AS Chemistry- 3.1.1 Atomic Structure

West Kirby Grammar School

Learning about this topic is important because:
The chemical properties of elements depend on their atomic structure and in particular on the arrangement of electrons around the nucleus. The arrangement of electrons in orbitals is linked to the way in which elements are organised in the Periodic Table. Chemists can measure the mass of atoms and molecules to a high degree of accuracy in a mass spectrometer. The principles of operation of a modern mass spectrometer are studied.

This builds on:
GCSE Atomic Structure, The Periodic Table and Bonding.

This leads to:
3.1.3 Bonding

We will learn:

- Determine the number of fundamental particles in atoms and ions using mass number, atomic number and charge
- Explain the existence of isotope
- Interpret simple mass spectra of elements
- Calculate relative atomic mass from isotopic abundance, limited to mononuclear ions.
- Define first ionisation energy
- Write equations for first and successive ionisation energies
- Explain how first and successive ionisation energies in Period 3 (Na–Ar) and in Group 2 (Be–Ba) give evidence for electron configuration in sub-shells and in shells.

We will develop/practise skills including:

- Students report calculations to an appropriate number of significant figures, given raw data quoted to varying numbers of significant figures.
- Students calculate weighted means, eg calculation of an atomic mass based on supplied isotopic abundances.
- Students interpret and analyse spectra.

Some of the vocabulary that we will use includes:

Ionic, Covalent, Metallic, Molecule, Macromolecular, Electrostatic, Intermolecular, Ion, Ionisation, Successive, Isotope, abundance.

You could learn more about this topic by:

AQA GCSE Physics Topic 4: Atomic Structure Revision - PMT (physicsandmathstutor.com)
AQA A-Level Chemistry - Atomic Structure and Electron Configuration - YouTube
AQA 1.1 Atomic Structure REVISION - 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: Assessed Homework and Assessed end of topic question.

AS Chemistry- 3.1.1 Atomic Structure

West Kirby Grammar School

GCSE Chemistry – 3.1.3 Bonding

West Kirby Grammar School

Learning about this topic is important because:
The physical and chemical properties of compounds depend on the ways in which the compounds are held together by chemical bonds and by intermolecular forces. Theories of bonding explain how atoms or ions are held together in these structures. Materials scientists use knowledge of structure and bonding to engineer new materials with desirable properties. These new materials may offer new applications in a range of different modern technologies.

This builds on:
GCSE Chemistry Topic 2- Bonding, Structure and the Properties of Matter

This leads to:
3.2.1 Periodicity
3.2.4 Properties of Period 3 elements and their Oxides
All most topics in organic Chemistry

We will learn:

- The different types of bonding, when each type of bonding occurs, how the bond forms and the types of structure each can make.
- The general properties of substances with a particular structure and how these properties relate to their structure of the substance.
- The 5 basic shapes of a molecule, how the number of bonding pairs and lone pairs effects the shape and bond angle of a molecule.
- What electronegativity is and how it effects a covalent bond, the trend in electronegativity down a group and across a period and explain these trends.
- The 3 different types of intermolecular force and how they come about, how to identify which intermolecular force(s) are acting between molecules. The effect of the different intermolecular forces on melting/boiling point of a molecular substance.

We will develop/practise skills including:

How to determine the type of bonding and structure in a substance.

How to predict/explain the properties of a substance from its structure.

Determine the shape and explain and bond angle of a molecule and be able to draw it.

Predict polarity of a bond using knowledge of electronegativity.

Identifying the strongest type of Intermolecular force acting between given molecules and use this to make predictions about melting/boiling point of a substance.

Some of the vocabulary that we will use includes:

You could learn more about this topic by:

GCSE Chemistry – 3.1.3 Bonding

West Kirby Grammar School

Ionic bonding **Giant ionic Lattice** **Ion** **Covalent bonding** **Molecule** **Giant covalent lattice** **Metallic bonding** **Delocalised electrons** **Giant metallic Lattice**	**Coordinate bond** **Electrostatic attraction** **Polar bond** **Electronegativity** **Polarisation** **Intermolecular Force** **Van der Waal's forces** **Permanent dipole-dipole forces** **Hydrogen bonding**	[1.3-revision-guide-bonding-aqa.pdf (wordpress.com)] [Bonding menu (chemguide.co.uk)] [Structures menu (chemguide.co.uk)] [3.1.3 Bonding - 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 test

Assessed homework

AS Chemistry – 3.1.4 Energetics

West Kirby Grammar School

Learning about this topic is important because:
The enthalpy change in a chemical reaction can be measured accurately. It is important to know this value for chemical reactions that are used as a source of heat energy in applications such as domestic boilers and internal combustion engines.

This builds on:
GCSE – Energy Changes, AS – Amount of Substance, bonding

This leads to:
3.3.5 Kinetics, 3.1.7 Thermodynamics

We will learn:
What is the definition of an enthalpy change (ΔH)?
What are the standard conditions for an standard enthalpy change?
Define standard enthalpy of combustion (ΔH_c)
Define standard enthalpy of formation (ΔH_f)
How to construct equations for enthalpy of formation / combustion reactions
How can heat change (q) be calculated using the equation q=mcΔT?
How can heat change q be used to calculation enthalpy change ΔH?
What is Hess's law?
How can a Hess cycle be used to work out ΔH?
What is the definition of mean bond enthalpy?
How can mean bond enthalpy data be used to calculate an approx. ΔH?
Why is this only an approximate value?

We will develop/practise skills including:
Constructing chemical symbol equations for (ΔH_c) and (ΔH_f)

Using given data and manipulation of the equations q= q=mcΔT and (q/1000)/mol to complete calculations

Using given data to construct Hess cycles and calculate enthalpy changes ΔH

Using given mean bond enthalpy data to calculate an approximate value for ΔH

Using practical methods to determine ΔH of neutralisation or burning fuels

Being able to evaluate practical methods of determining ΔH

Some of the vocabulary that we will use includes:

Enthalpy, formation, combustion, specific heat capacity, Joule, calorimetry, calorimeter

You could learn more about this topic by:
AQA A-Level Chemistry - Energetics Pt. 1 (Enthalpy & Bond Energies) - YouTube
AQA A-Level Chemistry - Energetics Pt. 2 (Calorimetry) - YouTube
AQA A-Level Chemistry - Energetics Pt. 3 (Hess' Law) - 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, CPACs in required practical

AS Chemistry – 3.1.4 Energetics

West Kirby Grammar School

AS Chemistry – 3.1.5 Kinetics

West Kirby Grammar School

Learning about this topic is important because:
The study of kinetics enables chemists to determine how a change in conditions affects the speed of a chemical reaction.
Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are variables that can be manipulated in order to speed them up or slow them down.

This builds on:
GCSE – 4.6 Rates of Reaction

This leads to:
3.3.6 Equilibrium, 3.1.9 Rate Equation

We will learn:

How and when collisions take place between particles.
Definition of the term activation energy.
How to draw and interpret the Maxwell–Boltzmann distribution of molecular energies in gases.
Definition of the term rate of reaction.
How the distribution curves differ for different temperatures and how this affects rate.
How to the Maxwell–Boltzmann distribution to explain why a small temperature increase can lead to a large increase in rate.
How the qualitative effect of changes in concentration on collision frequency.
The qualitative effect of a change in the pressure of a gas on collision frequency.
How a change in concentration or a change in pressure influences the rate of a reaction
What a catalyst is and how they work.
How to use a Maxwell–Boltzmann distribution to explain how a catalyst increases the rate of a reaction involving a gas.

We will develop/practise skills including:

Drawing and interpreting Maxwell–Boltzmann distribution of molecular energies in gases.
Predicting changes in activation energy, most probable energy, area under the curve and molecules with greater or equal to the activation energy.
Use appropriate apparatus to record a range of measurements (to include mass, time, volume of liquids and gases, temperature)
Use water bath or electric heater or sand bath for heating
Safely and carefully handle solids and liquids, including corrosive, irritant, flammable and toxic substances
Measure rates of reaction by at least two different methods:

- an initial rate method such as a clock reaction
- a continuous monitoring method

Identify variables including those that must be controlled
Plot and interpret graphs

Some of the vocabulary that we will use includes:
Maxwell-Boltmann distribution, rate, activation energy, most probable energy, collision theory, initial rate, catalyst

You could learn more about this topic by:
[Detailed Notes - Topic 1.5. Kinetics - AQA Chemistry A-level (physicsandmathstutor.com)]

AS Chemistry – 3.1.5 Kinetics

West Kirby Grammar School

	1-5-revision-guide-reaction-kinetics-aqa.pdf (wordpress.com) AQA 1.5 Kinetics REVISION - 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, CPACs in required practical 3.	

AS Chemistry – 3.1.6 Chemical equilibria, Le Chatelier's principle and K_c

West Kirby Grammar School

Learning about this topic is important because:

In contrast with kinetics, which is a study of how quickly reactions occur, a study of equilibria indicates how far reactions will go. Le Chatelier's principle can be used to predict the effects of changes in temperature, pressure and concentration on the yield of a reversible reaction. This has important consequences for many industrial processes. The further study of the equilibrium constant, K_c, considers how the mathematical expression for the equilibrium constant enables us to calculate how an equilibrium yield will be influenced by the concentration of reactants and products.

This builds on:
Le Chatelier's principle in GCSE 4.10 Using resources
The Haber process in GCSE 4.10 Using resources

This leads to:
3.1.10 Equilibrium constant K_p for homogeneous systems

We will learn:

Many chemical reactions are reversible

Forward and reverse reactions proceed at equal rates

The concentrations of reactants and products remain constant

Le Chatelier's principle can be used to predict the effects of changes in temperature, pressure and concentration on the position of equilibrium in homogeneous reactions.

A catalyst does not affect the position of equilibrium.

The equilibrium constant K_c is deduced from the equation for a reversible reaction.

The concentration, in mol dm^{-3}, of a species X involved in the expression for K_c is represented by [X]

The value of the equilibrium constant is not affected either by changes in concentration or addition of a catalyst

develop/practise skills including:

Use Le Chatelier's principle to predict qualitatively the effect of changes in temperature, pressure and concentration on the position of equilibrium

Explain why, for a reversible reaction used in an industrial process, a compromise temperature and pressure may be used.

Construct an expression for K_c for a homogeneous system in equilibrium

Calculate a value for K_c from the equilibrium concentrations for a homogeneous system at constant temperature.

Predict the qualitative effects of changes of temperature on the value of K_c

Some of the vocabulary that we will use includes:

You could learn more about this topic by:
Chemrevise [chemrevise | Resources for A-level and GCSE Chemistry]

AS Chemistry – 3.1.6 Chemical equilibria, Le Chatelier's principle and K_c

Reversible reaction, Haber process, Dynamic equilibrium, Homogenous reactions	Allery tutors: Kc and the equilibrium expression - Bing video
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 test and assessed homework End of topic test & Assessed homework	

GCE Chemistry – 3.1.7 oxidation, reduction and redox equations

West Kirby Grammar School

Learning about this topic is important because:
Redox reactions involve a transfer of electrons from the reducing agent to the oxidising agent. The change in the oxidation state of an element in a compound or ion is used to identify the element that has been oxidised or reduced in a given reaction. Separate half-equations are written for the oxidation or reduction processes. These half-equations can then be combined to give an overall equation for any redox reaction.

This builds on:
4.4 chemical changes, 4.5 energy changes

This leads to:
3.2.3 group 7 the halogens, 3.1.11 electrode potentials and electrochemical cells

We will learn:

Oxidation is the process of electron loss and oxidising agents are electron acceptors. Reduction is the process of electron gain and reducing agents are electron donors. The rules for assigning oxidation states.

We will develop/practise skills including:

Working out the oxidation state of an element in a compound or ion from the formula.

Writing half-equations identifying the oxidation and reduction processes in redox reactions.

Combining half-equations to give an overall redox equation.

Some of the vocabulary that we will use includes:
Oxidation
Reduction
Disproportionation
Oxidising agent
Reducing agent

You could learn more about this topic:

1-7-revision-guide-redox-aqa.pdf (wordpress.com)
AQA 1.7 Oxidation, reduction and redox reactions REVISION - 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 test
Assessed homework

GCE Chemistry – 3.2.1Periodicity

West Kirby Grammar School

Learning about this topic is important because: The Periodic Table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the Periodic Table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time.	
This builds on: 3.1.1 atomic structure, 3.1.3 Bonding,	
This leads to: 3.2.4 Properties of period 3 elements and their oxides	
We will learn: An element is classified as s, p, d or f block according to its position in the Periodic Table, which is determined by its proton number. The trends in atomic radius, first ionisation energy and melting point of the elements Na–Ar The reasons for these trends in terms of the structure of and bonding in the elements.	We will develop/practise skills including: • Making the link between the trends in atomic radius and first ionisation energy • Making the link between the melting point of the elements in terms of their structure and bonding.
Some of the vocabulary that we will use includes: Ionisation energies Atomic radius Covalent Ionic Monoatomic diatomic	You could learn more about this topic by: https://chemrevise.files.wordpress.com/2019/12/2.1-revision-guide-periodicity-aqa.pdf Periodicity - trends - YouTube

GCE Chemistry – 3.2.1Periodicity

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 test
Self Assessed homework

AS Level Chemistry – Group VII

West Kirby Grammar School

Learning about this topic is important because:
The halogens in Group 7 are very reactive non-metals. Trends in their physical properties are examined and explained. Fluorine is too dangerous to be used in a school laboratory but the reactions of chlorine are studied. Challenges in studying the properties of elements in this group include explaining the trends in ability of the halogens to behave as oxidising agents and the halide ions to behave as reducing agents

This builds on:
3.1.7 Oxidation, Reduction and Redox Equations, 3.2.1 Periodicity, 3.1.2 Amount of Substance, 3.2.2 Group II

This leads to:
3.2.4 Properties of Period 3 Elements and their Oxides

We will learn:

What is the trend in electronegativity
What is the trend in the boiling point of the elements in terms of their structure and bonding.
What is the trend in oxidising ability of the halogens down the group, including displacement reactions of halide ions in aqueous solution.
What is the trend in reducing ability of the halide ions, including the reactions of solid sodium halides with concentrated sulfuric acid.
How to acidified silver nitrate solution can be used to identify and distinguish between halide ions.
What is the trend in solubility of the silver halides in ammonia.

The reaction of chlorine with water to form chloride ions and chlorate(I) ions.

The reaction of chlorine with water to form chloride ions and oxygen.
Appreciate that society assesses the advantages and disadvantages when deciding if chemicals should be added to water supplies.

The use of chlorine in water treatment. Appreciate that the benefits to health of water treatment by chlorine outweigh its toxic effects.

The reaction of chlorine with cold, dilute, aqueous NaOH and uses of the solution formed

We will develop/practise skills including:

Use laboratory apparatus for a variety of experimental techniques including:
• titration, using burette and pipette
• distillation and heating under reflux, including setting up glassware using retort stand and clamps
• qualitative tests for ions and organic functional groups

Safely and carefully handle solids and liquids, including corrosive, irritant, flammable and toxic substances

Writing and combining half-equations
Identifying oxidation states

Some of the vocabulary that we will use includes:

You could learn more about this topic by:

AS Level Chemistry – Group VII

West Kirby Grammar School

Oxidation Reduction Chlorate	Periodic Table Group 7 menu (chemguide.co.uk) RP 04 - Identification of cations and anions.pdf (physicsandmathstutor.com) AQA Chemistry A-level Inorganic I 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 test homework Required Practical 4	

GCE Chemistry – 3.2.4 Properties of Period 3 Elements and their Oxides

Learning about this topic is important because:
The Periodic Table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the Periodic Table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time.

This builds on:
3.1.1 atomic structure, 3.1.3 Bonding, 3.2.3 Periodicty

This leads to:
3.2.5 Transition Metals

We will learn:

What are the reactions of Na and Mg with water?

What are the trends in the reactions of the elements Na, Mg, Al, Si, P and S with oxygen, limited to the formation of Na_2O, MgO, Al_2O_3, SiO_2, P_4O_{10}, SO_2 and SO_3?

What are the trend in the melting point of the highest oxides of the elements Na–S?

What are the reactions of the oxides of the elements Na–S with water, limited to Na_2O, MgO, Al_2O_3, SiO_2, P_4O_{10}, SO_2 and SO_3, and the pH of the solutions formed?

What are the structures of the acids and the anions formed when P_4O_{10}, SO_2 and SO_3 react with water?

We will develop/practise skills including:

Explain the trend in the melting point of the oxides of the elements Na–S in terms of their structure and bonding

Explain the trends in the reactions of the oxides with water in terms of the type of bonding present in each oxide

Write equations for the reactions that occur between the oxides of the elements Na–S and given acids and bases

GCE Chemistry – 3.2.4 Properties of Period 3 Elements and their Oxides

Some of the vocabulary that we will use includes: Amphoteric Reduction Oxidation pH Anions	You could learn more about this topic by: Questions by Topic - 2.4 Properties of Period 3 Elements and their Oxides - AQA Chemistry A-level - 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 test Whiteboard quizzes Assessed homework	

A level Chemistry – 3.1.10 Equilibrium constant K_p for homogeneous systems

Learning about this topic is important because:

The further study of equilibria considers how the mathematical expression for the equilibrium constant K_p enables us to calculate how an equilibrium yield will be influenced by the partial pressures of reactants and products. This has important consequences for many industrial processes

This builds on:
Le Chatelier's principle and Haber process in GCSE 4.10 Using resources
3.1.3 Chemical equilibria, Le Chatelier's principle and Kc

This leads to: 3.1.12 Acids and Bases

We will learn:

The equilibrium constant K_p is deduced from the equation for a reversible reaction occurring in the gas phase.

K_p is the equilibrium constant calculated from partial pressures for a system at constant temperature.

A catalyst can affect the rate of attainment of an equilibrium, however it does not affect the value of the equilibrium constant.

develop/practise skills including:

-Calculating partial pressure from mole fraction and total pressure

-Construct an expression for K_p for a homogeneous system in equilibrium

-Perform calculations involving K_p

-How to predict the qualitative effects of changes in temperature and pressure on the position of equilibrium

-How to predict the qualitative effects of changes in temperature on the value of K_p

Some of the vocabulary that we will use includes:
Partial pressure, Mole Fraction, Equilibrium, Homogenous phase, Reversible reaction

You could learn more about this topic by:
Chemrevise Maths and Physics tutor
Allerytutors:

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 test and assessed homework
End of topic test, Self assessed homework