Science – Year 7

	Year 7 – Cycle A	Year 7 – Cycle B	Year 7 – Cycle C	Year 7 – Cycle D
What do we teach?	**Hazards, Introduction to the Scientific Method Mixtures and Separation Techniques Living Things - Cells, Tissues and Organs.**	**Energy The Particle Model**	**Introduction to Static Electricity and Magnetism. Human Reproduction.**	**Electricity (Collaboration with Evidence in Action research project). Atoms, Elements and Compounds**
How does this meet the national curriculum?	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 2 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3 & 6 Measurement – point 1 & 3. Students generate risk assessments, plan and complete scientific enquiries using appropriate techniques and begin to look at the core ways in which experimental data is recorded and analysed through bar charts, tables and basic statistics. In terms of content Cycle A covers the following parts of the KS3 Science NC: Biology: Structural and function of living organisms – (i) Cells and Organisation, Homework activities link to ii) The skeletal and muscular system. Point 3 of Chemistry –(iii) Pure and Impure substances.	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 1 & 3. Experimental skills and Investigations – point 1, 3, 4 & 5 Analysis and evaluation – point 1, 2, 4, 5. Measurement – point 1 & 3. Students generate risk assessments and evaluate the experiment involving energy release in different foods. Students model the behaviour of particles and build theories based on observations of how particles behave. Students also look at how the scientific method was used in the development of Brownian motion. In terms of content cycle B covers the following parts of the KS3 Science NC: Chemistry – (i) The particulate nature of matter Physics (i) – Energy (ii) Energy changes and transfers, and Matter (i) Physical changes and (ii) particle model	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 1,2 & 3. Experimental skills and Investigations – point 1, 3, 4 & 5 Analysis and evaluation – point 1, 2, 4, 5 & 6. Measurement – point 1, 2 & 3. Students will be introduced to the electrical equipment and how to manage this safely. They will use mathematical equations to calculate the voltage, current and resistance. Students will use models to understand how electricity flows around a circuit. In terms of content cycle C covers the following parts of the KS3 Science NC: Physics: Static Electricity and Magnetism Biology: Structural and function of living organisms: (v) Reproduction in humans	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 1, 2 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3, 4, 5 & 6 Measurement – point 1,2 & 3. Students will In terms of content cycle D covers the following parts of the KS3 Science NC: Chemistry: ii) Atoms, elements and compounds, Electricity and Electromagnetism (ii) Static Electricity and (i) Current Electricity This topic is extended to cover the full cycle due to the collaboration with a research project and evidence in action research.
Why does this knowledge matter?	Students require a thorough grounding in the basis of the scientific method to understand how experiments are planned and carried out day to day by scientists. Students cover health and safety to ensure that they understand how the practical aspect of science can make it dangerous and that they must behave in a certain way. Students will learn the fundamentals of structures that make up living things and develop basic microscopy skills.	Students must understand the different mechanisms for generating energy and the impact that this has on the environment as this is a current topic of tension in the news. Again, these topics are core fundamentals for science learning, especially particles which combines knowledge in both chemistry and physics.	Human reproduction allows students to develop an understanding of how bodies will change as students move through puberty. This topic overlaps with some work around healthy relationships in PCHSE. Students will be introduced to the atom, static electricity and magnetism. Drawing comparisons between static electricity and magnetism as well as apply them to everyday examples.	Electricity is used daily by students and they must be aware of how to handle gadgets safely. Students must be aware of how the circuits in their houses work to supply them with electricity daily. Students will build on their knowledge of the atom in cycle C to develop a strong understanding of the atom, how atoms are rearranged to form compounds. Students should be able to compare elements and compounds and recognize the chemical formula of common compounds.
Why do we teach in this sequence?	The topics students begin with have a practical focus and allow topics covering fundamental concepts in biology and chemistry that must be understood before students move further in their learning. The practical skills of microscopy and separation techniques allow key practical skills to be registered and practiced by students early on in their scientific journey through KS3.	The particle model and energy are fundamental in the disciplines of physics and chemistry and must be understood for students to move forward with their learning. Students must have a clear understanding of how particles behave to tackle more difficult concepts in chemistry. The Royal Society of Chemistry propose that chemistry is composed of 3 core aspects: 1) Chemical Concepts 2) Chemistry of the World 3) Chemistry as a Science The topics selected for year 7 chemistry allow all 3 of these core aspects to be introduced to students through foundation content.	Based on feedback from the Institute of Physics we placed the atom and static before electricity to help students to understand static electricity and therefore the concept of current and voltage when taught in electricity. Human reproduction is taught in Cycle D as teachers have developed strong professional relationships with their classes and have a thorough understanding of any topics that could trigger a reaction in students.	An introduction to atoms, elements and compounds builds on particles to provide a sound basis of chemistry for students to build on as they move through more complex chemical reactions through KS3 and KS4. Students are taught electricity after the topic of energy in the previous cycle allowing them to make links. The sequence of learning is based heavily on research as designed by Evidence in Action resources.
What career links are made?	Microscopy and separation techniques are fundamental skills for all biology and chemistry careers. Microbiology, Cellular Biology, Medical Biology, Chemical purity, Water purification	Environmental scientist, materials scientist, nutritionist, energy scientist – particles is fundamental to all physics and chemistry careers.	Medical Careers – doctor, medical technicians, lab assistants, gynecology, physiology, sexual health. Electrical engineering, Electrician, Electrical sciences and hazards.	Electrical engineering, Electrician, Electrical sciences and hazards. The topic of atoms, elements and compounds are fundamental for all chemists.

Science – Year 8

	Year 8 – Cycle A	Year 8 – Cycle B	Year 8 – Cycle C	Year 8 – Cycle D
What do we teach?	**Nutrition and Digestion** **Acids and Alkalis** **Forces**	**Breathing and Respiration** **Combustion and Atmosphere** **Sound and Waves**	**Photosynthesis and Plant reproduction** **The Periodic Table** **Light and Waves**	**Ecosystems** **Chemical Reactions – Metals and Acids** **Earth and Space**
How does this meet the national curriculum?	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 2 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3 & 6 Measurement – point 1 & 3. Students look at graph skills in springs and extension and evaluate results as part of this. Students look at healthy eating and the role of science in the wider community. In terms of content cycle A covers the following parts of the KS3 Science NC: Biology – Structural and function of living organisms: (iii) Nutrition and Digestion. Homeworks linked to (vi) Health Chemistry – ii) Acids and Alkalis Physics: Motion and Forces (ii) Forces, (iii) Pressures in fluids, (iv) balanced forces, (v) Forces in motion	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 2 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3 & 6 Measurement – point 1 & 3. Students look at evaluations of practical models of the lungs. Students look at the problems with combustion experiments and how energy is lost to the environment unless there is a closed system. Students look at the problems that can occur in the ear linking physics to medical applications. In terms of content cycle B covers the following parts of the KS3 Science NC: Biology – Structural and function of living organisms: (iv) Gas Exchange and Materials cycles and energy (ii) Cellular Respiration Chemistry – (iv) Chemical Reactions/Atmosphere Physics – Waves: (i) observed waves (ii) Sound Waves, (iii) energy and waves.	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 2 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3 & 6 Measurement – point 1 & 3. Students look at arrangement and organization of scientific material through the periodic table and how scientists build on each others ideas over time. Students practice scientific drawings to show reflection and refraction of light. In terms of content cycle C covers the following parts of the KS3 Science NC: Biology: Structural and function of living organisms: (v) Reproduction in plants, Materials cycles and energy (i) Photosynthesis Chemistry – (v) The Periodic Table Physics – (iv) Light Waves	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 2 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3 & 6 Measurement – point 1 & 3. Students will use a range of materials to conduct reactions in the lab and make observations of different reactions. Students will be introduced to models to explain orbits and seasons and will practice fieldwork through ecology, with a focus on biodiversity. In terms of content cycle D covers the following parts of the KS3 Science NC: Biology – Interactions and Independencies (i) - Relationships in an Ecosystem Chemistry – (iv) Chemical Reactions – metals and acids Physics – Space Physics. This is a topic that is only taught in triple science at KS4, so it is important that all students are given the opportunity to learn this.
Why does this knowledge matter?	Students should understand that forces are responsible for movement and interaction across different systems. This provides the foundation for physics sequences in subsequent cycles. Students should understand how the pH scale can be used to assess substances and how this links to neutralization reactions in real life, e.g. antiacid tablets. Students should understand how nutrients are absorbed and processed by the body to carry out life processes.	Students must have a thorough grounding of the breathing system to understand the mechanics of their own body and how it is affected by exercise. Students should be able to understand how they hear sounds and how sound travels from the area that it was created to your ear and how this message is turned into a message that you interpret. This links back to work that they started in year 7 and in Cycle A of year 8. Students should understand how energy is release from a variety of different sources through complete and incomplete combustion.	Students should be able to recall certain metals that objects are made of and they should be able to explain how these are extracted from the ground for use. Students should be able to understand how plants utilize the sun's energy to produce food and store this to be passed along the food chain. Students should also understand the importance of plant reproduction for food production. Students should understand how light travels and interacts with different objects and surfaces to enable us to see.	Students should have an understanding of what lies beyond the planet Earth and how interactions with the sun and moon cause changes in our environment. Students should be aware of how the ecosystem that they live in is changing and how actions that they take, such as recycling, can have an impact on this. Students should be aware of biodiversity and its impact on ecosystem stability. Students should be able to recognize and describe different ways that substances react with each other and predict the products of certain reactions using the appropriate word equations and formulae.
Why do we teach in this sequence?	Nutrition is taught before respiration so that students understand where glucose has originated from and can link this to it being the major reactant in respiration. Forces is introduced at the beginning of year 8 as a good understanding of forces and energy is needed to approach waves and to understand ideas around orbits which occur in Earth and Space. Acids and alkalis are taught at this point because it builds upon Y7 chemistry and introduces students to more complex equations.	Combustion is within the same cycle as respiration due to the similarity of the reactions and cross over between the topics. The topic of waves has been extended to run over 2 cycles of learning so that students can fully understand the difference between longitudinal and transverse waves and firmly embed these concepts within the concepts of sound and light.	Photosynthesis is taught after respiration so that students are aware of the products and reactants used in bioenergetics reactions within living organisms. Plant reproduction is taught after human reproduction so that students have already been introduced to the process of sexual reproduction. Light is taught after sound due to the concept being more challenging and involving scientific diagrams which are more challenging than in sound.	Within year 8, topics have been selected to allow students to practice work around different chemical reactions. All topics allow students to practice word and symbol equations in increasing difficulty to prepare for more complex chemistry in year 9. Earth and space is taught after waves to enable students to understand the concepts of seasonality and day length more easily.
What career links are made?	Links to careers in CGI and game design are made in forces. Nutritional sciences and nutritionists are discussed as well as other medical career pathways.	Energy science – entropy and enthalpy studies, respiratory science, electrical engineering.	Environmental science, recycling, extraction, geology, biophysics, sensory ecology, plant science, botany,	Earth sciences, Microbiology and biochemistry. Parasitology. Fluid dynamics, energy system studies, ecology, Astronomy, Space science, Telecommunication.

Science – Year 9

	Year 9 – Cycle A	Year 9 – Cycle B	Year 9 – Cycle C	Year 9 – Cycle D
What do we teach?	**Atomic Structure** **Genetics** **Particle Model and Density**	**The Periodic Table** **Cell Structure** **Energy Stores**	**Ionic Bonding** **Cell Transport** **Energy Transfers / Pathways**	**Covalent Bonding** **Digestion** **Particle Model Continued**
How does this meet the national curriculum?	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 1, 2 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3, 4, 5 & 6 Measurement – point 1,2 & 3. In terms of content cycle A covers the following parts of the KS3 Science NC: Biology – Genetics and Evolution – Inheritance, chromosomes, DNA and genes; Chemistry – Atoms, Elements and Compounds Physics – Particle Model and physical changes.	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 1 & 3. Experimental skills and Investigations – point 1, 2, 3, 4 & 5 Analysis and evaluation - point 1, 2, 3, 4, 5 & 6 Measurement – point 1, 2 & 3. In terms of content cycle B covers the following parts of the KS3 Science NC: Biology – Cells and Organization Chemistry – The periodic table (vi) Physics – Energy (i) Energy changes and transfers (ii) changes in systems (iii)	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 2. Experimental skills and Investigations – point 1, 3, 4 & 5 Analysis and evaluation - point 1, 3 & 6 Measurement – point 1 & 3. In terms of content cycle C covers the following parts of the KS3 Science NC: Biology – Gas exchange systems. Cell transport Chemistry – (iv) Chemical reactions and (vi) the Periodic Table Physics – Energy (i) Energy changes and transfers (ii) changes in systems (iii)	Within the working scientifically part of the Science KS3 NC the following points are addressed: Scientific attitudes – point 2 & 3. Experimental skills and Investigations – point 1, 3, 4 & 5 Analysis and evaluation - point 1, 3 & 6 Measurement – point 1 & 3. In terms of content cycle D covers the following parts of the KS3 Science NC: Biology – Structural and function of living organisms: (iii) Nutrition and Digestion. Homeworks linked to (vi) Health Chemistry – (iv) Chemical reactions and (vi) the Periodic Table Particle Model and physical changes, pressure
Why does this knowledge matter?	Students must have a clear understanding of atomic structure to understand how to deduce valency and chemical compounds in ionic bonding. Students must understand how atoms rearrange in chemical reactions to continue to learn about more difficult concepts within chemistry. Genetics study allows students to understand the structure of DNA and how every human has a unique code which determines their characteristics. Students can related this to the concept of evolution to understand how all organisms are related. Density builds on the knowledge of Year 7 particles to link to the theme of density. Students will also be exposed to further experimental skills.	Cells are the building blocks for life and are an important foundation for students. Students must understand the different types of cells and be introduce to microscopy as a way of understanding cells. Students must have a clear understanding of the variety of elements within the periodic table and how the structure of their atoms will determine how they react with other substances to create new substances with different properties. Through energy transfers students will understand how everyday appliances use energy and how this energy is transferred from one store to others and how overall, energy is conserved.	Cells and transport within and between cells is an important foundation for students to understand how nutrients are cycled round their bodies and transferred between different areas. Ionic bonding introduces students to valency and give a greater depth to understanding of chemical formulae. Students will cover to concept of efficiency and how this should be considered when purchasing items such as light bulbs, insulating homes. Concept of specific heat capacity will enable pupils to how different materials can absorb different amounts of energy and this will then be linked to the particle behavior in the next cycle.	Digestion allows students to cover the pathway food takes through the body and what occurs at each location. Students are also introduced to enzymatic reactions in the digestive process. Covalent bonding builds on the fundamentals covered in ionic bonding to give students a greater understanding of how atoms bond. Pupils will link their prior learning of Yr 7 states of matter and gain deeper understanding of link of change of states to the energy transfers taking place
Why do we teach in this sequence?	Atomic structure is taught at the beginning of Year 9 to provide a basis of the atom for students to build on as they move through bonding and the periodic table. Genetics is taught at the beginning of year 9 as it is one of the more difficult aspects in the KS3 curriculum. Is provides a basis for cells to be discussed in more detail, particularly the nucleus and its importance. Particles and Density is are key topics and introduces students to simple equations. Students must be confident with the limitations of particle theory before they start learning about energy transfers.	Cells are the foundation of tissues and organs and an understanding is therefore needed to ensure that students can apply this to other concepts in biology. The periodic table is tackled again at the end of year 9 to build on the knowledge that students have covered around electron configuration and bonding in year 9 and use this to explain properties. This will form the launching pad for various other topics in Yr 9. Students need to appreciate significance of energy stores and transfers to apply synoptic links at various points during this academic year.	Cell transport is taught after cell structure as students need to have an understanding of the organelles. Students must also understand the content of the cytoplasm to link the cell to osmosis and diffusion. Physical and chemical trends is taught after atomic structure as students must understand the concept on the nucleus and electrons before they discuss valency and electron positions. Once confident with the energy stores and transfers, pupils would be equipped with knowledge to apply their prior learning into appreciating the global energy challenges.	Covalent bonding builds on ionic bonding and student must have a solid understanding of electronic structure and how electrons behave before covering this topic. Digestion is taught after cell transport as a knowledge of active transport is needed to understand how nutrients are absorbed into the blood at the small intestine. Building on Cycle A and C, the students will develop the link between thermal, potential and kinetic energy stores in confidently explaining changes in the states of matter and pressure.
Careers	Atomic structure and states of matter are fundamental for all careers in chemistry and physics. Genetics – geneticist, oncology, medical careers, genetic counsellor.	Cell structure and Energy are fundamental for all biology and physics careers. Periodic table – materials and trend in chemistry. Energy- Most of Physics we see in our everyday life is about energy transfers!	Ionic bonding – Fundamental for all chemistry careers Energy resources is a key topic for ensuring understanding of energy challenges we face in the 21st century	Digestion – Nutrition and sports science. Medical careers. Covalent bonding and cell transport are fundamental for all careers in biology and chemistry. Particle model- engineers use these principles when designing vessels to withstand high pressures.