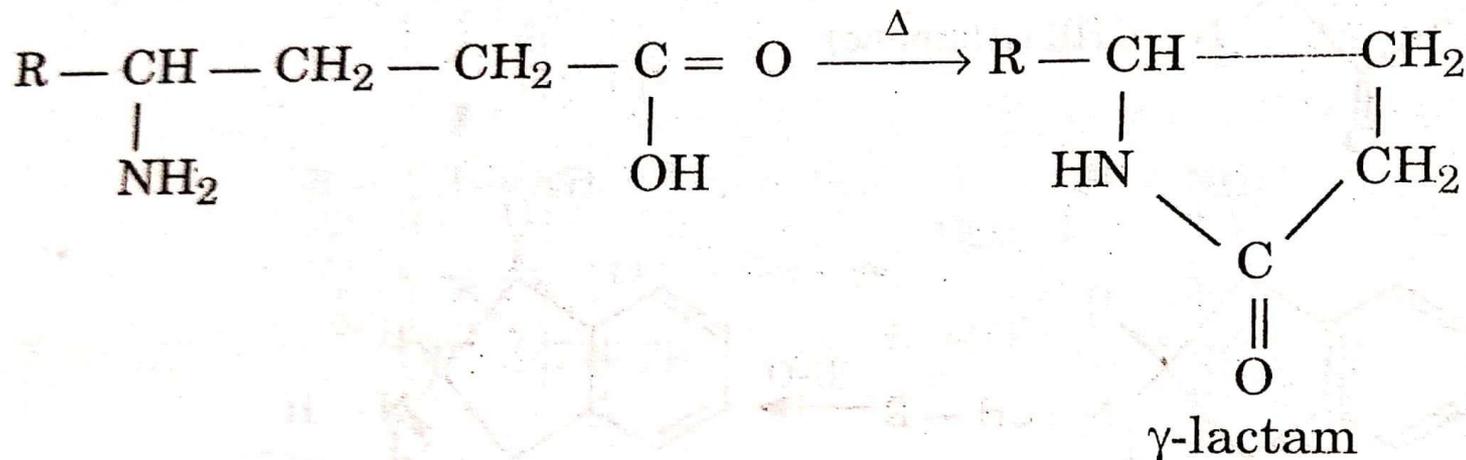




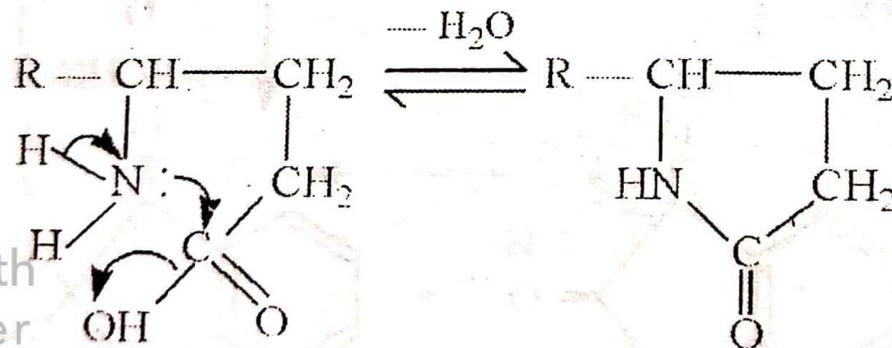
# Properties due to $-NH_2$ as well as $-COOH$ Group

(c)  $\gamma$ - and  $\delta$ -Amino acids give cyclic amides also known as lactams upon heating.

(i)  $\gamma$ -Amino acid give  $\gamma$ -lactam upon heating :



**Mechanism :**

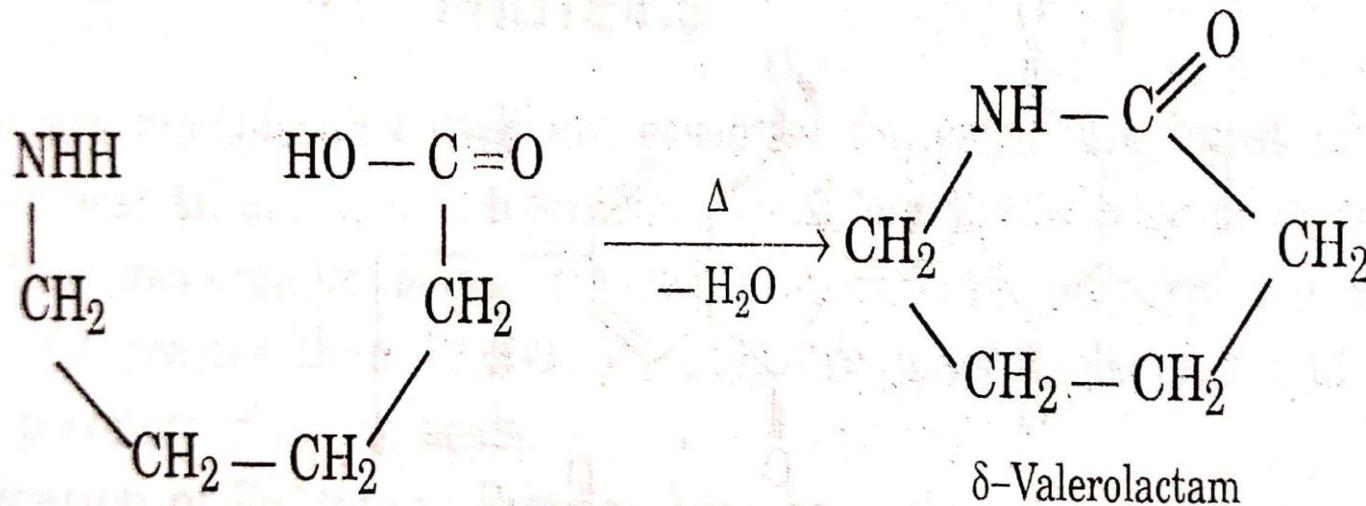


(ii)  $\delta$ -Amino acids give  $\delta$ -lactam upon heating :



# Properties due to $\text{-NH}_2$ as well as $\text{-COOH}$ Group

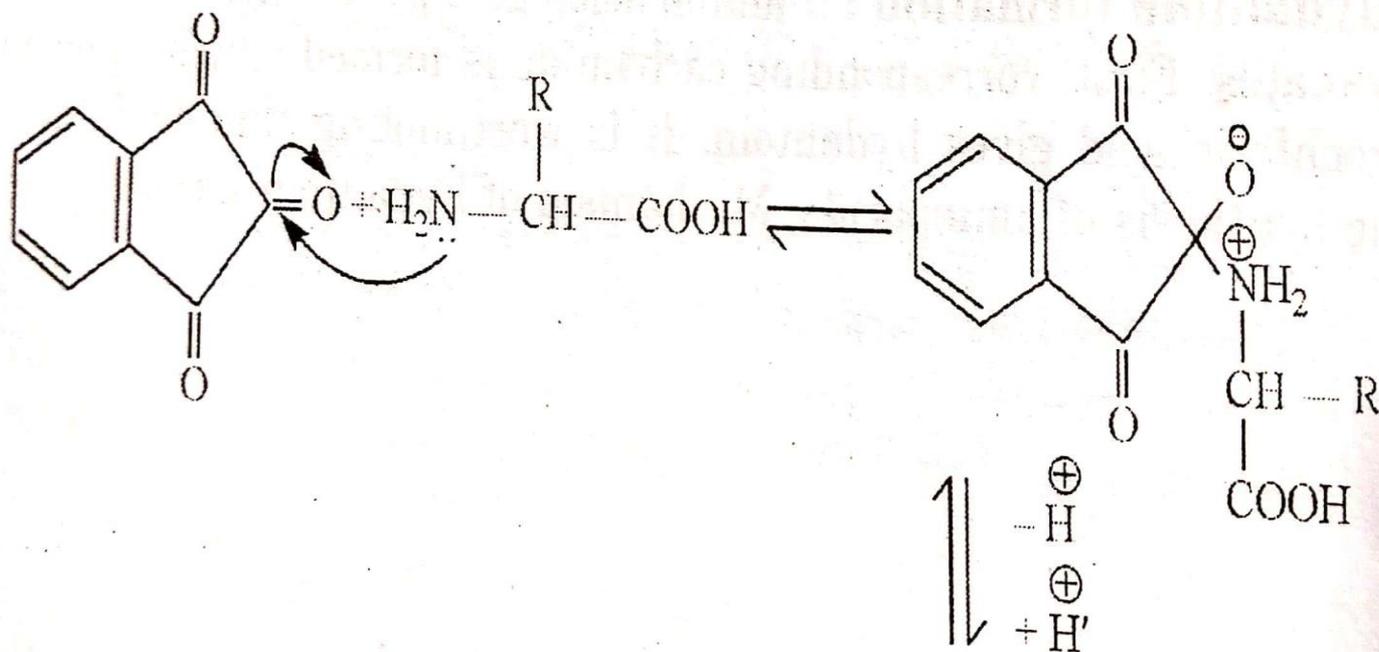
(ii)  $\delta$ -Amino acids give  $\delta$ -lactam upon heating by the similar mechanism as for  $\gamma$ -lactam e.g.

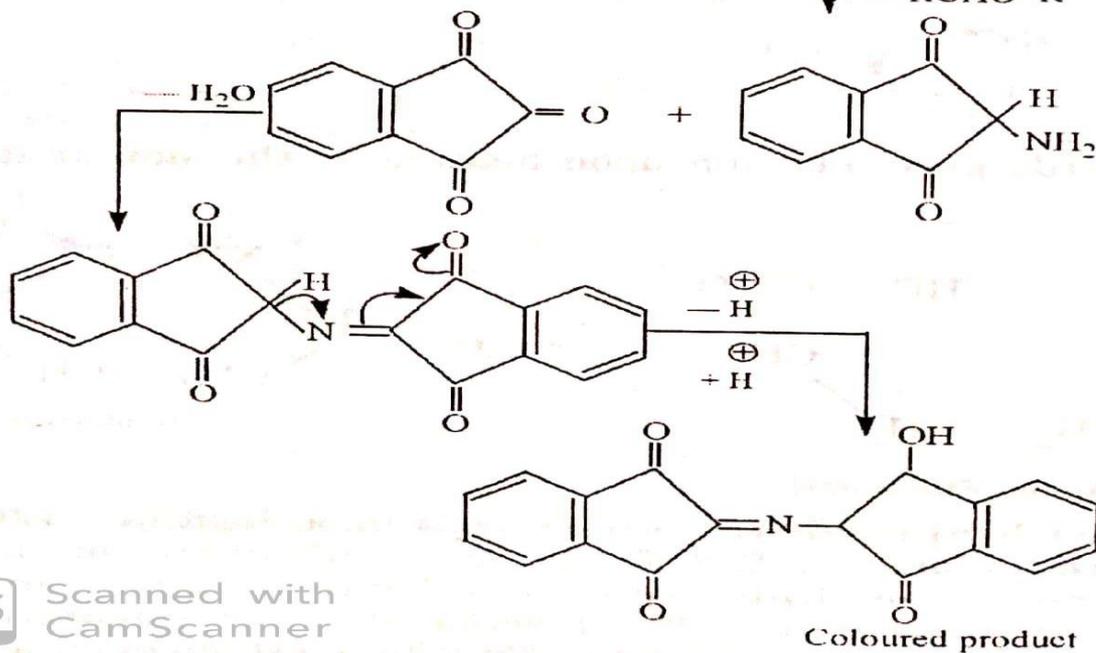
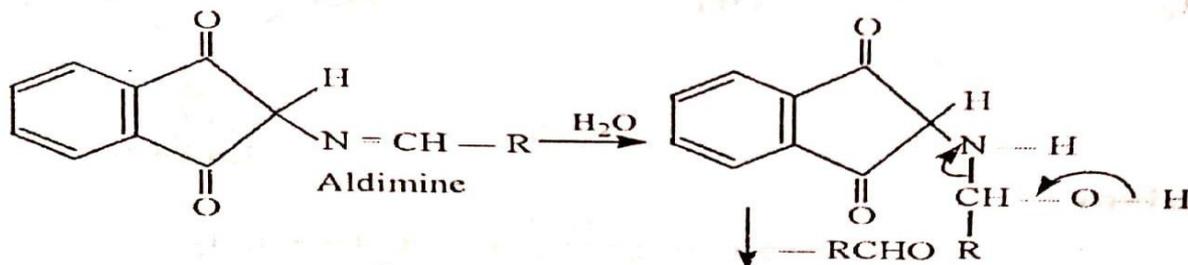
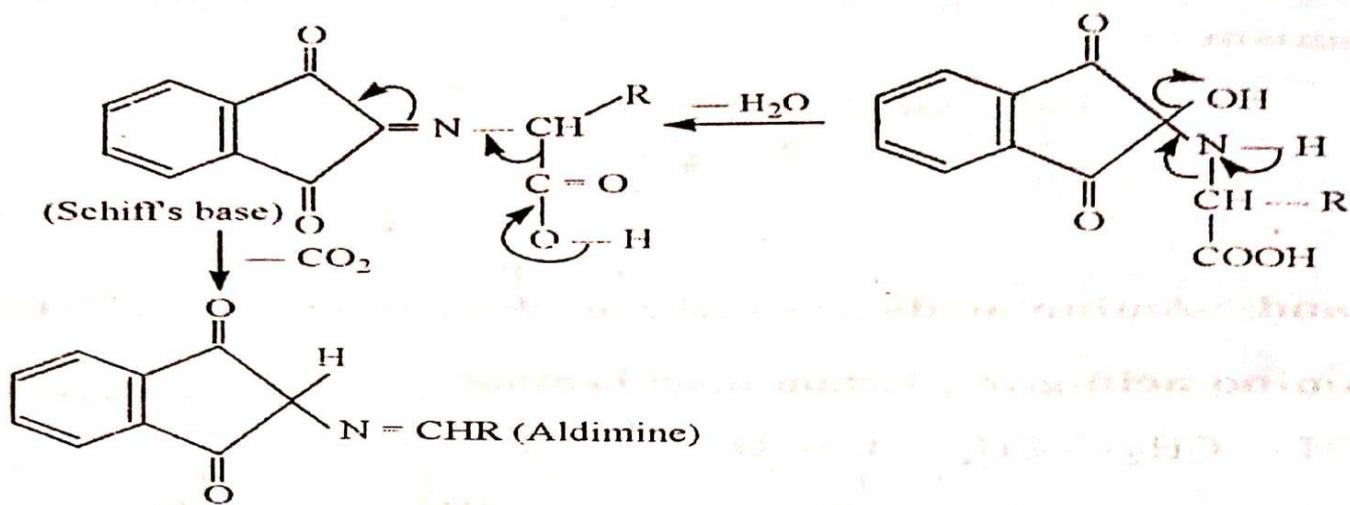


$\delta$ -Amino Valeric acid

# Properties due to $-NH_2$ as well as $-COOH$ Group

(2) **Reaction with ninhydrin** : Amino acids upon heating with alcoholic solution of **ninhydrin** (indane —1, 2, 3. Trione) give brilliant blue or violet colour (only exceptions are proline and hydroxyproline which give yellow colour because they contain secondary amino group). This reaction is used in qualitative as well as quantitative determination of amino acids. Possible mechanism of appearance of blue or violet colour is as follows :





# Hydantoin Formation

