Calday Grange Grammar School

Year 7 - Chemistry- Topic Introduction

Understanding this is important because: Health and safety lessons as they are new to a laboratory environment and need guidance on how to behave safely. We then move on to chemical reactions as the rearrangement of atoms, and representing chemical reactions using equations as these lay key foundation principles to understanding chemistry going forward through the year.

Key Skills:

During the topic, students carry out a practical to investigate which is the hottest flame on the methane burner. They construct their first hypothesis and seek evidence to prove their hypothesis correct, carefully analysing theirs and other's results. HPL - Analysing

Assessment:

Summative:

- Homework set on Educake, termly CCT and end of year exam

Formative:

ongoing feedback, verbal assessment, self assessment students assess in purple pen. Mini-whiteboards are used to gain whole class feedback especially drawing equipment

Curriculum Enhancement:

- https://education.nationalgeographic.org/resource/changes-matter-physical-vs-chemical-changes/

'The Big Picture':

Understanding that not all changes in the world are chemical changes—some are physical. Understanding chemical safety symbols to be able to identify hazards on everyday items e.g. bleach at home.

Planning experiments—being able to identify variables (independent, dependent and controls), coming up with a hypothesis, using results to either support or refute the hypothesis and writing a basic conclusion from the evidence.

Key Vocabulary / Terms:

Hazard, corrosive, irritant, toxic, methane burner, beaker, conical flask, funnel, filter paper, evaporating basin, safety mat, goggles, chemical change, physical change, independent variable, dependent, control, hypothesis

Prior Learning

- KS2 Yr5 explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda
- **Next Learning**
- Laboratory Safety
- Carrying out an investigation

Cross Curricular Links:

- Biology, Physics

Finding Connections With:

- DT safety

'Curriculum is content structured as narrative over time' (Councell,C)

- Academically challenging
- Ambitious and stimulating
- Vertically integrated
- Breadth and depth
- Rigorous and coherent

DEVELOPING TOMORROW'S LEADERS

Calday Grange Grammar School

Year 8 - Chemistry - Matter and the periodic table

Understanding this is important because:: Chemists have always looked for ways of arranging the elements to reflect the similarities between their properties. The modern periodic table lists the elements in order of increasing atomic number (the number of protons in the nucleus of an atom). Historically, however, relative atomic masses were used by scientists trying to organise the elements. This was mainly because the idea of atoms being made up of smaller sub-atomic particles (protons, neutrons and electrons) had not been developed.

Key Skills:

- **Processsing data,**
- **HPL** Big Picture thinking, critical and logical thinking, meta-cognition, generalisation, precision, speed and accuracy.

'The Big Picture':

- From mobile phones to the clothes we wear, everything consists of one or more of the 118 known chemical elements. So how do scientists know where to start when they are developing new or existing materials?
- Chemists will often begin by making observations, then looking for patterns. They will use the periodic table to help as it is central to our understanding and classification of the world around us. It orders and classifies all the elements according to their physical and chemical properties.

Prior Learning

- **: KS 2 explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda**
- **Year 7 chemical reactions and elements compounds and mixtures**
- **Next Learning**
- **3.5.3 Periodic table Sort elements using chemical data and relate this to their position in the periodic table**

Assessment:

Summative:

- Standardised on Educake homework, termly test

Formative:

- ongoing feedback, verbal assessment, self assessment etc

Cross Curricular Links:

- Physics

Finding Connections With:

- DT and materials

Curriculum Enhancement:

- **https://www.rsc.org/periodic-table/history/about**
- **https://www.rsc.org/periodic-table/podcast**
- **https://www.rsc.org/periodic-table/video**

Key Vocabulary / Terms:

Periodic table, groups, periods, transition metals, alkali metals, halogens, noble gases

'Curriculum is content structured as narrative over time' (Councell,C)

- Academically challenging
- Ambitious and stimulating

DEVELOPING TOMORROW'S LEADERS

Calday Grange Grammar School

Year 9 - Chemistry - Atomic Structure and the periodic table

Understanding this 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 as new evidence emerges. The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.

Key Skills:

- ACPs: Big picture thinking, precision, generalisation, connection finding, speed and accuracy, critical and logical thinking, self-regulation
- VAAs: Practice

Assessment:

Summative:

- Homework completed on Educake. CCT done during October which covers half of topic. CCT at end of topic which covers all content.

Formative:

- Through class activities which students mark in purple.

Curriculum Enhancement:

- https://www.rsc.org/periodic-table/about

'The Big Picture':

- Understanding how the periodic table is used and how it is arranged. Understanding the history of the periodic table and how our understanding of technology has improved that.
- Understanding the basic structure of an atom along with its subatomic particles, protons, neutrons and electrons. Knowing that the proton number determines the element, the electron number is the same as the protons in an atom and the neutron number is different between isotopes.
- Understanding relative atomic mass and how to calculate it from data.
- Understanding how the electrons are arranged in the shells of the atom and understanding how atoms will gain or lose electrons to gain full outer shells.
- Understanding how outer electrons determine an elements properties.
-

Key Vocabulary / Terms:

Electrostatic forces, sub-atomic particles, proton, electron, neutron, atom, element, ion, periodic table, group, period, Mendeleev, Newlands, atomic model, chemical formulae, balancing equations, distillation, filtration, chromatography, atomic number, relative atomic mass, isotope, standard form, electron shells, alkali metal, halogen, noble gas, reactivity.

Prior Learning

- Year 7 and 8 topics; Periodic table, separating mixtures, acids and alkalis.

Next Learning

Developing understanding of atomic models and atoms to lead to understanding structure and bonding

Cross Curricular Links:

- Physics

Finding Connections With:

- Mathematics

'Curriculum is content structured as narrative over time' (Councell,C)

- Academically challenging
- Ambitious and stimulating

DEVELOPING TOMORROW'S LEADERS

Calday Grange Grammar School

Year 10 - Chemistry - Chemical change

Understanding this is important because:

Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically.

Key Skills:

- Mixing of reagents to explore chemical changes and/or products—preparing a pure, dry sample of a insoluble salt
- Investigate pH changes when a strong acid neutralises a strong alkali
- HPL: Realising Automaticity. Speed and accuracy. Hard working—practice

Assessment:

Summative:

Standardised homework, CCT

Formative:

ongoing feedback, verbal assessment, self assessment etc: through the booklet student self assess in purple pen. Mini-whiteboards are used to gain whole class feedback especially drawing equipment.

Curriculum Enhancement:

- **https://edu.rsc.org/science-research/surprise-origin-for-benin-bronzes/4017488.article**
- **https://edu.rsc.org/science-research/new-insight-into-ancient-chinese-bronze-making-recipes/4016303.article**
- **https://www.bbc.co.uk/bitesize/topics/zcdj97h**

'The Big Picture':

- Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically.
- Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes.
- It also helped biochemists to understand the complex reactions that take place in living organisms.

- The extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'

Key Vocabulary / Terms:

Reactivity, oxidation, reduction, reactivity series, displacement, dilute, acid, extraction, half equation, electrons, ore, soluble, insoluble, sulfate, carbonate, oxide, base, alkali, neutralisation, filtration, saturated, crystallisation, pH, universal indicator, aqueous

Prior Learning

- **result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda**
- **KS3 Separating mixtures, Chemical and Physical reactions, Acids and Alkalis**

Next Learning

Key stage 4 4.4 Chemical Changes 4.4.1 Reactivity of metals 4.4.2 Reactions of acids

Cross Curricular Links:

- History—industrial revolution

Finding Connections With:

- technology improvements for metal extraction

'Curriculum is content structured as narrative over time' (Councell,C)

- Academically challenging
- Ambitious and stimulating
- Vertically integrated
- Breadth and depth
- Rigorous and coherent

DEVELOPING TOMORROW'S LEADERS

Calday Grange Grammar School

Year 10 - Trilogy Chemistry - Chemical change

Understanding this is important because:

Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically.

Key Skills:

- Mixing of reagents to explore chemical changes and/or products—preparing a pure, dry sample of a insoluble salt
- Investigate pH changes when a strong acid neutralises a strong alkali
- HPL: Realising Automaticity. Speed and accuracy. Hard working—practice

Assessment:

Summative:

- Standardised homework, CCT

Formative:

ongoing feedback, verbal assessment, self assessment etc: through the booklet student self assess in purple pen. Mini-whiteboards are used to gain whole class feedback especially drawing equipment.

Curriculum Enhancement:

- https://edu.rsc.org/science-research/surprise-origin-for-benin-bronzes/4017488.article
- https://edu.rsc.org/science-research/new-insight-into-ancient-chinese-bronze-making-recipes/4016303.article
- https://www.bbc.co.uk/bitesize/topics/zcdj97h

'The Big Picture':

- Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically.
- Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes.
- It also helped biochemists to understand the complex reactions that take place in living organisms.

- The extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'

Key Vocabulary / Terms:

Reactivity, oxidation, reduction, reactivity series, displacement, dilute, acid, extraction, half equation, electrons, ore, soluble, insoluble, sulfate, carbonate, oxide, base, alkali, neutralisation, filtration, saturated, crystallisation, pH, universal indicator, aqueous

Prior Learning

- result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda
- KS3Separating mixtures, Chemical and Physical reactions, Acids and Alkalis

Next Learning

Key stage 4 4.4 Chemical Changes 4.4.1 Reactivity of metals 4.4.2 Reactions of acids

Cross Curricular Links:

- History—industrial revolution

Finding Connections With:

- technology improvements for metal extraction

'Curriculum is content structured as narrative over time' (Councell,C)

- Academically challenging
- Ambitious and stimulating
- Vertically integrated
- Breadth and depth
- Rigorous and coherent

DEVELOPING TOMORROW'S LEADERS

Calday Grange Grammar School

Year 11 - Chemistry - Electrolysis

Understanding this is important because:

Studying electrolysis, and what we use electrolysis for and what happens during the process.

Key Skills:

- Use scientific theories and explanations to develop hypotheses
- HPL: Linking—big picture thinking
- Meta thinking—strategy planning - the ability to approach new learning experiences by actively attempting to connect it to existing knowledge or concepts and hence determine an appropriate way to think about the work

Assessment:

Summative:

- Standardised homework, end of topic test
- **Formative:**
- ongoing feedback, verbal assessment, self assessment

Curriculum Enhancement:

- **https://www.bbc.co.uk/bitesize/guides/zcsyw6f/revision/1**
- **https://www.youtube.com/watch?v=7uIIq_Ofzgw**
- **https://www.youtube.com/watch?v=87K8QsMl8nc**
- **https://www.chemguide.co.uk/inorganic/extraction/aluminium.html**

'The Big Picture':

- When an ionic compound is melted or dissolved in water, the ions are free to move about within the liquid or solution. These liquids and solutions are able to conduct electricity and are called electrolytes.
- Passing an electric current through electrolytes causes the ions to move to the electrodes. Positively charged ions move to the negative electrode (the cathode), and negatively charged ions move to the positive electrode (the anode). Ions are discharged at the electrodes producing elements. This process is called electrolysis.
- (HT only) Throughout Section 4.4.3 Higher Tier students should be able to write half equations for the reactions occurring at the electrodes during electrolysis, and may be required to complete and balance supplied half equations

Key Vocabulary / Terms:

Oxidation, reduction, cathode, anode, half equations, redox, cation, anion, electrolysis, electrolyte, reactivity, ionic compounds, positive, negative

Prior Learning

- **Linking to: KS2 explain that some changes result in the formation of new materials, and that this kind of change is not reversible**
- **KS3Metals and non-metals - oxidation and reduction**
- **KS4 4.2.1.3 Ionic compounds**
- **4.4.1 Reactivity of metals**

Next Learning

- **4.4.3 Electrolysis**

Cross Curricular Links:

- **Physics - electricity**

Finding Connections With:

- Technology and electricity

'Curriculum is content structured as narrative over time' (Councell,C)

- Ambitious and stimulating
- Vertically integrated
- Breadth and depth
- Rigorous and coherent

DEVELOPING TOMORROW'S LEADERS

Calday Grange Grammar School

Year 12 - Chemistry - Atomic Structure

Understanding this is important because:

Atoms are the ultimate building blocks of all matter. The modern atomic theory establishes the concepts of atoms and how they compose matter.

Key Skills:

- Use an appropriate number of significant figures
- Find arithmetic means
- Students interpret and analyse spectra.
- HPL: linking –big picture thinking

Assessment:

Summative:

- Standardised homework, half term test

Formative:

- ongoing feedback, verbal assessment, self assessment

Curriculum Enhancement:

- https://pmt.physicsandmathstutor.com/download/Chemistry/A-level/Notes/AQA/Physical-I/Detailed/1.1.%20Atomic%20Structure.pdf
- https://www.chemguide.co.uk/atoms/properties/gcse.html

'The Big Picture':

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.

Key Vocabulary / Terms:

protons, neutrons, electrons, isotopes, mass spectrometer, periodic table, orbitals, nuclear charge, shielding, ionisation, electronic configuration

Prior Learning

- Links to ks4 Atomic Structure
- Next Learning
- 3.1.1 Atomic structure

Cross Curricular Links:

- Enter text here

Finding Connections With:

- Enter text here

'Curriculum is content structured as narrative over time' (Councell,C)

- Academically challenging
- Ambitious and stimulating
- Vertically integrated
- Breadth and depth
- Rigorous and coherent

DEVELOPING TOMORROW'S LEADERS

Calday Grange Grammar School

Year 13 - Chemistry - Acid base equilibria

Understanding this is important because: : Acids and bases are important in domestic, environmental and industrial contexts.

Key Skills:

- Carry out pH calculations.
- Given concentration values and asked to calculate pH or vice versa
- Use an appropriate number of decimal places in pH calculations. Students understand standard form when applied to areas such as (but not limited to) Kw
- Plot pH curves to show how pH changes during reactions.
- HPL Analysing— Complex and multistep problem solving

Assessment:

Summative:

- Standardised homework, half term test
- Required practical 9 Investigate how pH changes when a weak acid reacts with a strong base and when a strong acid reacts with a weak base.

Formative:

- ongoing feedback, verbal assessment, self assessment

Curriculum Enhancement:

- https://www.chemguide.co.uk/physical/acidbaseeqia/buffers.html
- https://edu.rsc.org/infographics/brilliant-buffers/4014620.article

'The Big Picture':

Acidity in aqueous solutions is caused by hydrogen ions and a logarithmic scale, pH, has been devised to measure acidity. Buffer solutions, which can be made from partially neutralised weak acids, resist changes in pH and find many important industrial and biological applications.

Key Vocabulary / Terms:

Hydrogen ion, pH, Buffer, Neutralise, Ka, Conjugate acid, Conjugate base

Prior Learning

- **Linking to:** Links to KS4 titration topics
- **Next Learning**
- 3.1.12.1 Brønsted–Lowry acid–base equilibria in aqueous solution (A-level only)
- 3.1.12.2 Definition and determination of pH (A-level only)
- 3.1.12.3 The ionic product of water, Kw (A-level only)
- 3.1.12.4 Weak acids and bases Ka for weak acids (A-level only)
- 3.1.12.5 pH curves, titrations and indicators (A-level only)
- 3.1.12.6 Buffer action (A-level only)

Cross Curricular Links:

- Biology - use of buffers

Finding Connections With:

- Mathematics

'Curriculum is content structured as narrative over time' (Councell,C)

- Academically challenging
- Ambitious and stimulating
- Vertically integrated
- Breadth and depth
- Rigorous and coherent

DEVELOPING TOMORROW'S LEADERS