A' Level Chemistry – 3.3.8 Aldehydes & Ketones

West Kirby Grammar School

Learning about this topic is important because:
Aldehydes, ketones, carboxylic acids and their derivatives all contain the carbonyl group which is attacked by nucleophiles. This section includes the addition reactions of aldehydes and ketones.

This builds on:
3.3.1 Introduction to Organic Chemistry, 3.3.7 Optical Isomers, 3.3.5 Alcohols

This leads to:
3.3.9 Carboxylic Acids & Derivatives

We will learn:

- Aldehydes are readily oxidised to carboxylic acids.
- Chemical tests to distinguish between aldehydes and ketones including Fehling's solution and Tollens' reagent.
- Aldehydes can be reduced to primary alcohols, and ketones to secondary alcohols, using NaBH4 in aqueous solution. These reduction reactions are examples of nucleophilic addition.
- The nucleophilic addition reactions of carbonyl compounds with KCN, followed by dilute acid, to produce hydroxynitriles.
- Aldehydes and unsymmetrical ketones form mixtures of enantiomers when they react with KCN followed by dilute acid.
- The hazards of using KCN.

We will develop/practise skills including:

Writing overall equations for reduction reactions using [H] as the reductant

Outlining the nucleophilic addition mechanism for reduction reactions with NaBH4 (the nucleophileshould be shown as H^-)

Writing overall equations for the formation of hydroxynitriles using HCN

Outlining the nucleophilic addition mechanism for the reaction with KCN followed by dilute acid

Explain why nucleophilic addition reactions of KCN, followed by dilute acid, can produce a mixture of enantiomers.

Some of the vocabulary that we will use includes:

Reduction	Nucleophile	Hydroxynitrile
Oxidation	Addition	Enantiomers

You could learn more about this topic by:

AQA Chemistry A-level Organic II Revision - PMT (physicsandmathstutor.com)

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

End of topic assessed question, retrieval questions, mini white boards, exercise questions, exam questions.

A' Level Chemistry – 3.3.9 Carboxylic Acids

West Kirby Grammar School

Learning about this topic is important because:
Carboxylic acids are weak acids but strong enough to liberate carbon dioxide from carbonates. Esters occur naturally in vegetable oils and animal fats. Important products obtained from esters include biodiesel, soap and glycerol.

This builds on:
3.3.1 Introduction to Organic Chemistry, 3.3.7 Optical Isomers, 3.3.5 Alcohols, 3.3.8 Aldehydes and Ketones

This leads to:
3.3.10 Aromatic Chemistry

We will learn:

- The structures of: carboxylic acids and esters.
- Carboxylic acids are weak acids but will liberate CO2 from carbonates.
- Carboxylic acids and alcohols react, in the presence of an acid catalyst, to give esters.
- Common uses of esters (eg in solvents, plasticisers, perfumes and food flavourings).
- Vegetable oils and animal fats are esters of propane-1,2,3-triol (glycerol).
- Esters can be hydrolysed in acid or alkaline conditions to form alcohols and carboxylic acids or salts of carboxylic acids.
- Vegetable oils and animal fats can be hydrolysed in alkaline conditions to give soap (salts of long-chain carboxylic acids) and glycerol.
- Biodiesel is a mixture of methyl esters of long-chain carboxylic acids. Biodiesel is produced by reacting vegetable oils with methanol in the presence of a catalyst.
- The structures of: acid anhydrides, acyl chlorides and amides.
- The nucleophilic addition–elimination reactions of water, alcohols, ammonia and primary amines with acyl chlorides and acid anhydrides.
- The industrial advantages of ethanoic anhydride over ethanoyl chloride in the manufacture of the drug aspirin.
-

We will develop/practise skills including:

Give the structural, displayed and skeletal formulas of carboxylic acids, esters, acyl chlorides, acid anhydrides and amides

Name carboxylic acids, esters, acyl chlorides, acid anhydrides and amides using IUPAC rules.

Give equations for reactions of:

- carboxylic acids and alcohols to form esters
- Acid and base catalysed hydrolysis of esters
- Hydrolysis of triglycerides to form glycerol and carboxylate salts (saponification)
- Triglycerides with methanol to form biodiesel in an transesterification reaction
- Acyl chlorides with water, alcohols, ammonia and primary amines
- Acid anhydrides with water, alcohols, ammonia and primary amines

Outlining the mechanism of nucleophilic addition–elimination reactions of acyl chlorides with water, alcohols, ammonia and primary amines.

Some of the vocabulary that we will use includes:

You could learn more about this topic by:

A' Level Chemistry – 3.3.9 Carboxylic Acids

Hydrolysis Ester Carboxylic acid Carboxylate salt Acyl chloride Acid anhydride Nucleophilic addition-elimination	Carboxylic Acids
Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: End of topic assessed question, retrieval questions, mini white boards, exercise questions, exam questions.	

AS Chemistry – 3.3.10 Aromatic Chemistry

West Kirby Grammar School

Learning about this topic is important because:

Aromatic chemistry takes benzene as an example of this type of molecule and looks at the structure of the benzene ring and its substitution reactions.

This builds on:
GCSE – Organic Chemistry, AS – Introduction to Organic Chemistry, halogenoalkanes, Alkenes

This leads to:
3.3.11 Amines

We will learn:
What is the structure and bonding in a molecule of benzene?
What evidence is there of this being the true structure?
How does bond enthalpy data show that benzene is more stable that cyclohexa-1,3,5-triene?
Why does benzene undergo substitution reactions rather than addition?
What is the mechanism for the electrophilic substitution of benzene?
Why is nitration of benzene important?
What are the reactants, conditions and mechanisms for the Freidel-Crafts acylation of aromatic compounds?

We will develop/practise skills including:
Naming and drawing aromatic compounds using IUPAC nomenclature

Outlining curly arrow mechanisms for electrophilic substitution reactions of aromatic compounds

Giving the steps, reactants, conditions and mechanisms of the Freidel-Crafts acylation of aromatic compounds

Predicting the products of reactions of aromatic compounds given the reactants and reaction conditions

Some of the vocabulary that we will use includes:

Benzene, phenol / phenyl, electrophile, nitration, acylation, delocalisation

You could learn more about this topic by:
AQA A-Level Chemistry - Aromatic Chemistry 1 (Benzene Structure) - YouTube
AQA A-Level Chemistry - Aromatic Chemistry 2 (Nitration) - YouTube
AQA A-Level Chemistry - Aromatic Chemistry 3 (Friedel-Crafts Acylation) - YouTube

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

End of topic assessed question, retrieval questions, mini white boards, exercise questions.

AS Chemistry – 3.3.10 Aromatic Chemistry

West Kirby Grammar School

A2 Chemistry – 3.3.12 - Polymers

West Kirby Grammar School

Learning about this topic is important because:
The study of polymers is extended to include condensation polymers. The ways in which condensation polymers are formed are studied, together with their properties and typical uses. Problems associated with the reuse or disposal of both addition and condensation polymers are considered.

This builds on:
3.3.4 Alkenes (Addition Polymers)
3.3.9 Carboxylic Acids and Derivatives (Esterification)
3.3.10 Aromatic Chemistry (Kevlar etc.)
3.3.11 Amines
3.3.13 Amino Acids, Proteins and DNA (Natural Polymers - Condensation)

This leads to:
3.3.14 Organic Synthesis

We will learn:
Condensation polymers are formed by reactions between dicarboxylic acids and diols, dicarboxylic acids and diamines, amino acids.
The repeating units in polyesters (eg Terylene) and polyamides (eg nylon 6,6 and Kevlar) and the linkages between these repeating units.
Typical uses of these polymers.
Polyalkenes are chemically inert and non-biodegradable.
Polyesters and polyamides can be broken down by hydrolysis and are biodegradable.
The advantages and disadvantages of different methods of disposal of polymers, including recycling.
Why polyesters and polyamides can be hydrolysed but polyalkenes cannot.

We will develop/practise skills including:
Drawing the repeating unit from monomer structure(s)

Drawing the repeating unit from a section of the polymer chain

Drawing the structure(s) of the monomer(s) from a section of the polymer

Some of the vocabulary that we will use includes:
Addition, condensation, hydrolysis, polymerisation, polymer, repeating unit, biodegradable, non-biodegradable, terylene, nylon, Kevlar

You could learn more about this topic by:
AQA A-Level Chemistry - Polymers - YouTube

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:
End of topic assessed question, retrieval questions, mini white boards, exercise questions