

AMINES

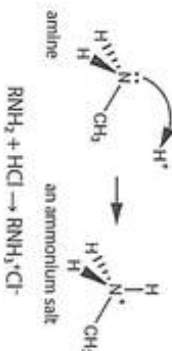
Y13 - Term 2

NUCLEOPHILIC REACTIONS

BASE PROPERTIES

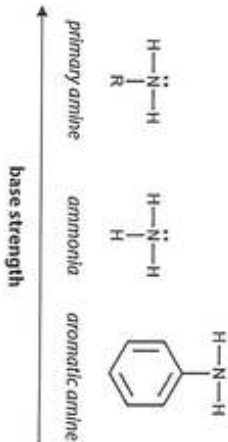
BASICITY

Amines are bases because they can **accept protons**. This is possible because of the lone pair on the nitrogen atom, which can form a dative covalent bond with a hydrogen ion.

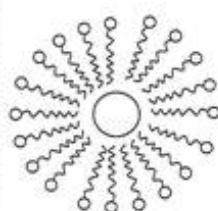


BASE STRENGTHS

On the whole, amines are weak bases. The base strength of amines depends on the availability of the lone pair on the nitrogen atom. The R-group in primary amines increases the electron density on the N, so primary amines are more basic than ammonia. However, in aromatic amines, the lone pair delocalises into the ring, decreasing the base strength.



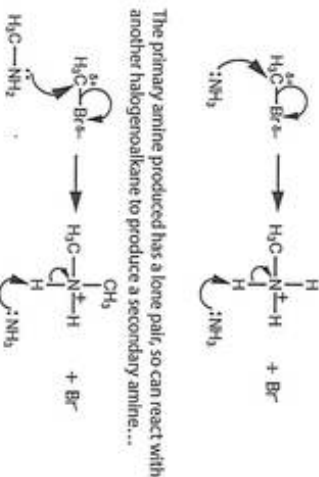
USES OF QUATERNARY AMMONIUM SALTS



Quaternary ammonium salts can be used as cationic surfactants and fabric softeners – they have hydrophobic and hydrophilic parts, so can dissolve oils in water.

WITH HALOGENOALKANES

These reactions are nucleophilic substitution reactions. Nitrogen is a lone pair donor, and substitutes the halogen.



... which goes on to react again and produce a tertiary amine.



Quaternary ammonium salts are formed when a tertiary amine reacts with another haloalkane molecule.

PREPARATION

ALIPHATIC

Aliphatic amines (amines without benzene rings) are produced by reacting ammonia with a haloalkane in ethanol. To stop at this point, use **excess ammonia**.



Nitriles can be reduced using hydrogen and a nickel catalyst or LiAlH_4 in ether.



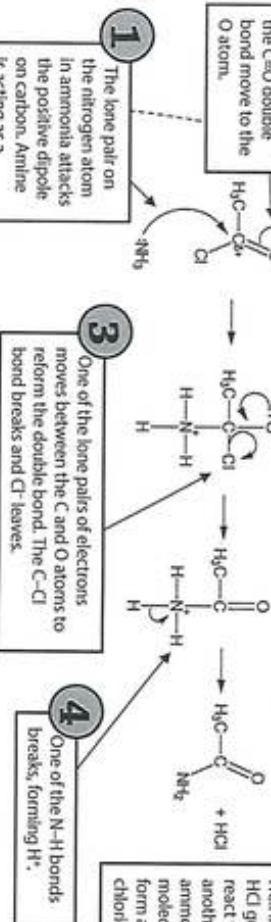
AROMATIC

Aromatic nitro groups are reduced by tin and concentrated hydrochloric acid to form an aromatic amine group.



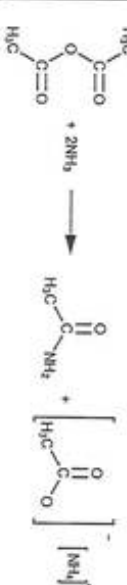
ADDITION-ELIMINATION MECHANISM

The mechanism for the reaction between ammonia and an acyl chloride involves addition followed by elimination:



REACTION WITH ACID ANHYDRIDE

Amines can also react with acid anhydrides to form the same amide and an ammonium carboxylate salt.



WITH ACYL CHLORIDES

Acyl chlorides react with ammonia to form amides:



Acyl chlorides react with primary amines to form N-substituted amides:

