Core Concepts
Science

Curriculum Themes (Big Ideas in Science)	Core concepts - How the theme is developed through the curriculum				
	Year 7 (KS4)	Year 8 (KS3)	Year 9 (Bridging Year)	Year 10 (KS4)	Year 11 (KS4)
Working Scientifically (KS3 only)	Predictions and Hypotheses • Writing a prediction • Writing a hypothesis				
	Planning Experimental Methods • Identifying risks and plan ways to control risks • Identifying independent and dependent variables • Identifying control variables and how to control them • Writing an experimental method that will lead to a valid outcome • Select appropriate apparatus				
	Collecting and Recording Results • Use apparatus to complete an experiment, making accurate readings • Understand potential causes of errors when collecting data. • Produce labelled drawings and diagrams • Use and develop results tables to record observations and data				
	Considering Results and Drawing Conclusions • Use observations and data, backed with scientific knowledge, to draw conclusions • Construct reasoned explanations for conclusions • Interpret and plot bar charts, line graphs and scatter graphs • Use rearranged equations to perform calculations • Calculate means and uncertainty • Present data to a certain degree of accuracy • Identify patterns, correlations and linear relationships • Identify anomolous results • Use lines on graphs to estimate unknown values				
	Evaluating experimental methods • Suggest ways to improve an experiment • Suggest reasons for differences in repeat readings and suggest better ways to control variables				

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Organisms	**B1.1 Cells** All life is made of cells Microscopes can be used to observe cells Cells are dynamic and exchange substances with their surroundings	**B2.1 Health and Lifestyle** Health is defined as a state of complete physical, mental and social well-being and not merely the absence of disease or illness A healthy diet is defined as a balance of essential nutrients from the food we eat that can be biochemically tested. The digestive system is responsible for the breakdown of food and adsorption of essential nutrients	**B1 Part 1: Cell Biology - Cells** Cells can be classed as eukaryotic or prokaryotic and can be specialised to perform a particular function For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of Using microscopy, cells and organelles can be observed and sizes then calculated. **RP1 - Microscopes**	**B3 Infection and Response** Communicable diseases caused by fungi, protists, bacteria and viruses The human immune system Vaccinations, antibiotics and painkillers The discovery and development of drugs Monoclonal antibodies, production and uses Plant defences and responses. (Biology only)	**B5 Homeostasis and Response** Homeostasis Structure and function of the human nervous system **RP7- Reaction time required practical** The brain (biology only) The eye (biology only) Control of body temperature (biology only) The human endocrine system Control of blood glucose concentration Maintaining water and nitrogen balance in the body (biology only) Hormones in human reproduction Contraception The use of hormones to treat infertility (HT only) Negative feedback (HT only) Plant Hormones- Coordination and Control (biology only) **RP8- Germination required practical (biology only)** Uses of plant hormones (biology only)
	B1.2 Structure and Function: Multicellular organisms contain organ systems that work together to maintain the conditions of live for all cells. Gas exchange takes place in the lungs The muscular and skeletal system work together to provide movement and support		**B1 Part 2: Cell Biology - Transport Mechanisms** Substances can move in an out of cells by diffusion and numerous factors can affect this Osmosis is the movement of water across a partially permeable membrane **RP2 - Osmosis** Active transport moves substances against its concentration gradient, requiring energy **B2 Part 1: Digestion and Plants** Enzyme controlled factors affect digestion of different foods in the digestive system **RP4 - Enzymes** Qualitative tests can be used to identify the presence and absence of certain food groups **RP3- Food Tests** Plants tissues are adapted for the plant organ system to survive in its environment **B2 Part 2: Circulation and Health** There are five levels of organisation with any organism, each comprised of specialised cells and tissues. The circulatory system is composed of many organs that enable oxygen and other substances to be transported around the body in the blood Organisms can aquire diseases that are influenced by their lifestyle choices and other risk factors		

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Working Scientifically (Bridging year and KS4 only)		• Identify the main hazards in a practical context. • Record measurements appropriately. • Use an appropriate number of significant figures. • Substitute numerical values into algebraic equations. • Make order of magnitude calculations. • Construct diagrams. • Describe a practical procedure for a specified purpose. • Recognise or describe patterns and trends in data. • Record measurements appropriately. • Find the arithmetic mean of data. • Plot two variables from experimental or other data. • Use the appropriate SI units for quantities. • Draw conclusions from data and observations.	• Find the arithmetic mean in a set of data. • Translate data between graphical and numeric form. • Make order of magnitude calculations. • Recognise or describe trends in data. • Draw conclusions from given observations	• Suggest and describe an appropriate sampling technique in a given context. • Explain the need to manipulate and control variables. • Assess whether sufficient measurements have been taken in an experiment. • Assess the precision of measurements taken in an experiment. • Calculate uncertainty of data and understand what it means. • Comment on the extent to which data is consistent with a given hypothesis. • Draw and use the slope of a tangent to a curve as a measure of rate of change. • Understand that any anomalous values should be examined to try to identify the cause and, if a product of a poor measurement, ignored. • Understand that measurements are affected by random error due to results varying in unpredictable ways. • Understand that systematic error is due to results differing from the true value by a consistent amount each time. • Understand that measurements are precise if they cluster closely. • Understand that an accurate measurement is one that is close to the true value. • Understand that measurements are reproducible if similar results are obtained by different investigators with different equipment.
		RP1 – Microscopes • AT 1 – use appropriate apparatus to record length and area. • AT 7 – use a microscope to make observations of biological specimens and produce labelled scientific drawings **RP3 - Osmosis** • AT 1 – use appropriate apparatus to record mass and time. • AT 3 – use appropriate apparatus and techniques to observe and measure the process of osmosis. • AT 5 – measure the rate of osmosis by water uptake **RP4 – Food Tests** • AT 2 – safe use of a Bunsen burner and a boiling water bath. • AT 8 – use of qualitative reagents to identify biological molecules. **RP5 – Enzymes** • AT 1 – use appropriate apparatus to record the volumes of liquids, time and pH. • AT 2 – safe use of a water bath or electric heater • AT 5 – measure the rate of reaction by the colour change of iodine indicator. • AT 8 – use of qualitative iodine reagent to identify starch by continuous sampling	**RP2 – Antimicrobial Activity** • AT 1 – use appropriate apparatus to record length and area. • AT 3 – use appropriate apparatus and techniques to observe and measure the process of bacterial growth. • AT 4 – safe and ethical use of bacteria to measure physiological function and response to antibiotics and antiseptics in the environment. • AT 8 – the use of appropriate techniques and qualitative reagents in problem-solving contexts to find the best antibiotic to use or the best concentration of antiseptic to use	**RP 7 – Reaction Time** • AT 1 – use appropriate apparatus to record time. • AT 3 – selecting appropriate apparatus and techniques to measure the process of reaction time. • AT 4 – safe and ethical use of humans to measure physiological function of reaction time and responses to a chosen factor. **RP 8 - Germination (Biology only)** • AT 1 – use appropriate apparatus to record length and time. • AT 3 – selecting appropriate apparatus and techniques to measure the growth of shoots or roots. • AT 4 – safe and ethical use of plants to measure physiological function of growth in response to light or gravity. • AT 7 – observations of biological specimens to produce labelled scientific drawings.

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Origins	**B1.3 Reproduction** Multicellular organisms need reproductive systems to sustain new life During sexual reproduction, gametes are produced. These fuse together during fertilisation, leading to the formation of offspring. In plants, the fertilised ovules develop into seeds, which are dispersed away from the parent	**B2.4 Inheritence** All organisms in a species show variation and can be caused by genetic information, the Inheritance occurs across generations within a species through genetic information in our DNA Species have gradually evolved over billions of years through natural selection	Not taught or assessed	Not taught or assessed	**B6 Inheritence, Variation and Evolution** Sexual and asexual reproduction Meiosis Advantages and disadvantages of sexual and asexual reproduction (biology only) DNA and the genome DNA structure (biology only) Genetic inheritance, Inherited disorders and sex determination Variation Classification of living organisms Selective breeding Genetic engineering Cloning (biology only) Theory of evolution (biology only) Speciation (biology only) The understanding of genetics (biology only) Evidence for evolution and fossils and extinction
Working Scientifically (Bridging year and KS4 only)				Not taught or assessed	• Explain why a given practical procedure is well designed for its specified purpose. • Explain the need to manipulate and control variables. • Assess whether sufficient measurements have been taken in an experiment. • Assess the precision of measurements taken in an experiment. • Understand that measurements are reproducible if similar results are obtained by different investigators with different equipment. • Draw and use the slope of a tangent to a curve as a measure of rate of change. • Understand the physical significance of area between a curve and the xaxis and measure it by counting squares as appropriate. • Understand that measurements are repeatable when repetition, under the same conditions by the same investigator, gives similar results. • Understand that measurements are reproducible if similar results are obtained by different investigators with different equipment.

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Cycles and Interactions	Not taught or assessed	**B2.2 Biological Processes** Photosynthesis is the process by which plants use carbon dioxide and water to make glucose Plants have special adaptations to enable photosynthesis to take place and to take in To transfer energy from glucose, aerobic respiration or anaerobic respiration can take place in cells. **B2.3 Ecosystems and Adaptations** Energy and potentially toxic materials are transferred between organisms within a food Organisms within an ecosytem exhibit an interdependence with each other Organisms within an ecosystem adapt to help them survive through being successful competitors or within harsh and changing environments.	Not taught or assessed	**B4 Bioenergetics** Photosynthetic reaction **RP6 – Photosynthesis Required Practical** Factors affecting the rate of photosynthesis Uses of glucose from photosynthesis Aerobic and anaerobic respiration How the body responds to exercise **B7 part 2 Ecosystems** Communities Abiotic factors Biotic factors Adaptations Estimating Population sizes **RP 9 - Ecological Sampling Required Practical**	**B7 Part 2 Biodiversity and Resources** Organisation of an ecosystem and Trophic levels Pyramids of biomass and Transfer of biomass Factors affecting food security including Farming techniques Sustainable fisheries Role of biotechnology How materials are recycled Decomposition (biology only) **RP 10 - Decay Required Practical** Impact of environmental change (biology only) (HT only) Land use and Deforestation

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Working Scientifically (Bridging year and KS4 only)	[redacted]	• Select and justify the apparatus to be used for a specific technique or purpose. • Describe a practical procedure for a specified purpose. • Explain why a given practical procedure is well designed for its specified purpose. • Apply understanding of apparatus and techniques to suggest a procedure. • Use data to make predictions. • Identify the dependent and independent variables in a given context. • Identify which of two or more hypotheses provides a better explanation of data in a given context. • Identify the main hazards in a practical context. • Record measurements appropriately and assess the precision of measurements taken in an experiment.. • Find the arithmetic mean of a set of data. • Plot 2 variables from experimental or other data. • Recognise or describe patterns or trends in data. • Draw conclusions from given data. • Select the apparatus to be used for a specific technique or purpose. • Suggest and describe an appropriate sampling technique in a given context. • Explain the need to manipulate and control variables. • Calculate uncertainty of data and understand what it means. • Understand that any anomalous values should be examined to try to identify the cause and, if a product of a poor measurement, ignored. • Understand that measurements are affected by random error due to results varying in unpredictable ways. • Understand that systematic error is due to results differing from the true value by a consistent amount	• Suggest and describe an appropriate sampling technique in a given context. • Explain the need to manipulate and control variables. • Assess whether sufficient measurements have been taken in an experiment. • Use data to make predictions. • Comment on the extent to which data is consistent with a given hypothesis. • Understand that any anomalous values should be examined to try to identify the cause and, if a product of a poor measurement, ignored. • Understand that measurements are affected by random error due to results varying in unpredictable ways. • Understand that systematic error is due to results differing from the true value by a consistent amount each time. • Understand that measurements are precise if they cluster closely. • Assess the precision of measurements taken in an experiment. • Draw and use the slope of a tangent to a curve as a measure of rate of change.
		RP6 – Photosynthesis • AT 1 – use appropriate apparatus to record the rate of production of oxygen gas produced; and to measure and control the temperature of water • AT 2 – use a thermometer to measure and control temperature of water bath. • AT 3 – use appropriate apparatus and techniques to observe and measure the process of oxygen gas production. • AT 4 – safe and ethical use and disposal of living pondweed to measure physiological functions and responses to light. • AT 5 – measuring rate of reaction by oxygen gas production. RP 9 - Ecological Sampling • AT 1 – use appropriate apparatus to record length and area. • AT 3 – use transect lines and quadrats to measure distribution of a species. • AT 4 – safe and ethical use of organisms and response to a factor in the environment. • AT 6 – application of appropriate sampling techniques to investigate the distribution and abundance of organisms in an ecosystem via direct use in the field. • AT 8 – use of appropriate techniques in more complex contexts including continuous sampling in an investigation	RP 10 - Decay • AT 1 – use appropriate apparatus to record temperature and pH. • AT 3 – the use of appropriate apparatus to measure anaerobic decay. • AT 4 – safe use of microorganisms. • AT 5 – measurement of rate of decay by pH change.

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Matter	**C1.1 Particle Model** Substances can exist in three states of matter with different physical properties A physical change is where a substance changes state with no new products formed Every substance has a melting point and boiling point	**C2.1 The Periodic Table** The periodic table is grouped into metals and non metals of similar chemical and physical properties Elements in similar groups have similar physical properties The position of elements in the periodic table can explain their chemical reactivity	**C1 Part 1: Atomic Structure and the Periodic Table** The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels The periodic table and structure of the atom have been developed by numerous scientists and their theories The position of an element in the periodic table and its atomic structure can be used to determine its reactivity	**C2 Structure and Bonding** Covalent, ionic and metallic bonds. Alloys and the conductive properties of metals Properties of ionic compounds Properties of small molecules, Polymers, giant covalentstructures (diamond, graphite, graphene and fullerenes The properties and uses of nanoparticles (chemistry only)	**C7 Oganic Chemistry** Crude oil, hydrocarbons and alkanes Fractional distillation and petrochemicals Properties of hydrocarbons Cracking and alkenes **Chemistry Only Organic Chemistry** Structure and formulae of alkenes Reactions of alkenes Alcohols Carboxylic acids Addition polymerisation Condensation polymerisation (HT only) Amino acids (HT only) DNA (deoxyribonucleic acid) and other naturally occurring polymers
	C1.2 Atoms, Elements and Compounds The difference between an atom, element, compound and mixture Compounds are formed when 2 more elements chemically combine and have different properties to the element it is made from The periodic table can be used to work out the chemical formula of a compound or molecule	**C2.2 Seperating Techniques** Substances can be classed as pure substances and mixtures with different physical properties Different techniques can be used to the different components of a mixture and qualitatively analyse them	**C1 Part 2: Seperating Techniques** The physical and chemical properties of elements are unique to the compounds formed following a chemical reaction Mixtures can be seperated physically whilst a compound can only be seperated into its constituent elements following a chemical reaction Physical techniques can be used to separate either a solvent or solute from a solution or a mixture of soluble components **P4 Atomic Structure and Radiation** There are 3 types of ionising radiation with different properties Atomic model has changed over time due to significant scientific discoveries Safety procedures when using ionising radiation	**P3 Particle Model of Matter** Changes of state and internal energy Temperature changes in a system and specific heat capacity Changes of heat and specific latent heat. **RP 1 – Specific Heat Capacity** Density of materials **RP 5 – Density** Particle motion in gases Atmospheric pressure Pressure in gases (physics only) Increasing the pressure of a gas (physics only) (HT only)	

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Working Scientifically (Bridging year and KS4 only)		• Identify the main hazards in specified practical contexts. • Suggest methods of reducing harm in practical contexts • Translate data between graphical and numeric form. • Recognise or describe patterns and trends in data. • Describe a procedure for a specified purpose. • Read measurements off a scale in a practical context. • Record measurements appropriately. • Substitute numerical values into algebraic equations. • Use an appropriate number of significant figures. • Draw conclusions from given observations. • Use data to make predictions.	• Identify the main hazards in specified practical contexts. • Describe a procedure for a specified purpose. • Read measurements off a scale in a practical context. • Record measurements appropriately. • Use the appropriate SI values for quantities. • Substitute numerical values into algebraic equations. • Use an appropriate number of significant figures. • Plot two variables from experimental or other data. • Translate data between graphical and numeric form. • Recognise or describe patterns and trends in data. • Draw conclusions from given observations. • Change the subject of an equation • Use data to make predictions. • Identify which of two or more hypotheses provides a better explanation of data in a given context. • Make order of magnitude calculations • Identify which of two or more hypotheses provides a better explanation of data in a given context. • Comment on the extent to which data is consistent with a given hypothesis.	• Use Data to make predictions • Explain why a given practical procedure is well designed for its specified purpose.
		RP 6 – Chromatography • AT 1 – use of appropriate apparatus to make and record a range of measurements accurately • AT 4 – safe use of a range of equipment to purify and/or separate chemical mixtures including chromatography.	**RP 1 – Specific Heat Capacity** • AT 1 – use appropriate apparatus to make and record measurements of mass, time and temperature accurately. • AT 5 – use, in a safe manner, appropriate apparatus to measure energy changes/transfers and associated values such as work done. **RP 5 – Density** • AT 1 – use appropriate apparatus to make and record measurements of length, area, mass and volume accurately. Use such measurements to determine the density of solid objects and liquids.	

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Reactions	**C1.3 Chemical Reactions** In a chemical reaction, atoms in the reactants are rearranged and joined together differently to make new products Mass is always conserved in a chemical reaction Chemical reactions can be classed into different types	**C2.3 Metals and Acids** The reactivity series lists metals in order of vigorous they react and can be used to predict their reactivity with different substances Metals can exist in their native state or be extracted from their ores Most materials are mixtures of different substances with unique properties	**C5 Energy Changes** Exothermic and endothermic reactions involve an overall transfer of energy with the reaction mixture and the surroundings, resulting in a temperature change. Reaction profiles are used to display the changes in energy during a chemical reaction. Energy changes are explained in terms of breaking bonds in reactants and making bonds in products, and can be applied to estimate energy changes in reactions using bond energy data	**C3 Quantitative Chemistry** Chemical measurements, formula mass, conservation of mass and the quantitative interpretation of chemical equations Moles (HT only) Amounts of substances in equations (HT only) Using moles to balance equations (HT only) Limiting reactants (HT only) Concentration of solutions in g/dm3 **Chemistry Only C3** Percentage yield and Atom economy Use of amount of substance in relation to volumes of gases (HT only) Titrations Using concentrations of solutions in mol/dm3 (HT only)	**C6 Rates of Reaction** Calculating the overall rates of reactions Factors which affect the rates of chemical reactions, collision theory and activation energy, catalysts. **RP 5 – Rates of Reaction** Calculating rates of reactions (gradients of curves) (HT Only) Reversible reactions, energy changes and reversible reactions Equilibrium The effect of changing conditions on equilibrium (concentration, temperature, pressure) (HT Only)
	C1.4 Acids and Alkalis Solutions can be classed as acid or alkaline The pH scale is a measure of the acidity or alkalinity of a solution and can be measured using indicators Acids and alkalis can react with each other or different chemicals to form new substances			**C4 Chemical Changes** Investigating the reactivity of metals and the reactivity series; Including oxidation, reduction and displacement Acids, alkalis and the pH scale Reactions of acids with metals, including neutralisation of acids and soluble salt production. **RP1 - Making Soluble Salts** The process of electrolysis Electrolysis of molten ionic compounds and using electrolysis to extract metals Electrolysis of aqueous solutions Representation of reactions at electrodes as half equations (HT only)	**C8 Chemical Analysis** Testing for gases: H_2 , O_2 , Cl_2 , CO_2 Chromatography **RP 6 – Chromatography** **Chemistry only C8** Flame tests Identifying - Metal hydroxides, Carbonates, Halides, Sulfates **RP 7 – Testing for Ions (Chemistry Only)**

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		RP 4 – Energy Changes • AT 1 – use of appropriate apparatus to make and record a range of measurements accurately, including mass, temperature, and volume of liquids. • AT 3 – use of appropriate apparatus and techniques for conducting and monitoring chemical reactions. • AT 5 – making and recording of appropriate observations during chemical reactions including changes in temperature. • AT 6 – safe use and careful handling of gases, liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes.	**RP1 - Making Soluble Salts** • AT 2 – safe use of appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater. • AT 3 – use of appropriate apparatus and techniques for conducting chemical reactions, including appropriate reagents. • AT 4 – safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, filtration, crystallisation. • AT 6 – safe use and careful handling of liquids and solids, including careful mixing of reagents under controlled conditions. **RP 2 – Titration (Chemistry only)** • AT 1 – use of appropriate apparatus to make and record a range of measurements accurately, including volume of liquids. • AT 8 – the determination of concentrations of strong acids and strong alkalis. **RP 3 – Electrolysis** • AT 3 – use of appropriate apparatus and techniques for conducting and monitoring chemical reactions. • AT 7 – use of appropriate apparatus and techniques to draw, set up and use electrochemical cells for separation and production of elements and compounds. • AT 8 – use of appropriate qualitative reagents and techniques to analyse and identify unknown samples or products including gas tests for hydrogen, oxygen and chlorine.	**RP 5 – Rates of Reaction** • AT 1 – use of appropriate apparatus to make and record a range of measurements accurately, including mass, time, temperature, and volume of liquids and gases. • AT 3 – use of appropriate apparatus and techniques for conducting and monitoring chemical reactions. • AT 5 – making and recording of appropriate observations during chemical reactions including the measurement of rates of reaction by a variety of methods such as production of gas and colour change. • AT 6 – safe use and careful handling of gases, liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes. **RP 7 – Testing for Ions (Chemistry only)** • AT 2 – safe use of a Bunsen burner. • AT 8 – use of appropriate qualitative reagents and techniques to analyse and identify unknown samples or products including gas tests, flame tests, precipitation reactions.

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Earth and Beyond	**P1.4 Space** Earth is part of the solar system along with the sun, 7 other planets and their moons The seasons of the year exist because the Earth rotates on a tilted axis around the sun The moon can appear to change because of how it rotates around the Earth	**C2.4 Earth** The earth is made of a mixture of different materials including rocks that are a mixture of different minerals Materials are reused and recycled in biogeochemical cycles Human activity has an impact on the earth and its atmosphere	Not taught or assessed	Not taught or assessed	**C9 Chemistry of the Atmosphere** The proportions of different gases in the atmosphere The Earth's early atmosphere, including , how oxygen increased and how carbon dioxide decreased Greenhouse gases and human activities which contribute to an increase in greenhouse gases in the atmosphere Global climate change and the carbon footprint Atmospheric pollutants from fuels, properties and effects of atmospheric pollutants **C10 Using resources** Using the Earth's resources and sustainable development Potable water Waste water treatment **RP 8 – Analysis and purification of water** Extraction of metals using phytomining and bioleaching. Corrosion of metals and the use of alloys The Haber process Production and uses of NPK fertilisers (Chemistry only). Life cycle assessment and ways of reducing the use of resources **P8 Space Physics (Physics only)** Our solar system The life cycle of a star Red Shift Orbital motion, natural and artificial satellites

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Working Scientifically (Bridging year and KS4 only)	[redacted]				• Use data to make predictions. • Comment on the extent to which data is consistent with a given hypothesis. • Assess whether sufficient measurements have been taken in an experiment. • Identify which of two or more hypotheses provides a better explanation of data in a given context. Draw and use the slope of a tangent to a curve as a measure of rate of change (Haber Process only- chemistry only) • Select and justify the apparatus to be used for a specific technique or purpose. • Apply understanding of apparatus and techniques to suggest a procedure. • Assess the precision of measurements taken in an experiment. • Understand that measurements are repeatable when repetition, under the same conditions by the same investigator, gives similar results. • Understand that measurements are reproducible if similar results are obtained by different investigators with different equipment. • Assess the precision of measurements taken in an experiment. **RP 8 – Analysis and purification of water** • AT 2 – safe use of appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater. • AT 3 – use of appropriate apparatus and techniques for the measurement of pH in different situations. • AT 4 – safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, distillation.
Energy	**P1.2 Introduction to Energy** Energy can not be created or destroyed, only transferred between 8 stores of energy Electricity is generated from renewable and non-renewable energy resources Sometimes energy is not transferred usefully and is wasted	**P2.2 Energy- Heating and Cooling** Energy can be transferred by conduction, convection and radiation Materials can be classed as insulators or conductors of thermal energy Work is the energy transferred to or from an object via the application of force along a distance.	**P1 Energy Part 1: Energy Calculations** The law of conservation states that energy cannot be created or destroyed, rather it is transferred from one store to another by a transfer pathway Changes in the of energy in a particular store can be calculated using a specific formula The conservation of energy and power in a system can be calculated using a specific formula	Not taught or assessed	Not taught or assessed
			P1 Energy Part 2: Energy Resources There are numerous energy resources available to be used, where certain resources are used for specific functions Environmenatal impacts of using certain resources and how different resources have been used over time Energy resources are used to generate electricity **RP 2 – Thermal Insulation**		

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Working Scientifically (Bridging year and KS4 only)			• Identify the main hazards in specified practical contexts. • Identify the dependent and independent variables in a given context • Explain the need to manipulate and control variables. • Select the apparatus to be used for a specific technique or purpose. • Assess whether sufficient measurements have been taken in an experiment. . • Record measurements appropriately. • Use the appropriate SI values for quantities. • Find the arithmetic mean and range of a set of data. • Substitute numerical values into algebraic equations. • Use an appropriate number of significant figures. • Plot two variables from experimental or other data. • Translate data between graphical and numeric form. • Recognise or describe patterns and trends in data. • Draw conclusions from given observations.		
			RP 2 – Thermal Insulation • AT 1 – use appropriate apparatus to make and record a range of measurements accurately, including length, area, mass, time, volume and temperature. • AT 5 – use, in a safe manner, appropriate apparatus to		
Electricity and Magnetism	Not taught or assessed	**P2.1 Electricity and Magnetism** Current is the flow of charge per second, whilst potential difference is the energy per charge Series circuits have one loop, whilst parallel circuits have more than one loop, with current and potential difference affected by this. All magnets or things that exhibit magnetic properties will have a magnetic field; with this phenomena used to make electromagnets.	Not taught or assessed	**P2 Electricity** Standard circuit diagram symbols Electrical charge and current Current, resistance and potential difference Series and parallel circuits **RP 3 – Factors affecting resistance in circuits** **RP 4 – I-V Characteristics of circuit elements** Direct and alternating potential difference Mains electricity Power and energy transfers in everyday appliances The National Grid Static electricity and electric fields (Physics only)	**P7 Magnetism** Poles of a magnet Magnetic fields Electromagnetism and making electromagnets Fleming's left-hand rule (HT only) Electric motors (HT only) Loudspeakers (physics only) (HT only) Induced potential (physics only) (HT only) Uses of the generator effect (physics only) (HT only) Microphones (physics only) (HT only) Transformers (physics only) (HT only)

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Working Scientifically (Bridging year and KS4 only)	[redacted]	• Select the apparatus to be used for a specific technique or purpose. • Describe a procedure for a specified purpose. • Identify the dependent and independent variables in a given context. • Read measurements off a scale in a practical context. • Record measurements appropriately. • Assess the precision of measurements taken in an experiment. • Use the appropriate SI values for quantities. • Substitute numerical values into algebraic equations. • Change the subject of an equation • Use an appropriate number of significant figures. • Understand that any anomalous values should be examined to try to identify the cause and, if a product of a poor measurement, ignored. • Understand that systematic error is due to results differing from the true value by a consistent amount each time. • Plot two variables from experimental or other data. • Translate data between graphical and numeric form. • Draw conclusions from given observations. • Recognise or describe patterns and trends in data. • Explain the need to manipulate and control variables.	• Select and justify the apparatus to be used for a specific technique or purpose. • Apply understanding of apparatus and techniques to suggest a procedure. • Explain why a given practical procedure is well designed for its specified purpose.
		RP 3 – Factors affecting resistance in circuits • AT 1 – use appropriate apparatus to measure and record length accurately. • AT 6 – use appropriate apparatus to measure current, potential difference and resistance. • AT 7 – use circuit diagrams to construct and check series and parallel circuits. **RP 4 – I-V Characteristics of circuit elements** • AT 6 – use appropriate apparatus to measure current and potential difference and to explore the characteristics of a variety of circuit elements. • AT 7 – use circuit diagrams to construct and check series and parallel circuits including a variety of common circuit elements.	

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Science

Forces	**P1.1 Forces** Forces can be classed as contact or non-contact Forces affect the shape, speed and direction of an object The extension of a spring is proportional to the force exerted on it. Weight (N) = mass x strength of gravity	**P2.3 Motion and Pressure** Forces can cause objects to stop or start moving, change their speed or direction of motion Distance time graphs can be used to represent the motion and calculate speed of an object Pressure is the continuous physical force exerted on or against an object by something in contact with, that occurs in all states of matter	Not taught or assessed	**P5 Forces and their interactions** Scalar and vector quantities Contact and non-contact forces Gravity Resultant forces Work done and energy transfer Forces and elasticity **RP 6 – Hooke's Law and Extension** Moments, levers and gears (physics only) Pressure in a fluid (physics only) Atmostphieric pressure	**P5 Forces and Motion** Distance and displacement Speed vs Velocity The distance–time relationship Acceleration Velocity - time graphs Terminal Velocity Newton's Laws of motion **RP 7 – Force and Acceleration** Stopping distance and reaction time Factors affecting braking distance Conservation of momentum (physics only) Changes in momentum (physics only)
Working Scientifically (Bridging year and KS4 only)				• Use the appropriate SI values for quantities. • Find the arithmetic mean and range of a set of data. • Substitute numerical values into algebraic equations. • Use an appropriate number of significant figures. • Change the subject of an equation • Make order of magnitude calculations. • Identify the main hazards in specified practical contexts. • Identify the dependent and independent variables in a given context. • Read measurements off a scale in a practical context. • Record measurements appropriately. • Use the appropriate SI values for quantities. • Find the arithmetic mean and range of a set of data. • Construct frequency tables and diagrams, bar charts and histograms. • Plot two variables from experimental or other data. • Translate data between graphical and numeric form. • Recognise or describe patterns and trends in data. • Draw conclusions from given observations. • Use data to make predictions. • Identify which of two or more hypotheses provides a better explanation of data in a given context.	• Select and justify the apparatus to be used for a specific technique or purpose. • Apply understanding of apparatus and techniques to suggest a procedure. • Explain why a given practical procedure is well designed for its specified purpose. • Assess the precision of measurements taken in an experiment. • Draw and use the slope of a tangent to a curve as a measure of rate of change. • Determine the slope and intercept of a linear graph • Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate. • Understand that measurements are repeatable when repetition, under the same conditions by the same investigator, gives similar results. • Understand that measurements are reproducible if similar results are obtained by different investigators with different equipment.
				RP 6 – Hooke's Law and Extension • AT 1 – use appropriate apparatus to make and record length accurately. • AT 2 – use appropriate apparatus to measure and observe the effect of force on the extension of springs and collect the data required to plot a force-extension graph.	**RP 7 – Force and Acceleration** • AT 1 – use appropriate apparatus to make and record measurements of length, mass and time accurately. • AT 2 – use appropriate apparatus to measure and observe the effect of force. • AT 3 – use appropriate apparatus and techniques for measuring motion, including determination of speed and rate of change of speed (acceleration/deceleration).

Core Concepts
Science

Waves	**P1.3 Sound and Light** Both sound and light are transferred by different types of waves Sound waves require a medium to travel through as vibrations Light can be reflected, emitted, refracted and made of different colours To detect sound and light, an organism needs specific receptors	Not taught or assessed	Not taught or assessed	Not taught or assessed	**P6 Waves** Transverse and longitudinal waves Properties of waves **RP 8 – Observing and measuring waves in a ripple tank and solid** Reflection of waves (physics only) **RP 9 – Reflection and Refraction (Physics only)** Sound Waves (physics only HT) Waves for detection and exploration (physics only HT) Types of electromagnetic waves Properties of electromagnetic waves Uses and applications of electromagnetic waves Visible light (physics only) Lenses (physics only) Emission and absorption of infrared radiation Perfect black bodies and radiation Red-shift (physics only) **RP 10 – Investigating absorption and emission (Physics only)**
Working Scientifically (Bridging year and KS4 only)				• Change the subject of an equation • Use data to make predictions. • Comment on the extent to which data is consistent with a given hypothesis. • Understand that any anomalous values should be examined to try to identify the cause and, if a product of a poor measurement, ignored. • Understand that measurements are affected by random error due to results varying in unpredictable ways. • Understand that systematic error is due to results differing from the true value by a consistent amount each time. • Understand that measurements are precise if they cluster closely. • Understand that an accurate measurement is one that is close to the true value.	
				RP 8 – Observing and measuring waves in a ripple tank and solid • AT 4 – make observations of waves in fluids and solids to identify the suitability of apparatus to measure speed, frequency and wavelength. **RP 9 – Reflection and Refraction (Physics only)** • AT 4 – make observations of the effects of the interaction of electromagnetic waves (light) with matter. • AT 8 – make observations of waves in fluids and solids to identify the suitability of apparatus to measure the effects of the interaction of waves with matter **RP 10 – Investigating absorption and emission** • AT 1 – use appropriate apparatus to make and record temperature accurately. • AT 4 – make observations of the effects of the interaction of electromagnetic waves with matter	