Lesson/Learning Sequence	Intended Knowledge: *Students will know that…*	Prior Knowledge: *In order to know this, students need to already know that…*	Working Scientifically	Tiered Vocabulary and Reading Activity	Assessment	Support
Lesson: States and State symbols	• *Students will know that intermolecular forces are forces that act between molecules* • *Students will know that the changes of states are known as:* *1) Melting (solid to liquid)* *2) Boiling (liquid to gas)* *3) Condensing (gas to liquid)* *4) Freezing (liquid to solid)* *5) subliming (solid to gas)* *6) Deposition (gas to solid)* • *Students will know that for changes of state to take place energy is needed to overcome intermolecular forces between the particles* • *Students will know that the stronger the intermolecular forces, the more difficult it is to overcome them* • *Students will know limitations of the particle model include that there are no forces represented, that all particles are represented with spheres and that the spheres are solid.* • *Students will know that state symbols can be used to represent the states of different substances in a symbol equation* • *Students will know that the state symbols are:* *(s) - solid* *(l) - liquid* *(g) - gas* *(aq) - aqueous (dissolved in water)* • *Students will know how to use data to identify the state of substances in certain conditions* 1. *Students will know how to explain the limitations of the particle model*	• *Students need to already know that the three states of matter are solids, liquids and gases* • *Students need to already know how to draw particle models of solids, liquids and gases*	*Working Scientifically Link: Vocabulary, Units, Symbols and Nomenclature. Extended response questions.*	*Aqueous- An aqueous solution is a solution in which the solvent is water.* *Subliming- solid to gas* *Deposition- gas to solid*	*State the key word that describes the change of state from a solid to a liquid.* *Melting* *What word is used to describe water into water vapour.* *Evaporation* *What might be the limitations of using the particle model to show changes of state?* *What might cause a substance to have a high melting point?*	Tassomai Kay science videos BBC bitesize Knowledge organiser
Lesson: Electronic configuration and Forming Ions	• *Students will know that atoms are more stable if they have a full outer shell of electrons* • *Students will know that atoms can either gain or lose electrons to gain a full outer shell* • *Students will know that metals lose their outer electrons to get a full outer shell* • *Students will know that metals form positive ions* • *Students will know that non-metals gain electrons to get a full outer shell*	*Students need to already know that ions are charged atoms*	*Development of scientific thinking- understanding the formation of ions* *Analysis and evaluation – interpreting how the groups link to the type of ions formed.*	*Ion: A charged atom, formed by losing or gaining electrons*	*What ions are formed when metals lose electrons* *Why might metals lose electrons rather than gain electrons* *Why might non-metals gain electrons*	Tassomai Kay science videos BBC bitesize Knowledge organiser

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	• *Students will know that non-metals form negative ions*				*rather than gain electrons.*	
Lesson: Metallic Bonding	• *Students will know that metals consist of giant structures of atoms arranged in a regular pattern* • *Students will know that the outer shell electrons in a metal are delocalised, and are free to move around the structure* • *Students will know that metallic bonds are strong electrostatic forces of attraction between metal ions and delocalised electrons* • *Students will know the difference between pure metals and an alloy to be a mixture of one metal with a small amount of another element (metal or non-metal)*	*Students need to already know that metal ions are positively charged.*	*Working Scientifically Link: Vocabulary, Units, Symbols and Nomenclature. Extended response questions.*	*Tier 3* *Lattice: A series of particles arranged in a distinct pattern.* *Delocalised: free moving* *Malleable: able to bend into different shapes*	*Lesson: Metallic Bonding*	Tassomai Kay science videos BBC bitesize Knowledge organiser
TRIPLE: Use of alloys	• *Students will know that the difference between a pure metal (one type of metal) and an alloy (another additional element).* • *Students will know that the elements in steel to be; iron (99%) and carbon (1%). Bronze to be; copper (88%) and tin (12%).* • *Students will be able to list examples of alloys and their uses;* *Brass- copper and zinc – coins, musical instruments* *Bronze – copper and tin- ship propellers and bells* *Solder – tin and lead – joining copper pipe and electrical components* • *Students will know that pure metals have a regular lattice structure and when a force is applied to a metal the layers of atoms can move past each other. Adding another type of atom that is a different size distorts the layers so they cannot slide over each other so easily. This makes the alloys stronger than pure metals.* • *Students will know that iron and carbon form steel, there are three categories of steel; low carbon steel, medium carbon steel and high carbon steel. The higher the carbon content the harder the resulting material and therefore harder*	*Students will know the structure of a pure metal and the difference between a pure metal and alloy.* *Students will know the difference in strength of an alloy in comparison to a pure metal is due to the difference in size of the atoms and the distortion of the layers.*	*Development of scientific understanding- the variations of alloys* *Presentation of data – calculation of percentages of metals in alloys*	*Carat- the measure of the purity of a gold alloy* *Alloy- a mixture where at least one of the elements is a metal*		*https://www.youtube.com/watch?v=QRDctnk7sF4 – Alloys* Tassomai Kay science videos BBC bitesize Knowledge organiser

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	to work. For this reason, low steel is more commonly used. • *Define the term 'carat to be the measure of the purity of a gold alloy.* • *Students will be able to use data on properties of unfamiliar alloys to explain a suitable alloy for a given purpose.* • *Students will be able to evaluate an alloy it terms of its properties and uses*					
Lesson: Ionic Bonds	• *Students will know that ionic bonds form between metals and non-metals* • *Students will know that electrons are transferred from the outer shell of the metal atom* • *Students will know that metals lose electrons from their outer shell to form positive ions* • *Students will know that non-metal atoms gain electrons to form negative ions* • *Students will know that ions formed from group 1 elements have a +1 charge* • *Students will know that ions formed from group 2 elements have a +2 charge* • *Students will know that ions formed from group 6 elements have a -2 charge* • *Students will know that ions formed from group 7 elements have a -1 charge* • *Students will know that ions formed by group 1, group 2, group 6 and group 7 elements have the same electronic structure as noble gases* • *Students will know that an ionic bond is an electrostatic attraction between oppositely charged ions* • *Students will know how to represent ionic compounds using dot and cross diagrams* • *Students will know how to determine the charge on an ion*	• *Students need to already know that ions are charged atoms* • *Students need to already know how to draw electronic structures*	*Development of scientific understanding* *Scientific terminology – rationalising the formation of ions*	*Tier 2* *Imbalance: A lack of balance* *Tier 3* *Electrostatic attraction: attraction between charged objects* *Ionic bond: The electrostatic attraction between two oppositely charged ions*	*What atoms form ionic bonds?* *What ions do metals form?* *What metals do non-metals form?* *What ion will (name element from group2)* *Why does an element from group 6 form a -2 Ion?*	Tassomai Kay science videos BBC bitesize Knowledge organiser
Lesson: Ionic Compounds	• *Students will know that an ionic compound is a giant structure made from ions* • *Students will know that ionic compounds are held together by strong electrostatic forces of attraction between oppositely charged ions* • *Students will know that a lattice is a repeating 3D shape of ions*	*Students need to already know that ionic compounds form between metals and non-metals*	*Scientific communication – describing the properties of ionic compounds*	*Tier 3* *Lattice: a regular repeated three-dimensional arrangement of atoms, ions, or molecules in a metal*	*Explain why ionic compounds have high melting points* *Why might using dot and cross diagrams not be accurate in*	Ionic jigsaw in Prep room 1 Tassomai Kay science videos BBC bitesize

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	• *Students will know that the electrostatic attractions in an ionic compound are felt in all directions* • *Students will know that a limitation of dot and cross diagrams is that it shows electrons as being different in different atoms, whereas electrons are the same* • *Students will know that ionic compounds have high melting and boiling points as the strong electrostatic forces of attraction require a lot of energy to overcome* • *Students will know that solid ionic compounds are electrical insulators as there are no charged particles that are free to move* • *Students will know that melted or dissolved ionic compounds are able to conduct electricity as the ions are free to move and carry a charge* • *Students will know how to deduce the formula of an ionic compound based on the charges of the ions* *Students will know how to deduce the formula of an ionic compound based on a diagram of the lattice*			*or other crystalline solid.* *Aqueous: Dissolved in water*	*showing ionic bonding.* *Why do ionic compounds need to be molten or dissolved to conduct electricity*	Knowledge organiser
Lesson: Simple Covalent Molecules	• *Students will know that a covalent bond is between two non-metal atoms* • *Students will know that a covalent bond occurs when a pair of electrons is shared between two atoms* • *Students will know how to represent the covalent bonds in water, hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, ammonia and methane using dot and cross diagrams*	*Students need to already know how to draw electronic configurations*	*Development of scientific terminology*	*Tier 2* *Limitation: Weakness* *Tier 3* *Covalent: chemical bond formed by the sharing of a pair of electrons between atoms*	*What do covalent bonds occur between?* *What is the structure of a water molecule. Describe how we might represent the bonds.*	Molymod 2D molymod Both in prep room 1 Tassomai Kay science videos BBC bitesize Knowledge organiser
Lesson: Properties of Simple Covalent Molecules & Polymers	• *Students will know that most substances that contain covalent bonds are simple covalent molecules* • *Students will know that to melt or boil a simple covalent molecule enough energy is needed to overcome weak intermolecular forces* • *Students will know that simple covalent molecules have low melting and boiling*	*Students need to already know that intermolecular forces are forces that occur between molecules*	*Scientific communication – describing the properties of simple covalent compounds*	*Tier 2* *Tier 3* *Intermolecular forces: forces acting in between molecules*	*Explain why simple covalent molecules have low boiling points?* *Why might simple covalent molecules be poor conductors of electricity.*	*Molymods and elastic bands – elastic band to represent intermolecular forces.* Also 2D molymod

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	points as not a lot of energy is needed to overcome the intermolecular forces • *Students will know that simple covalent molecules are poor electrical conductors as they don't have any charged particles that are free to move.* • *Students will know how to explain the properties of simple covalent substances.* • *Polymers contain covalent bonds between the polymer chain.*					Tassomai Kay science videos BBC bitesize Knowledge organiser
Lesson: Giant Covalent Structures and Polymers	• *Students will know that some substances that contain covalent bonds are very large molecules called polymers* • *Students will know that some covalently bonded substances have giant structures, such as silicon dioxide, diamond and graphite* • *Students will know that since polymers are large molecules, the intermolecular forces between them are relatively large* • *Students will know that polymers tend to be solids at room temperature* • *Students will know that giant covalent structures have very high melting and boiling points* • *Students will know that to melt a giant covalent structure a lot of energy is required to break strong covalent bonds* *Students will know how to represent polymers*	*Students need to already know that the melting point is the temperature needed to reach to melt a substance*	*Scientific communication – describing the properties of giant covalent compounds*	*Tier 2* *Compare: estimate, measure, or note the similarity or dissimilarity between* *Tier 3* *Polymer: A long chain of repeating units* *Polymerisation: is a process of reacting monomer molecules together in a chemical reaction to form polymer chains* *Macromolecule: is defined as a molecule with a very large number of atoms* *Allotropes: each of two or more different physical forms in which an element can exist*	*Explain why most polymers are solid at room temperature?* *Why do giant covalent structures have high melting and boiling points?* *How do we represent polymers.*	Polymer beads in prep room 1 Tassomai Kay science videos BBC bitesize Knowledge organiser
Lesson: Diamond and Graphite	• *Students will know that diamond and graphite are both forms of carbon* • *Students will know that in diamond each carbon atom is covalently bonded to 4 other carbon atoms* • *Students will know that diamond is very hard due to its repeating structure of each carbon*	*Students need to already know that delocalised electrons are electrons that are free to move*	*Scientific communication – answering exam questions using various command words and formulating written responses.* *Use a variety of models such as representational, spatial, descriptive, computational and*		*Describe the difference in structure between diamond and graphite?* *Why can graphite conduct electricity?*	Giant ionic lattice of diamond and carbon in AG16 Tassomai Kay science videos

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	atom being covalently bonded to 4 other carbon atoms • *Students will know that diamond has a very high melting point as a lot of energy is required to overcome the strong covalent bonds between the carbon atoms* • *Students will know that in graphite each carbon atom is covalently bonded to 3 other carbon atoms, leaving one electron per carbon atom delocalised* • *Students will know that the structure of graphite consists of layers of repeating hexagonal rings of carbon atoms* *Students will know that graphite is able to conduct electricity as the delocalised electrons are free to move and carry charge*		*mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.*			BBC bitesize Knowledge organiser
Lesson: Graphene and Fullerenes	• *Students will know that graphene is a single layer of graphite* • *Students will know that graphene consists of a single layer of carbon atoms, each covalently bonded to 3 other carbon atoms* • *Students will know that graphene can conduct electricity due to having delocalised electrons* • *Students will know that graphene is useful in electronics and composites* • *Students will know that a composite is a material that is made up of at least 2 different parts* • *Students will know that fullerenes are molecules of carbon atoms that have a hollow shape* • *Students will know that the structure of fullerenes is based on rings of carbon atoms, where the rings can consist of either 5 or 7 carbon atoms* • *Students will know that the first fullerene to be discovered was buckminsterfullerene, which consisted of 60 carbon atoms in a spherical shape* • *Students will know that nanotubes are cylindrical fullerenes.* *Students will know how to recognise graphene and fullerenes*	*Students need to already know that delocalised electrons are electrons that are free to move*	*Scientific communication – answering exam questions using various command words and formulating written responses.* *Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.*	*Tier 3* *Composite: A material that is made up of at least two different parts*	*Why can graphene conduct electricity* *What is a composite* *What are the benefits of using a composite* *Describe the shape of Buckminster fullerenes.*	Tassomai Kay science videos BBC bitesize Knowledge organiser

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Lesson: Nanotechnology (Triple only)	• *Students will know that 1 nm is 1 x 10^-9 m* • *Students will know that nanoscience refers to structures that are 1 - 100 nm in size* • *Students will know that fine particles have diameters in the range of 100 - 250 nm* • *Students will know that coarse particles have diameters between 1 x 10^-5 and 2.5 x 10^-6 m* • *Students will know that coarse particles are often referred to as dust* • *Students will know that as the side of a cube decreases by a factor of 10, the surface area : volume ratio increases by a factor of 10* • *Students will know that nanoparticles have different properties to the same material in bulk due to their high surface area : volume ratio* • *Students will know that only small amounts of nanoparticles are needed to be as effective as the same material in bulk* • *Students will know that nanoparticles are used in medicine, electronics, cosmetics, deodorants, sun cream and as catalysts* *Students will know how to evaluate the use of nanoparticles for a specific purpose*	*Students will already know the allotropes of carbon to be graphite and diamond. Students will know that graphene is one single layer of graphite.*	*Scientific communication – answering exam questions using various command words and formulating written responses.*	*Tier 2* *Bulk: in large quantities* *Tier 3* *Nanoscience: the study of structures that are in the range of 1-100 nm* *Fine particles: Particles with a diameter in the range of 100 – 250 nm* *Coarse particles (also known as dust): Particles with a diameter in the range of 1 x 10^{-5} m to 2.5 x 10^{-6} m*	*What might be the application of nanotechnology.* *What are the advantages and disadvantages of nanotechnology*	Tassomai Kay science videos BBC bitesize Knowledge organiser