

Inspire, Challenge, Enrich

SUBJECT/YEAR - Curriculum maps

Department mission/curriculum statement: e.g. Science department aims to enable students to appreciate the awe and wonder of the world around them, by giving them the skills and knowledge to make informed decisions in a rapidly changing society.

Year 7	Autumn HT 1	Autumn HT 2	Spring HT 1	Spring HT 2	Summer HT 1	Summer HT 2
Topic and/or Key Question	Science Investigation Skills B1.1 Cells C1.1 Particles and their behaviour	P1.1 Forces B1.2 Structure and function of body systems	C1.2 Elements, atoms and compounds P1.2 Sound	B1.3 Reproduction C1.3 Reactions	P1.3 Light C1.4 Acids and alkalis	P1.4 Space
Key Knowledge/Skills Main skills (subject specific and generic) that will be developed and how	<u>B1.1 Cells</u> - cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope - the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts - the similarities and differences between plant and animal cells - the role of diffusion in the movement of materials in and between cells - the structural adaptations of some unicellular organisms - use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety - make and record observations and measurements using a range of methods for different investigations; <u>C1.1 Particles and their behaviour</u> - the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure - similarities and differences, including	<u>P1.1 Forces</u> - forces as pushes or pulls, arising from the interaction between 2 objects - using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces - forces measured in Newtons, measurements of stretch or compression as force is changed - opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface - forces: associated with deforming objects; stretching and squashing – springs - force-extension linear relation; Hooke's Law as a special case - opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface - energy changes on deformation - forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) - change depending on direction of force and its size	<u>C1.2 Elements, atoms and compounds</u> - differences between atoms, elements and compounds - chemical symbols and formulae for elements and compounds - a simple (Dalton) atomic model - atoms and molecules as particles - present observations and data - using appropriate methods, including tables and graphs - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature <u>P1.2 Sound</u> - waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition - using physical processes and mechanisms, rather than energy, to explain the	<u>B1.3 Reproduction</u> - 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 - reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms - the importance of plant reproduction through insect pollination in human food security - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - presenting observations and other data using appropriate methods - use appropriate techniques, apparatus, and materials during fieldwork	<u>P1.3 Light</u> - the similarities and differences between light waves and waves in matter - light waves travelling through a vacuum; speed of light - the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface - use of ray model to explain imaging in mirrors - differential colour effects in absorption and diffuse reflection - the refraction of light and action of convex lens in focusing (qualitative); the human eye - light transferring energy from source to absorber, leading to chemical and electrical effects; photosensitive material in the retina and in cameras - use of ray model to explain imaging in mirrors, the pinhole camera - colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection - evaluate data, showing awareness of potential	<u>P1.4 Space</u> - gravity force, weight = mass x gravitational field strength (g), on Earth $g=10$ N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and sun (qualitative only) - our sun as a star, other stars in our galaxy, other galaxies - the seasons and the Earth's tilt, day length at different times of year, in different hemispheres - the light year as a unit of astronomical distance - understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusion - make predictions using scientific knowledge and understanding

	density differences, between solids, liquids and gases - diffusion in terms of the particle model - reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving - the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density - energy changes on changes of state (qualitative)	- make predictions using scientific knowledge and understanding - present observations and data using appropriate methods, including tables and graphs - select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables - present observations and data using appropriate methods, including tables and graphs <u>B1.2 Structure and function of body systems</u> - the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms - the structure and functions of the gas exchange system in humans, including adaptations to function - the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume - the impact of exercise, asthma and smoking on the human gas exchange system - the structure and functions of the human skeleton, to include support, protection, movement and making blood cell - biomechanics – the interaction between skeleton and muscles, including the	intermediate steps that bring about such changes - sound needs a medium to travel, the speed of sound in air, in water, in solids - sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal - the auditory range of humans and animals - pressure waves transferring energy; use for cleaning and physiotherapy by ultrasound; waves transferring information for conversion to electrical signals by microphone - frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound - interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions - presenting reasoned explanations, including relating data to hypotheses - make predictions using scientific knowledge and understanding - evaluate risks - present reasoned explanations, including explaining data in relation to predictions and hypotheses	and laboratory work, paying attention to health and safety - make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements <u>C1.3 Reactions</u> - chemical reactions as the rearrangement of atoms - what catalysts do - the difference between chemical and physical changes - chemical symbols and formulae for elements and compounds - chemical reactions as the rearrangement of atoms - representing chemical reactions using formulae and using equations - combustion, thermal decomposition, oxidation and displacement reactions - conservation of mass changes of state and chemical reactions - chemical reactions as the rearrangement of atoms - exothermic and endothermic chemical reactions (qualitative) - make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements - present observations and data using appropriate	sources of random and systematic error - use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety - present observations and data using appropriate methods, including tables and graphs - make predictions using scientific knowledge and understanding <u>C1.4 Acids and alkalis</u> - defining acids and alkalis in terms of neutralisation reactions - the pH scale for measuring acidity/alkalinity; and indicators - reactions of acids with metals to produce a salt plus hydrogen - reactions of acids with alkalis to produce a salt plus water - evaluate risks - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables - present observations and data using appropriate methods, including tables and graphs	
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			measurement of force exerted by different muscles - the function of muscles and examples of antagonistic muscles - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety - make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements			methods, including tables and graphs - evaluate data, showing awareness of potential sources of random and systematic error - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions						
Key Vocabulary (School Improvement Priority)	amoeba cell wall cells chloroplasts concentration diffusion euglena flagellum leaf cell microscope nerve cell nucleus observation organisms red blood cell root hair cell specialised cell sperm cell unicellular vacuole	boiling boiling point change of state collide condense diffusion evaporate freezing gas liquid material melting melting point mixture particle property solid states of matter sublime substance	air resistance balanced compress contact force deform drag force driving force elastic limit electrostatic force. equilibrium extension field friction gravity Hooke’s Law interaction pair kilogram (kg) lubrication magnetic force mass newtonmeter newtons non-contact force pull push reaction	resistive forces A tension unbalanced water resistance weight alveolus antagonistic muscles bone cartilage condense diaphragm exhale inhale joint ligament lungs multicellular organ organ system respiration respiratory system ribcage skeleton tendon. tissue	atom chemical formula chemical symbol compound element molecule amplifier amplitude audible range auditory canal. auditory nerve cochlea compression crest decibel diaphragm. eardrum echo hertz incident wave infrasound inner ear cochlea. kilohertz) longitudinal loudness	medium microphone middle ear oscillation oscilloscope ossicles outer ear oval window. pinna pitch rarefaction receiver reflected wave reflection reverberation medium speed of light speed of sound superpose transmitter transverse trough ultrasound vacuum vibration vocal chords	adolescence anther carpel cervix cilia. condom contraception contraceptive pill ejaculation embryo fertilisation fetus filament fluid sac fruit. gametes germination implantation uterus menstrual cycle ovary (human) ovary (plant) oviduct tube ovulation ovule penis period petal placenta pollen pollination	semen. sepal sexual intercourse sperm cell sperm duct stamen stigma style testes umbilical cord urethra uterus vagina balanced symbol equation chemical reaction combustion conservation of mass. decomposition discrete endothermic exothermic fossil fuel fuel hazard non-renewable	absorb angle of incidence angle of reflection A grid of pixels at the back of a digital camera that absorbs light and produces an image. continuous convex cornea. diffuse reflection dispersion emit endoscope eye filter focal point focus frequency image incident ray inverted Iris law of reflection lens light-time	plane primary colour prism pupil real image reflect reflected ray refraction retina. secondary colour source specular reflection tertiary colour translucent transmit. transparent vacuum virtual wave acid alkali base concentrated corrosive dilute indicator litmus neutral	artificial satellite asteroid astronomer axis comet constellation day dwarf planet. Earth ellipse exoplanets galaxy gas giant gravity. lunar eclipse Mars Mercury meteor night sky. meteorite space. Milky Way	Moon satellite. natural satellite night orbit partial eclipse Moon. phases of the Moon planet season solar eclipse Earth. Solar System star Sun terrestrial. total eclipse Universe Venus year.

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Extended Writing / Disciplinary Reading (School Improvement Priority)	Extended Writing Task - "Cell City: Exploring the Microscopic Metropolis." Their essay should draw parallels between the city features and the corresponding components of a cell. Each essay should include the following sections: Introduction: Introduce the concept of cells as miniature cities and provide a brief overview of their functions. Body paragraphs: Dedicate each paragraph to describing a specific cell component and its corresponding city feature. Include details about their function and importance within the cell/city. Conclusion: Summarize the main points and reinforce the understanding that cells are complex, organized systems.	Reading Task Title: The Fascinating Process of Breathing Breathing is an essential bodily function that allows us to take in oxygen and expel carbon dioxide. It involves a complex interplay between various organs and muscles. In this reading task, you will learn about the fascinating process of breathing and the key terms associated with it. Read the passage below and answer the questions that follow.	Reading Task - How Do We Detect Sound Waves? In this reading activity, we will delve into the fascinating world of sound waves and explore how our ears enable us to hear. We'll learn about the key structures of the ear and their roles in detecting and processing sound. Along the way, we'll encounter important scientific terms related to sound and the ear. Keep an eye out for these words in the text and use the provided word bank to deepen your understanding. Let's get started!	Writing - Michael (Biological Male) and Elaine (Biological Female) are two twins who are 12 years old They are very worried due to changes they are experiencing I want you to write a letter to them both explaining what puberty is and also some of the symptoms that should be expecting, and explain how some of the symptoms may be different for Elaine, and Michael	Reading Task - Title: The Eye: A Marvel of Light Perception Our eyes are incredible organs that allow us to perceive the world around us. They function like complex cameras, capturing and processing light to create visual images. Let's explore the key components of the eye and how they interact with light.	Writing - Your task is to write an engaging and informative piece that explores various aspects of space and the incredible discoveries and challenges encountered by astronauts and scientists. Feel free to be creative and include any additional information, research, or personal insights you discover during your exploration of this vast topic.				
Assessment [Summative & Formative] How knowledge and skills will be assessed formally and informally. How feedback will be given	End of Chapter tests Feedback sheets DIRT Task activities Homework – Formative	End of Chapter tests Feedback sheets DIRT Task activities Homework – Formative	End of Chapter tests Feedback sheets DIRT Task activities Homework - Formative	End of Chapter tests Feedback sheets DIRT Task activities Homework - Formative	End of Chapter tests Feedback sheets DIRT Task activities Homework – Formative	End of Chapter tests Feedback sheets DIRT Task activities Homework – Formative				

Year 8	Autumn HT 1	Autumn HT 2	Spring HT 1	Spring HT 2	Summer HT 1	Summer HT 2
Topic and/or Key Question	B2.1 Health and lifestyle C2.1 The Periodic Table	P2.1 Electricity and Magnetism B2.2 Biological processes	C2.2 Separation techniques P2.2 Energy	B2.3 Ecosystems and Adaptation B2.4 Inheritance	C2.3 Metals and other materials P2.3 Motion and pressure	C2.4 The Earth

Key Knowledge/Skills	B2.1 Health and lifestyle	P2.1 Electricity and Magnetism	C2.2 Separation techniques	- the variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection - differences between species - changes in the environment which 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 - the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation - heredity as the process by which genetic information is transmitted from one generation to the next - a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model - how organisms affect, and are affected by, their environment, including the accumulation of toxic materials - the variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection - changes in the environment which may leave individuals within a	C2.3 Metals and acids	C2.4 The Earth
	- The content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed - Simple food tests for starch, simple sugars, protein and lipids - calculations of energy requirements in a healthy daily diet - the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases - the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) - the importance of bacteria in the human digestive system - the effects of recreational drugs (including substance misuse) on behaviour, health and life processes - the effect of maternal lifestyle on the foetus through the placenta - interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions - use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety - make and record observations and	- separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects - the idea of electric field, forces acting across the space between objects not in contact - non-contact forces: forces due to static electricity - using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about changes in systems - electric current, measured in amperes - current as flow of charge - potential difference, measured in volts, battery and bulb ratings - series and parallel circuits, currents add where branches meet - resistance, measured in ohms, as the ratio of potential difference (p.d.) to current - differences in resistance between conducting and insulating components (quantitative) - magnetic poles, attraction and repulsion - magnetic fields by plotting with compass, representation by field lines - Earth's magnetism, compass and navigation - the magnetic effect of a current, electromagnets, DC motors (principles only) - interpreting observations and other data, including identifying patterns and	- the concept of a pure substance - mixtures, including dissolving - the identification of pure substances - simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography - use appropriate techniques, apparatus, and materials during fieldwork and laboratory work - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables <u>P2.2 Energy</u> - comparing energy values of different foods (from labels) (kJ) - fuels and energy resources - energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change - comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions		- comparing energy and carbon in the reactivity series - combustion, thermal decomposition, oxidation and displacement reactions - the use of carbon in obtaining metals from metal oxides - properties of ceramics, polymers and composites (qualitative) - interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions - select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables - make predictions using scientific knowledge and understanding - present observations and data using appropriate methods, including tables and graphs <u>P2.3 Motion and pressure</u> - speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) - relative motion: trains and cars passing one another - using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes in systems	- the composition of the Earth - the structure of the Earth - the composition of the atmosphere - the rock cycle and the formation of igneous, sedimentary and metamorphic rocks - the carbon cycle - the production of carbon dioxide by human activity and the impact on climate - Earth as a source of limited resources and the efficacy of recycling - present observations and data using appropriate methods, including tables and graphs - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - make predictions using scientific knowledge and understanding - apply mathematical concepts and calculate results

	measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements 4. present observations and data using appropriate methods, including tables and graphs <u>C2.1 The Periodic Table</u> - the periodic table: periods and groups; metals and non-metals - how patterns in reactions can be predicted with reference to the periodic table - the properties of metals and non-metals - the chemical properties of metal and non-metal oxides with respect to acidity - the principles underpinning the Mendeleev periodic table - the varying physical and chemical properties of different elements - how patterns in reactions can be predicted with reference to the periodic table 1. interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions 2. apply mathematical concepts and calculate results 3. make and record observations and measurements using a range of methods for different investigations 4. evaluate risks	trends, making inferences and drawing conclusions 2. use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety 3. select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables 4. make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements 5. make predictions using scientific knowledge and understanding <u>B2.2 Ecosystem processes</u> - the reactants in, and products of, photosynthesis, and a word summary for photosynthesis - the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere - the adaptations of leaves for photosynthesis - the role of leaf stomata in gas exchange in plants - plants making carbohydrates in their leaves by photosynthesis	and in chemical compositions - other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels - work done and energy changes on deformation - heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators - changes with temperature in motion and spacing of particles - domestic fuel bills, fuel use and costs - fuels and energy resources - comparing power ratings of appliances in watts (W, kW) - comparing amounts of energy transferred (J, kJ, kW hour) - simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged 1. present reasoned explanations, including explaining data in relation to predictions and hypotheses 2. make and record observations and measurements using a	species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material 1. interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions 2. present observations and data using appropriate methods, including tables and graphs 3. understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review 4. present reasoned explanations, including explaining data in relation to predictions and hypotheses	- the representation of a journey on a distance-time graph - atmospheric pressure, decreases with increase of height as weight of air above decreases with height - pressure in liquids, increasing with depth; upthrust effects, floating and sinking - pressure measured by ratio of force over area – acting normal to any surface - moment as the turning effect of a force 1. use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety 2. present observations and data using appropriate methods, including tables and graphs 3. interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions 4. make predictions using scientific knowledge and understanding 5. identify further questions arising from their results	
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		and gaining mineral nutrients and water from the soil via their roots - aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life - a word summary for aerobic respiration - the process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration - the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism - the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops - how organisms affect, and are affected by, their environment, including the accumulation of toxic materials - use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety - make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements	range of methods for different investigations - evaluate data, showing awareness of potential sources of random and systematic error - interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - evaluate risks - make predictions using scientific knowledge and understanding			
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			3. undertake basic data analysis including simple statistical techniques 4. understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas 5. select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables 6. evaluate data, showing awareness of potential sources of random and systematic error 7. presenting observations and other data using appropriate methods 8. apply sampling techniques								
Key Vocabulary (School Improvement Priority)	addiction alcoholic anus balanced diet amounts. bile carbohydrase carbohydrate catalyst deficiency depressant digestion molecules. digestive system drug enzyme ethanol fibre food test gullet hypothesis large intestine Lipase lipids malnourishment medicinal drug mineral nutrient obese passive smoking	protease protein recreational drug rectum small intestine starvation stimulant stomach unit of alcohol villi vitamin withdrawal symptom acid rain chemical property density displace displacement reaction group Group 0 Group 1 Group 7 halogen metal metalloid noble gases non-metal period physical property reactive unreactive	ammeter amps atom attract battery cell conductor core current electric charge electrical field electromagnet electron insulator lightning magnetic field magnetic field lines magnetic magnetise motor negative neutral Neutron north pole ohms parallel positive potential difference proton rating relav	voltage voltmeter volts aerobic respiration algae anaerobic respiration bioaccumulation chemosynthesis chlorophyll co-exist community consumer deficiency ecosystem fermentation fertiliser. food chain food web habitat haemoglobin interdependence magnesium niche ecosystem. nitrates oxygen debt phosphates photosynthesis plasma population	chromatogram chromatography dissolve distillation filtering filtrate filtration impure insoluble mixture pure saturated solution solubility solute The solid or gas that dissolves in a liquid. solution solvent chemical store conduction conductor convection convection current. dissipated elastic store energy energy resources	energy store equilibrium fossil fuel gear gravitational potential store infrared radiation insulator joules kilojoules kilowatt kilowatts kinetic store law of conservation of energy lever. non-renewable power rating radiation renewable simple machine temperature thermal imaging camera thermal power station thermal store thermometer watt work	adaptation chromosome competition. continuous variation discontinuous variation DNA evolution extinct fossil gene gene bank interdependence natural selection species variation	carbon fibre ceramic composite displace displacement reaction metal natural polymer ore polymer reactive reactivity series state symbol synthetic polymer thermite reaction acceleration atmospheric pressure	average speed centre of gravity centre of mass compressed density distance-time graph gas pressure incompressible instantaneous speed law of moments liquid pressure metres per second moment pivot pressure relative motion speed	atmosphere biological weathering carbon cycle carbon store cementation chemical weathering climate change combustion compaction crust deforestation deposition durable. erosion freeze-thaw global warming greenhouse effect greenhouse gas	igneous inner core lava magma metamorphic rock outer core photosynthesis physical weathering porous radiation recycling objects. respiration rock cycle sediment sedimentary transport troposphere uplift weathering

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			repel resistance series south pole.	potassium predator prey producer stomata						
Extended Writing / Disciplinary Reading (School Improvement Priority)	Write an article for a newspaper or magazine about 1½ pages long in your Science book on “A Healthy Lifestyle”. You need to write in full sentences and use some of these words below. You should recommend what people should and shouldn’t do to remain healthy, including diet and exercise	Title: "The Electrifying World of Energy" Objective: To introduce and reinforce understanding of key concepts in electricity, including resistance, current, and potential difference, using an analogy to enhance comprehension.	Writing Task - Divide yourselves into groups of 4-5 students. Each group will focus on one specific energy resource. The options are as follows: a) Solar energy b) Wind energy c) Fossil fuels (coal, oil, and natural gas) d) Nuclear energy e) Hydropower (water) f) Biomass energy Conduct research using reliable sources. Focus on the following aspects: a) How the energy resource is generated or extracted. b) Availability and geographical distribution. c) Environmental impact (e.g., greenhouse gas emissions, pollution, habitat disruption). d) Advantages and disadvantages (cost, reliability, scalability, etc.). e) Current and potential future uses. Create a 10 minute presentation to showcase your findings. Your presentation should be visually appealing and informative. Consider including the following elements: a) Introduction to your energy resource. b) Explanation of the generation/extraction process. c) Comparison of its advantages and disadvantages. d) Examples of real-life applications. e) Environmental impact assessment. f) Potential future developments or improvements.		Reading Task - "Surviving in Harsh Conditions: The Fennec Fox and Arctic Fox" Reading Passage: Objective: To explore and compare the unique adaptations of the Fennec Fox and Arctic Fox that enable them to thrive in extreme environments, fostering an understanding of animal adaptations.		Reading Task - Title: Pressure Variation with Depth in Liquids Pressure is a fundamental physical property that plays a significant role in various natural phenomena, including the behaviour of liquids. As we delve deeper into a liquid, we encounter an increase in pressure due to several factors. This article aims to explain why pressure increases with depth in a liquid while also highlighting other factors that can affect pressure and the resultant changes as we go deeper.		Writing Task - Writing Task: Exploring the Rock Cycle Journey Imagine you are an adventurous geologist on a thrilling expedition to study the remarkable world of rocks! Your mission is to craft an engaging and informative piece of writing that takes your readers on an exhilarating journey through the rock cycle. As you embark on this expedition, you will encounter various stages and processes that shape rocks over time. Your task is to write a captivating story or descriptive essay that vividly captures the essence of the rock cycle. Your writing should engage your audience of Activate 2 Year 8 students and spark their curiosity about the amazing geological processes that transform rocks. Consider using imaginative language, sensory details, and storytelling techniques to bring the rock cycle to life.	

			g) Recommendations for the use or development of your energy resource.			
Assessment [Summative & Formative] How knowledge and skills will be assessed formally and informally. How feedback will be given	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework – Formative	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework– Formative	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework– Formative	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework– Formative	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework– Formative	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework– Formative

Year 9	Autumn HT 1	Autumn HT 2	Spring HT 1	Spring HT 2	Summer HT 1	Summer HT 2
Topic and/or Key Question	B.3.1.Cells C.3.1 Particle model	P.3.1. Forces and Motion B.3.2 Cell Systems	C.3.2 Atoms and The Periodic Table P.3.2 Energy	B3.3: Fertilisation and implantation C3.3 : Chemical changes	P3.3 Waves, sound, and light B3.4 Variation and natural selection	C3.4 Useful chemical reactions P3.1 Electricity and magnetism
Key Knowledge/Skills Main knowledge/skills (subject specific and generic) that will be developed and how	Cells - Cells as the basic structural unit of all organisms; adaptations of cells related to their functions; the main sub-cellular structures of eukaryotic and prokaryotic cells - The importance of cellular respiration; the processes of aerobic and anaerobic respiration - Photosynthesis as the key process for food production and therefore biomass for life - The need for transport systems in multicellular organisms, including plants Particle model - The shapes of molecules (groups of atoms bonded together) and the way giant structures are arranged is of great importance in terms of the way they behave.	Forces and motion - forces and fields: electrostatic, magnetic, gravity - forces as vectors - calculating work done as force x distance; elastic and inelastic stretching - pressure in fluids acts in all directions: variation in Earth's atmosphere with height, with depth for liquids, up-thrust force (qualitative). - speed of sound, estimating speeds and accelerations in everyday contexts - interpreting quantitatively graphs of distance, time, and speed - acceleration caused by forces; Newton's First Law - weight and gravitational field strength - decelerations and braking distances involved on roads, safety.	Atoms and The Periodic Table - a simple model of the atom consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes - the number of particles in a given mass of a substance - the modern Periodic Table, showing elements arranged in order of atomic number - position of elements in the Periodic Table in relation to their atomic structure and arrangement of outer electrons - properties and trends in properties of elements in the same group - characteristic properties of metals and non-metals - chemical reactivity of elements in relation to their position in the Periodic Table. Energy	Fertilisation and implantation - 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. - Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, and seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. - Heredity as the process by which genetic information is transmitted from one generation to the next. - Single gene inheritance and single gene crosses with dominant and recessive phenotypes.	Waves, sound and light - The concept of a wave as something that transfers energy from a source. - Sound is a longitudinal wave that travels through solids, liquids, and gases, and can be represented as sinusoidal waves – it has many applications involving reflection. - Waves have amplitude, wavelength, and frequency. - Light is a transverse wave – we represent light as a ray to show its direction. - Humans can only hear/see certain frequencies of sound/light. - Different frequencies of light correspond to us seeing different colours. - White light is made up of all other colours. - Calculating wave speed, using frequency and wavelength	Useful chemical reactions - Chemical reactions as the rearrangement of atoms. - Representing chemical reactions using formulae and using equations. - Combustion, thermal decomposition, oxidation, and displacement reactions. - Reactions of acids with metals to produce a salt plus hydrogen. - What catalysts do. - The properties of metals and non-metals. - The order of metals and carbon in the reactivity series. - The use of carbon in obtaining metals from metal oxides. - Characteristic properties of metals and non-metals. - Chemical reactivity of elements in relation to their position in the Periodic Table.

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	- Changes of state in terms of particle kinetics, energy transfers, and the relative strength of chemical bonds and intermolecular forces. - Bulk properties of materials related to bonding and intermolecular forces. - Relating models of arrangements and motions of the molecules in solid, liquid, and gas phases to their densities. - Melting, evaporation, and sublimation as reversible changes. - Calculating energy changes involved in heating, using specific heat capacity, and those involved in changes of state, using specific latent heat. - Link between pressure and temperature of a gas at constant volume, related to the motion of its particles (qualitative). - Sublimation and deposition are often forgotten about, as most substances go via the liquid state. Two common substances that sublime are iodine, which has a very impressive purple vapour, and carbon dioxide, known as dry ice in its solid form	Cell Systems - the relationship between the structure and functions of the human circulatory system. - the need for transport systems in multicellular organisms, including plants	- energy changes in a system involving heating, doing work using forces, or doing work using an electric current: calculating the stored energies and energy changes involved - power as the rate of transfer of energy - conservation of energy in a closed system, dissipation - calculating energy efficiency for any energy transfers - renewable and non-renewable energy sources used on Earth, changes in how these are used.	- Genetic variation in populations of a species. - The uses of modern biotechnology including gene technology – some of the practical and ethical considerations of modern biotechnology. Chemical Changes - Chemical reactions as the rearrangement of atoms. - Representing chemical reactions using formulae and using equations. - Combustion, thermal decomposition, oxidation, and displacement reactions. - Exothermic and endothermic chemical reactions (qualitative). - Balanced chemical equations, ionic equations, and state symbols. - Measurement of energy changes in chemical reactions (qualitative). - Bond breaking, bond making, activation energy, and reaction profiles (qualitative).	- Determining the speed of water waves or sound waves experimentally - Ultrasound and infrasound - Seismic waves - The effects of ionising radiation Variation and natural selection - Heredity as the process by which genetic information is transmitted from one generation to the next. - Differences between species. - Changes in the environment which 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. - The variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection. - The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material. - The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops. - How organisms affect, and are affected by, their environment, including the accumulation of toxic materials. - The importance of biodiversity. - Positive and negative human interactions with ecosystems. - Some abiotic and biotic factors that affect communities; the importance of interactions between organisms in a community	- The chemistry of acids; reactions with some metals and carbonates. - Electrolysis of molten ionic liquids and aqueous ionic solutions. - Extraction and purification of metals related to the position of carbon in the reactivity series. Electricity and magnetism - Charges can be positive or negative – like charges repel and opposite charges attract. - Electrons have negative charge. - If you rub two things together, you can rub electrons off one onto the other, making both objects charged. - Current is the charge per second passing a point – potential difference depends on the energy given to a component by the charges passing through it. - Resistance is a measure of how difficult it is for a p.d. to push a current through a component, $V = IR$. - Simple series and parallel circuits. - What a 'field' is, and what shape the magnetic field is around a current-carrying wire and an electromagnet. - Magnetic poles can be north or south; like poles repel and opposite poles attract. - The main parts of a power station. - Uses and dangers of static electricity. - Drawing electric fields. - Magnetic fields around permanent and induced magnets. - Determining the direction of the Earth's magnetic field, using a compass. - Magnetic effects of currents and how solenoids enhance the effect. - How motors and generators work. - How transformers are used in the National Grid and the reasons for their use.
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Key Vocabulary (School Improvement Priority)	active transport / adaptation aerobic respiration / aerosol alveolus / bacteria / Brownian motion / cell cell membrane / cell wall chloroplasts / concentration gradient cytoplasm / deposition / diffusion / egg cell endothermic / eukaryote exothermic / flagellum / foam/ haemoglobin mitochondria / model / muscle cell / nucleus osmosis / partially permeable membrane phloem /photosynthesis /plasma / plasmid prokaryote / respiration / specialised cell / sperm cell / sublimation / subliming substance / transfer / vacuole / vapour xylem	Accelerating / acceleration /alveolus Artery / atria / balanced / Capillary / carbohydrase cardiac muscle / catalyst / cell / centripetal force / circulatory system / contact force / diffusion / digestion / directly proportional / displacement distance–time graph /double circulatory system enzyme / epidermis / equilibrium / exchange surface gravitational field / gravitational field strength guard cell / inertia / interaction /interaction pair / lipase / magnitude / mass / Newton’s first law Newton’s third law / non-contact force / random errors / resultant force / scalar / speed / speed-time graph / systematic error / tangent / terminal velocity /unbalanced / upthrust / vector /velocity / weight	Analogy / atomic mass / combined heat and power Compound / covalent bond / deform / dissipation Efficiency / elastic / elastic limit / elastic store Electron / electronic structure / element energy resource / energy store / extension formulation / fossil fuel / generators gravitational potential energy hardness / infrared radiation / insulation ion / ionic bond / kinetic law of conservation of energy limit of proportionality / lubrication metal / mixture / neutron / non-metal non-renewable / nucleus / pathways Periodic Table / power / power station Proton / spring constant / subatomic particle thermal conductivity / turbines / work	Allele/anther/ asexual reproduction/ chromosomes/ clone/ condom/ contraception/ contraceptive pill/ Cutting/ dominant/ egg cell/ embryo Expressed/ fertilisation/ filament/ gamete Gene/ gene pool/ hormone/ implantation/ luteinising hormone/ menstrual cycle/ oestrogen/ ovary/ ovulation/ ovule/ period pollen/ pollination/ pregnancy/ puberty/ recessive/ reproducible/ seed/ seed / dispersal/ sexual reproduction/ sperm cell/ spread/ stigma/ style/ uterus/ valid/ variation balanced symbol equation/ biofuel/ carbon neutral/ chemical reaction/ combustion/ conservation of mass/ endothermic/ exothermic/ hydrocarbon/ physical change/ product/ ratio/ reactant/ word equation	Aerial/ amplitude/ carrier wave/ concave/ convex/ electromagnetic spectrum/ eyepiece lens (telescope)/ focus/ frequency/ image/ ionisation/ lens/ longitudinal/ magnified/ mechanical waves/ mutation/ objective lens / telescope)/ period/ primary colours/ P- waves/ radiation/ radioactive/ radiotherapy/ ray/ ray diagram/ real / image)/ reflecting telescope/ reflection/ refracting telescope/ refraction/ secondary colours/ seismic/ seismograph/ seismometers/ signal/ snapshot/ spectral frequency/ spectrum/ S-waves/ time trace/ transducer/ transverse/ ultrasound/ virtual (image)/ wavelength abiotic factors/ adaptation/ antibiotic/ antiseptic/ behavioural adaptation/ biodiversity/ biotic factors/ breeding / programmes/ camouflage/ competition/ competitor/ conservation/ disinfectant/ environmental variation/evolution/ extinction/ functional adaptation/ inherited variation/ mutation/ natural selection/ quadrat/ sampling/ seed banks/ species/ sterile/ structural adaptation/ transect/ variation	actual yield/ catalyst/ catalytic converter/ chemical (property)/ displacement reaction/ ductile/ electrolysis/ hardness/ malleable/ percentage yield/ physical (property)/ reacting mass/ reactive/ relative mass/ theoretical yield/ transition metal/ unreactive alternating current (AC)/ conventional / current/ current/ demagnetise/ direct current (DC)/ domain/ earthing/ electric field/ electromagnet induction/ electromagnetism/ generator/ induced magnet/ induction/ ion/ light dependent resistor/ lightning/ magnetic field/ magnetise/ motor/ national grid permanent magnet/ spark/ transformer variable resistor
Extended Writing / Disciplinary Reading (School Improvement Priority)	B.3.1 Cells – Transport in plants extended writing task. 3 separate tasks - Imagine you are nutrients, mineral ions and water. Explain in detail, your journey through a plant. C.3.1 Particle Model - Reading comprehension on the strengths and limitations of the particle model. Students to then evaluate the strengths and limitations of the particle model by creating a model using building blocks and writing an extended piece of writing.	P.3.1. Forces and Motion Reading comprehension on gravitational field strength on different planets. Students to research a planet of their choosing and create an extended piece of writing – 5 marker calculation question for a peer - based on the gravitational potential energy of that planet. B.3.2 Cell Systems Digestive system extended writing task. Journey of a sandwich – students to include the enzymes involved and the structure of the digestive system.	C.3.2 Atoms and The Periodic Table Reading comprehension on the development of the periodic table. Students to answer questions and pick out the key facts, constructing a periodic table timeline, including scientists and discoveries. P.3.2 Energy Conservation and dissipation reading comprehension. Students to construct a glossary of key terms and to answer summary questions.	B3.3: Fertilisation and implantation C3.3 : Chemical changes	P3.3 Waves, sound, and light B3.4 Variation and natural selection	C3.4 Useful chemical reactions P3.1 Electricity and magnetism

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Assessment [Summative & Formative] How knowledge and skills will be assessed formally and informally. How feedback will be given	Formative assessments will be set using the Oxford Activate Smart “Checkpoint Assessments”. These assignments are symbiotic with our scheme of work and produce tailor made “next steps” questions for students and once enough assessments have been taken, generates a “Reactivate” assessment of 15 questions that are personalised to each student – this will be set as homework. Students will complete 30 mark summative assessments in class to assess their understanding of full topics. Feedback is given automatically on the Checkpoint assignments for formative assessments and will be set as a relearn DIRT lesson for summative assessments.	Formative assessments will be set using the Oxford Activate Smart “Checkpoint Assessments”. These assignments are symbiotic with our scheme of work and produce tailor made “next steps” questions for students and once enough assessments have been taken, generates a “Reactivate” assessment of 15 questions that are personalised to each student – this will be set as homework. Students will complete 30 mark summative assessments in class to assess their understanding of full topics. Feedback is given automatically on the Checkpoint assignments for formative assessments and will be set as a relearn DIRT lesson for summative assessments.	Formative assessments will be set using the Oxford Activate Smart “Checkpoint Assessments”. These assignments are symbiotic with our scheme of work and produce tailor made “next steps” questions for students and once enough assessments have been taken, generates a “Reactivate” assessment of 15 questions that are personalised to each student – this will be set as homework. Students will complete 30 mark summative assessments in class to assess their understanding of full topics. Feedback is given automatically on the Checkpoint assignments for formative assessments and will be set as a relearn DIRT lesson for summative assessments.	Formative assessments will be set using the Oxford Activate Smart “Checkpoint Assessments”. These assignments are symbiotic with our scheme of work and produce tailor made “next steps” questions for students and once enough assessments have been taken, generates a “Reactivate” assessment of 15 questions that are personalised to each student – this will be set as homework. Students will complete 30 mark summative assessments in class to assess their understanding of full topics. Feedback is given automatically on the Checkpoint assignments for formative assessments and will be set as a relearn DIRT lesson for summative assessments.	Formative assessments will be set using the Oxford Activate Smart “Checkpoint Assessments”. These assignments are symbiotic with our scheme of work and produce tailor made “next steps” questions for students and once enough assessments have been taken, generates a “Reactivate” assessment of 15 questions that are personalised to each student – this will be set as homework. Students will complete 30 mark summative assessments in class to assess their understanding of full topics. Feedback is given automatically on the Checkpoint assignments for formative assessments and will be set as a relearn DIRT lesson for summative assessments.	Formative assessments will be set using the Oxford Activate Smart “Checkpoint Assessments”. These assignments are symbiotic with our scheme of work and produce tailor made “next steps” questions for students and once enough assessments have been taken, generates a “Reactivate” assessment of 15 questions that are personalised to each student – this will be set as homework. Students will complete 30 mark summative assessments in class to assess their understanding of full topics. Feedback is given automatically on the Checkpoint assignments for formative assessments and will be set as a relearn DIRT lesson for summative assessments.
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Year 10	Autumn HT 1	Autumn HT 2	Spring HT 1	Spring HT 2	Summer HT 1	Summer HT 2
Topic and/or Key Question	B6 Preventing and treating disease C6 Electrolysis P5 Electricity in the home	B7 Non-communicable disease C6 Electrolysis (continued) P6 Molecules and matter	B8 Photosynthesis B9 Respiration C7 Energy changes C8 Rates of reaction P7 Radioactivity	B10 The human nervous system B11 Hormonal coordination C9 Crude oil and fuels P8 Forces in balance	B11 Hormonal coordination (cont) C12 Chemical analysis P9 Motion	B13 Reproduction C13 The Earth’s atmosphere P10 Forces in motion
Key Knowledge/Skills Main skills (subject specific and generic) that will be developed and how	<u>B6 Preventing and treating disease</u> This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. <u>C6 Electrolysis</u>	<u>B7 Non-communicable disease</u> This section discusses the human and financial cost of non-communicable diseases to an individual, a local community, a nation or globally and looks at how lifestyle factors including diet, alcohol and smoking contribute to the incidence of non-communicable diseases <u>C6 Electrolysis (continued)</u> When an ionic compound is melted or dissolved in water, the ions are free to move about within the liquid or solution. These liquids and solutions are able to conduct electricity and are called electrolytes.	<u>B8 Photosynthesis</u> <u>B9 Respiration</u> In this section we will explore how plants harness the Sun’s energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth’s atmosphere. Both animals and plants use this oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to	<u>B10 The human nervous system</u> <u>B11 Hormonal coordination</u> Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the	<u>B11 Hormonal coordination (cont)</u> We will explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility. <u>C12 Chemical analysis</u> Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with	<u>B13 Reproduction</u> meiosis leads to non-identical cells being formed while mitosis leads to identical cells being formed. Sexual reproduction involves the joining (fusion) of male and female gametes: • sperm and egg cells in animals • pollen and egg cells in flowering plants. In sexual reproduction there is mixing of genetic information which leads to variety in the offspring. The formation of gametes involves meiosis. Asexual reproduction involves only one parent and no fusion of gametes. There is no mixing of genetic information. This leads to

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	When an ionic compound is melted or dissolved in water, the ions are free to move about within the liquid or solution. These liquids and solutions are able to conduct electricity and are called electrolytes. Passing an electric current through electrolytes causes the ions to move to the electrodes. Positively charged ions move to the negative electrode (the cathode), and negatively charged ions move to the positive electrode (the anode). Ions are discharged at the electrodes producing elements. This process is called electrolysis. <u>P5 Electricity in the home</u> Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we all continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future?	Passing an electric current through electrolytes causes the ions to move to the electrodes. Positively charged ions move to the negative electrode (the cathode), and negatively charged ions move to the positive electrode (the anode). Ions are discharged at the electrodes producing elements. This process is called electrolysis. <u>P6 Molecules and matter</u> The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft. It also explains why it is difficult to make a good cup of tea high up a mountain!	anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue. <u>C7 Energy changes</u> Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way. <u>C8 Rates of Reaction</u> Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. Understanding energy changes that accompany chemical reactions is important for this process. In industry, chemists and chemical engineers	hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility. <u>C9 Crude oil and fuels</u> The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents. <u>P8 Forces in balance</u> Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible.	distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work. <u>P9 Motion</u> Distance is how far an object moves. Distance does not involve direction. Distance is a scalar quantity. Speed does not involve direction. Speed is a scalar quantity. The speed of a moving object is rarely constant. When people walk, run or travel in a car their speed is constantly changing. The velocity of an object is its speed in a given direction. Velocity is a vector quantity. If an object moves along a straight line, the distance travelled can be represented by a distance–time graph. The speed of an object can be calculated from the gradient of its distance–time graph. So, the velocity (speed and/or direction) of an object will only change if a resultant force is acting on the object.	genetically identical offspring (clones). Only mitosis is involved. Cells in reproductive organs divide by meiosis to form gametes. When a cell divides to form gametes: • copies of the genetic information are made • the cell divides twice to form four gametes, each with a single set of chromosomes • all gametes are genetically different from each other. Gametes join at fertilisation to restore the normal number of chromosomes. The new cell divides by mitosis. The number of cells increases. As the embryo develops cells differentiate. The genetic material in the nucleus of a cell is composed of a chemical called DNA. DNA is a polymer made up of two strands forming a double helix. The DNA is contained in structures called chromosomes. A gene is a small section of DNA on a chromosome. Each gene codes for a particular sequence of amino acids, to make a specific protein. The genome of an organism is the entire genetic material of that organism. The whole human genome has now been studied and this will have great importance for medicine in the future. <u>C13 The Earth's Atmosphere</u> The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to
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					determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way.					develop solutions that help to reduce the impact of human activity.	
					<u>P7 Radioactivity</u> Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently improved. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.					<u>P10 Forces in motion</u> The acceleration of an object is proportional to the resultant force acting on the object, and inversely proportional to the mass of the object. Whenever two objects interact, the forces they exert on each other are equal and opposite. The stopping distance of a vehicle is the sum of the distance the vehicle travels during the driver’s reaction time (thinking distance) and the distance it travels under the braking force (braking distance). For a given braking force, the greater the speed of the vehicle, the greater the stopping distance	
Key Vocabulary (School Improvement Priority)	clinical trials hybridomas placebo preclinical testing vaccine anode brine cathode electrolyte half equation inert	Unreactive alternating current (a.c.) direct current (d.c.) earth wire fuse live wire neutral wire oscilloscope plugs step-down transformers step-up transformers three-pin plug	benign tumours cancer carcinogens causal mechanism correlation ionising radiation biologically active and may result in mutation and cancer malignant tumours tumour anode brine cathode electrolyte half equation inert	unreactive boiling point Boyle’s Law density freezing point the temperature at which a pure substance freezes internal energy latent heat melting point physical change pressure specific latent heat of fusion Lf specific latent heat of vaporisation Lv	endothermic reaction glucose limiting factors photosynthesis aerobic respiration anaerobic respiration endothermic reaction exothermic reaction glycogen lactic acid oxygen debt activation energy bond energy endothermic exothermic fuel cells activation energy anhydrous atmosphere catalyst climate change closed system collision theory	equilibrium hydrated Le Châtelier’s Principle precise / precision reversible reaction activity alpha radiation (α) atomic number beta radiation (β) chain reaction count rate gamma radiation (γ) half-life ionisation irradiated isotopes mass number moderator nuclear fission nuclear fusion radioactive contamination reactor core	central nervous system (CNS) cerebral cortex cerebellum ciliary muscles coordination centres effectors homeostasis hyperopia medulla motor neurones myopia nerve neurones receptors reflex arcs reflexes sensory neurone stimuli suspensory ligaments adrenaline auxin phototropism gravitropism contraception endocrine system follicle stimulating hormone (FSH)	type 1 diabetes type 2 diabetes alkane alkene cracking distillation double bond flammable fraction fractional distillation general formula hydrocarbon mixture oxidised saturated hydrocarbon thermal decomposition unsaturated hydrocarbon viscosity displacement driving force effort force multiplier forces friction load magnitude	adrenaline auxin phototropism gravitropism contraception endocrine system follicle stimulating hormone (FSH) gibberellins glucagon insulin oestrogen ovaries ovulation phototropism pituitary gland testosterone tropism type 1 diabetes type 2 diabetes pipette Rf (retention factor) acceleration deceleration displacement gradient (of a straight line graph) tangent velocity	alleles asexual reproduction bases (DNA) carriers cystic fibrosis dominant allele genetic engineering genotype heterozygote homozygote meiosis mutation natural selection nucleotide phenotype polydactyly Punnett square diagram recessive sex chromosomes sexual reproduction atmosphere	carbon capture and storage carbon footprint global dimming incomplete combustion nitrogen oxides particulate braking distance conservation of momentum directly proportional elastic extension gravitational field strength, g inertia limit of proportionality mass momentum Newton’s second law of motion stopping distance terminal velocity thinking distance weight

						gibberellins glucagon insulin oestrogen ovaries ovulation phototropism pituitary gland testosterone tropism	moment parallelogram of forces principle of moments resultant force scalar vector			
Extended Writing / Disciplinary Reading (School Improvement Priority)	Reading – article “History of the Atom” (found on staff drive: S:\Curriculum Team Folders\Science\Reading and Extended Writing Resources). Revision opportunity – content originally covered in Y9. Pupils to complete timeline showing the key moments in the development of the model of the atom, with details of experiments where relevant.	Writing – Evaluate in detail the uses of adult stem cells vs. embryonic stem cells. You must include definitions of both, along with at least three advantages and three disadvantages for each. You must include a conclusion. Revision opportunity – content originally covered in Y9.	Reading – news article – “Advanced Rock Weathering and Climate Change” (found on staff drive S:\Curriculum Team Folders\Science\Reading and Extended Writing Resources). Revision & Science in the real world – connects to previous and future topics in Biology, Chemistry, and Physics. Pupils to create a summary of what is covered in the article, in the form of a flow chart/comic strip, or list of advantages/disadvantages of the process, or simply through a discussion based evaluation – is this a sustainable and useful thing to be doing?	Writing – Compare in detail the processes and importance of photosynthesis and respiration. You must include relevant equations, organisms and organelles where the processes take place, and at least three uses for each process. You may also wish to relate this to the Chemistry topic Energy Changes. Revision opportunity – bioenergetics and energy changes (endothermic/exothermic). Could be expanded to cover specialised cell adaptations as well. Also possible to tie in to the carbon cycle etc.	Reading – article from ChatGPT – The S:\Curriculum Team Folders\Science\Reading and Extended Writing Resources). Revision opportunity – content covered in Rates and Equilibrium topic. Recommended teaching: First get pupils to read the title and predict what the article will be about/activate prior knowledge about the Haber process. Next read the article <i>at least twice</i> , possibly with teacher modelling the first time. Allow pupils to highlight sections that they do not understand. Discuss them either in small groups or as a whole class to clarify. Some suggested follow up questions are included in the text file for the article. Alternatively, you could get pupils to create their own set of questions to test each other, or use a set of exam style questions.	Writing – task taken from TES resource, Physics Extended Writing (see staff drive: S:\Curriculum Team Folders\Science\Reading and Extended Writing Resources) Task is on page 19 of the document, “Physics 2 Topic 5”. Marking guidance is included on the document and it is suitable for peer assessment. A summary of the task is below. Rutherford’s scattering experiment changed the way that we think about atoms. Outline the significance of the results of his experiment. Your answer should include the following: • What the Plum Pudding model of the atom is • The experimental set up that Rutherford used • What results he obtained • The nuclear model of the atom • How his results supported the nuclear model of the atom • How the results disproved the Plum Pudding model of the atom.				

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Assessment [Summative & Formative] How knowledge and skills will be assessed formally and informally. How feedback will be given	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework
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Year 11	Autumn HT 1	Autumn HT 2	Spring HT 1	Spring HT 2	Summer HT 1	Summer HT 2
Topic and/or Key Question	B13 Reproduction B14 Variation and evolution C9 Crude oil and fuels C12 Chemical analysis P9 Motion P10 Forces and motion	Exam Revision C14 The Earth's resources P12 Wave properties	B15 Genetics and evolution B16 Adaptations, interdependence and competition P15 Electromagnetism	B17 Organising an ecosystem B18 Biodiversity and ecosystems	Revision	Revision
Key Knowledge/Skills Main skills (subject specific and generic) that will be developed and how	<u>B13 Reproduction</u> meiosis leads to non-identical cells being formed while mitosis leads to identical cells being formed. Sexual reproduction involves the joining (fusion) of male and female gametes: - sperm and egg cells in animals - pollen and egg cells in flowering plants. In sexual reproduction there is mixing of genetic information which leads to variety in the offspring. The formation of gametes involves meiosis. Asexual reproduction involves only one parent and no fusion of gametes. There is no mixing of genetic information. This leads to genetically identical offspring (clones). Only mitosis is involved. Cells in reproductive organs divide by meiosis to form gametes. When a cell divides to form gametes: - copies of the genetic information are made	<u>C14 The Earth's resources</u> Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised. <u>P12 Wave properties</u> Wave behaviour is common in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing	<u>B15 Genetics and evolution</u> In this unit we will look at the evidence for evolution including fossils and antibiotic resistance in bacteria. The theory of evolution by natural selection is now widely accepted. Evidence for Darwin's theory is now available as it has been shown that characteristics are passed on to offspring in genes. There is further evidence in the fossil record and the knowledge how resistance to antibiotics evolves in bacteria. <u>B16 Adaptations, interdependence and competition</u> The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in ecosystems composed of complex	<u>B17 Organising an ecosystem</u> Photosynthetic organisms are the producers of biomass for life on Earth. Feeding relationships within a community can be represented by food chains. All food chains begin with a producer which synthesises molecules. This is usually a green plant or alga which makes glucose by photosynthesis. A range of experimental methods using transects and quadrats are used by ecologists to determine the distribution and abundance of species in an ecosystem. B18 Biodiversity and ecosystems Biodiversity is the variety of all the different species of organisms on earth, or within an ecosystem. A great biodiversity ensures the stability of ecosystems by reducing the dependence of one species on another for food, shelter and the maintenance of the physical environment. The future of the human species on Earth relies on us maintaining a		

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	- the cell divides twice to form four gametes, each with a single set of chromosomes - all gametes are genetically different from each other. Gametes join at fertilisation to restore the normal number of chromosomes. The new cell divides by mitosis. The number of cells increases. As the embryo develops cells differentiate. The genetic material in the nucleus of a cell is composed of a chemical called DNA. DNA is a polymer made up of two strands forming a double helix. The DNA is contained in structures called chromosomes. A gene is a small section of DNA on a chromosome. Each gene codes for a particular sequence of amino acids, to make a specific protein. The genome of an organism is the entire genetic material of that organism. The whole human genome has now been studied and this will have great importance for medicine in the future. <u>B14 Variation and evolution</u> We will look at how the genome and its interaction with the environment influence the development of the phenotype of an organism. Differences in the characteristics of individuals in a population is called variation and may be due to differences in: - the genes they have inherited (genetic causes) - the conditions in which they have developed (environmental causes) - a combination of genes and the environment. Mutations occur continuously. Very rarely a mutation will lead to a new phenotype. If the new phenotype is suited to an environmental change it can lead	comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves.	communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being. <u>P15 Electromagnetism</u> Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this	good level of biodiversity. Many human activities are reducing biodiversity and only recently have measures been taken to try to stop this reduction.		
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	to a relatively rapid change in the species. Students will also study evolution as a change in the inherited characteristics of a population over time through a process of natural selection which may result in the formation of a new species. The theory of evolution by natural selection states that all species of living things have evolved from simple life forms that first developed more than three billion years ago. We will look at how evolution occurs through natural selection of variants that give rise to phenotypes best suited to their environment. If two populations of one species become so different in phenotype that they can no longer interbreed to produce fertile offspring they have formed two new species. <u>C9 Crude oil and fuels</u> The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents. <u>C12 Chemical analysis</u>					
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Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work.

P9 Motion

Distance is how far an object moves. Distance does not involve direction. Distance is a scalar quantity. Speed does not involve direction. Speed is a scalar quantity. The speed of a moving object is rarely constant. When people walk, run or travel in a car their speed is constantly changing. The velocity of an object is its speed in a given direction. Velocity is a vector quantity. If an object moves along a straight line, the distance travelled can be represented by a distance–time graph. The speed of an object can be calculated from the gradient of its distance–time graph. So, the velocity (speed and/or direction) of an object will only change if a resultant force is acting on the object.

P10 Forces in motion

The acceleration of an object is proportional to the resultant force acting on the object, and inversely proportional to the mass of the object. Whenever two objects interact, the forces they exert on each other are equal and opposite.

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	The stopping distance of a vehicle is the sum of the distance the vehicle travels during the driver’s reaction time (thinking distance) and the distance it travels under the braking force (braking distance). For a given braking force, the greater the speed of the vehicle, the greater the stopping distance							
Key Vocabulary (School Improvement Priority)	alleles asexual reproduction bases (DNA) carriers cystic fibrosis dominant allele genetic engineering genotype heterozygote homozygote meiosis mutation natural selection nucleotide phenotype polydactyly Punnett square diagram recessive sex chromosomes sexual reproduction mutation natural selection selective breeding tissue culture alkane alkene cracking distillation double bond flammable fraction fractional distillation	general formula hydrocarbon mixture oxidised saturated hydrocarbon thermal decomposition unsaturated hydrocarbon viscosity pipette Rf (retention factor) acceleration deceleration displacement gradient (of a straight line graph) tangent velocity braking distance conservation of momentum directly proportional elastic extension gravitational field strength, g inertia limit of proportionality mass momentum Newton’s second law of motion stopping distance terminal velocity thinking distance weight	bioleaching blast furnace life cycle assessment (LCA) non-renewable thermal decomposition amplitude compression echo electromagnetic waves frequency longitudinal waves mechanical wave oscillate	primary seismic wave (P-wave) rarefaction reflection medium refraction secondary seismic wave (S-wave) seismic waves speed transmission/transmitted transverse wave ultrasound wave vibrate wavelength	archaea classification domain evolutionary trees extinction speciation selection species abundance adaptations community competition distribution extremophile interdependence mean median mode quadrat quantitative sampling	range sample size transect alternator dynamo electromagnet electromagnetic induction Fleming’s left-hand rule generator effect induced magnetism magnetic field magnetic field line magnetic flux density motor effect solenoid split-ring commutator step-down transformer step-up transformer transformer	biomass carbon cycle decomposers primary consumer secondary consumer acid rain biodiversity deforestation incident energy trophic level	

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Extended Writing / Disciplinary Reading (School Improvement Priority)	Disciplinary reading on Mitosis and Meiosis	Extended writing activity on Transverse and Longitudinal waves	Disciplinary reading on the theory of evolution by Charles Darwin	Extended writing on problems caused by bracken	Disciplinary reading : Biodiversity in England news article	Extended writing of waves of the EM spectrum
Assessment [Summative & Formative] How knowledge and skills will be assessed formally and informally. How feedback will be given	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework	End of Chapter tests (higher and Foundation tier) Feedback sheets DIRT Task activities Homework		