

# Chapter: 13

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## **AIM: TO SYNTHESIZE HIPPURIC ACID (BENZOYL GLYCINE)**

<sup>1</sup>Mr. MANOJ KUMAR SHARMA

<sup>1</sup>Assistant Professor, School of Pharmaceutical Sciences,  
Apeejay Stya University, Gurugram, Haryana, India

<sup>2</sup>Dr. NARENDER YADAV

<sup>2</sup>Assistant Professor, School of Pharmaceutical Sciences,  
Apeejay Stya University, Gurugram, Haryana, India

## **Requirements**

### **Chemicals**

1. Glycine
2. 10% NaOH
3. Benzoyl chloride

### **Apparatus**

1. Conical flask
2. Beaker
3. Pipette
4. Glass rod
5. Buchner funnel

## **Theory**

Hippuric acid, a naturally occurring component of urine as a metabolite of aromatic chemicals from diet, is an acyl glycine formed via the conjugation of benzoic acid and glycine. Amides are made up of an amine and an organic acid molecule bonded together and water molecule is eliminated. While the -H is derived from the -NH<sub>2</sub> group, the -OH component is from the -COOH. Because the result of the reaction would be an acid-base neutralisation reaction, because the -OH is a very poor leaving group, this reaction cannot be completed by just combining the acid and amine molecules. As a result, the acid must first be transformed into a derivative that is more reactive often an acid chloride, which lacks an acidic H but has a great leaving group.

## **Chemical properties of compounds**

### **A) Hippuric acid (Benzoyl glycine)**

- 1) It has a 240 degree Celsius boiling point.
- 2) The density of it is 1.371 g/cm<sup>3</sup>.
- 3) Its melting point is between 187 and 188 degrees Celsius.
- 4) The molar mass of it is 179.17 g/mol.

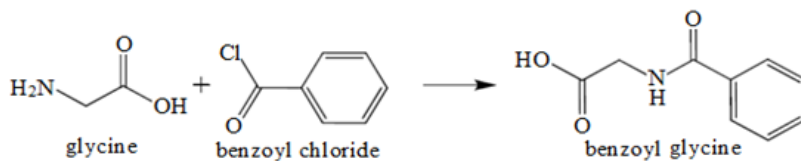
### **B) Glycine**

- 1) It acts like a buffer solution at a P.H 6.00 due to it's acidic nature.
- 2) It is the only achiral proteinogenic amino acid.

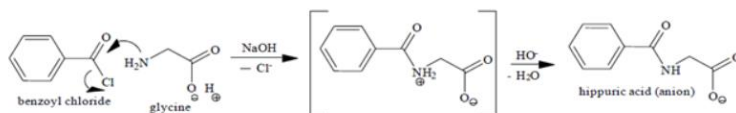
## **Procedure**

1. In a flask, dissolve the glycine in a 10% NaOH solution before adding the benzoyl chloride.
2. Cover the flask's mouth with a cotton and vibrate vigorously until the scent of benzoyl chloride is gone.
3. Next, add 1-2 drops of concentrated HCl to the liquid to make it acidic.
4. After filtering, washing with water, and recrystallizing the dry product with a little amount of decolorizing charcoal from boiling water (approximately 20 ml), Filter through a hot-water funnel, if necessary, then let the mixture crystallise.
5. Gather the benzoyl glycine in a Buchner funnel, then dry it at 192 degrees Celsius in an oven.

## Reaction



## Mechanism



## Calculation

Since glycine is the limiting reagent in this situation, yield should be determined based on its quantity.

Glycine's molecular formula is C<sub>2</sub>H<sub>5</sub>NO<sub>2</sub>.

Benzoyl glycine has the molecular formula C<sub>9</sub>H<sub>9</sub>NO<sub>3</sub>.

Glycine's molecular weight is 75g/mole.

179 g/mole is the molecular weight of benzoyl glycine.

## Applications

- 1) It is a biomarker that has the potential to be antibacterial.
- 2) The salts of hippuric acid are applied therapeutically (hippurates of calcium and ammonium).
- 3) The medication containing hippuric acid is typically effective against staphylococci, enterococci, and E. coli.

- 4) When long-term therapy is deemed required, Hiprex (tablet) is authorised for the preventive or suppressive treatment of frequently reoccurring urinary tract infections.

**Results:** The percentage yield of the synthesised benzoyl glycine was discovered to be..... %.