Year 9 Curriculum Overview Chemistry 2023-24

	Term 1	Term 2	Term 3
Unit Title	C1 Atomic structure and the periodic table and starting	Finish C1 Atomic structure and the periodic table. C2 Bonding, structure and states of matter.	C2 Bonding, structure and states of matter.
Approximate Number of Lessons	15 x 75 min lessons.	9 x 75 min lessons	9 x 75 min lessons
Curriculum Content	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	Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies.	Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies.

	of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.		
Links to prior learning	Students should be able to: • Name some examples of elements and recognise the periodic table. • Describe the difference between elements, compounds and mixtures. • Name techniques, such as filtration and evaporation, to separate mixtures. Some:	Students should be able to: • State that atoms can be held together by chemical bonds. • Recognise elements as metals and non-metals. • Represent the different states of matter by particle diagrams. • Recognise that there are different types of chemical bond. • Describe the formation of ions.	Students should be able to: • State that atoms can be held together by chemical bonds. • Recognise elements as metals and non-metals. • Represent the different states of matter by particle diagrams. • Recognise that there are different types of chemical bond. • Describe the formation of ions.

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	• Represent chemical reactions using word equations. • Describe the structure of the atom.		
Cultural Capital Opportunities	Encourage students to pursue a career in science. We embrace the spirit of curiosity and endeavour to help students to develop the skills to think scientifically and to investigate ideas using the scientific method. Educational visits allow pupils to experience science in action past and present: visits to British natural history museum, Science Museum.	Encourage students to pursue a career in science. Polymer work can be linked to the development of new products and materials. We embrace the spirit of curiosity and endeavour to help students to develop the skills to think scientifically and to investigate ideas using the scientific method. Educational visits allow pupils to experience science in action past and present: visits to British natural history museum, Science Museum. **Key topics that could be further discussed:** 3D polymer printing to replace body parts - https://www.bbc.co.uk/news/uk-wales-46468898 Bioinks https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5889544/ **Suggestive reading:** New Scientist, All about chemistry by Robert Winston, Bad science, Life on Earth.	Encourage students to pursue a career in science. Polymer work can be linked to the development of new products and materials. We embrace the spirit of curiosity and endeavour to help students to develop the skills to think scientifically and to investigate ideas using the scientific method. Educational visits allow pupils to experience science in action past and present: visits to British natural history museum, Science Museum. **Key topics that could be further discussed:** 3D polymer printing to replace body parts - https://www.bbc.co.uk/news/uk-wales-46468898 Bioinks https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5889544/ **Suggestive reading:** New Scientist, All about chemistry by Robert Winston, Bad science, Life on Earth.

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	Key topics to discuss: The development of the atomic model and the development of the periodic table. Students could research the scientist involved and produce a bibliography of events that lea to the changes in our scientific understanding. Can be linked to the multi diversity seen in the scientific community. **Suggestive reading:** New Scientist, All about chemistry by Robert Winston, Bad science, Life on Earth. See inside atoms and molecules. Does the atom have a designer? **Learning skills:** Allow pupils to	**Learning skills:** Allow pupils to develop skills in the following areas: information retrieval, listening and observing, scientific reading, data representation, scientific writing and knowledge presentation.	**Learning skills:** Allow pupils to develop skills in the following areas: information retrieval, listening and observing, scientific reading, data representation, scientific writing and knowledge presentation.

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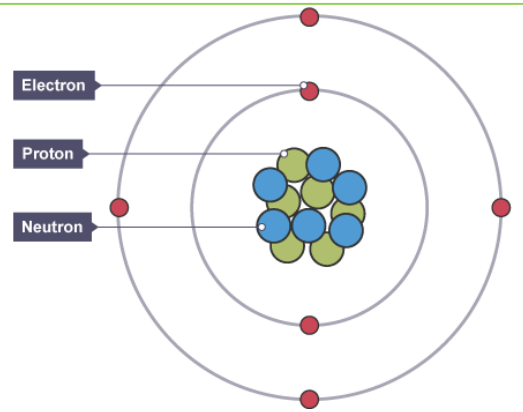
Assessment Focus	End of topic test on Atomic Structure & The Periodic Table		End of topic test on Bonding, Structure & Properties of Matter and Atomic Structure & The Periodic Table
Name of Knowledge Organiser	Atomic structure and the periodic table.		

Science Literacy recommendations:

- Pig Heart Boy – Malorie Blackman
- Flood Child – Emily Diamond
- The House of Light – Julia Green
- The Girl of Ink & Stars – Kiran Millwood
- Kensuke's Kingdom – Michael Morpurgo
- Thornhill – Pam Smy
- The Butterfly Club – Jacqueline Wilson

Atoms make up all substances. They are extremely small. Atoms contain Protons, Neutrons and Electrons. Protons and Neutrons are found in the nucleus of an atom. Electrons move around the nucleus in shells



23
Na
11

Atomic number

Mass number

In the periodic table each element has a symbol. The two numbers tell us the atomic number of the element and the mass number. The atomic number is the number of Protons. The number of electrons is the same as the atomic number. The mass number is the total number of protons + neutrons.

C1 Atomic structure and the periodic table

Ideas about the periodic table and the atom have changed over time. You need to know the details of this.

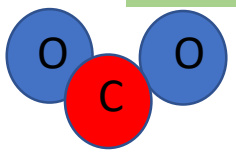
Electron shells
Electrons move in shells (energy levels).
The inner shells are always filled first.
The first shell can hold 2 electrons.
The second and third shells can hold 8 electrons. Having a full outer shell makes an atom more stable. Most atoms do not have full outer shells, so they react with other atoms.

Particle	Relative mass	Charge
Proton	1	+1
Neutron	1	0
Electron	Very small	-1

Overall, there is no charge on an atom. This is because the number of protons and electrons are the same. An ion does have a charge as it has more or less electrons, so the charges do not balance

Separating mixtures
Mixtures are made of different elements or compounds.
They can be separated using different methods
Chromatography
Filtration and crystallisation-2
Simple distillation
Fractional distillation

Isotopes are atoms with the same number of protons, but a different number of neutrons. So, they have a different mass.



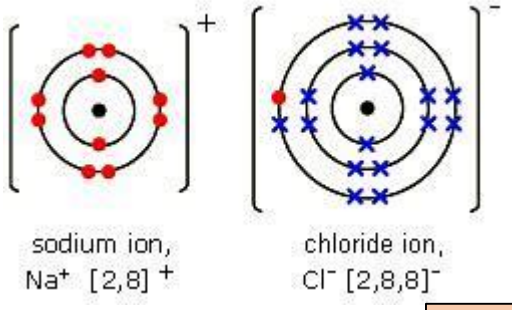
Atoms join together to make compounds. Compounds are represented by a formula. The compound to the left is carbon dioxide. It has two oxygen atoms joined to one carbon. Its formula is CO_2.

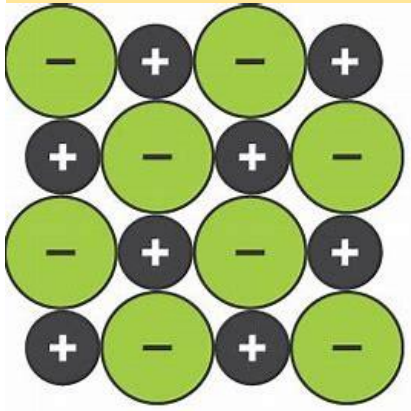
Group 1 elements – The alkali metals	Group 7 elements – The Halogens	Group 0 elements – Noble gases
As you go down the group the metals become more reactive.	As you go down the group the Halogens get less reactive.	All unreactive gases – they have full outer shells of electrons
They form ionic compounds with non-metals.	They can react with other non-metals, metals and salts.	The atoms do not form molecules easily because they unreactive
Their melting and boiling points become lower down the group.	Their boiling and melting points increase as you go down the group.	Their boiling point increases as you go down the group.

C2 Bonding

Ionic bonding

This involves the transfer of electrons between metal atoms and non-metals.
Metals lose electrons and become positively charged ions. Non-metals gain electrons and become negatively charged ions.
The opposite charges mean that the ions have a strong electrostatic attraction – an ionic bond



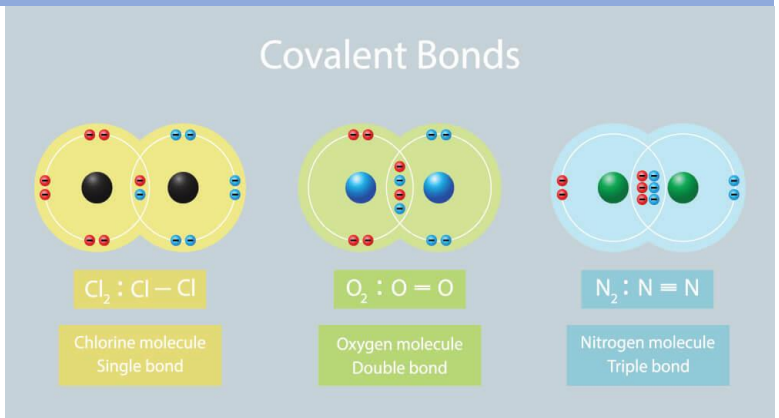


Ionic compounds form giant lattice structures.
They have high melting and boiling points. They cannot conduct electricity when solid because the ions are held in place.

Covalent bonding

This involves sharing electrons between atoms
It happens between atoms of non-metals. It only happens in their outer shells
Covalent bonds are very strong.

Giant covalent structures include diamond, graphite and silica.

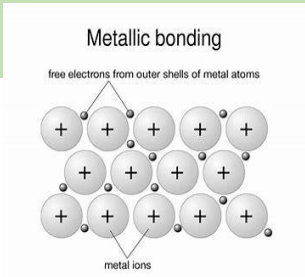


States of matter

The three states of matter are:
Solid
Liquid
Gas
The state symbols are S, L, G and Aq (aqueous)

Metallic bonding

Metals are giant structures of atoms. They contain lots of metal atoms joined together. The electrons in the outer shell are delocalised and therefore there are strong forces of attraction between positive metal ions and the negative electrons. The forces are metallic bonds.



Structures of carbon

Diamond – very hard
Graphite - has layers of carbon atoms. The layers can move over each other so Graphite is soft and slippery.
Graphene – a single layer of graphite. Can be added to other materials to make them stronger.
Fullerenes – form spheres and tubes Can be used to deliver drugs in the body or as catalysts.