KESTEVEN AND SLEAFORD HIGH SCHOOL

Chemistry Scheme of Learning

Year 1 – Term 2 – C1: The Periodic Table

Intent – Rationale

Students continue to build foundational chemistry knowledge by examining the history of the Periodic table, the organisation of the modern Periodic Table, and the significance of group and period numbers. Groups 1 and 7 are examined in more detail, to show how trends in properties such as colour, melting and boiling point, and reactivity change within groups and why this occurs with respect to electrons. Demonstrations of the reactions of some Group 1 and Group 7 elements are shown to identify trends. The transition metals are introduced briefly, to link in with later topics e.g. catalysis, and the differences and similarities between transition metals and other metals are highlighted.

After the summative test on the Periodic Table, ions are revisited to help understanding before covering common reactions and properties of metals – including the reactivity series of metals, and redox reactions of metals.

Sequencing – what prior learning does this topic build upon?	**Sequencing – what subsequent learning does this topic feed into?**
• Year 7 Topic 1 Particles • Year 7 Topic 2 Atoms and Elements. • Year 7 Topic 5 Simple chemical reactions • Year 7 Topic 6 Compounds • Year 8 Topic 8 Periodic Table • First half of Topic 1 (Term 1) Atoms and Elements	• Topic 2 Structure and bonding • Topic 4 Chemical changes • Topic 4 Electrolysis • Topic 7 Crude oil • Topic 8 Chemical analysis • Topic 10 Using Resources
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
• Georgraphy – resource extraction (impact on the environment?)	• SMSC – So – Different scientistis' contributions towards the construction of the Periodic Table, the collaborative nature of science as a discipline • GB4a • GB4d • GB4e • GB4g
What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?	**What are the opportunities for developing mathematical skills?**
FROM THE LIBRARY *The Elements*; Dan green-546 *Periodic Table*; Brian Knapp-546 *Chemistry in a Social and Historical context*; D. Warren-540 *Elephants on Acid and Other Bizarre Experiments*; Alex Boese-500 *Chemicals in Action-Acids and Bases*; Chris Oxlade-546 *Chemicals in Action-ATOMS*; Chris Oxlade-541.24 *Chemicals in Action-Materials Changes and Reactions*- 541.39	• Balancing chemical equations • Calculating charges on ions.

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Chemistry Scheme of Learning

Year 9 – Term 2

Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?

Know

- Describe the steps in the development of the Periodic Table.
- Recall the properties of the Group 1 metals.
- Explain how properties of the elements in Group 7 depend on the outer shell of electrons of the atoms.
- Explain how the position of an element in the Periodic Table is related to the arrangement of electrons in its atoms and hence its atomic number.
- Explain the differences between metals and non-metals on the basis of their characteristic physical and chemical properties.
- Use state symbols in chemical equations.
- Deduce that a compound is ionic from a diagram of its structure (in one of several specified forms).
- Describe oxidation reactions of metals.
- Understand that metals can be put in order of their reactivity from their reactions with water and dilute acids.
- Recall and describe the reactions of metals with dilute acid and water.
- Know that unreactive metals such as gold are found in the Earth as the metal itself.
- Know that metals less reactive than carbon can be extracted from their oxides by reduction with carbon.
- Know hat a more reactive metal can displace a less reactive metal from a compound.

Apply

- Explain how properties of the elements in group 1 depend on the outer shell electrons of the atoms.
- Explain how properties of elements in the same group depend on the outer shell of electrons of the atoms.
- Compare the transition metals to Group 1 metals.
- Draw dot-and-cross diagrams for ionic compounds formed by metals in Group 1 and 2 with non-metals in Groups 6 and 7.
- Describe the limitations of using dot-and-cross, ball-and-stick, two- and three-dimensional diagrams to represent giant ionic structures.
- Explain reduction and oxidation in terms of oxygen.
- Understand that when metals react with other substances the metal atoms form positive ions.
- Deduce an order of reactivity based on experimental results.
- Identify the substances which are oxidised or reduces in terms of gain or loss of oxygen.
- Identify which species are oxidised and which are reduced in a given chemical equation.

Extend

- Describe and explain how testing a prediction can support or refute a new scientific idea.
- Predict properties from a given trends down a group.
- Carry out displacement reactions to demonstrate the trends in reactivity.
- Predict possible reactions and probably reactivity of elements from their positions in the Periodic Table.
- Explain how the atomic structure of metals and non-metals related to their position in the Periodic Table.
- Calculate the charge on the ions of metals and non-metals from the group number of the element, for elements in Groups 1, 2, 6, and 7.

- Deduce the empirical formula of an ionic compound from a given model of diagram that shows the ions in the structure.
- Understand that the reactivity of a metal is related to its tendency to form positive ions.
- Explain how the reactivity of metals with water or dilute acids is related to the tendency of metals to form their positive ions.
- Understand that oxidation is the loss of electrons and reduction is the gain of electrons.
- Write ionic equations for displacement reactions.

What subject specific language will be used and developed in this topic?

Word	**Definition**
Atom	The smallest particle that takes part in a chemical reaction
Element	Only contain 1 type of atom
Compound	2 or more elements chemically bonded together
Mixture	To or more different substances not chemically bonded together
Reactants	Elements or compounds that react together
Products	What is made during a chemical reaction
Chemical reaction	What happens when reactants make products
Distillation	Separating a liquid from a mixture using evaporation and condensation
Fractional distillation	Separating mixtures using their different boiling points
Condenser	Apparatus that cools down a vapour to a liquid
Filtration	Separating a solid from a liquid
Filtrate	The solution that passes through the filter paper

What opportunities are available for assessing the progress of students?

- Long answer question – Periodic Table Group 1
- Summative test

Crystallisation	Forming crystals from a solution
Chromatography	Separating pigments from a mixture
Solubility	How easily a substance dissolves
Electron	The particle that orbits the nucleus in an atom
Proton	Positive particles found in the nucleus of an atom
Neutron	Neutral particles found in the nucleus of an atom
Nucleus	The centre of an atom containing the protons and neutrons
Isotope	Atoms of the same element with a different number of neutrons
Ion	A charged atom (formed by losing or gaining electrons)
Plum-pudding model	Model of an atom that is made of positive material and negative electrons like the currents in a pudding
Nuclear model	The model of an atom with most of the mass in the centre.
Mass number	The number of particles in the nucleus
Atomic number	The number of protons in the nucleus
Periodic table	All the known elements arranged in proton number
Period	The row of elements in the periodic table
Group	A column of elements in the Periodic Table
Electronic structure	Arrangement of elements in an atom

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Density	Mass per unit volume
Alkali metals	Group 1 elements
Displacement	When a more reactive element pushes out a less reactive element
Halogen	Group 7 elements
Halide	Group 7 ions (that are found in compounds with group 7 elements)
Transition metal	Found in the centre of the periodic table
Catalyst	Speeds up a chemical reaction.
Oxidation	Loss of electrons/ gain of oxygen
Reduction	Gain of electrons/ loss of oxygen
Reactivity series	List of elements in order of their reactivity
Ion	An atom that has gained or lost an electron to form a charged particle
Cation	A positively charged ion
Anion	A negatively charged ion
Half equation	An equation that describes oxidation or reduction by showing the movement of electrons.
Salt	A compound formed when the hydrogen in an acid is replaced by a metal
Neutralisation	The chemical reaction of an acid with a base in which salt and water are formed. If the base is a carbonate CO_2 is also produced
Soluble	Can dissolve
Filtration	A method of separating mixtures which separates solids from liquids/solutions
Filtrate	The liquid/solution collected after removing the solid
Crystallisation	Forming solid crystals from a salt solution.
Acids	When dissolved in water the solution has a pH below 7. They are H^+ donors

Alkalis	A solution that has a pH above 7
Ph	A number that tells you how acidic or alkaline a solution is. It tells you the concentration of H^+ in a solution
Titration	A method for measuring the volumes of two solutions reacting together
Ionised	When an ionic compound separates into separate ions in solution
Strong Acid	An acid which fully ionises in a solution, producing many H^+
Weak Acid	An acid which partially ionises in a solution, not producing many H^+
Concentration	The amount of particles in a solution compared to the volume of water

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Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Topic 1 Lesson 8 – History of the development of the Periodic Table	Can I describe the steps in the development of the Periodic Table?	Can I describe and explain how testing a prediction can support or refute a new scientific idea?	
Topic 1 Lesson 9 – Group 1	Can I recall the properties of the Group 1 metals? Can I explain how properties of the elements in Group 1 depend on the outer shell electrons of the atoms?	Can I predict properties from given trends down a group?	
Topic 1 Lesson 10 – Group 7	Can I explain how properties of the elements in Group 7 depend on the outer shell of electrons of the atoms?	Can I predict properties from given trends down a group? Can I carry out displacement reactions to demonstrate the trends in reactivity?	
Topic 1 Lesson 11 – Explaining trends	Can I explain how the position of an element in the Periodic Table is related to the arrangement of electrons in its atoms and hence its atomic number? Can I explain how properties of elements in the same group depend on the outer shell of electrons of the atoms?	Can I predict properties from given trends down groups? Can I predict possible reaction and probable reactivity of elements from their positions in the Periodic Table?	
Topic 1 Lesson 12 – Transition metals	Can I explain the differences between metals and non-metals on the basis of their characteristic physical and chemical properties? Can I compare the transition metals to Group 1 metals?	Can I explain how the atomic structure of metals and non-metals related to their position in the Periodic Table?	
Summative test			
C2			
Topic 2 – Lesson 1 The formation of ions	Can I use state symbols in chemical equations? Can I draw dot-and-cross diagrams for ionic compounds formed by metals in Groups 1 and 2 with non-metals in Groups 6 and 7?	Can I work out the charge on the ions of metals and non-metals from the group number of the element, for elements in Groups 1, 2, 6 and 7?	
Topic 2 – Lesson 2 Ionic bonding	Can I deduce that a compound is ionic from a diagram of its structure (in one of the specifies forms)?	Can I work out the empirical formula of an ionic compound from a given model of diagram that shows the ions in the structure?	

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	Can I describe the limitations of using dot-and-cross, ball-and-stick, two- and three-dimensional diagrams to represent a giant ionic structure?		
Topic 4 – Lesson 1 Reactions of metals with oxygen	Can I describe oxidation reactions of metals? Can I explain reduction and oxidation in terms of oxygen?	Can I understand that when metals react with other substances the metal atoms form positive ions? Can I understand that the reactivity of a metal is related to its tendency to form positive ions?	
Topic 4 – Lesson 2 The reactivity series	Can I understand that metals can be put in order of their reactivity from their reactions with water and dilute acids? Can I recall and describe the reactions of metals with acid and water?	Can I deduce an order of reactivity based on experimental results? Can I explain how the reactivity of metals with water or dilute acids is related to the tendency of metals to form its positive ion?	
Topic 4 – Lesson 3 Reduction of oxides with carbon	Can I understand that unreactive metals such as gold are found in the Earth as the metal itself? Can I understand that metals less reactive than carbon can be extracted from their oxides by reduction with carbon?	Can I identify the substances which are oxidised or reduced in terms of gain or loss of oxygen? Can I understand that oxidation is the loss of electrons and reduction is the gain of electrons?	
Topic 4 – Lesson 4 OIL RIG	Can I understand that a more reactive metal can displace a less reactive metal from a compound?	Can I identify which species are oxidised and which are reduced in given chemical equations? Can I write ionic equations for displacement reactions?	