Quadrant II – Transcript and Related Materials

Programme: Bachelor Of Science(Second Year)

Subject: Chemistry

Paper Code: CHC 103

Paper Title: Physical Chemistry & Organic Chemistry

Unit: II Amines & Diazonium Salts

Module Name: Gabriel Phthalimide Synthesis

Module No: 12

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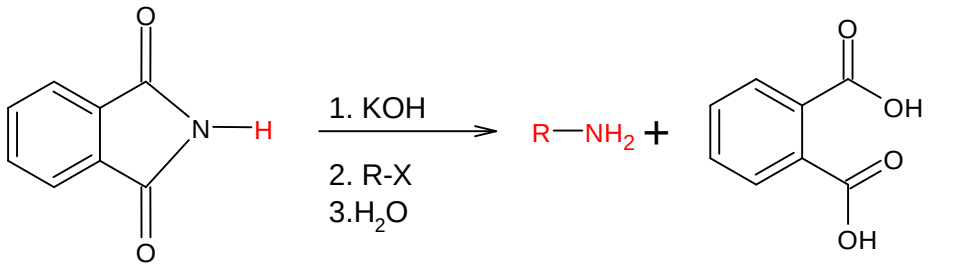
Notes:

Gabriel Phthalimide Synthesis

Gabriel Phthalimide Synthesis is a synthesis aimed for the preparation of primary amine. Its a reaction between Pthalimide and an alkyl halide in presence of a base to give respective primary amine.

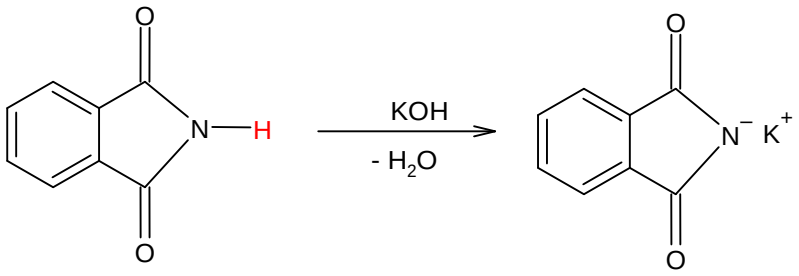


Phthalimide Primary amine Phthalic acid

This synthesis takes place in **3** steps.

The first step is the **abstraction of acidic proton** from Pthalimide by a base to give a Pthalimide anion.

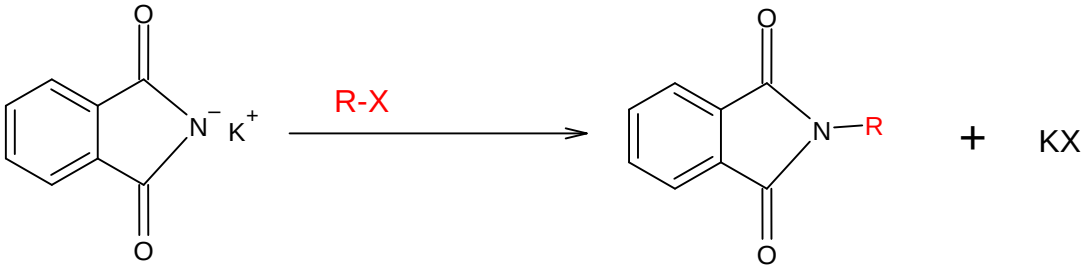
Step I : Abstraction of proton:



Phthalimide **Pthalimide anion**

The second step is **N-Alkylation** wherein alkyl group from alkyl halide get bonded to the nitrogen atom of Pthalimide. These is a simple SN-2 displacement reaction that occurs between the pthalimide anion and alkyl halide wherein the halogen group gets knocked off(displaced) by the pthalimide anion giving respective N-Alkyl Pthalimide. Here the alkyl halide to be used must be primary alkyl halide. These reaction is not shown by aromatic halides as it is very difficult to remove halogen that is bonded to sp^2 hybridised carbon (halogen that is bonded to C=C) & therefore aryl amines cannot be synthesized using this particular method.

Step II : N-Alkylation :



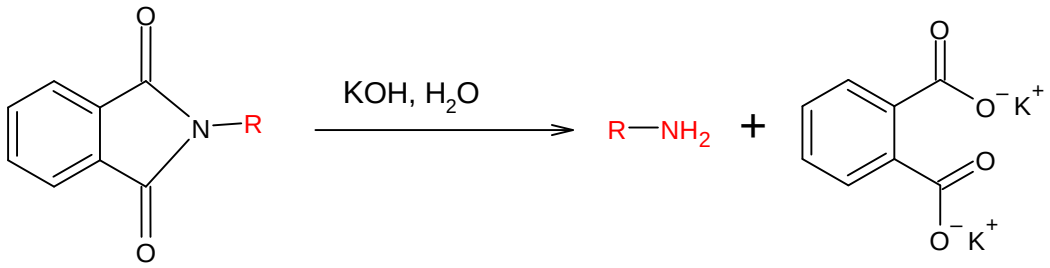
Pthalimide anion **N-Alkyl Phthalimide**

The **third step** is **hydrolysis** which gives primary amine as the main product. Here depending on the condition available two types of Hydrolysis can occur. One i.e. **Base hydrolysis** & other is **acid hydrolysis**.

In **Base hydrolysis** N-Alkyl Pthalimide will be hydrolysed in presence of base to give primary amine & a salt of Pthalic acid.

Step III : Hydrolysis :

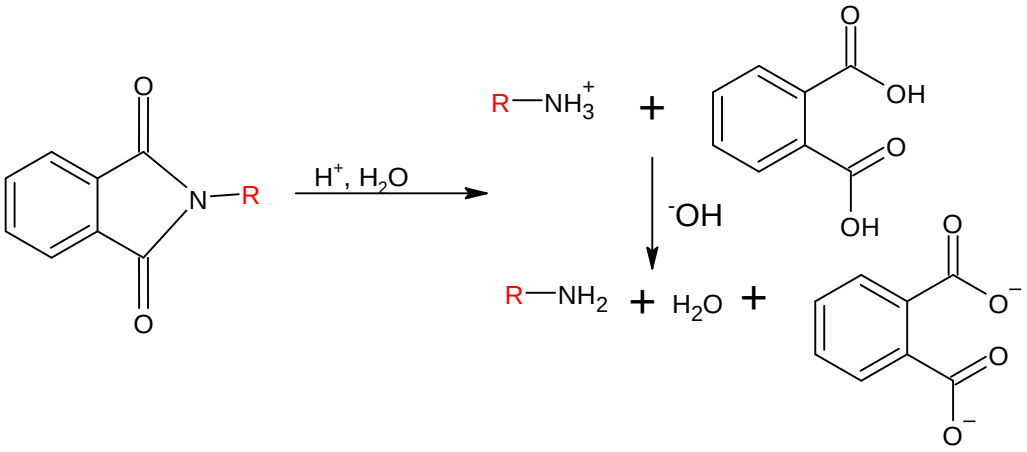
Base Hydrolysis:



N-Alkyl Phthalimide Primary amine Phthalic acid

In **Acid hydrolysis** N-Alkyl Pthalimide will be hydrolysed in presence of an acid & will give protonated primary amine and Pthalic acid which on treatment with suitable base will give our main product i.e. **primary amine** & salt of Pthalic acid.

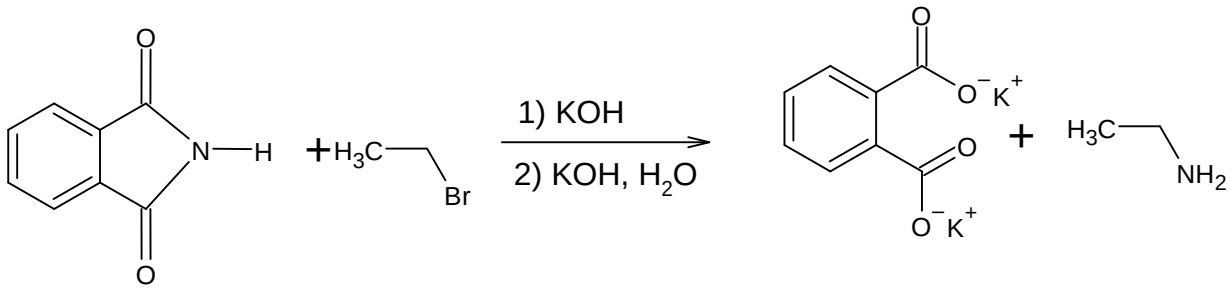
Acid Hydrolysis :



Alkyl group of the primary amine is identical to the alkyl group of the alkyl halide that means if your alkyl halide is Chloropropane then your main product will be Propanamine.If alkyl halide chosen is Bromopentane then the main product will be Pentanamine.

Examples on Gabriel Pthalimide Synthesis :

1.



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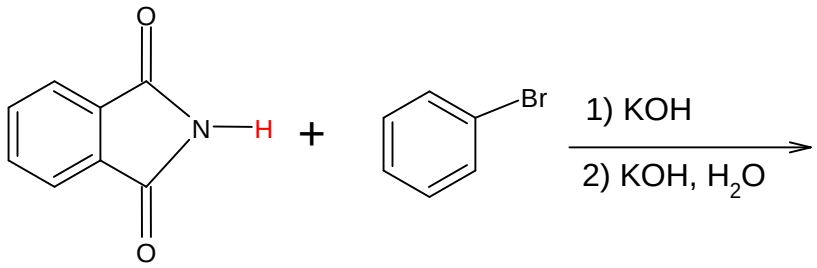

Reaction does not occur because aryl halide do not undergo nucleophilic substitution reaction.

3.