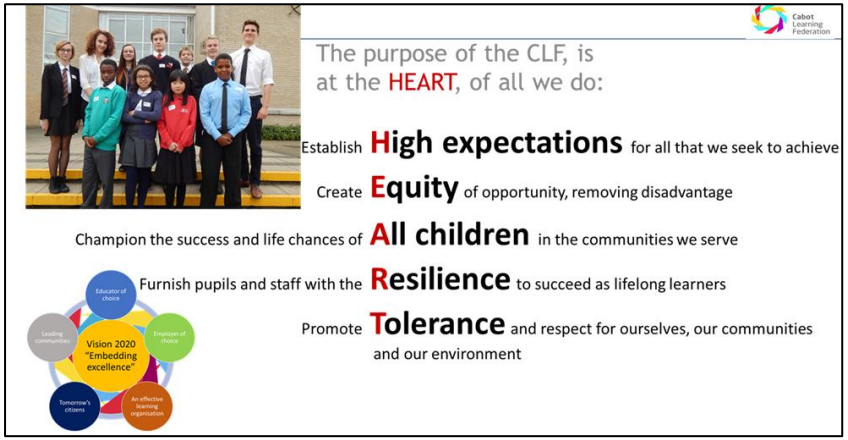
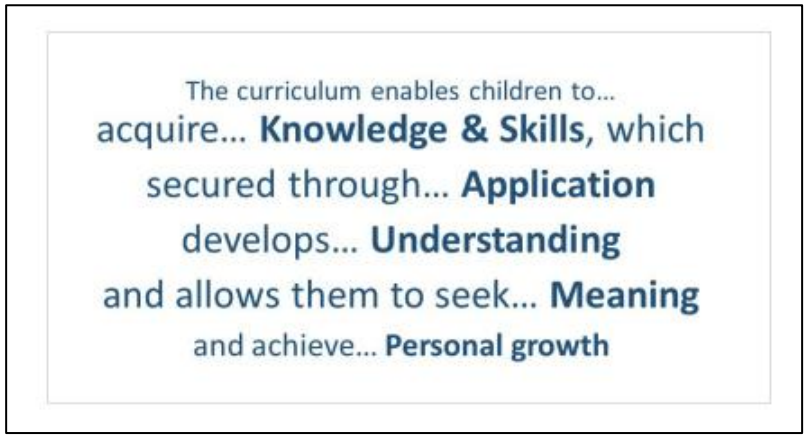
Key Stage 3

Curriculum Excellence

Science





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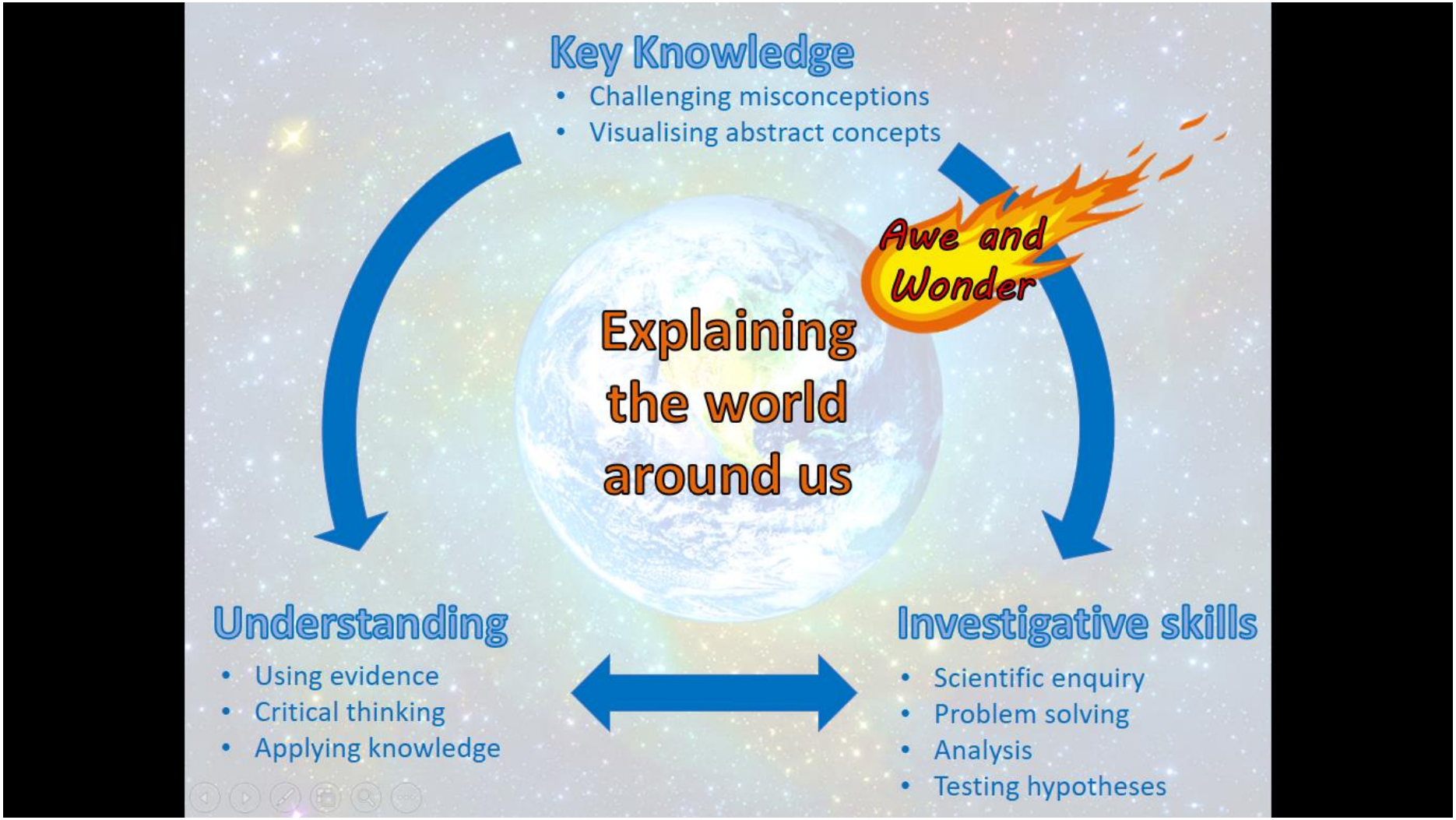
CLF KS3 Curriculum Principles

- The curriculum enables children to acquire **knowledge and skills**, which are secured through **application** (over time and in different contexts) to develop **understanding** (change in long term memory) and allows children to seek **meaning** and achieve **personal growth**.
- Built-up from KS2 to secure a foundation for young people for life (… and KS4). **Based on Age Related Expectations and using DOYA.** (Not built down from KS4).
- Focused on the **progression of content and concepts** through the KS3 curriculum that accelerates progress within a **progressive and purposeful 3-19 CLF Curriculum.**
- The curriculum is our opportunity to inspire children to be **successful individuals, historians, mathematicians, geographers, musicians, authors, artist, sportspeople, scientists, writers, innovators, dreamers, magicians, mothers, fathers, positive citizens.**
- On a platform of standardisation the curriculum releases teachers to drive up learning and progress. **Standardised Age Related Expectations, curriculum and assessment** frees and empowers experts to collaborate, follow the learning and teach.
- The curriculum will be **curated by subject experts and teams from across the Trust** who are empowered to evolve the curriculum that will allow all children to thrive.
- The content of the curriculum is progressive and is based on **consolidating and revisiting** content over time to secure progress over time.
- The curriculum seeks **depth of study rather than breadth** to build understanding and to seek meaning; stretching and challenging children to think.
- The Age Related Expectations and exemplars are **widely published** to support child, parent, teacher, leader and other staff understanding of the expected standards and the content of the curriculum, **enabling wider ownership of the curriculum**
- **Two key areas of assessment:**
    - **Shared on-line MCQ assessments four times a year** to assess knowledge/skills acquisition and elements of application and understanding. Immediate feedback from on-line supports understanding of gaps and re-teaching.
    - **Teacher assessment of learning that uses standardised exemplar material** to assess agreed subject written responses/assessments, supporting teachers to make a broad assessment of children's attainment against DOYA.
- Given the shared AREs and assessment cycle teachers are freed to **plan to meet need** and support all children to feel and be successful. Approaches to **pedagogy are based on cognitive science**:
    - Supporting children to experience **desirable difficulty** and grapple with learning in their proximal zone.
    - Explicitly secure **knowledge and skills** through **application** to build **understanding and seek meaning**
    - **Specificity of feedback** for impact and the **developed and precise use of modelling, explanations and questioning** to secure progress.
    - Emphasis on the development of **reading (widely and often), oracy and quality of writing**.


Key Knowledge
• Challenging misconceptions
• Visualising abstract concepts
Awe and Wonder
Explaining the world around us
Understanding
• Using evidence
• Critical thinking
• Applying knowledge
Investigative skills
• Scientific enquiry
• Problem solving
• Analysis
• Testing hypotheses

Statement of Intent Example

This is the core content for the KS3 curriculum for year 7 and 8. This is the minimum content that should be taught to all KS3 science students. This is designed to be a slim curriculum with time to reteach and possibly time to teach additional content to engage and inspire students. There may be time to include additional knowledge and understanding or enrichment opportunities. Knowledge, skills, understanding and meaning are split into 4 units for each year. The units are unequal sizes, with unit 1 in each year being 5/6 teaching weeks and units 2 and 3, 8 weeks and unit 4, 8 weeks, this is reflected in the amount of content in each unit. There is time in unit 3 for a period of reteach to ensure that students have a sound understanding of content in units 1 and 2 before continuing.

There will be a **multiple choice test** at the end of each unit and a **longer assessment** after units 2 and 4 in each year, which will take the form of a long answer paper. Each assessment will be synoptic, and include questions on content taught from previous blocks within the year. Within each unit academies can teach this content in which ever order suits their students. The **baseline test** will be completed in the first month of year 7 and the results collected via and excel spreadsheet.

The **core practicals** are designed to be taught in a similar way to the new GCSE core practicals and will be examined in the assessments. The resources for teaching these are included in the KS3 folder in O365. Opportunities for **working scientifically** are included for each topic, and mapped onto the GCSE working scientifically objectives, included in the document. Working scientifically objectives should be covered throughout. Opportunities for teaching maths skills are included for each topic, and mapped on the GCSE **maths skills** objectives, included in this document. The **objectives in bold** are suggested as “deepening objectives” and while they will be examined, they may not be taught to the lowest prior attaining students.

Mastery learning breaks subject matter and learning content into units with clearly specified objectives which are pursued until they are achieved. However, without repetition of material there is a high chance pupils will not be able to utilise old modules and topics later on. Interleaving content ensures repetition over a long time scale, keeping the science fundamentals in children’s minds and gets them to use this knowledge again and again, and in different contexts. With these ideas in mind, we highlight the key ideas that are repeated throughout the KS3 Science Curriculum. Our schemes of work should be designed to make pupils explicitly aware of the science they are using in all contexts in order to reinforce and embed the 'Key Ideas' of science. This will ensure that their science GCSE foundations are strong.

Notable additions from previous versions (16-17) are highlighted in yellow. Feedback and development on this curriculum is ongoing and we welcome your comments and ideas. Please email louisa.aldridge@clf.cabot.ac.uk or tcourt761@bristolmet.net. While we will make minor amendments throughout the year, a larger review will take place in June 2019.

Curriculum and Assessment Skeleton

The multiple choice assessments will be completed on the online Diagnostic Questioning software assessment software which will mark the tests and give a report. Teachers should use the results of this to reteach any content the students found difficult, during the reteach time.

Year 7					
ARE Point		**1**	**2**	**3**	**4**
Unit Title		**Particle model** **Pure and impure substances** **Cells and organisation** *What are the building blocks of life?* *What are the building blocks of all matter?*	**Atoms, elements and the periodic table** **Forces** **Nutrition and digestion** What are the building blocks of the universe? *What forces act in the universe?* *How does our body use food?*	**Energy changes** **Microbes and disease** **Reproduction** *How do energy changes occur?* *What causes diseases?* *How human babies are made?*	**Physical changes** **Acids and alkalis** **Magnetism** **Electrical circuits** *How do reactions, and acids and alkalis affect us?* *How do invisible forces act?* *How do electrical devices work?*
MCQ	Time	25	30	35	40
	Number marks	20	25	30	35
	Number marks for new content	20	20	20	20
	Approxi previous content	n/a	5 marks from block 1	5 marks from block 1 5 marks from block 2	5 marks from block 1 5 marks from block 2 5 marks from block 3
DOYA		**The longer assessments** (two per year) will be made up of structured and longer answer GCSE style questions, they will examine the core practicals where possible. They will be 35 marks in a 45 minute paper. The first paper in each year will assess content covered in blocks 1 and 2. The second paper will assess content covered in blocks 1,2,3 & 4 of that year. Year 7 content will also be assessed in year 8 where it fits in with the year 8 topic being assessed. The assessments will have two tiers of entry, standard demand and higher demand to mirror GCSE. The grade boundaries for each test are below			
Time to teach		5-6	8	8	8

Year 8					
ARE Point		**1**	**2**	**3**	**4**
Unit Title		**Chemical reactions** **Forces and motion** *How are compounds formed?* *How do forces act to produce movement?*	**Cellular respiration and gas exchange** **Waves** *How do organisms get energy?* *How do we use waves for communication?*	**Evolution** **Energy in chemical reactions** **Metals and reactivity** *How do organisms evolve?* *How are reactions useful?* *How are metals useful?*	**Photosynthesis** **Relationships in ecosystems** **Earth and atmosphere** *Why are plants so important for life on earth?* *How do organisms depend on each other?* *How can we conserve the earth and atmosphere?*
MCQ	Time	25	30	35	40
	Number marks	20	25	30	35
	Number marks for new content	20	20	20	20
	Approxi previous content	n/a	5 marks from block 1	5 marks from block 1 5 marks from block 2	5 marks from block 1 5 marks from block 2 5 marks from block 3
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		Standard demand	Higher demand
Deepening understanding	D	85-100%	60-100%
On age related expectation	O	50-84%	20-59%
Yet to be meeting age related expectation	Y	10-49	0-19%
At an earlier stage	A	0-9%	N/A

ARE Descriptors

Year 7			
KS2 Prior Learning	**Knowledge and Skills**	**Understanding**	**Meaning**
What is the key knowledge, skills, understanding and meaning that children bring from the AREs in KS2 in this subject?	**What is the key knowledge and skills that we want to pass on to children as ARE in Year 7 that build up from KS2?**	**What do we want children to build through the application of knowledge and skills, including key concepts and misconceptions?**	**What is the meaning that we want children to seek by age that supports their personal growth?**
Year 7 Block 1			
From KS2 students should • have experience of identifying solids, liquids and gases and describing the properties of each • know that the same material can exist as a solid, liquid and gas • have observed that melting, freezing, condensation and evaporation.	**Chemistry - Particle model** Students will: • recall the properties of the different states of matter (solid, liquid and gas) in terms of the particle model • describe the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition • state that atoms and molecules are particles. • Modelling solids liquids and gases WS 1b.	Students will: • explain the changes of state in terms of the particle model. • describe the effects of changes in particle structure and movement. Change of state of steric acid WS 2d, WS 3c, WS 3e • Applying pressure to syringes of solids liquids and gases WS 3f	To explain the building blocks of matter. We are learning this in order to • Know that matter is made of particles • That differences in particle arrangement affects the property of materials • Explore how temperature affects particles
	Chemistry - Pure and impure substances	Students will:	

From KS2 students should • have had experience of dissolving solids in water and know that not all are soluble • have separated mixtures of solids and liquids • know that not all liquids contain water • know that all materials are made up of very small particles	Students will: • describe mixtures and methods to make mixtures including dissolving • describe simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography.	• Using different methods of separation WS 2d, WS 2c	To understand the processes used to separate different mixtures. We are learning this in order to • Be able to identify what is meant by a mixture • Be able to separate mixtures through a range of methods
From KS2 students should • Use the names and functions of some major organs in plants and animals • Understand some of the life processes common to living things, eg movement, growth, reproduction, nutrition	**Biology - Cells and organisation** Students will: • describe cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope (WS 2c 3e, 4d) • recall the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts • describe the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • make a model of a cell WS 1b	Students will: • explain the similarities and differences between plant and animal cells • **explain how and why some cells are specialised**	To explain the building blocks of life. We are learning this in order to • learn that cells are the basic units of life and are organised into tissues from which organs are made • explore cell structure and differences between plant and animal cells • learn about some functions of cells

Year 7 Block 2			
From KS2 student should • have experience of the physical properties of materials From KS3 students will: revisit particles, atoms and molecules, particle motion revisit separation techniques	**Chemistry - Atoms and elements and the periodic table** Students will: • describe a simple (Dalton) atomic model, including that the atom is made of protons, electrons and neutrons. • recall the differences between atoms, elements and compounds • use chemical symbols and formulae for elements and compounds • describe the varying physical and chemical properties of different elements • describe the Periodic Table: periods and groups; metals and non-metals • recall the properties of metals and non-metals	Students will: • Evaluate models of the atom, and explain how the model of an atom has changed over time, simple overview of historic models of the atom WS 1a, 1b • explain the concept of a pure substance • explain how pure substances can be identified. • explain the conservation of mass changes of state and chemical reactions. Weighing products and reactants before and after chemical reaction WS 3g • Maths Skills 1a, 2b • Testing properties of materials WS 2f • explain the principles underpinning the Mendeleev Periodic Table • explain how patterns in reactions can be predicted with reference to the Periodic Table	To understand the fundamental building blocks of the universe. We are learning this in order to • understand that the huge range of materials is made from a relatively small number of elements • learn that each element is composed of one sort of atom only • explore the characteristics of some elements • use the particle model to describe what happens when elements combine

From KS2 students should • know that pushes and pulls change the speed, direction or shape of an object • know how to measure distance and how to use a forcemeter to • measure force in newtons • know that forces act in a particular direction and this can be indicated • by arrows • have experience of the effects of a variety of forces, eg magnetic, • gravity, friction, air resistance	**Physics - Forces** Students will: • describe forces as pushes or pulls, arising from the interaction between two objects • describe forces associated with deforming objects, stretching and squashing, springs, friction between surfaces, resistance to motion of air and water • recall forces measured in Newtons as measurements of stretch or compression as force is changed • list some non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity.	Students will • explain the force-extension linear relationship and Hooke's Law as a special case, F=kx • Investigate how Hooke's Law describes the relationship between force and extension of a spring. WS 3d, WS 3c • explain how opposing forces can cause equilibrium, for example in the case of a weight held by stretched spring or supported on a compressed surface. • Calculate the resultant force when given forces acting on an object. • Maths skills 2g, 3b, 3c, 3d, 4a, 4c	To explain how the same forces that hold the universe together also hold atoms together and help us to move around. We are learning this in order to: • consolidate and build on our concept of force and its measurement • identify the origin of friction, air resistance, upthrust and weight and describe situations in which these forces act • identify weight as a force • relate forces acting to changes in motion • identify situations in which forces are balanced and unbalanced • describe the effect of forces on springs
From KS2 students should • know that food is needed for activity and growth, and that an	**Biology - Nutrition and digestion** Students will: • recall the content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins,	Students will: • explain the adaptations of the digestive system and how it	To explain what happens to the food we eat after we eat it.

• adequate and varied diet is needed to maintain health • know that matter, including food, consists of particles, eg molecules, • which can differ in size • recognise that food provides energy for the body From KS3 student will: revisit cells- specialised cells, tissues, organs etc.	vitamins, minerals, dietary fibre and water, and why each is needed • Food tests WS 2b • describe the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • recall the tissues and organs of the human digestive system,	digests food (enzymes simply as biological catalysts) • explain diffusion in terms of the particle model • Maths skills 1c, 2g, 4a,	We are learning this in order to understand: • the nutritional content of different foods and how they can be combined to produce a balanced diet • how food is broken down by digestion so it can be used by the body, for energy, growth and repair
Year 7 Block 3			
From KS3 students will: revisit energy revisit particles	**Physics - Energy changes and transfers** Students will: • describe the use of insulators • identify energy stores. • describe processes that involve energy transfer including changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels. • recall energy as a quantity that can be quantified and calculated;	Students will: • **explain heating and thermal equilibrium; through temperature difference between two objects lead to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; and how such transfers reduce the temperature difference** • compare power ratings of appliances.	We are learning this so students can explain simple energy transfers e.g. what is happening when things are heated or lose heat. We are learning this in order to • identify energy stores and simple transfers • Know that energy is measurable. • Explain how heat is transferred through different mechanisms.

	• recall the total energy has the same value before and after a change • Variety of energy transfer experiments WS 3a • Spirit burners, including deciding on best fuel WS 2g WS 1d • Maths skills 4a		• Identify materials as heat conductors or insulators
From KS3 students will: revisit cells, specialised cells revisit particles	**Biology – Microbes and disease** Students will: • recall pathogens as a disease causing organism, including virus, fungi and bacteria. • describe how the physical and chemical defences of the human body provide protection from pathogens • Core practical. Compare amounts of bacteria on washed and non-washed hands. WS 1c, 2a, 2d, 2f, 3e, 4d • Maths skills 5c	Students will: • explain how pathogens are spread • **explain the role of the specific immune system of the human body in defence against disease.** • **explain how immunisation/vaccination works to protect against infection**	To explain what causes diseases, how they are spread and how we can prevent them. We are learning this in order to understand: • that micro-organisms share the characteristics of other living things • about growing micro-organisms, and about the role of micro-organisms in infectious diseases

			• about the body's defence systems and how immunisation can protect against microbial infections and describe how antibiotics may be effective across a wide spectrum or against specific bacteria
From KS3 students will: revisit cells	**Biology - Reproduction** Students will: • describe reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta	Students will: • explain heredity as the process by which genetic information is transmitted from one generation to the next • relate the structure of the egg and sperm cell to their function. (Cell specialisation) E.g sperm cell has a tail so that it can swim.	We are learning this so we can explain how human babies are made. We are learning this in order to understand: • about human reproduction and consider how offspring are protected and nurtured • relate what they know of the way their bodies change during adolescence to knowledge about human

			reproduction, growth and the menstrual cycle
Year 7 Block 4			
From KS3 students will: revisit particles	**Chemistry/Physics - Physical changes** Students will: • describe Brownian motion in gases • **describe diffusion in liquids and gases driven by differences in concentration** • recall the difference between chemical and physical changes. • Experiments to show differences between physical and chemical changes WS 3a	Students will: • explain conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving • explain similarities and differences, including density differences, between solids, liquids and gases	To explain the difference between physical changes and chemical reactions so students can identify these in their everyday lives. We are learning this in order to • Identify common observations as either chemical reactions or physical changes. • Explain that mass is conserved in all changes. • Understand that mass doesn't change in these reactions.
From KS3 students will: revisit particles, atoms and molecules, particle motion, diffusion	**Chemistry -Chemical reactions – acids and alkalis** Students will: • define acids and alkalis in terms of neutralisation reactions • recall the pH scale for measuring acidity/alkalinity and indicators colour changes • Maths skills 2a, 2b, 5c	Students will • test pH with different indicators WS 3g, WS 2g	Students are learning this so they can identify what an acid and alkali is and how they can neutralise it. This will allow them to deal with situations like this in real life e.g. bee stings. We are learning this in order to understand • How acids and alkalis behave

			• Neutralisation changes the acidity of these chemicals.
From previous study at KS2 students will • know that magnets attract magnetic materials • know that magnets can attract and repel other magnets • know that magnets have a range of uses in everyday life, e.g. *fridge door catches*. From KS3 students will: revisit forces	**Physics - Magnetism** Students will: • recall how magnetic poles can attract and repel. • describe magnetic fields using representation of field lines • describe how navigation uses the Earth's magnetic field • **Plotting magnetic field with compass WS 3f**		So that students can understand that there are invisible force-fields that act throughout the universe and these affect different materials in different ways. We are learning this in order to • identify magnetic materials • use the concepts of a magnetic field use scientific knowledge and understanding to make predictions about the behaviour of magnets and magnetic material
From KS3 students will: revisit particles	**Physics – Electrical circuits** Students will: • describe electric current, measured in amperes, in series and parallel circuits, • describe potential difference, measured in volts, in series and parallel circuits and using battery and bulb ratings,	Students will: • build a variety of electrical circuits WS 2a, WS 2b, WS 2f, WS 3f. • explain how currents add where branches meet and current as flow of charge. • use V=IR and be able to rearrange and apply this equation	To explain how electrical devices work to enable new devices to be designed for the future. We are learning this in order to • consolidate and extend their ideas about circuits • use concepts of electric current and energy transfer to explain the working of circuits in both series and parallel

	• recall that resistance is measured in ohms and is defined as the ratio of potential difference (p.d.) to current • **describe the differences in resistance between conducting and insulating components (quantitative).** • Core practical Investigate the resistance of different lengths of wire, using a voltmeter and ammeter. • Maths skills Use, apply and rearrange V=IR 2g, 3b, 3c, 3d, 4a, 4c	• explanation and evaluation of methods of electricity generation has been moved to year 8 block 4, earth and atmosphere.	• explain patterns in the measurements of current and voltage • use the concept of resistance qualitatively, and quantitatively • build circuits in which current flow is usefully controlled • consider the hazards of electricity for humans • explore early ideas about electric current • model current in a variety of ways • use ammeters and voltmeters • investigate how resistance is affected by the length of a wire.

Year 8			
Year 7 Prior Learning	**Knowledge and Skills**	**Understanding**	**Meaning**
What is the key knowledge, skills, understanding and meaning that children bring from the AREs in Year 7 in this subject?	**What is the key knowledge and skills that we want to pass on to children as ARE in Year 8 that build up from Year 7?**	**What do we want children to build through the application of knowledge and skills, including key concepts and misconceptions?**	**What is the meaning that we want children to seek by age that supports their personal growth?**
Year 8 Block 1			
From previous study at KS3 students will have an understanding of the difference between an element, mixture and compound. They will have experienced a variety of different chemical reactions and should know the difference between a chemical and a physical change.	**Chemistry - Chemical reactions** Students will: • describe combustion, thermal decomposition, oxidation and displacement reactions • describe the reactions of acids with metals to produce a salt plus hydrogen • describe the reactions of acids with alkalis to produce a salt plus water • describe the chemical properties of metal and non-metal oxides with respect to acidity.	Students will: • explain chemical reactions as the rearrangement of atoms • represent chemical reactions using formulae and using equations • peform a variety of displacement replacement reaction some that displace and some that don't, leading to reactivity series WS 3f • Maths skills 1c	To understand the fundamental building blocks of the universe. We are learning this in order to • To understand how new substances can be formed through chemical changes, and that the new substances are different from the ones from which they are made. • To understand how chemical reaction can be useful to us in forming materials and substances that we use and how they need to be used carefully,

			for example combustion and particularly fire safety.
From previous study at KS3 students will use the concept of speed and describe changes of speed and know that unbalanced forces cause a change in movement.	**Physics - Forces & motion** Students will: • describe the forces needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) • describe how a force produces a change depending on its direction and size. • define speed and describe the quantitative relationship between average speed, distance and time (speed = distance ÷ time) and to rearrange and apply this equation. • describe gravity forces between Earth and Moon, and between Earth and Sun (qualitative only)	Students will: • **represent and explain the representation of a journey on a distance-time graph** • explain gravity as a force, and use and apply the equation weight = mass x gravitational field strength (g), on Earth g=10 N/kg and different on other planets • Core practical - Investigate how length of wing of a helicopter affects the time of flight. WS 1b, 2b, 2f, 2g, 3a, 3c, 4c • Maths skills Use, apply and rearrange speed = distance/time 3b, 3c, 3d, 4a, 4c	To explain how to predict the future motion using a scientific law We are learning this in order to • use the concept of speed • consider the relationship between forces (including balanced forces) on an object, and its movement • study the effects of water and air resistance on speed, and how streamlining reduces these effects • use ideas of balanced and unbalanced forces to explain the movement of falling objects
Year 8 Block 2			
	Biology - Cellular respiration and gas exchange.		

From previous study at KS3 students will understand that air contains carbon dioxide and oxygen, with other gases They will recall that smaller molecules, including glucose, are produced from larger ones in digestion understand that cells are organised into tissues and tissues can form organs	Students will: • describe aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life • recall a word summary for aerobic respiration • describe the process of anaerobic respiration in humans and a word summary for anaerobic respiration • recall the structure and functions of the gas exchange system in humans • describe the role of diffusion in the movement of materials in and between cells	Students will: • explain diffusion in terms of the particle model • explain the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism. • explain the adaptations of gas exchange systems to function • explain the impact of exercise, asthma and smoking on the human gas exchange system • Maths skills 2g	To explain how plants and animals get the energy they need for life. We are learning this in order to: • understand how cells are supplied with the materials they need for respiration • explain how cells in animals and plants release energy • understand that the process of respiration is similar in all cells
From previous study in KS2 students should have an understanding that light travels from a source; the key terms opaque, transparent and translucent materials and relate shadow formation to opaque	**Physics - Waves** Students will: Observed waves, • describe waves on water as undulations which travel through water with transverse motion;.	Students will: • explain how these waves can be reflected, **and add or cancel – superposition** • explain echoes, reflection and absorption of sound • explain how sound is produced by vibrations of objects, in loud	We are learning this so we can describe how sound and light transfer information for sight and sound. We are learning this in order to • Identify similarities and differences of phenomena involving waves

materials; light is reflected from shiny surfaces; that we see things only when light from them enters our eyes; that sounds are produced by vibrating sources and that sounds produced by musical instruments can be changed As part of this topic students should revisit energy, particles and speed calculation	Sound waves • recall that the frequency of sound wave is measured in hertz (Hz); • state that sound needs a medium to travel, the speed of sound in air, in water, in solids • state the auditory range of humans and animals. Light waves • recall that light waves can travel through a vacuum and the speed of light • describe the transmission of light through materials: absorption, diffuse scattering and **specular** reflection at a surface • describe the colours as different frequencies of light, white light	speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • explain the similarities and differences between light waves and waves in matter • use the ray model to explain imaging in mirrors, the refraction of light • explain the use of prisms (qualitative only) in differential colour effects in absorption and diffuse reflection. • Properties of light investigations, for example reflection, refraction, dispersion WS 3f	• Perform calculations to evaluate the movement of waves. • Explain why we see and hear as we do.
Year 8 Block 3			
From previous study at KS2 and KS3 students will describe how individuals of a species show characteristics which may be	**Biology - Evolution** Students will:	• explain how the variation between species and between	To understand how variation can lead to new species or extinction.

environmentally determined or inherited. They will understand that sexual reproduction involves the fusion of a male and female cell. They will be able to explain that organisms are well adapted for the environment that they live in	• describe the differences between species • recall the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation • Maths skills 2a, 2b, 2c, 2f, 4a, 4c, 5c	individuals of the same species means some organisms compete more successfully, which can drive natural selection • explain how changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • **explain the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.** • Ethics of extinction WS 1f • Development of theories of evolution WS1a	We are learning this in order to • explore variation within and between species • investigate patterns of variation in living things and ways of representing and explaining the occurrence of variations • understand about variations arising from inherited and environmental differences
From previous study at KS3 students will be able to •Describe states of matter in terms of particles. •know that burning involves a reaction with oxygen in which oxides are formed	**Chemistry - Energy in chemical reactions** Students will: • describe how energy changes on changes of state (qualitative)		To describe that some reactions take in energy and some reactions release energy We are learning this in order to

•know that new materials are formed when chemical reactions occur and can identify evidence of these •have used symbols and formulae and word and/or symbol equations •displacement reactions	• describe exothermic and endothermic chemical reactions (qualitative). • Thermite demonstration WS 2d		• Recall how energy affects a change in state • Define the terms exothermic and endothermic. • Be able to investigate energy changes in reactions.
From previous study at KS3 students will be able to • can name some metals, understanding that they are elements, and can give some of their characteristics • know that atoms join together in different ways when chemical reactions take place • have represented some elements and compounds by symbols and formulae • understand that chemical reactions can be represented by word, particle and symbol equations Revisit particles, atoms, elements, compounds, periodic	**Chemistry – Metals and reactivity** Students will: • describe the order of metals and carbon in the reactivity series • Thermite demonstration WS 2d	Students will • explain the use of carbon in obtaining metals from metal oxides • describe the reaction of metals with acids. • describe the reaction of metal carbonates with acids.	We are learning this so we can describe where the metals we use in everyday life come from and how we process them. We are learning this in order to • Describe the reactivity series • Describe patterns in the reactivity of metals • Explain how metals are extracted from their ores.

table, properties of metals, chemical reactions			
Year 8 Block 4			
From previous study at KS2 and KS3 students • know how organisms are sorted into groups based on features in common • can describe the basic structure of plants, *eg leaf, root, stem, flower* • know the conditions that plants need to grow well • know that green plants take in water through their roots and that the leaf plays a part in photosynthesis • know that respiration releases carbon dioxide	**Biology - Photosynthesis** Students will: • recall the reactants in, and products of, photosynthesis, and a word summary for photosynthesis • describe the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis and to maintain levels of oxygen and carbon dioxide in the atmosphere • Elodea bubbles in water WS 2g • Maths skills 4a, 4c	• **explain how plants make carbohydrates in their leaves by photosynthesis and gain mineral nutrients and water from the soil via their roots.** • Investigate where starch is stored in a leaf. WS 2f, 2g, 3a, 3f	We are learning this so that we can explain why plants are so important for the survival of all life on Earth. We are learning this in order to understand: • about photosynthesis as the key process producing new plant biomass • that the carbon dioxide for photosynthesis comes from the air and that the water is absorbed through the roots • that chlorophyll enables a plant to utilise light in photosynthesis • about the role of the leaf in photosynthesis • about the importance of photosynthesis to humans and other animals

From previous study at KS2 and KS3 students will: • know that different living things live in different habitats • can describe ways in which animals and plants are adapted to survive in a habitat • can represent feeding relationships by food chains and food webs • know that organisms can be classified into animals and plants and	**Biology - Relationships in an ecosystems**, Students will: • describe the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • describe the principles of sampling as applied to scientific data. • Quadrat sampling WS 2e • Maths skills 2c, 2d	Students will: • explain how organisms affect, and are affected by, their environment, including the accumulation of toxic materials. • Ethical considerations in using pesticides WS 1c	To explain how organisms depend on each other in an ecosystem. We are learning this in order to • understand how sizes of populations can be modelled qualitatively • understand how living things within a community influence each other and are affected by the environment
From previous study in KS2 and KS3 students • know that there are rocks under the surface of the Earth and that soils come from rocks • know that electricity comes from power stations. • know that carbon dioxide is a gas	**Chemistry - Earth and atmosphere** Students will: • state the composition of the Earth • describe the structure of the Earth • describe the carbon cycle • Maths skills 4a, 4c	Students will: • explain how the production of carbon dioxide by human activity has an impact on climate • Evaluating evidence for and against climate change WS 1f • describe and explain different methods of generating electricity including burning	So they can describe the atmosphere, and what we can do to keep it healthy for humans in the future. We are learning this in order to • State how the atmosphere has changed over time. • Describe the structure of the Earth. • Describe the carbon cycle.

		fossil fuels and renewable energy resources. • Evaluating different electricity generation methods WS 1d	• consider how the atmosphere and water resources are affected by natural processes and the activity of humans • consider the nature and origin of fossil fuels and renewable sources of energy and how their use has implications for the environment • Evaluate power stations in terms of impact on the atmosphere & environment

Working scientifically

The GCSE in Combined Science requires students to develop the skills, knowledge and understanding of working scientifically. Working scientifically will be assessed through examination and the completion of the eight core practicals.

1 Development of scientific thinking

a Understand how scientific methods and theories develop over time.

b Use a variety of models, such as representational, spatial, descriptive, computational and mathematical, to solve problems, make predictions and to develop scientific explanations and an understanding of familiar and unfamiliar facts.

c Appreciate the power and limitations of science, and consider any ethical issues that may arise.

d Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

e Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences.

f Recognise the importance of peer review of results and of communicating results to a range of audiences.

2 Experimental skills and strategies

a Use scientific theories and explanations to develop hypotheses.

b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.

c Apply a knowledge of a range of techniques, instruments, apparatus and materials to select those appropriate to the experiment.

d Carry out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.

e Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative.

f Make and record observations and measurements using a range of apparatus and methods.

g Evaluate methods and suggest possible improvements and further investigations.

3 Analysis and evaluation

Apply the cycle of collecting, presenting and analysing data, including:

a presenting observations and other data using appropriate methods.

b translating data from one form to another.

c carrying out and representing mathematical and statistical analysis.

d representing distributions of results and making estimations of uncertainty.

e interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions.

f presenting reasoned explanations, including relating data to hypotheses.

g being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error.

h communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions through paper-based and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.

4 Scientific vocabulary, quantities, units, symbols and nomenclature

a Use scientific vocabulary, terminology and definitions.

b Recognise the importance of scientific quantities and understand how they are determined.

c Use SI units (e.g. kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate.

d Use prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano).

e Interconvert units.

f Use an appropriate number of significant figures in calculation.

		Biology	Chemistry	Physics
1	**Arithmetic and numerical computation**			
a	Recognise and use expressions in decimal form	✓	✓	✓
b	Recognise and use expressions in standard form	✓	✓	✓
c	Use ratios, fractions and percentages	✓	✓	✓
d	Make estimates of the results of simple calculations	✓	✓	✓
2	**Handling data**			
a	Use an appropriate number of significant figures	✓	✓	✓
b	Find arithmetic means	✓	✓	✓
c	Construct and interpret frequency tables and diagrams, bar charts and histograms	✓	✓	✓
d	Understand the principles of sampling as applied to scientific data	✓		
e	Understand simple probability	✓		
f	Understand the terms mean, mode and median	✓		✓
g	Use a scatter diagram to identify a correlation between two variables	✓		✓
h	Make order of magnitude calculations	✓	✓	✓
3	**Algebra**			
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~	✓	✓	✓
b	Change the subject of an equation		✓	✓
c	Substitute numerical values into algebraic equations using appropriate units for physical quantities		✓	✓
d	Solve simple algebraic equations	✓		✓

		Biology	Chemistry	Physics
4	**Graphs**			
a	Translate information between graphical and numeric form	✓	✓	✓
b	Understand that $y = mx + c$ represents a linear relationship	✓	✓	✓
c	Plot two variables from experimental or other data	✓	✓	✓
d	Determine the slope and intercept of a linear graph	✓	✓	✓
e	Draw and use the slope of a tangent to a curve as a measure of rate of change		✓	✓
f	Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate			✓
5	**Geometry and trigonometry**			
a	Use angular measures in degrees			✓
b	Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects		✓	✓
c	Calculate areas of triangles and rectangles, surface areas and volumes of cubes.	✓	✓	✓

Medium Term Plans

Subject: Science	Unit Title: Particles	ARE Point: Year 7 block 1

Key Essentials:
Describe states of matter in terms of particles.

Content:

Knowledge and Skills

Recall the properties of the different states of matter (solid, liquid and gas) in terms of the particle model
State that atoms and molecules are particles.
Describe the differences in arrangements, in motion and in closeness of particles

- Modelling solids liquids and gases WS 1b.
- Describe the arrangement and motion of particles in different states of matter

Understanding

Explain changes of state and shape in terms of the particle model

- describe how changes in particles cause state changes
- explain how temperature affects motion of particles
- explain the changes with temperature in motion and spacing of particles
- **Change of state of steric acid WS 2d, WS 3c, WS 3e**

Describe the effects of changes in particle structure and movement.

- explain how density is linked to particles, including the anomaly of ice-water transition
- **Describe how particles cause pressure in gases e.g. how a balloon stays inflated.**
- **Applying pressure to syringes of solids liquids and gases WS 3f**

WHY are children LEARNING this?

We are learning this so we can explain the building blocks of matter.

We are learning this in order to

- Know that matter is made of particles
- That differences in particle arrangement affects the property of materials
- Explore how temperature affects particles

Concepts: Misconceptions • Particles do not change size when they are heated. • Confusion between melting and dissolving • Amount of space in between particles in a liquid is small	**HOW will ORACY, NUMERACY, READING and WRITING be developed?** Writing – Using key terms, descriptions of states of matter
Terminology and Vocabulary (subject specific and academic): • words with a precise meaning in scientific contexts, eg evidence, theory, model • words and phrases relating to the particle model, eg particle, diffusion, gas pressure, vibration • words relating to scientific enquiry, e.g. evidence, data	**WHAT will PROGRESS look like in this unit?** Prior learning • have experience of identifying solids, liquids and gases and describing the properties of each • know that the same material can exist as a solid, liquid and gas • have observed that melting, freezing, condensation and evaporation. **D-** use the particle model to explain a range of phenomena compare explanations of a phenomenon and evaluate whether evidence supports or refutes them in terms of materials and their properties **O-** describe and explain observations, using the particle model; classify materials as solid, liquid or gas; explain their classification of some 'difficult' materials; describe materials as being made of particles and describe the movement and arrangement of these, and begin to use the particle model to explain phenomena, eg the mixing of liquids, the expansion of a metal bar **Y-** describe observations and try to offer explanations for them; classify materials as solid, liquid or gas and recognise that materials are made of particles
Extended Response (writing, performance or product): • Explaining how states of matter change in terms of particles.	

Subject: Science	Unit Title: Pure and Impure Substances	ARE Point: Year 7 block 1

Key Essentials:
Describe the processes we can use to separate a range of mixtures.

Content:

<u>Knowledge and Skills</u>

Students will:

describe mixtures and methods to make mixtures including dissolving

- Describe what is meant by the term mixture
- Know the key terms of dissolving e.g. solute, solvent, solution
- Describe the process of dissolving

Describe and perform simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography.

- Be able to describe filtration
- Be able to describe the process of evaporation
- Be able to describe simple distillation e.g. to produce pure water from sea water
- Be able to describe the process of chromatography

<u>Understanding</u>

- Using different methods of separation WS 2d, WS 2c

WHY are children LEARNING this?

We are learning this so we know the processes used to separate different mixtures.

We are learning this in order to

- Be able to identify what is meant by a mixture
- Be able to separate mixtures through a range of methods

Concepts:

Misconceptions –
Confusion between melting and dissolving.
-that particles are still there when solutes dissolves.

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Writing – Using key terms -writing methods for separating substances e.g. rock salt & sea water
Numeracy – calculating Rf values?

Terminology and Vocabulary (subject specific and academic):

WHAT will PROGRESS look like in this unit?

words and phrases relating to dissolving, eg solution, solute, solvent, soluble, insoluble, saturated solution words and phrases relating to the separation of mixtures, eg filtration, distillation, chromatography, chromatogram words and phrases relating to explanations using the particle model, eg particle, attracted, mixing	Prior learning • have had experience of dissolving solids in water and know that not all are soluble • have separated mixtures of solids and liquids • know that not all liquids contain water • know that all materials are made up of very small particles **D-** evaluate their method for obtaining pure salt in terms of the mass obtained use the particle model to explain a range of phenomena **O-** describe how mixtures can be separated including; interpreting data from chromatograms; plan how to separate pure salt from rock salt. Use the particle model to explain what happens when some solid dissolves in water, explaining why mass is conserved **Y-** separate different mixtures e.g. sample of salt from rock salt; describe how pure water can be obtained from sea water and how different colours can be separated from some inks
Extended Response (writing, performance or product): • Writing a method for the separation of rock salt. • A comparison of separating techniques.	

Subject: Science	Unit Title: Cells and organisation	ARE Point: Yr 7 block 1

Key Essentials:
Structure of cells and using microscopes.

Content:

<u>Knowledge and Skills</u>

Describe cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope (WS 2c 3e, 4d)

- Name the parts of a light microscope
- Describe how to make a slide
- Draw and label plant and animal cell, describe similarities and differences
- Calculate magnification

Recall the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts

Describe the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms.

<u>Understanding</u>

Explain the similarities and differences between plant and animal cells

- role of chloroplasts in plant cells.

Explain how and why some cells are specialised

- **root hair cells are adapted to have a large surface area to aid absorption. Nerve cells are long to transmit messages more quickly.**

WHY are children LEARNING this?

We are learning this so we can explain the building blocks of life.

We are learning this in order to

- learn that cells are the basic units of life and are organised into tissues from which organs are made
- explore cell structure and differences between plant and animal cells
- learn about some functions of cells

Concepts:

Misconceptions – Calculation of ratio.

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Numeracy – Calculating magnification

	Writing – Using key terms.
Terminology and Vocabulary (subject specific and academic): Use and understand words relating to the structure of organisms, *eg organ, tissue, cell* • more specialised words relating to cells, eg membrane, cytoplasm, nucleus, chloroplast, vacuole • words with similar but distinct meanings, eg membrane and skin, or terms that they regularly interchange, eg cell wall and membrane • words with different meanings in scientific and everyday contexts, eg cell, wall, tissue • words and phrases relating to scientific enquiry, eg variable, sample size, evaluate, magnification	**WHAT will PROGRESS look like in this unit?** <u>Prior learning</u> • the names and functions of some major organs in plants and animals • about some of the life processes common to living things, eg movement, growth, reproduction, nutrition D- describe how some cells in an organism are specialised to carry out particular functions O-make observations using a microscope and record them in simple drawings; identify and name features of cells and describe some differences between plant and animal cells; explain that growth occurs when cells divide and increase in size; describe how cells are grouped to form tissues Y- recognise that all organisms are made from cells and name some parts of a cell; relate drawings to observations made using a microscope and describe what they found out from their investigation
Extended Response (writing, performance or product): • Making a model of a cell WS 1b	

Subject: Science	Unit Title: Atoms, Elements and the Periodic table	ARE Point: Year 7 block 2

Key Essentials:
Structure of an atom, understanding of elements as the building blocks of all materials

Content:

Knowledge and Skills

Students will:

describe a simple (Dalton) atomic model, including that the atom is made of protons, electrons and neutrons.
recall the differences between atoms, elements and compounds
use chemical symbols and formulae for elements and compounds
describe the varying physical and chemical properties of different elements , could include the alkali metals as a key group
describe the Periodic Table: periods and groups; metals and non-metals
recall the properties of metals and non-metals, to include malleability, heat and electricity conduction.

Understanding

Evaluate models of the atom, and explain how the model of an atom has changed over time, simple overview of historic models of the atom WS 1a, 1b
explain the concept of a pure substance
testing the properties of materials,

- boiling and melting points of pure vs salt water WS 2f
- explain how pure substances can be identified
- linked to melting and boiling points

explain the conservation of mass changes of state and chemical reactions - Weighing products and reactants before and after chemical reaction WS 3g, lead iodide demo, burning iron wool on a balance.

WHY are children LEARNING this?

To understand the fundamental building blocks of the universe.

In this unit students will:

- learn that the huge range of materials is made from a relatively small number of elements
- learn that each element is composed of one sort of atom only
- explore the characteristics of some elements
- use the particle model to describe what happens when elements combine

<table>
<tr><td>explain the principles underpinning the Mendeleev Periodic Table, overview of key concepts.
explain how patterns in reactions can be predicted with reference to the Periodic Table</td><td></td></tr>
<tr><td>Concepts:
The unit relates to, and expands upon themes from the particle model.</td><td>HOW will ORACY, NUMERACY, READING and WRITING be developed?

Maths Skills 1a, 2

Writing – Using key terms.</td></tr>
<tr><td>Terminology and Vocabulary (subject specific and academic):
Through the activities in this unit pupils will be able to understand, use and spell correctly:
• scientific words, eg element, compound, atom, molecule, symbol,
• formula
• names of elements and compounds, eg oxygen, carbon dioxide,
• sodium, chlorine, sodium chloride
• words and phrases with different meanings in scientific and everyday
• contexts, eg element, equation, state
• words relating to scientific enquiry, eg data search, predicting
• products of reactions</td><td rowspan="2">WHAT will PROGRESS look like in this unit?
Prior learning
• students should have experience of the physical properties of materials from KS2,
• they will have an understanding of the particle model of solids, liquids and gases from Year 7 block 1.
• This unit provides a foundation for the later study of chemical reactions and reactivity.

D- some pupils will have progressed further and will: identify elements whose properties do not fit the general pattern of metals and non-metals; begin to represent compounds by formulae; describe products and reactants; label atoms; use the periodic table to predict reactions.
O- most pupils will: recognise that there is a small number of elements and name some of these; explain that compounds are made when atoms of different elements join together; begin to use symbols for elements and to represent reactions</td></tr>
<tr><td>Extended Response (writing, performance or product):

Describe and explain why a hydrogen fuel cell powered car would be environmentally friendly. Include details of the chemical reactants and products in your answer.</td></tr>
</table>

	in word equations; recognise the periodic table; recall that atoms have structure Y- some pupils will not have made so much progress and will: name some elements and represent these by symbols; distinguish between symbols for elements and formulae for compounds; name a wide variety of materials; look for symbols in the periodic table.

Subject: Science	Unit Title: Forces	ARE Point: Year 7 block 2

Key Essentials:
Investigations of different forces.

Content:
<u>Knowledge and Skills</u>

Describe forces as pushes or pulls, arising from the interaction between two objects.

Recall forces measured in Newtons as measurements of stretch or compression as force is changed

Describe forces associated with deforming objects, stretching and squashing, springs, friction between surfaces, resistance to motion of air and water:

- Tension in a spring (Hooke's Law WS 3d, WS 3c);
- Air Resistance (helicopter investigation);
- Friction (Force needed to pull a trainer investigation);
- Upthrust (investigation: compare weight and tension [in N-meter] for objects in air, and then in water. Calculate the upthrust from the difference);
- Drag in water (terminal velocity of different size ball bearings in measuring cylinder – v α r2);
- Normal Force (acts at right angles to a surface).

Describe non-contact forces:

WHY are children LEARNING this?

We are learning this so we can explain how the same forces that hold the universe together also hold atoms together and help us to move around.

We are learning this in order to consolidate and build on our concept of force and its measurement

- identify the origin of friction, air resistance, upthrust and weight and describe situations in which these forces act
- identify weight as a force
- relate forces acting to changes in motion
- identify situations in which forces are balanced and unbalanced
- describe the effect of forces on springs

• gravity forces (examine different orbits e.g. comets, asteroids, planets, galaxies, satellites going round planets going round the sun going round the galaxy, apples falling – all are governed by the same law F = GMm/r2); • forces between magnets (suspended paperclip demo, compass); • static electricity (water and charged comb, balloons on ceiling). **<u>Understanding</u>** Explain the force-extension linear relationship and Hooke's Law as a special case, F=kx • Use of equation NOT required, just investigation with mathematical description of the line and examples of proportionality. <u>Core practical</u> - Investigate how Hooke's Law describes the relationship between force and extension of a spring. WS 3d, WS 3c Explain how opposing forces can cause equilibrium, for example in the case of a weight held by stretched spring or supported on a compressed surface. Calculate the resultant force when given forces acting on an object. Forces circus	
Concepts: Misconceptions Upthrust is often taught incorrectly at KS2 and KS3. Make sure pupils only use the term as "Upthrust is an upwards force when immersed in a fluid" e.g. upthrust helps you to float in the swimming pool. <u>Upthrust only applies to fluids</u> e.g. liquids like water NOT solids.	**HOW will ORACY, NUMERACY, READING and WRITING be developed?** Numeracy – calculating forces, drawing force-arrows roughly to scale. Writing – Using key terms. Writing – report on friction investigation, spring investigation etc. Oracy – can be used as part of a class discussion to deal with misconceptions but make sure that questions are

<table>
<tr><td>Stress that each action has an equal and opposite reaction .e.g you push on the wall, and the wall pushes back on you.

Pupils confuse forces and energy. Stress that all forces are a push or a pull.

Stress difference between <u>weight</u> (force) and <u>mass</u> – a major issue. Always use the word “force” when saying “weight” e.g. “weight-force”.</td><td rowspan="2">carefully scripted so that misconceptions are <u>addressed</u> and not repeated!

Maths skills 2g, 3b, 3c, 3d, 4a, 4c</td></tr>
<tr><td>Terminology and Vocabulary (subject specific and academic):
• words and phrases with different meanings in scientific and everyday contexts, eg drag, upthrust
• words with a more precise meaning in scientific contexts than in everyday contexts, eg weight, mass, density</td></tr>
<tr><td>Extended Response (writing, performance or product):

• Investigations on upthrust, friction, springs, air resistance, drag

<u>Core practical</u> - Investigate how Hooke’s Law describes the relationship between force and extension of a spring. WS 3d, WS 3c</td><td rowspan="2">WHAT will PROGRESS look like in this unit
Prior learning
KS2 know that pushes and pulls change the speed, direction or shape of an object
• know how to measure distance and how to use a forcemeter to measure force in newtons
• know that forces act in a particular direction and this can be indicated by arrows
• have experience of the effects of a variety of forces, eg magnetic, gravity, friction, air resistance

D show how forces can combine to give a resultant force which depends on both the sizes and directions of the forces; describe how weight is caused by gravity and how gravity is different on the Earth and on the Moon; explain contact friction in simple terms
O identify directions in which forces act and describe situations in which forces are balanced; identify non-contact forces including weight; describe some ways of reducing friction and some situations in which friction is useful; describe a linear relationship in terms of proportionality
Y identify forces, eg friction, upthrust and weight; recognise that friction opposes motion, upthrust pushes upwards in a fluid and weight pulls downwards.</td></tr>
</table>

Subject: Science	Unit Title: Nutrition and digestion	ARE Point: Year 7 block 2

Key Essentials:
Structure of the human digestive system and the human diet.

Content:

<u>Knowledge and Skills</u>

Recall the content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed. Food tests (WS 2b)

Describe the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases.

Recall the tissues and organs of the human digestive system.

- Label the human digestive system and describe the function of each part.

<u>Understanding</u>

Explain the adaptations of the digestive system and how it digests food (enzymes simply as biological catalysts).

- What happens to food on its journey from mouth to anus, including physical digestion, chemical digestion and diffusion.

Explain diffusion in terms of the particle model.

WHY are children LEARNING this?

We are learning this so we can explain why we need a balanced diet and what happens to the food we eat after we eat it.

We are learning this in order to understand:

- the nutritional content of different foods and how they can be combined to produce a balanced diet
- how food is broken down by digestion so it can be used by the body, for energy, growth and repair

Concepts:

Misconceptions – Whilst the concept of a balanced diet is easy for pupils to understand, the media present much conflicting dietary advice, which may be biased according to its source.

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Numeracy – Maths skills

1c. Use ratios, fractions and percentages

2g. Use a scatter diagram to identify a correlation between two variables

4a. Translate information between graphical and numeric form

<table>
<tr><td>This provides an opportunity for considering an area of science in which our knowledge is incomplete and interpretation of the available evidence is difficult.</td><td>Writing – Using key terms.</td></tr>
<tr><td>Terminology and Vocabulary (subject specific and academic):
Use and understand scientific words relating to the structure of organisms, eg intestine, villus
more specialised words relating to nutrition, eg carbohydrate, protein, enzyme
words and phrases with similar but distinct meanings, eg take in and absorb, feeding and digestion
words that extend their vocabulary, eg absorption, diffusion</td><td rowspan="2">WHAT will PROGRESS look like in this unit?
Prior learning
know that food is needed for activity and growth, and that an adequate and varied diet is needed to maintain health
know that matter, including food, consists of particles, eg molecules, which can differ in size
recognise that food provides energy for the body
D- explain why some nutrients have to be broken down before they can be used by the body and why some foods cannot be digested by humans; explain consequences of diet on health.
O-name nutrients, fibre and water as part of a balanced diet, identifying examples of foods in which they are found, and describe the role of the main nutrients in the body; use a model to describe how large molecules are broken down during digestion and describe the role of blood in transporting products of digestion around the body
Y- name some groups of nutrients and identify some examples of foods in which they are found; describe a balanced diet; recognise that blood transports products of digestion around the body</td></tr>
<tr><td>Extended Response (writing, performance or product):

Use visking tubing to model the small intestine.</td></tr>
</table>

Subject: Science	Unit Title: Energy changes and transfer	ARE Point: Year 7 block 3

Key Essentials:
Identify the energy stores and common transfers, describe how heat is transferred through different materials

Content:

Knowledge and Skills

Students will:
describe the use of insulators
identify energy stores
describe processes that involve energy transfer including changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels.
recall energy as a quantity that can be quantified and calculated;
recall the total energy has the same value before and after a change
Variety of energy transfer experiments WS 3a
Spirit burners, including deciding on best fuel WS 2g WS 1d
Maths skills 4a

Understanding

explain heating and thermal equilibrium; through temperature difference between two objects lead to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; and how such transfers reduce the temperature difference
compare power ratings of appliances.

WHY are children LEARNING this?

We are learning this so students can explain simple energy transfers e.g. what is happening when things are heated or lose heat.

We are learning this in order to

- identify energy stores and simple transfers
- Know that energy is measurable.
- Explain how heat is transferred through different mechanisms.
- Identify materials as heat conductors or insulators

Concepts:

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Misconceptions • When something cools down it is gaining coldness rather than losing energy. • Which energy types are stores and which can be transferred. • Energy is lost and disappears rather than is dissipated.	Writing: long answer assessment explaining heat transfers. Numeracy: 4a) construct a graph from data collected. 3c) Use the power equation P = E/T 3b) change the subject of the equation.
Terminology and Vocabulary (subject specific and academic): • relating to heat transfer, e.g. conduction, convection, radiation, insulator, conductor • with similar but distinct meanings, egg heat (as energy), temperature • relating to scientific enquiry, e.g. sample size, trial measurements, evaluation, prediction	**WHAT will PROGRESS look like in this unit?** Prior learning • • know that temperature is a measure of how hot an object is • can use a thermometer • know that metals are good thermal and electrical conductors • recall that evaporation occurs at the surface of a liquid • know about the particle model of matter • can describe differences between solids, liquids and gases
Extended Response (writing, performance or product): Create a heating and cooling curve of water. Conclusion of which fuel is provides the most thermal energy. Written assessment explaining the heat transfers in a pan of water when cooking.	**D-** compare conductivity of materials and relate this to their uses; use the particle model to explain change of state relating this to the forces between particles **O-** distinguish between heat and temperature, describe energy flow as the result of temperature difference; describe some uses of good conductors and insulators and examples of conduction in solids and convection in liquids and gases; explain conduction and convection, expansion and change of state in terms of the particle model **Y-** distinguish between heat and temperature, describe energy flow as the result of temperature difference; describe some uses of good conductors and insulators and examples of conduction in solids and convection in liquids and gases; explain conduction and convection, expansion and change of state in terms of the particle model

Subject: Science	Unit Title: Microbes and disease	ARE Point: Year 7 block 3

Key Essentials: The different types of microbes, the diseases they cause and how we can prevent diseases. .	**WHY are children LEARNING this?** To explain what causes diseases, how they are spread and how we can prevent them.
Content: **<u>Knowledge and Skills</u>** Students will: recall pathogens as disease causing organisms, these include, fungi and bacteria. Label diagrams of each and be able to identify them if given diagrams of them, using their key features. describe how the physical and chemical defences of the human body provide protection from pathogens. • recall that antibiotics can only be used to treat bacterial infections **Core practical**. Compare amounts of bacteria on washed and non-washed hands. WS 1c, 2a, 2d, 2f, 3e, 4d **<u>Understanding</u>** explain how pathogens are spread **explain the role of the specific immune system of the human body in defence against disease.** **explain how immunisation/vaccination works to protect against infection**	We are learning this in order to understand: • that micro-organisms share the characteristics of other living things • about growing micro-organisms, and about the role of micro-organisms in infectious diseases • about the body's defence systems and how immunisation can protect against microbial infections and describe how antibiotics may be effective across a wide spectrum or against specific bacteria
Concepts: Misconceptions Pupils sometimes find it hard to distinguish between infectious illnesses and other forms of illness, *eg dietary*	• **HOW will ORACY, NUMERACY, READING and WRITING be developed?** • Maths skills 5c • Writing – using key terms

Teachers will be aware of the need for sensitivity to pupils and their families who may have or have had, a particular illness or may have reduced resistance to infection.	
Terminology and Vocabulary (subject specific and academic): Use and understand scientific words and phrases relating to micro-organisms and diseases, *Eg. bacteria, viruses, fungi, measles, chickenpox, infection, pathogen, infectious disease,* words with precise meanings in scientific contexts, *eg immunity, virus, food poisoning* • words with similar but distinct meanings, *eg vaccination, inoculation and immunisation, antibiotic, anti-microbial*	**WHAT will PROGRESS look like in this unit?** Prior learning It is helpful if pupils: • know that micro-organisms are living organisms • have explored the characteristics of micro-organisms and know that they feed, grow and reproduce like other organisms • know that organisms respire aerobically and produce carbon dioxide during the process can name some diseases caused by micro-organisms
Extended Response (writing, performance or product): • Writing up method results, conclusion and evaluation of hand washing investigation.	**D-** explain how immunisation can improve immunity to certain diseases. **O-** Identify and classify bacteria, fungi and viruses as micro-organisms, name some of the diseases they can cause and describe how they can be transmitted; describe some of the defences the body has against disease and describe immunisation as a way of improving immunity; recognise that antibiotics are effective against bacteria but not against viruses **Y-** name some infectious diseases and describe how they can be transmitted; describe immunisation as a way of protecting against infectious disease

Subject: Science	Unit Title: Reproduction	ARE Point: Year 7 block 3

Key Essentials: The structure of the human reproductive system and how human babies are made.

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WHY are children LEARNING this?

We are learning this so we can explain how human babies are made.

Content:

<u>Knowledge and Skills</u>

Students will:

describe reproduction in humans (as an example of a mammal).

Include:

the structure and function of the male and female reproductive systems

the menstrual cycle (without details of hormones),

label and identify the gametes, egg and sperm cells

- the process of fertilisation,
- gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta

<u>Understanding</u>

relate the structure of the egg and sperm cell to their function. (Cell specialisation) E.g sperm cell has a tail so that it can swim.

describe heredity as the process by which genetic information is transmitted from one generation to the next.

- Include the idea that the nuclei from the ovum and sperm cell fuse at fertilisation so the parent's genetic information s passed on to the offspring. (There is no requirement to teach students about genetic diagrams.)

We are learning this in order to understand:

- about human reproduction and consider how offspring are protected and nurtured
- relate what they know of the way their bodies change during adolescence to knowledge about human reproduction, growth and the menstrual cycle

Concepts:	**HOW will ORACY, NUMERACY, READING and WRITING be developed?**
Misconceptions Pupils often have the misconception that fertilisation takes place in the vagina or the uterus. Reinforce the idea that fertilisation takes place in the fallopian tube/oviduct. Teachers should make reference to their school's sex-education policy and personal, social and health education (PSHE) programme. They will also be aware of the need for sensitivity to the personal circumstances of pupils and their families. Reassurance about the range of different secondary sexual characteristics can alleviate pupils' concerns and sensitivities about their stage of development.	• Write a story/ create a storyboard about the journey of the sperm cell to the egg cell
Terminology and Vocabulary (subject specific and academic): Use and understand scientific words and phrases relating to the names of reproductive organs, *eg ovary, testis, oviduct, uterus* • specialised terms, *eg menstruation, ovulation, fertilisation, placenta, sperm, gestation* • words with similar but distinct meanings, *eg hereditary and inherited, baby and foetus, puberty and adolescence* • words with different meanings in scientific and everyday contexts, *eg. cell, fuse*	**WHAT will PROGRESS look like in this unit?** Prior learning It is helpful if pupils: can describe the human life cycle in terms of infancy, childhood, adolescence, maturity and ageing know that organisms are made of cells which have a nucleus and that cells are adapted for their functions **D-** explain how egg and sperm cells are specialised, and describe how they carry the information for development of a new life **O-** identify and name the main reproductive organs and describe their functions; describe fertilisation as the fusion of two cell nuclei; describe egg and sperm cells; explain how the foetus obtains the materials it needs for growth; describe the gestation period and the menstrual cycle
Extended Response (writing, performance or product): • Write a story/ create a storyboard about the journey of the sperm cell to the egg cell • Make a model of sperm cell or an egg cell and evaluate the model.	

	Y- identify and name the main reproductive organs; describe fertilisation as the fusion of egg and sperm and identify the importance of the placenta in supplying food for a developing foetus

Subject: Science	Unit Title: Physical Changes	ARE Point: Year 7 block 4

Key Essentials:
To identify that physical changes and chemical reactions both conserve mass.

Content:

<u>Knowledge and Skills</u>

Students will:

describe Brownian motion in gases

describe diffusion in liquids and gases driven by differences in concentration

recall the difference between chemical and physical changes.

Experiments to show differences between physical and chemical changes WS 3a

<u>Understanding</u>

explain conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving

explain similarities and differences, including density differences, between solids, liquids and gases

WHY are children LEARNING this?

To explain the difference between physical changes and chemical reactions so students can identify these in their everyday lives.

We are learning this in order to

- Identify common observations as either chemical reactions or physical changes.
- Explain that mass is conserved in all changes.
- Understand that mass doesn't change in these reactions.

Concepts:

Misconceptions

That state changes are a chemical reaction.

That mass is lost when a physical change or chemical reaction occurs.

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Explaining the changes in diffusion and chemical changes.

Numeracy: 1a) use numbers in decimal form.

Terminology and Vocabulary (subject specific and academic): • Key words: Physical, chemical, state, mass, diffusion, Brownian motion.	**WHAT will PROGRESS look like in this unit?** Prior learning • know that there are many gases • have explored changes in which new materials are formed and which cannot easily be reversed • have experience of identifying solids, liquids and gases and describing the properties of each • know that the same material can exist as a solid, liquid and gas **D-** Explain diffusion using the idea of Brownian motion. **O-** Be able to explain the difference between physical and chemical changes. **Y-** identify that some new materials are formed during a chemical reaction
Extended Response (writing, performance or product): • Investigating factors affecting diffusion.	

Subject: Science	Unit Title: Acids and Alkalis	ARE Point: Year 7 block 4
Key Essentials: To define acids and alkalis, use indicators and begin to explore neutralisation.	**WHY are children LEARNING this?** Students are learning this so they can identify what an acid and alkali is and how they can neutralise it. This will allow them to deal with situations like this in real life e.g. bee stings. We are learning this in order to understand • How acids and alkalis behave • Neutralisation changes the acidity of these chemicals.	
Content: **<u>Knowledge and Skills</u>** Students will: define acids and alkalis in terms of neutralisation reactions recall the pH scale for measuring acidity/alkalinity and indicators colour changes • be able to identify the products of neutralisation. **<u>Understanding</u>** Testing pH with different indicators WS 3g, WS 2g		
Concepts: Misconceptions • Acids and alkalis are not found in common products. • Everyday items e.g. milk are not chemicals. • Mixing any acids and alkalis can cause explosions / extreme reactions. • Differences between pH and concentration.	**HOW will ORACY, NUMERACY, READING and WRITING be developed?** Numeracy: 2b) Averages (mean) of results from investigation. 4a) Potential graph drawing of results Writing methods for testing which indigestion remedy is best through a neutralisation reaction. Maths skills 2a, 2b, 5c	
Terminology and Vocabulary (subject specific and academic):	**WHAT will PROGRESS look like in this unit?**	

names of laboratory acids and alkalis, eg hydrochloric acid, sodium hydroxide names of classes of chemical, eg acid, alkali words with different meanings in scientific and everyday contexts, eg indicator, solution, neutral, react, equation • words with similar but distinct meanings, eg harmful, corrosive, caustic • words and phrases relating to scientific enquiry, eg hazard, risk, pH range, evaluate, strength of evidence	Prior learning • know that solids can dissolve and form solutions • have experience of mixing materials and seeing that new materials are formed as a result of a reaction **D-** explain how a neutral solution can be obtained and relate the pH value of an acid or alkali to its hazards and corrosiveness **O-** Name common acids and alkalis. Describe what happens to pH during neutralisation. Be able to use acids and alkalis safely. **Y-** Describe hazards of acids and alkalis. Be able to use indicators to classify chemicals. State everyday uses of acids and alkalis
Extended Response (writing, performance or product): • Investigating the strength of indigestion tablets.	

Subject: Science	Unit Title: Magnetism	ARE Point: Year 7 block 4

Key Essentials:
Magnets have a force-field around them that attracts three elemental metals. Like poles repel and unlike poles attract.

Content:

<u>Knowledge and Skills</u>
Students will:
recall how magnetic poles can attract and repel.
- Magnetism acts at a distance.

describe magnetic fields using representation of field lines
describe how navigation uses the Earth's magnetic field
- Magnetic field can be found using plotting compasses.

Plotting magnetic field with compass WS 3f

<u>Understanding</u>

WHY are children LEARNING this?

So that students can understand that there are invisible force-fields that act throughout the universe and these affect different materials in different ways.

We are learning this in order to
- identify magnetic materials
- use the concepts of a magnetic field
- use scientific knowledge and understanding to make predictions about the behaviour of magnets and magnetic material

Concepts:

Misconceptions
- 'all metals are magnetic' - in fact only three metals display ferromagnetic properties.

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Carrying out an investigation - predicting, gathering data, concluding (PEE / PEEL).

Terminology and Vocabulary (subject specific and academic):

WHAT will PROGRESS look like in this unit?
Prior learning

• *north-seeking pole, south-seeking pole, magnetic field, magnetic field line, compass*	• know that magnets attract magnetic materials • know that magnets can attract and repel other magnets • know that magnets have a range of uses in everyday life, e.g. *fridge door catches*.
Extended Response (writing, performance or product): • Design a test that will distinguish between two identical steel cylinders - which one is magnetised? [both are attracted but only the magnetised rod can be repelled].	**D-** use a model of the magnetic field to explain phenomena **O-** make predictions about the behaviour of magnets and magnetic materials and draw conclusions from patterns in evidence **Y-** suggest how to carry out a test to distinguish between magnets and magnetic materials

Subject: Science	**Unit Title: Electrical circuits**	**ARE Point: Year 7 block 4**
Key Essentials: Build and measure electrical circuits and calculate resistance of components.		**WHY are children LEARNING this?** To explain how electrical devices work to enable new devices to be designed for the future. We are learning this in order to • consolidate and extend their ideas about circuits • use concepts of electric current and energy transfer to explain the working of circuits in both series and parallel • explain patterns in the measurements of current and voltage • use the concept of resistance qualitatively, and quantitatively • build circuits in which current flow is usefully controlled
Content: **<u>Knowledge and Skills</u>** Students will: describe electric current, measured in amperes, in series and parallel circuits, describe potential difference, measured in volts, in series and parallel circuits and using battery and bulb ratings, recall that resistance is measured in ohms and is defined as the ratio of potential difference (p.d.) to current		

describe the differences in resistance between conducting and insulating components (quantitative). Core practical Investigate the resistance of different lengths of wire, using a voltmeter and ammeter. **<u>Understanding</u>** building variety of electrical circuits WS 2a, WS 2b, WS 2f, WS 3f. • Modelling current e.g. using pupils and sweets. • Describe directly proportional relationships explain how currents add where branches meet and current as flow of charge. • explain electrical energy as being delivered to components and hence voltage adds in a series circuit but is the same in a parallel circuit use V=IR and be able to rearrange and apply this equation	• consider the hazards of electricity for humans • explore early ideas about electric current • model current in a variety of ways • use ammeters and voltmeters • investigate how resistance is affected by the length of a wire.
Concepts: Current flows from +ve to -ve <u>by definition</u>. This is extremely important in order to explain physical phenomena e.g. motors etc. In a metal, electrons flow from -ve to +ve so technically in all circuits, the current is -ve e.g. -0.17A to show the direction. Students should practice tracing the flow of the current (with their finger) round circuit diagrams, and need practice building circuits themselves. Potential Difference is the <u>difference in electrical potential energy</u> between two points in a circuit, and is measured in Volts (e.g.10V before the bulb, 7V after the bulb, potential difference <u>across</u> the bulb = 3V)	**HOW will ORACY, NUMERACY, READING and WRITING be developed?** • Maths skills Use, apply and rearrange V=IR 2g, 3b, 3c, 3d, 4a, 4c • Group work on explaining conclusions for circuit rules on voltage and current before writing. • Use of specific vocabulary to describe circuits. • Write a full investigation on the length of a wire experiment.

<table>
<tr><td>Misconceptions
• Current is 'used up' around a circuit (actually current is the flow of charge, and charge is <u>always</u> conserved - current out of a cell = current returning).
• Voltage is a 'push' (actually, voltage is a measure of electrical energy - 1V = 1J per Coulomb).
• Electrons/current 'knows' how much 'voltage' to deliver (in actual fact the current is fixed by the total resistance, I = V/R, and the energy dissipated by each resister relates to the work done moving electrons through it P = I^2R)</td><td rowspan="2"></td></tr>
<tr><td>Terminology and Vocabulary (subject specific and academic):
• circuit components, e.g. battery, cell, bulb or lamp, connecting wire,
• switch, power supply, fuse
• electrical concepts, e.g. current, resistance, energy transfer
• electrical measurements e.g. Potential Difference (V,) Current (A), Resistance (Ohms)</td></tr>
<tr><td>Extended Response (writing, performance or product):

• Writing a summary of Kirchhoff's laws that is clearly backed up by their evidence.
• Write a full investigation into the resistance of a wire.</td><td rowspan="2">WHAT will PROGRESS look like in this unit?
Prior learning
• recall that a complete circuit is required for electrical devices to work
• can connect a circuit
• can draw and interpret standard electrical symbols for connection, cell/battery, bulb and switch.

D- relate voltage of cells and batteries qualitatively and quantitatively to energy transfer in circuits; use a flow model to explain the difference between electric current and energy transfer; apply the idea that nerves are electrical conductors to explain electrical hazards; explain and calculate resistance of components.
O- construct a range of working electrical circuits and represent these in circuit diagrams; state that electric current is the same at all points in a series circuit and divides along the branches of a parallel circuit; use a flow model to describe resistance and to distinguish</td></tr>
</table>

	between electric current and energy transfer in a circuit; compare and contrast the advantages of series and parallel circuits in use, e.g. *fuses, ring main*; complete simple resistance calculations **Y-** construct simple electrical circuits and represent these diagrammatically; give examples of useful circuits; state safety rules for use of electricity

Subject: Science	Unit Title: Chemical reactions	ARE Point: Year 8 Block 1
Key Essentials: Structure of an atom, understanding of elements as the building blocks of all materials	**WHY are children LEARNING this?** To understand the fundamental building blocks of the universe.	
Content: **<u>Knowledge and Skills</u>** Students will: describe combustion, thermal decomposition, oxidation and displacement reactions using word equations • combustion - students should know the fire triangle and the general equation for burning a hydrocarbon fuel. • thermal decomposition of carbonates – could be used to link with conservation of mass and the mass lost when heating a carbonate. • oxidation – investigation of the factors affecting rusting and how rusting can be prevented • displacement - perform a variety of displacement replacement reaction some that displace and some that don't, leading to reactivity series WS 3f. the reactions of acids with metals to produce a salt plus hydrogen • students should know the word equation for this and the test for hydrogen. Reaction of Mg, Cu, Al, could be used to construct a simple reactivity series, although this is covered in detail in a later topic describe the reactions of acids with alkalis to produce a salt plus water • student should write the word equations and apply naming conventions for salts – building on acids and alkalis topic from Year 7 block 4. describe the chemical properties of metal and non-metal oxides with respect to acidity.	To understand how new substances can be formed through chemical changes, and that the new substances are different from the ones from which they are made. To understand how chemical reaction can be useful to us in forming materials and substances that we use and how they need to be used carefully, for example combustion and particularly fire safety.	

<table>
<tr><td><u>Understanding</u>

• explain chemical reactions as the rearrangement of atoms – could link back to ideas of conservation of mass
• represent chemical reactions using formulae and using equations</td><td></td></tr>
<tr><td>Concepts:
The unit relates to, and expands upon atoms and elements from Year 7 Block 1, Physical changes and Acids and Alkalis from Year 7 Block 4 (comparing physical and chemical changes).</td><td>HOW will ORACY, NUMERACY, READING and WRITING be developed?
Writing – Using key terms.

Maths skills 1c</td></tr>
<tr><td>Terminology and Vocabulary (subject specific and academic):
Through the activities in this unit pupils will be able to understand, use and spell correctly:
• names of gases, eg hydrogen, oxygen, carbon dioxide, methane
• names of other elements and compounds, eg carbon, zinc, calcium carbonate
• words and phrases describing chemical reactions, eg reactant, product, word equation
• words and phrases relating to scientific enquiry, eg line graph, generalisation, evaluate</td><td rowspan="2">WHAT will PROGRESS look like in this unit?
Prior learning
• students should have an understanding of the difference between an element, mixture and compound.
• They will have experienced a variety of different chemical reactions and should know the difference between a chemical and a physical change.

D- : some students will have progressed further and will: predict that carbon dioxide and water will be made when a hydrocarbon burns and use word equations to represent reactions such as combustion, decomposition, displacement

O- most students will identify that some new materials are formed during a chemical reaction and generalise that hydrogen is formed when acids react with metals, carbon dioxide when acids react with carbonates, and oxides when materials burn; describe tests for carbon dioxide and hydrogen and describe burning as a reaction with oxygen</td></tr>
<tr><td>Extended Response (writing, performance or product):

Extended response analysis and evaluation of rusting experiment.</td></tr>
</table>

	Y- some students will not have made so much progress and will: identify some products of chemical reactions and state that oxygen or air is needed for burning

Subject: Science	Unit Title: Forces and Motion	ARE Point: Year 8 block 1

Key Essentials:
Speed calculations. Effect of forces on speed

Content:

Knowledge and Skills

Describe the forces needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)

- Use words balanced, unbalanced, resultant. Calculate the resultant force for one dimensional examples e.g. forward force of 550N and backwards force of 300N

Define speed and describe the quantitative relationship between average speed, distance and time (speed = distance ÷ time) and to rearrange and apply this equation.

- Investigate speed of cars down ramps, measure pupil walking/running speed, perform calculations.
- Calculating the speeds of different toys WS 2g WS 3c
- Units are essential. Convert from cm to m; use mph, km/h and m/s
- **Can introduce unit: ms^{-1}**

Describe how a force produces a change depending on its direction and size.

- Students should be able to identify and name the forces for situations where an object is: speeding up; slowing down; at a steady speed; changing direction.
- Investigate speed of falling cupcakes – how does changing the mass [no. of nestled cakes] affect the falling speed? NB need to

WHY are children LEARNING this?

We are learning this so we can explain how to predict the future using a scientific law

We are learning this in order to

- use the concept of speed
- consider the relationship between forces (including balanced forces) on an object, and its movement
- study the effects of water and air resistance on speed, and how streamlining reduces these effects
- use ideas of balanced and unbalanced forces to explain the movement of falling objects

use speed as a variable to include calculations and link to force effects. • Discussion on the design of vehicles to reduce air resistance e.g. Bloodhound. Describe gravitational forces between Earth and Moon, and between Earth and Sun (qualitative only) • Lots of data analysis questions. Can draw graph of force vs distance.. **<u>Understanding</u>** **Represent and explain the representation of a journey on a distance-time graph** • Note that the speed is the gradient of the graph (link to mathematics "the equation of a line"). Explain gravity as a force, and use and apply the equation weight = mass x gravitational field strength (g), on Earth g=10 N/kg and different on other planets Core practical - Investigate how length of wing of a helicopter affects the time of flight. WS 1b, 2b, 2f, 2g, 3a, 3c, 4c	
Concepts: Misconceptions On Earth the presence of friction leads to confusion about forces and motion.	**HOW will ORACY, NUMERACY, READING and WRITING be developed?** Numeracy – speed calculations Maths skills Use, apply and rearrange speed = distance/time 3b, 3c, 3d, 4a, 4c Writing – investigation reports Oracy – explaining tables of data on gravitational forces to class

Objects travel at a steady speed in a straight line UNLESS there is an unbalanced force. Balanced forces = steady speed (including a speed of zero). Check algebra skills when re-arranging. There is air resistance in space.	Oracy – justifying design of streamlined objects.
Terminology and Vocabulary (subject specific and academic): Speed Distance Time Metres, miles, kilometres, seconds, m/s, km/h, mph. Balanced, unbalanced, resultant. acceleration	**WHAT will PROGRESS look like in this unit** **Prior learning -** • Students can use the concept of speed and describe changes of speed and know that unbalanced forces cause a change in movement. D- use the definition of speed in calculations and conversions from different units; relate change in movement of an object to its mass and the forces acting upon it; explain increased air resistance with the speed of an object, using the particle theory O- manipulate and apply the relationship between speed, distance and time; relate forces acting on an object to its movement; describe how streamlining reduces resistance to air and water and how this resistance increases with the speed of the object, and relate this to the particle model; apply ideas of unbalanced and balanced forces to falling objects Y- compare speeds; describe how forces change movement; give examples of streamlined objects; identify the forces acting on an object
Extended Response (writing, performance or product): • Investigations into walking students, falling cupcakes, cars-down-ramps • Core practical - Investigate how length of wing of a helicopter affects the time of flight. WS 1b, 2b, 2f, 2g, 3a, 3c, 4c	

Subject: Science	Unit Title: Gas exchange and cellular respiration	ARE Point: Year 8 block 2

Key Essentials:
Structure of the human gas exchange system. The importance of aerobic and anaerobic respiration in living things.

Content:

<u>Knowledge and Skills</u>

Recall the structure and functions of the gas exchange system in humans

Describe the role of diffusion in the movement of materials in and between cells

Describe aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life

Recall a word summary for aerobic respiration

Describe the process of anaerobic respiration in humans and a word summary for anaerobic respiration

- Time for lactic acid build up, for example when holding weights. WS3 3e

<u>Understanding</u>

Explain the adaptations of gas exchange systems to function

Explain the impact of exercise, asthma and smoking on the human gas exchange system

Explain the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism

Explain diffusion in terms of the particle model

WHY are children LEARNING this?

We are learning this so we can explain how plants and animals get the energy they need for life.

We are learning this in order to understand:

- how cells are supplied with the materials they need for respiration
- how cells in animals and plants release energy
- that the process of respiration is similar in all cells

<table>
<tr><td>• Different examples of diffusion WS 3f</td><td></td></tr>
<tr><td>Concepts:

Misconceptions – At this point teachers may wish to reinforce the idea that respiration and breathing have different scientific meanings.
Pupils often think that plants photosynthesise but do not respire. It is helpful to emphasise that plants do respire before photosynthesis is studied.</td><td>HOW will ORACY, NUMERACY, READING and WRITING be developed?
Numeracy – Maths skills
Time for lactic acid build up, for example when holding weights. WS3 3e
Different examples of diffusion WS 3f

Maths skills 2g
Writing – Using key terms.</td></tr>
<tr><td>Terminology and Vocabulary (subject specific and academic):
understand, use and spell correctly:
• names of organs of the chest linked to breathing, eg lung, trachea, bronchus, ribcage
• names of cells and tissue substances linked to circulation, eg red blood cell, haemoglobin, artery, vein
• more specialised scientific vocabulary, eg carbon dioxide, oxygen, diffusion
• words with similar but distinct meanings, eg breathing, ventilation, inspire, respire, inhale, exhale
• words with different meanings in scientific and everyday contexts, eg inspiration, aerobic, ventilation</td><td rowspan="2">WHAT will PROGRESS look like in this unit?
Prior learning
• that air contains carbon dioxide and oxygen, with other gases
• that smaller molecules, including glucose, are produced from larger
• ones in digestion
• that cells are organised into tissues and tissues can form organs

D- represent the process of aerobic respiration as a word and/or symbol equation and identify similarities with the burning of fuels; describe the features of alveoli and explain how damaged alveoli result in less gas exchange
O- describe the role of blood in transporting carbon dioxide from, and oxygen to, the lungs and explain why tissues need a good blood supply; describe aerobic respiration as a reaction with oxygen; describe some effects of an inadequate oxygen supply; describe and explain differences between inhaled and exhaled air and identify similarities in aerobic respiration in plants and animals</td></tr>
<tr><td>Extended Response (writing, performance or product):</td></tr>
</table>

	Y - recognise that oxygen is required for aerobic respiration and that oxygen and glucose are transported in the blood; describe differences between inhaled and exhaled air

Subject: Science	Unit Title: Waves	ARE Point: Year 8 block 2

Key Essentials:
Describe how sound and light travel through waves.

Content:

<u>Knowledge and Skills and understanding</u>

Students will:

<u>Observed waves</u>, describe waves on water as undulations which travel through water with transverse motion.

- Observe waves in water e.g. with a ripple tank WS 2g WS 3e
- Label the key features of a transverse wave

explain echoes, reflection and absorption of sound; explain how these waves can be reflected, and **add or cancel – superposition**

<u>Sound waves</u>

Define the term frequency and that it is measured in Hz
Use, apply and rearrange speed = distance / time
Use, apply and rearrange v=fλ

- calculate the speed of sound in air, in water, in solids.
- State that sound needs a medium to travel

explain how sound is produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal,
state the auditory range of humans and animals.

- Describe how sound is produced e.g. in a loud speaker
- Describe how sound is detected in the ear
- Describe how sound is detected by a microphone
- Explain how sound is reflected (echoes) or absorbed

WHY are children LEARNING this?

We are learning this so we can describe how sound and light transfer information for sight and sound.

We are learning this in order to

- Identify similarities and differences of phenomena involving waves
- Perform calculations to evaluate the movement of waves.
- Explain why we see and hear as we do.

• **Explain how sound waves can add or cancel - superposition** <u>Light waves</u> recall that light waves can travel through a vacuum and at the speed of light, explain the similarities and differences between light waves and waves in matter • Recall that light travels in straight line, through a vacuum at the speed of light. • Explain similarities between light waves and waves in matter. use the ray model to explain imaging in mirrors and the refraction of light. describe the transmission of light through materials: absorption, diffuse scattering and **specular** reflection at a surface, properties of light investigations, for example reflection, refraction, dispersion • Recall the key terms for reflection and refraction • Draw ray model diagrams to explain reflection in mirrors • Investigate angles of reflection • **Explain scattering and specular reflection** • Use ray diagrams to describe refraction of light through materials. Describe colours as different frequencies of light, white light; explain the use of prisms (qualitative only) in differential colour effects in absorption and diffuse reflection. • Describe white light as a mixture of different wavelength of light	

• Explain how prisms split light • Explain how absorption of light relates to colour Properties of light investigations, for example reflection, refraction, dispersion WS 3f	
Concepts: Misconceptions – Light is only reflected from shiny surfaces Different wavelengths of light travel at different speeds Distance light travels depends on light intensity. Light needs air to travel Hitting an object harder changes the pitch of the sound produced Loudness and pitch of sounds are the same things Sounds cannot travel through liquids and solids. Sound waves are transverse waves (like water and light waves)	**HOW will ORACY, NUMERACY, READING and WRITING be developed?** Writing – Using key terms -comparison of types of waves. Concluding results of experiments e.g. refraction. Numeracy – calculating speed of waves through speed = distance / time and v=fλ Maths skills Use, apply and rearrange v=fλ and speed = distance/time 3b, 3c, 3d, 4a
Terminology and Vocabulary (subject specific and academic): • relating to the behaviour of light and its interaction with materials, eg transparent, opaque, spectrum, reflection, refraction • with similar but distinct meanings in everyday use, eg image, reflection • words and phrases describing features of sound, eg loud, soft, quiet, high, low, pitch, noise pollution, temporary deafness • words to describe sound vibrations, eg frequency, amplitude, wave • words with different meanings in scientific and everyday contexts, eg quiet, soft, low, pitch, wave, loudness, volume, dynamics	**WHAT will PROGRESS look like in this unit?** Prior learning: • that light travels from a source; • the key terms opaque, transparent and translucent materials and relate shadow formation to opaque materials; • light is reflected from shiny surfaces • that we see things only when light from them enters our eyes; • that sounds are produced by vibrating sources and that sounds produced by musical instruments can be changed
Extended Response (writing, performance or product): A conclusion explaining results from an investigation into the angles of refraction.	**D-** relate pitch to frequency of sounds and loudness to amplitude; use a model of the ear to discuss possible causes of hearing impairment; draw conclusions from their data of reflection and refraction; calculate the time for light to travel; describe general

	features and properties of waves, including superposition; describe and explain reflection, refraction, dispersion, colour. **O-** relate changes in pitch and loudness of sounds to changes in vibrations; recognise that sound needs a medium to travel through and that it travels at different speeds through different media; explain simply how the ear works and give examples of hearing ranges; compare the effects of materials on light; represent the path of light by rays; describe how light is reflected and refracted at plane surfaces; explain the origin of colour in the dispersion of white light **Y-** relate sound to vibration; explain that sound waves cause our eardrums to vibrate and that this enables us to hear; classify materials as opaque, transparent, translucent, reflectors or absorbers; identify patterns in reflected rays of light; describe how light is reflected at plane surfaces and describe reflected images

Subject: Science	Unit Title: Evolution	ARE Point: Year 8 block 3
Key Essentials: Describe variation within and among species, and how evolution leads to the survival of a species.		**WHY are children LEARNING this?** To understand how variation can lead to new species or extinction.
Content: **<u>Knowledge and Skills</u>** Students will: • describe the differences between species • recall the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation **<u>Understanding</u>** • explain how the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • explain how changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • **explain the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.** • Ethics of extinction WS 1f • Development of theories of evolution WS1a		We are learning this in order to • explore variation within and between species • investigate patterns of variation in living things and ways of representing and explaining the occurrence of variations • understand about variations arising from inherited and environmental differences
Concepts: Misconceptions		**HOW will ORACY, NUMERACY, READING and WRITING be developed?** • Maths skills 2a, 2b, 2c, 2f, 4a, 4c, 5c

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- Characteristics are developed in an organism's lifetime is passed on in the genes, eg a giraffe's neck becomes longer in its lifetime due to stretching for high branches and that this is passed on. Rather than giraffes with a long neck genetic mutation are more likely to survive to reproduce and pass that genetic information to offspring.

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Terminology and Vocabulary (subject specific and academic):

- Use and understand scientific words relating to evolution eg inheritance, species.
- more specialised words relating to evolution, eg variation
- words and phrases with similar but distinct meanings, eg environmental characteristics, genetic characteristics, survival, adaptation.

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WHAT will PROGRESS look like in this unit?

Prior learning

- individuals of a species show characteristics which may be environmentally determined or inherited
- sexual reproduction involves the fusion of a male and female cell
- organisms are well adapted for the environment that they live in

D- explain clearly how evolution leads to characteristics advantageous to survival to passed onto offspring, and how extinction of species can occur.

O- describe how some characteristics are influenced by environmental conditions; identify characteristics in a plant or animal which are advantageous in particular circumstances; outline how these characteristics might be passed on;

Y- identify some inherited characteristics and some influenced by environmental conditions; identify some characteristics of an animal or plant which are advantageous in particular circumstances

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Extended Response (writing, performance or product):

- Piece of writing about evolution or extinction.

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Subject: Science	Unit Title: Energy in Chemical Reactions	ARE Point: Year 8 block 3

Key Essentials:
Describe that reactions can either give out or take in heat.

Content:
<u>Knowledge and Skills</u>

Students will:
- describe how energy changes with change of state (qualitative)
- describe exothermic and endothermic chemical reactions (qualitative).
- Thermite demonstration WS 2d

<u>Understanding</u>

WHY are children LEARNING this?

To describe that some reactions take in energy and some reactions release energy

We are learning this in order to
- Recall how energy affects a change in state
- Define the terms exothermic and endothermic.
- Be able to investigate energy changes in reactions.

Concepts:

Misconceptions
- Ice gives out coldness.
- Misconceptions about where the energy comes from (not linking to bonds)
- Confusion about energy changes needing activation energy. If it's giving out energy why do you need to put energy in?

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Writing: Conclusion of investigation into heat transfers in reactions.

Numeracy: 1a) calculating energy changes using decimal places.
4a) Drawing sketch graphs to show energy changes

Terminology and Vocabulary (subject specific and academic):
- Specific terms: Heat, thermal, exothermic, endothermic, bonds, activation energy.

WHAT will PROGRESS look like in this unit?
Prior learning
- Describe states of matter in terms of particles.

Extended Response (writing, performance or product): • Conclusion of investigation into exo and endothermic reactions.	• know that burning involves a reaction with oxygen in which oxides are formed • know that new materials are formed when chemical reactions occur and can identify evidence of these • have used symbols and formulae and word and/or symbol equations • displacement reactions **D-** reconcile observations in which mass appears to be lost with the principle of conservation of mass, and represent some reactions by symbol equations **O-** describe how chemical reactions are used as a source of energy; represent chemical reactions by word equations **Y-** name some products produced by chemical reactions and identify burning as a reaction which produces energy

Subject: Science	Unit Title: Metals and reactivity	ARE Point: Year 8 block 3

Key Essentials:
Describe how we can use the reactivity series to predict reactions of metals.

Content:
<u>Knowledge and Skills</u>
Students will:
describe the order of metals and carbon in the reactivity series

- Describe reactions of metals & metal carbonates with acids
- Identify the test for hydrogen
- Identify the test for carbon dioxide
- Describe the pattern of reactivity in group 1 metals.

Thermite demonstration WS 2d

<u>Understanding</u>

- explain the use of carbon in obtaining metals from metal oxides
- describe the reaction of metals with acids.
- describe the reaction of metal carbonates with acids.

WHY are children LEARNING this?

We are learning this so we can describe where the metals we use in everyday life come from and how we process them.

We are learning this in order to

- Describe the reactivity series
- Describe patterns in the reactivity of metals
- Explain how metals are extracted from their ores.

Concepts:

Misconceptions

- Metals are all found pure in the ground.
- Metals disappear in water.
- Fizzing is a result of CO_2/O_2/ air being produced in reactions of metal and acids.

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Writing: written method for making copper sulfate.
Written explanation of how metals are extracted, linked to the reactivity series.

Terminology and Vocabulary (subject specific and academic): • names of compounds, including salts, e.g. magnesium sulphate, copper carbonate, copper nitrate, sodium chloride, potassium nitrate, recognising that the whole name is needed to specify a compound • words with different meanings in scientific and everyday contexts, e.g. salt, reaction, product • words and phrases relating to scientific enquiry, e.g. visible change, evidence of reaction	**WHAT will PROGRESS look like in this unit?** Prior learning • can name some metals, understanding that they are elements, and can give some of their characteristics • know that atoms join together in different ways when chemical reactions take place • have represented some elements and compounds by symbols and formulae • understand that chemical reactions can be represented by word, particle and symbol equations **D-** represent chemical compounds by formulae and combine these into symbol equations; use knowledge of reactions to make predictions about other reactions **O-**describe how metals react with acids and how acids react with metal carbonates, metal oxides and alkalis; identify evidence which indicates that a chemical reaction has taken place; represent reactions by word equations, identify patterns in these and produce general equations; name a variety of salts and describe the uses of some of them some pupils will not have **Y-** identify that hydrogen is produced when many metals react with acids, and carbon dioxide when acids react with carbonates, and describe tests for hydrogen and carbon dioxide; state that the production of a new material is evidence of a chemical reaction
Extended Response (writing, performance or product): • Written method for making copper sulfate crystals. • Explanation of metal extraction linked to reactivity series.	

Subject: Science	Unit Title: Photosynthesis	ARE Point: Year 8 block 4

Key Essentials: How plants make their food through photosynthesis

Content:

Knowledge and Skills

Students will:
recall the reactants in, and products of, photosynthesis, and a word equation for photosynthesis

- recall and label the structure of a leaf and how it is adapted for photosynthesis.

describe the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis and to maintain levels of oxygen and carbon dioxide in the atmosphere
Investigate how light affects photosynthesis. (Elodea bubbles in water WS 2g)

Understanding

- **explain how plants make carbohydrates in their leaves by photosynthesis and gain mineral nutrients and water from the soil via their roots. (Refer back to root hair cells)**
- Investigate where starch is stored in a leaf. WS 2f, 2g, 3a, 3f

WHY are children LEARNING this?
We are learning this so that we can explain why plants are so important for the survival of all life on Earth.

We are learning this in order to understand:

- about photosynthesis as the key process producing new plant biomass
- that the carbon dioxide for photosynthesis comes from the air and that the water is absorbed through the roots
- that chlorophyll enables a plant to utilise light in photosynthesis
- about the role of the leaf in photosynthesis
- about the importance of photosynthesis to humans and other animals

Concepts: Misconceptions A common misconception is that plants obtain their food from the soil. It is worth establishing that this is not the case early on in the teaching sequence, and reinforcing this idea throughout the unit.	**HOW will ORACY, NUMERACY, READING and WRITING be developed?** • Maths skills 4a, 4c • Writing using key terms. • Writing up the method, analysis and evaluation for the pondweed investigation work.
Terminology and Vocabulary (subject specific and academic): understand, use and spell correctly: • specialised words, *eg. palisade cell, chlorophyll, biomass* • words with similar but distinct meanings, *eg glucose and sugar* • composite words, *eg photosynthesis, biomass*, and explore their meaning	**WHAT will PROGRESS look like in this unit?** Prior learning It is helpful if pupils: • know how organisms are sorted into groups based on features in common • can describe the basic structure of plants, *eg leaf, root, stem, flower* • know the conditions that plants need to grow well • know that green plants take in water through their roots and that the leaf plays a part in photosynthesis • know that respiration releases carbon dioxide **D-** describe how cells in the leaf and root are adapted for photosynthesis and for taking in water; represent photosynthesis as a symbol equation; describe the relationship between photosynthesis and respiration in plants **O-** identify carbon dioxide from the air and water as the raw materials, and light as the energy source, for photosynthesis; explain photosynthesis as the source of biomass and represent photosynthesis by a word equation; describe how leaves are adapted for photosynthesis and how roots are adapted to take in water;
Extended Response (writing, performance or product): • How light affects the rate of photosynthesis investigation. (Elodea producing oxygen bubbles underwater) WS 2g. Writing a method, collecting primary data, analysis and evaluation of investigation.	

	distinguish between photosynthesis and respiration in plants **Y-** identify carbon dioxide from the air and water as the raw materials for photosynthesis; recognise that plants take in water through their roots and that photosynthesis takes place in leaves

Subject: Science	Unit Title: Relationships in Ecosystems	ARE Point: Year 8 block 4

Key Essentials:
Drawing and interpreting food chains and webs, and how the populations within them can change.

Content:
<u>Knowledge and Skills</u>

Students will:
describe the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops

- create their own food chains and food webs
- interpret webs
- drawing pyramids of numbers

describe the principles of sampling as applied to scientific data.
sample using quadrats (WS 2e)

<u>Understanding</u>
explain how organisms affect, and are affected by, their environment, including the accumulation of toxic materials

- use food webs to analysis effects of population changes following increases/decreases prey and predators.

consider the ethical issues in using pesticides WS 1c

WHY are children LEARNING this?

To explain how organisms depend on each other in an ecosystem.

We are learning this in order to

- understand how sizes of populations can be modelled qualitatively
- understand how living things within a community influence each other and are affected by the environment

Concepts:

Misconceptions

HOW will ORACY, NUMERACY, READING and WRITING be developed?

Maths skills 2c, 2d

• Pyramids of numbers relate to the quantity of organisms in a habitat, not their mass.	
Terminology and Vocabulary (subject specific and academic): • words and phrases relating to the environment, *eg community, habitat, pyramid of numbers* • words with similar but distinct meanings, *eg predator, carnivore, habitat, environment, ecosystem* • words and phrases relating to the classification of plants, *eg taxonomic group, mosses, ferns, conifers* • words and phrases relating to an investigation of a habitat, *eg environmental conditions, quadrat sampling, transect, population sizes, reliable data*	**WHAT will PROGRESS look like in this unit?** Prior learning • know that different living things live in different habitats • can describe ways in which animals and plants are adapted to survive in a habitat • can represent feeding relationships by food chains and food webs • know that organisms can be classified into animals and plants and **D-** explain how pyramids of numbers represent feeding relationships in a habitat **O-** relate the abundance and distribution of organisms to the resources available within a habitat and begin to represent this using pyramids of numbers **Y-** name some organisms found in a habitat, recognise that the abundance and distribution of organisms is different in different habitats
Extended Response (writing, performance or product): • Written piece about the advantages and disadvantages of pesticides.	

Subject: Science	Unit Title: Earth and Atmosphere	ARE Point: Year 8 block 4

Key Essentials:
Describe the evolution of the Earth's atmosphere, structure of the earth and effect of humans on climate, specifically power stations.

Content:

<u>Knowledge and Skills</u>

Students will:

- state the composition of the Earth
- describe the structure of the Earth
- describe the carbon cycle

<u>Understanding</u>

- explain how the production of carbon dioxide by human activity has an impact on climate
- Evaluating evidence for and against climate change WS 1f
- describe and explain different methods of generating electricity including burning fossil fuels and renewable energy resources.
- Evaluating different electricity generation methods WS 1d

WHY are children LEARNING this?

So they can describe the atmosphere, and what we can do to keep it healthy for humans in the future.

We are learning this in order to

- State how the atmosphere has changed over time.
- Describe the structure of the Earth.
- Describe the carbon cycle.
- consider how the atmosphere and water resources are affected by natural processes and the activity of humans
- consider the nature and origin of fossil fuels and renewable sources of energy and how their use has implications for the environment
- Evaluate power stations in terms of impact on the atmosphere & environment

Concepts:

Misconceptions

- Most students have no grasp on the scale of geological time in epochs.
- Students often fail to grasp the scale of global warming - an average rise of 1-degree will be devastating but this seems like a very small number.

HOW will ORACY, NUMERACY, READING and WRITING be developed?

- Maths skills 4a, 4c
- Class debate on power stations
- Writing a balanced argument for/against power stations

• Global warming is not affected by human heat production e.g. leaving the front door open. • Some pupils struggle to conceptualise the fact that the carbon in Carbon Dioxide is the same as the carbon in cellulose in a tree i.e. trees are 'built' out of air and water. • Plants respire all the time, and also photosynthesise during the day. • Pupils often confuse <u>energy stored</u> with <u>types of power station</u> e.g. 'wind' is not an energy store, but 'kinetic' is. • Diagrams of the Earth often lead pupils to think that the relative thickness of the crust is far higher than it actually is. • Difference between lava and magma.	
Terminology and Vocabulary (subject specific and academic): • relating to the environment, e.g. vegetation cover, acid rain, catalytic converter, air and water quality, global warming • words with similar but distinct meanings, e.g. energy, activity, force, power, fuel • Technical vocabulary, magma, core, crust, lava, turbine, generator, national grid, fuel, hydroelectricity, geothermal, ozone, global warming, carbon cycle, decomposer, respiration, photosynthesis	**WHAT will PROGRESS look like in this unit?** Prior learning • know that there are rocks under the surface of the Earth and that soils come from rocks • know that electricity comes from power stations. • know that carbon dioxide is a gas **D-** compare the advantages and limitations of a range of energy resources; give examples of how to use fuel economically; describe a variety of environmental issues and explain the implications of these; compare the impact of different processes on the amount of Carbon in the atmosphere. **O-** state that fuels release energy when burnt and describe how renewable energy resources can be used to generate electricity and provide heating; explain why conservation of fuels is important; describe how air and water pollution are monitored and how they
Extended Response (writing, performance or product): • Letter to your MP campaigning for/against a local power station.	

	might be controlled; distinguish between different environmental problems; describe the structure of the earth and its atmosphere; list processes that add or remove carbon from the atmosphere. **Y-** name a range of fuels used domestically and in industry and some renewable energy resources; give examples of how to save fuels; describe some of the consequences of acid rain and of other forms of pollution; identify why it is important to monitor and control pollution; label a diagram of the earth's structure; label a simple diagram of the carbon cycle.

DOYA Exemplification

- Deepening (D): describes a child who has reached the year group expectation and is now taking this deeper into more abstract work. These children are following their passion within a broad curriculum that inspires the full range of attainment and interest.
- On track/Working at current age related expectation (O): describes a child who is working at the age related expectation and fulfils all the descriptors.
- Yet to be on track (Y): describes a child who shows some working at age related expectations by fulfilling some of the descriptors, but is not yet on track to achieve all of them.
- At an earlier stage in their learning journey (A): describes a child who working at a level below the age related expectation, typically around a year behind.

Working Scientifically

Deepening

I can explain whether my prediction was correct and give scientific explanations.
I can recognise different variables in investigations and I can choose the range of the measurements I will make for my independent variable.
I can anticipate lots of risks associated with the equipment used in the practical and explain suggestions to control them.
I can suggest alternative equipment that would generate more accurate and reliable results. Explaining the reasons for these choices.
I can plan for repeated readings and mathematical calculations within my table.
I can assess how good the evidence is and decide if it is good enough to support my conclusion
I can say what was good and bad about my method. I can then suggest how I can improve my method and why this would improve it.
I can say what was good and bad about my model. I can then suggest how I can improve my model and why this would improve it.

On age related expectation

I can give scientific explanations for my prediction
I can recognise different variables in investigations and select the most suitable to investigate.
I can describe common risks and make suggestions to control them.
I can explain the reasoning behind my choice of equipment for this practical.

I can include appropriate units in my headings.
I can make conclusions using data, I can recognise anomalies
I can say what was good and bad about my method and how I can improve it
I can say what was good and bad about my model and how I can improve it.

Yet to meet required standard

I can give reasons for my prediction
I can state how to carry out a fair test in an investigation and describe how to keep control variables the same.
I can identify risks associated with hazards.
I can select all of the equipment needed to investigate an idea
I can label the headings appropriately
I can identify patterns in data to draw conclusions
I can say what was good and bad about my method.
I can describe how my model shows the scientific idea.

Scientific Content

Deepening

Has a detailed and extensive knowledge of the scientific content.
Can apply knowledge to a range of new and abstract contexts.
Can synthesis information from across a variety of different topics to explain a scientific phenomenon.
Routinely uses accurate scientific terminology in a range of contexts.
Can independently choose and manipulate equations to get a final answer.
Can use and convert between SI units and give answers to appropriate precision.

On age related expectation

Has secure subject knowledge
Can apply knowledge to a range of everyday contexts when directed.
Can explain scientific phenomenon unique to the current topic.
Consistently uses appropriate scientific terminology relevant to the current topic.

Can use equations to calculate quantities.
Can use SI units routinely and give answers to appropriate precision with support

Yet to meet required standard

Has incomplete subject knowledge.
Can apply knowledge to simple familiar contexts.
Has limited understanding of scientific phenomenon and finds explanations difficult.
Can use scientific vocabulary and occasionally scientific terminology relevant to the current topic.
Can perform simple calculations with support.
Can use SI units with support.