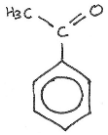
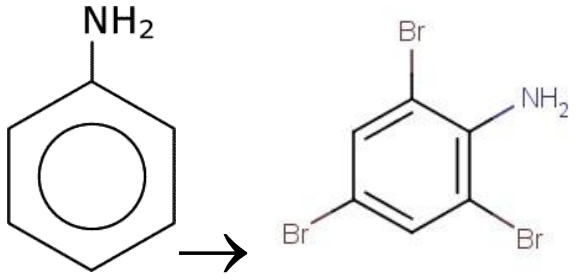
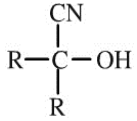
Acyl chloride → 1° amide	Acyl chloride → 2° amide	Acyl chloride → Carboxylic Acid
Carboxylic Acid → Acyl chloride	Halogenoalkane → Nitrile	Acyl chloride → Ester
Acid anhydride → ester	Acid anhydride → primary amide	Test for aldehydes AND ketones
Aldehyde → 1° alcohol	Ketone → 2° alcohol	Test for aldehydes

Reagents: H_2O	**Reagents:** 1° amine	**Reagents:** NH_3
Reagents: alcohol	**Reagents:** KCN **Conditions:** ethanol solvent **<u>Mechanism</u>:** Nucleophilic substitution	**Reagents:** $SOCl_2$ **N.B.** dry conditions or steamy fumes of HCl form
Reagents: 2,4-DNPH **Observation:** red/orange/yellow ppt **Notes:** To identify the aldehyde/ketone… Recrystallise precipitate (to purify) Record melting point Compare with database to identify	**Reagents:** NH_3 **N.B.** For a secondary amide, use an amine	**Reagents:** alcohol **Conditions:** r.t.p. **N.B.** carboxylic acid also formed
Reagents: $AgNO_3$, excess NH_3 **Conditions:** warm **Observation:** silver mirror **Reaction type:** Oxidation Aldehyde oxidised to carbox. acid Ag^+ reduced to Ag	**Reagents:** $NaBH_4$ **<u>Mechanism</u>:** nucleophilic addition	**Reagents:** $NaBH_4$ **<u>Mechanism</u>:** nucleophilic addition

Carboxylic acid → ester	Ester → Carboxylate salt	Ester → Carboxylic acid
Amine → amine salt	Nitrobenzene → phenylamine	Benzene → nitrobenzene
Benzene → methylbenzene	Benzene → phenylketone e.g. 	Benzene → bromobenzene
Phenol → sodium phenoxide	Phenol → 2,4,6-tribromophenol (test for phenol)	Nitrile ($R-C\equiv N$) → Carboxylic acid

Reagents: dilute acid **Conditions:** heat **N.B.** acid hydrolysis	**Reagents:** dilute NaOH(aq) **Conditions:** heat **N.B.** alkaline hydrolysis	**Reagents:** alcohol **Conditions:** conc. H_2SO_4 **Observation:** fruity smell
Reagents: conc. HNO_3, conc. H_2SO_4 **Notes:** 55°C (further subs. at higher temp.) NO_2 group is 3-directing (electron withdrawing) **Mechanism:** electrophilic substitution	**Reagents:** tin, conc. HCl (then NaOH) **Reaction type:** reduction	**Reagents:** dilute acid e.g.$HCl_{(aq)}$
Reagents: Br_2 **Conditions:** Fe / $FeBr_3$ catalyst **Mechanism:** electrophilic substitution	**Reagents:** CH_3COCl **Conditions:** $AlCl_3$ catalyst **Mechanism:** electrophilic substitution	**Reagents:** CH_3Cl **Conditions:** $AlCl_3$ catalyst **Mechanism:** electrophilic substitution
Reagents: H_2O **Conditions:** H^+ (e.g. $HCl_{(aq)}$)	**Reagents:** bromine water (Br_2) **Observation:** orange to colourless AND white ppt **Notes:** OH group is 2,4-directing (electron donating)	**Reagents:** $NaOH_{(aq)}$ OR Na **Observation:** colourless solution

Carboxylate salt → carboxylic acid	Carboxylic acid → sodium salt	Nitrile ($R-C\equiv N$) → Amine
Amide → carboxylic acid + amine salt	Haloalkane → amine	Carboxylic acid → Amide
Amide → carboxylate salt + amine	Amine salt → amine	
Hydrolysis of esters, amides, proteins and peptides	Aldehyde/ketone → hydroxynitrile 	Phenol → 2-nitrophenol

Reagents: H_2 **Conditions:** Ni	**Reagents:** NaOH OR Na_2CO_3 OR Na **Conditions:** r.t.p	**Reagents:** strong acid e.g.HCl **Conditions:** r.t.p
Reagents: amine	**Reagents:** excess NH_3 **Conditions:** ethanol solvent **Mechanism:** Nucleophilic substitution **Notes:** then $NaOH_{(aq)}$ (converts amine salt to amine)	**Reagents:** acid (e.g. H_2SO_4) **Conditions:** reflux, heat
Reagents: bromine water **Notes:** NH_2 group is 2,4-directing (electron donating)	**Reagents:** $NaOH_{(aq)}$ **Conditions:** r.t.p.	**Reagents:** $NaOH_{(aq)}$ **Conditions:** r.t.p.
Reagents: dilute. HNO_3 **Conditions:** r.t.p. **Notes:** OH group is 2,4-directing (electron donating)	**Reagents:** NaCN(aq) / H^+(aq) **Conditions:** H^+(aq) **Mechanism:** Nucleophilic addition	**Reagents:** $HCl_{(aq)}$ or $NaOH_{(aq)}$ **Conditions:** hot