KESTEVEN AND SLEAFORD HIGH SCHOOL

Chemistry Scheme of Learning

Year 9 – Term 6 Topic 2

Intent – Rationale

The students complete Topic 2 Bonding and apply what they have learnt about chemical bonds to more specific examples of allotropes of carbon and polymers. They also learn about nanotechnology, its uses and the potential risks.

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 8 Topic 12- Innovative Materials • 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 nanotechnology, current and future. Career prospects involved in developing this new technology in engineering, medicine and other areas of industry. • Uses of allotropes of carbon in everyday life, including future potential of carbon nanotubes in innovative ways • Polymers and their uses in plastics and other materials, questioning the sustainability of these substances and considering greener alternatives
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 Continue to reference the previous term's reading lists, as well as: *Expanding Industry*; I Teichmann-620 *Farming and the Environment;* Mark lambert-363.7	• Calculating surface area to volume ratios for nanoparticles • Standard form • Conversion of units

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Chemistry Scheme of Learning

Year 9 – Term 6

Intent – Concepts

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

Know

- Can I describe what a polymer is?
- Can I recognise the structure of diamond and graphite from information provided in written or diagrammatic form?
- Can I recognise the structure of a fullerene or nanotube in diagrams and prose?
- *Can I classify a particle as coarse, fine, or nanoparticles based on their size?*
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Apply

- Can I explain why small molecules and polymers do not conduct electricity?
- Can I explain the properties of diamond and graphite in terms of its bonding?
- Can I use molecular models of graphene, nanotubes, and fullerenes to explain their properties?
- *Can I quantitatively explain the relationship between surface area to volume ratio and particle size and its effect on properties? Can I decide and justify in detail why nanotechnology research should continue?*

Extend

- Can I evaluate the advantages and disadvantages of using polymers?
- Can I justify in detail a use for graphite and diamond based on their properties?
- Can I justify in detail a use for graphite and diamond based on their properties?
- *Can I convert standard form into a variety of length units? Can I calculate surface area to volume ratio? Can I evaluate the use of nanoparticles in their applications, including sun cream?*

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

Word	Definition
Anion	A negative non-metal ion
Cation	A positive metal ion

What opportunities are available for assessing the progress of students?

- Long answer questions
- Topic 2 End of topic Test

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
Diamond	An allotrope of carbon in which each carbon atom forms four covalent bonds to other carbon atoms
Ductile	The ability to draw a metal into wires
Electrostatic Force	The attraction between opposite charges
Graphite	An allotrope of carbon in which each carbon atom forms three covalent bonds to other carbon atoms. The fourth electron is delocalised
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
Molecular Formula	The chemical formula that shows the actual number of atoms in a particular molecule
Nanoscience	The study of very tiny particles or structures between 1 and 100 nanometres in size (1 nanometre = 10^{-9} metres)
Polymer	A substance made from very large molecules that form from many repeating units called monomers

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Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Topic 2 Lesson 9 Polymers	Can I describe what a polymer is? Can I explain why small molecules and polymers do not conduct electricity?	Can I evaluate the advantages and disadvantages of using polymers?	
Topic 2 Lesson 10a Giant Covalent Structures	Can I recognise the structure of diamond and graphite from information provided in written or diagrammatic form? Can I explain the properties of diamond and graphite in terms of its bonding?	Can I justify in detail a use for graphite and diamond based on their properties?	
Topic 2 Lesson 10b Fullerenes and Graphite	Can I recognise the structure of a fullerene or nanotube in diagrams and prose? Can I use molecular models of graphene, nanotubes, and fullerenes to explain their properties?	Can I justify in detail a use for graphene, nanotubes and fullerenes based on their properties?	
Topic 2 Nanotechnology	*Can I classify a particle as coarse, fine, or nanoparticles based on their size?*	*Can I convert standard form into a variety of length units?*	

	Can I quantitatively explain the relationship between surface area to volume ratio and particle size and its effect on properties?	*Can I calculate surface area to volume ratio?*	
Topic 2 Nanotechnology	*Can I decide and justify in detail why nanotechnology research should continue?*	*Can I evaluate the use of nanoparticles in their applications, including sun cream?*	
Test and Long Answer Question	Can I recall and apply my knowledge of bonding to unfamiliar questions and examples?		