19 Amines – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)		
amine			
lone pair			
nucleophile			
primary amine			
halogenoalkane			
ammonia			
nucleophilic substitution			

Recall

An **amine** is like ammonia (NH_3) with one hydrogen replaced by a carbon chain – it has the $-\mathbf{NH_2}$ group. Like ammonia, it has a **lone pair** on the nitrogen.

- That lone pair makes an amine a **base** and a **nucleophile** .
- Amines are made from halogenoalkanes.

Nothing here is harder than IGCSE – it just adds one reaction.

New ideas

Read these first, then do the Practice.

1 The amine group

A **primary amine** has the **–NH_2** group on a carbon chain (e.g. $C_2H_5NH_2$). The nitrogen keeps its **lone pair**.

2 Making a primary amine

Heat a **halogenoalkane** with **ammonia** in ethanol, under pressure:

$$C_2H_5Br + NH_3 \rightarrow C_2H_5NH_2 + HBr$$

This is a **nucleophilic substitution**: the lone pair on the ammonia nitrogen attacks the $\delta+$ carbon and pushes out the halogen.

3 Use an excess of ammonia

Use **excess ammonia**, or the amine you make can react again (it is also a nucleophile) to give secondary and tertiary amines.

Watch out: the amine forms by nucleophilic *substitution* – the nitrogen's lone pair attacks the $\delta+$ carbon and the halogen leaves. Use *excess* ammonia, or the amine (also a nucleophile) reacts on to give secondary and tertiary amines.

Practice

Try these in order.

19.1 Name the functional group of an amine. [1]

19.2 What gives the amine nitrogen its ability to act as a nucleophile? [1]

19.3 Write the equation for bromoethane reacting with ammonia. [2]

19.4 Name the type of mechanism for this reaction. [1]

19.5 Why is an excess of ammonia used? [2]

19.6 Challenge. Both ammonia and ethylamine ($C_2H_5NH_2$) have a lone pair on nitrogen, but ethylamine is a slightly *stronger* base. Suggest why. [2]