KESTEVEN AND SLEAFORD HIGH SCHOOL

Chemistry Scheme of Learning

Year 9 – Term 5, Topic 2

Intent – Rationale

The pupils start Topic 2 'Bonding'. They briefly touched on this when they studied atomic structure in Term 1, but they are now going to learn about all of the different types of chemical bonds, as well as how this affects the properties of the substance. This is a concept that underpins many other topics in chemistry, and it is one that is revisited frequently throughout. They will learn how to draw diagrams to represent different chemical bonds and carry out practical investigations to understand how the type of bonding affects the chemical properties.

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 6 – Chemical Compounds • Year 8 Topic 7 The Periodic Table • Year 9 GCSE Topic 1 – Atomic Structure	• Year 10 GCSE Topic 4 – Chemical Reactions (electrolysis) • Year 10 GCSE Topic 5 – Energy Changes (making and breaking bonds) • Year 11 GCSE Topic 7 – Organic Chemistry (organic molecules) • Year 11 GCSE Topic 8 – Chemical Analysis (Ion tests) • Year 11 GCSE Topic 9 – Chemistry of the Atmosphere (small molecules) • Year 11 GCSE Topic 10 – Using Resources (all!) • Year 12 AS Topic 1 – Atomic Structure and the Periodic Table • Year 12 AS Topic 3 – Bonding • Year 12 AS Topic 4 - Energetics • Year 12 AS Topic 6 – Redox • Year 12 AS Topic 7-9 Organic Chemistry • Year 13 A2 All Organic Topics
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
• Base the content here on what you already know but there will be time in future to liaise further as part of our collaborative work	• Uses of compounds in every day life e.g. metal alloys used in car parts • Understanding differences in materials due to the chemical bonding in a substance and understand how the type of bonding influences the properties and therefore the uses
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	• Working out empirical formulae from ball and stick models (ratios) • Graph plotting – cooling curves and comparing relative formulae mass to boiling point of small molecules

Chemicals in action-ATOMS; Chris Oxlade-541.24 *Chemicals in Action-Materials Changes and Reactions*- 541.39	

Chemistry Scheme of Learning

Year 9 – Term 5

Intent – Concepts

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

Know

- Can I explain how a covalent bond forms in terms of electronic structure? Can I describe metallic bonding? Can I identify the type of bonding in a substance from the formulae?
- Can I use data to determine the state of a substance at a given temperature
- Can I explain why ionic compounds have a high melting point? Can I explain how the size of molecules affects melting and boiling points?
- Can I explain what an alloy is?

Apply

- Can I draw dot and cross diagrams or ball and stick models to represent small molecules? Can I explain how metal atoms form giant structures?
- Can I use the particle model to describe how the energy, movement and attraction between particles change as a substance is heated or cooled? Can I explain in terms of particles, energy or temperature when a substance is at melting or boiling point?
- Can I explain why ionic compounds conduct electricity when molten or in solution, but not when solid? Can I justify in terms of properties that a compound has ionic bonding? Can I explain why small molecules an polymers don't conduct electricity?
- Can I justify why alloys are used more often than pure metals?

Extend

- Can I suggest how double and triple covalent bonds form? Can I suggest how the properties of a double bond are different to the properties of a single bond? Can I evaluate different models of metallic bonding? Can I compare the different types of chemical bonds?
- Can I suggest why substances have different melting and boiling points? Can I describe the factors that affect the rate of evaporation?
- Can I explain the movement of ions in solution or when molten? Can I apply the ionic model to make predictions about the physical properties of ionic compounds? Can I identify substances that would have weak intermolecular forces?
- Can I explain in detail using labelled diagrams, how alloying affects the structure and bonding in metals and its effects on properties

What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?

Word	Definition
Anion	A negative non-metal ion
Cation	A positive metal ion
Covalent bond	When two atoms share a pair of electrons. This is a result of electrostatic attraction between the nuclei of the atoms and the shared electrons
Delocalised Electron	A bonding electron which is no longer associated with any particular atom. It is free to move through the structure
Ductile	The ability to draw a metal into wires
Electrostatic Force	The attraction between opposite charges
Intermolecular force	The attraction between individual molecules in a covalently bonded substance
Ion	A charged particle produced by the loss or gain of electrons
Ionic Bond	The electrostatic force between oppositely charged ions
Lattice	A huge 3D network of atoms or ions
Malleable	The ability to hammer a material into shape
Metallic bond	The electrostatic attraction between the positive metal ions in the lattice and the delocalised electrons
Molecule	Two or more atoms covalently bonded together. Molecules can be elements or compounds

- 6 mark question on metallic bonding
- 6 mark question comparing ionic and covalent bonding
- Past paper questions

Molecular Formula	The chemical formula that shows the actual number of atoms in a particular molecule	
Polymer	A substance made from very large molecules that form from many repeating units called monomers	

Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Topic 2 Lesson 3 Covalent Bonding	Can I explain how a covalent bond forms in terms of electronic structure? Can I draw dot and cross diagrams or ball and stick models to represent small molecules?	Can I suggest how double and triple covalent bonds form? Can I suggest how the properties of a double bond are different to the properties of a single bond?	
Topic 2 Lesson 4 Metallic	Can I describe metallic bonding? Can I explain how metal atoms	Can I evaluate different models of metallic bonding?	

Bonding	form giant structures?		
Summary and Review	Can I identify the type of bonding in a substance from the formula e?	Can I compare the different types of chemical bonds?	
Topic 2 Lesson 5 States of Matter	Can I use data to determine the state of a substance at a given temperature? Can I use the particle model to describe how the energy, movement and attraction between particles change as a substance is heated	Can I suggest why substances have different melting and boiling points? Can I describe the factors that affect the rate of evaporation?	

	or cooled? Can I explain in terms of particles, energy or temperature when a substance is at melting or boiling point?		
Topic 2 Lesson 6 Properties of Ionic Compounds	Can I explain why ionic compounds have a high melting point? Can I explain why ionic compounds conduct electricity when molten or in solution, but not when solid? Can I justify in terms of properti	Can I explain the movement of ions in solution or when molten? Can I apply the ionic model to make predictions about the physical properties of ionic compounds?	

	es that a compound has ionic bonding?		
Topic 2 Lesson 7 Properties of Small Molecules	Can I explain how the size of molecules affects melting and boiling points? Can I explain why small molecules an polymers don't conduct electricity?	Can I identify substances that would have weak intermolecular forces?	
Topic 2 Lesson 8 Properties of Metals	Can I explain what an alloy is? Can I justify why alloys are used more often than pure metals?	Can I explain in detail using labelled diagrams, how alloying affects the structure and bonding in metals and its effects on properties	