GCSE Combined Science

Outline of Exams and RAG Checklists

We follow the AQA Trilogy specification and this course leads to 2 GCSE grades and consists of 6 written exam papers (2 in each science discipline), 70 marks each and lasting 1 hour 15 mins. The question styles include multiple choice, structured, closed short answer and open extended response. In addition to the checklists below, there will be questions relating to the required practical activities studied through the course and there will be calculations, so a calculator is required for all science exams. Each paper contributes 16.7% towards the grades.

Biology Paper 1: This paper is on 13th May and includes modules B1 to B4 Cell Biology; Organisation; Infection and response; and Bioenergetics.

Biology paper 2: This paper is on 9th June and includes modules: B5 to B7 Homeostasis and response; Inheritance, variation and evolution; and Ecology.

Chemistry paper 1 is on 19th May and includes modules: C1 to C5 Atomic structure and the periodic table; Bonding, structure, and the properties of matter; Quantitative chemistry; Chemical changes; and Energy changes.

Chemistry paper 2 is on 13th June and includes modules:C6 to C10 The rate and extent of chemical change; Organic chemistry; Chemical analysis; Chemistry of the atmosphere; and Using resources.

Physics paper 1 is on 22nd May includes Modules P1 to P4 Energy; Electricity; Particle model of matter; and Atomic structure.

Physics paper 2 is on 16th June 2025 (AM) includes Modules P5 to P7 Forces, Waves; Magnetism and electromagnetism.

Below are all Learning Journey Checklists for this GCSE. Bold statements are assessed on the higher tier paper only.

KS4 TRILOGY BIOLOGY

B1 LEARNING JOURNEY

B1	REF	SKILL	RAG
1.1 CELL STRUCTURE	B.1.1.1.a	I can use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells	
	B.1.1.1.b	I can describe the features of bacterial (prokaryotic) cells	
	B.1.1.2.a	I can state the structures found in animal and plant (eukaryotic) cells	
	B.1.1.2.b	I can describe the functions of the structures in animal and plant (eukaryotic) cells	
	B.1.1.4.a	I can describe what differentiation is, including differences between animals and plants	
	B.1.1.4.b	I can describe what a specialised cell is, including examples	
	B.1.1.5.a	I can define the terms magnification and resolution	
	B.1.1.5.b	I can compare electron and light microscopes in terms of their magnification and resolution, including the consequences of these differences for studying cells	
1.2 CELL DIVISION	B.1.2.1.a	I can describe how genetic information is stored in the nucleus of a cell	
	B.1.2.2.a	I can describe the processes that happen during the cell cycle, including an understanding of mitosis	
	B.1.2.3.a	I can describe stem cells, including sources of stem cells in plants and animals and their role in an organism	
	B.1.2.3.b	I can describe the use of stem cells in the production of plant clones and therapeutic cloning	
	B.1.2.3.c	I can discuss the potential risks, benefits and issues associated with using stem cells in medical research and treatments	
1.3 TRANSPORT IN CELLS	B.1.3.1.a	I can describe the process of diffusion, including examples	
	B.1.3.1.b	I can explain how diffusion is affected by different factors	
	B.1.3.1.c	I can explain the term "surface area to volume ratio", and how this relates to single-celled and multicellular organisms	
	B.1.3.1.d	I can explain how the effectiveness of an exchange surface can be increased, including examples of exchange surface adaptations	
	B.1.3.2.a	I can describe the process of osmosis	
	B.1.3.3.a	I can describe the process of active transport, including examples	
	B.1.3.3.b	I can explain the differences between diffusion, osmosis and active transport	

KS4 TRILOGY BIOLOGY

B2 LEARNING JOURNEY

B2	REF	SKILL	RAG
	B.2.1.1.a	I can describe the levels of organisation within living organisms	
2.2 ANIMAL TISSUES, ORGANS AND ORGAN SYSTEMS	B.2.2.1.a	I can describe basic features of enzymes	
	B.2.2.1.b	I can describe the lock and key theory as a model of enzyme action	
	B.2.2.1.c	I can explain the effect of temperature and pH on enzymes	
	B.2.2.1.d	I can describe the digestive enzymes, including their names, sites of production and actions	
	B.2.2.1.e	I can describe how the products of digestion are used	
	B.2.2.1.f	I can describe the features and functions of bile	
	B.2.2.2.a	I can describe the structure of the human heart and lungs	
	B.2.2.2.b	I can explain how the heart moves blood around the body	
	B.2.2.2.c	I can explain how the natural resting heart rate is controlled, and how irregularities can be corrected	
	B.2.2.2.d	I can describe the structure and function of arteries, veins and capillaries	
	B.2.2.3.a	I can describe blood and identify its different components, including identifying blood cells from photographs and diagrams	
	B.2.2.3.b	I can describe the functions of blood components, including adaptations to function	
	B.2.2.4.a	I can describe what happens in coronary heart disease	
	B.2.2.4.b	I can describe treatments for coronary heart disease and heart failure	
	B.2.2.4.c	I know that heart valves can become faulty and I can describe the consequences of this	
	B.2.2.5.a	I can describe health and the causes of ill-health	
	B.2.2.5.b	I can describe how different types of diseases may interact	
	B.2.2.6.a	I can describe what risk factors are and I can give examples	
	B.2.2.7.a	I can describe benign and malignant tumours	
	B.2.2.7.b	I can describe the known risk factors for cancer, including genetic and lifestyle risk factors	
2.3 PLANT TISSUES, ORGANS AND ORGAN SYSTEMS	B.2.3.1.a	I can name some plant tissues and describe their functions	
	B.2.3.1.b	I can explain how the structure of plant tissues are related to their function within the leaf, which is a plant organ	
	B.2.3.2.a	I know that the roots, stem and leaves form a plant organ system that transports substances around the plant	
	B.2.3.2.b	I can explain how root hair cells, xylem and phloem are adapted to their functions	
	B.2.3.2.c	I can describe what transpiration is	
	B.2.3.2.d	I can explain how the rate of transpiration can be affected by different factors	
	B.2.3.2.e	I can describe the role of stomata/guard cells in the control of gas exchange/water loss	

KS4 TRILOGY BIOLOGY

B3 LEARNING JOURNEY

B3	REF	SKILL	RAG
3.1 COMMUNICABLE DISEASE	B.3.1.1.a	I can describe what a pathogen is and how pathogens are spread	
	B.3.1.1.b	I can explain how pathogenic bacteria and viruses cause damage in the body	
	B.3.1.1.c	I can explain how the spread of diseases can be reduced or prevented	
	B.3.1.2.a	I can describe measles, HIV and tobacco mosaic virus as examples of viral pathogens (to include pathology, treatment and disease control where appropriate)	
	B.3.1.3.a	I can describe salmonella food poisoning and gonorrhoea as examples of bacterial pathogens (to include pathology, treatment and disease control where appropriate)	
	B.3.1.4.a	I can describe the signs, transmission and treatment of rose black spot infection in plants	
	B.3.1.5.a	I can describe the symptoms, transmission and control of malaria, including knowledge of the mosquito vector	
	B.3.1.6.a	I can describe defences that stop pathogens entering the human body	
	B.3.1.6.b	I can state the role of the immune system	
	B.3.1.6.c	I can describe how white blood cells attack pathogens	
	B.3.1.7.a	I can describe how vaccination works, including at the population level	
	B.3.1.8.a	I can explain how antibiotics and painkillers are used to treat diseases, including their limitations	
	B.3.1.9.a	I can describe how sources for drugs have changed over time, and give some examples	
	B.3.1.9.b	I can describe how new drugs are tested, including pre-clinical testing and clinical trials	

KS4 TRILOGY BIOLOGY

B4 LEARNING JOURNEY

B4	REF	SKILL	RAG
4.1 PHOTOSYNTHESIS	B.4.1.1.a	I can describe what happens in photosynthesis, including using a word equation	
	B.4.1.1.b	**I can describe photosynthesis using a chemical equation**	
	B.4.1.2.a	I can state the limiting factors of photosynthesis	
	B.4.1.2.b	I can explain how limiting factors affect the rate of photosynthesis, including graphical interpretation (limited to one factor)	
	B.4.1.2.c	**I can explain how the limiting factors of photosynthesis interact, including graphical interpretation involving two or three factors**	
	B.4.1.2.d	**I can explain how limiting factors are important to the economics of greenhouses, including data interpretation**	
	B.4.1.2.e	**I can explain and use inverse proportion in the context of photosynthesis**	
	B.4.1.3.a	I can describe how the glucose produced in photosynthesis is used by plants	
4.2 RESPIRATION	B.4.2.1.a	I can describe basic features of respiration	
	B.4.2.1.b	I can describe aerobic and anaerobic respiration using word equations	
	B.4.2.1.c	**I can describe aerobic and anaerobic respiration (in plants and yeast cells only) using chemical equations**	
	B.4.2.1.d	I can compare aerobic and anaerobic respiration	
	B.4.2.2.a	I can describe what happens to heart rate, breathing rate and breath volume during exercise and why these changes occur	
	B.4.2.2.b	I can explain what happens when muscles do not have enough oxygen	
	B.4.2.2.c	**I can explain what happens to lactic acid**	
	B.4.2.3.a	I can explain what metabolism is, including examples	

KS4 TRILOGY BIOLOGY

B5 LEARNING JOURNEY

B5	REF	SKILL	RAG
5.1 HOMEOSTASIS	B.5.1.1.a	I can describe what homeostasis is and why it is important, and I can give examples of conditions controlled by homeostasis	
	B.5.1.1.b	I can describe the common features of all control systems	
5.2 NERVOUS SYSTEM	B.5.2.1.a	I can state the function of the nervous system and name its important components	
	B.5.2.1.b	I can describe how information passes through the nervous system	
	B.5.2.1.c	I can describe what happens in a reflex action and why reflex actions are important	
	B.5.2.1.d	I can explain how features of the nervous system are adapted to their function, including a reflex arc	
5.3 HORMONAL CONTROL	B.5.3.1.a	I can describe the endocrine system, including the location of parts and the role of hormones	
	B.5.3.2.a	I can state that blood glucose concentration is monitored and controlled by the pancreas, and describe the body's response when blood glucose is too high	
	B.5.3.2.b	I can explain what type 1 and type 2 diabetes are and how they are treated	
	B.5.3.2.c	I can describe the body's response when blood glucose concentration is too low	
	B.5.3.2.d	I can explain how glucagon interacts with insulin to control blood glucose levels in the body	
	B.5.3.3.a	I can describe how water, ions and urea are lost from the body, and the consequences of losing or gaining too much water for body cells	
	B.5.3.3.b	I know that protein digestion leads to excess amino acids inside the body, and I can describe what happens to these	
	B.5.3.3.c	I can describe how the kidneys produce urine	
	B.5.3.3.d	I can explain how the water level in the body is controlled by ADH	

AREA	REF	SKILL	RAG
5.3 HORMONAL CONTROL	B.5.3.3.e	I can describe how kidney failure can be treated	
	B.5.3.4.a	I can describe what happens at puberty in males and females, including knowledge of male and female reproductive hormones	
	B.5.3.4.b	I can name and describe the roles of the hormones involved in the menstrual cycle	
	B.5.3.4.c	**I can explain how different hormones interact to control the menstrual cycle and ovulation**	
	B.5.3.5.a	I can describe how fertility can be controlled by hormonal and non-hormonal methods of contraception	
	B.5.3.6.a	**I can explain how hormones are used to treat infertility, including the steps involved in In Vitro Fertilisation (IVF) treatment**	
	B.5.3.6.b	**I can evaluate the risks and benefits of fertility treatments**	
	B.5.3.7.a	**I can describe the functions of adrenaline and thyroxine in the body, and I know where they are produced**	
	B.5.3.7.b	**I can explain the roles of thyroxine and adrenaline in the body as negative feedback systems**	

KS4 TRILOGY BIOLOGY

B6 LEARNING JOURNEY

AREA	REF	SKILL	RAG
6.1 REPRODUCTION	B.6.1.1.a	I can describe features of sexual and asexual reproduction	
	B.6.1.2.a	I can describe what happens during meiosis	
	B.6.1.2.b	I can describe what happens at fertilisation	
	B.6.1.4.a	I can describe the structure of DNA and its role in storing genetic information inside the cell	
	B.6.1.4.b	I can explain the term 'genome' and the importance of the human genome	
	B.6.1.6.a	I can describe how characteristics are controlled by one or more genes, including examples	
	B.6.1.6.b	I can explain important genetic terms: allele, genotype, phenotype, dominant, recessive, homozygous and heterozygous	
	B.6.1.6.c	I can understand and use Punnet square diagrams, genetic crosses and family trees	
	B.6.1.6.d	I can construct a Punnet square diagram to predict the outcome of a monohybrid cross	
	B.6.1.7.a	I can describe cystic fibrosis and polydactyly as examples of inherited disorders	
	B.6.1.7.b	I can evaluate social, economic and ethical issues concerning embryo screening when given appropriate information	
	B.6.1.8.a	I can describe how the chromosomes are arranged as 23 pairs in body cells, including the function of the sex chromosomes	
	B.6.1.8.b	I can explain how sex is determined and carry out a genetic cross to show sex inheritance	
6.2 VARIATION AND EVOLUTI	B.6.2.1.a	I can describe what variation is and how it can be caused	
	B.6.2.1.b	I can describe mutations and explain their influence on phenotype and changes in a species	
	B.6.2.2.a	I can explain the theory of evolution by natural selection	
	B.6.2.2.b	I can describe how new species can be formed	
	B.6.2.3.a	I can describe what selective breeding is	
	B.6.2.3.b	I can explain the process of selective breeding, including examples of desired characteristics and risks associated with selective breeding	

AREA	REF	SKILL	RAG
6.2 VARIATION AND EVOLUTION	B.6.2.4.a	I can describe what genetic engineering is, including examples, and how it is carried out	
	B.6.2.4.b	I can explain some benefits, risks and concerns related to genetic engineering	
	B.6.2.4.c	**I can explain the process of genetic engineering, to include knowledge of enzymes and vectors**	
	B.6.2.5.a	I can describe different cloning techniques, to include: tissue culture, cuttings, embryo transplants and adult cell cloning	
6.3 GENETICS OF EVOLUTION	B.6.3.4.a	I can describe some sources of evidence for evolution	
	B.6.3.5.a	I can describe what fossils are, how they are formed and what we can learn from them	
	B.6.3.5.b	I can explain why there are few traces of the early life forms, and the consequences of this in terms of our understanding of how life began	
	B.6.3.6.a	I can describe some of the causes of extinction	
	B.6.3.7.a	I can describe how antibiotic-resistant strains of bacteria can arise and spread	
	B.6.3.7.b	I can describe how the emergence of antibiotic-resistant bacteria can be reduced and controlled, to include the limitations of antibiotic development	
6.4 CLASSIFICATION	B.6.4.1.a	I can describe how organisms are named and classified in the Linnaean system	
	B.6.4.1.b	I can explain how scientific advances have led to the proposal of new models of classification, including knowledge of the three-domain system	
	B.6.4.1.c	I can describe and interpret evolutionary trees	

KS4 TRILOGY BIOLOGY

B7 LEARNING JOURNEY

AREA	REF	SKILL	RAG1
7.1 ADAPTATIONS, INTERDEPENDENCE AND COMPETITION	B.7.1.1.a	I can state what an ecosystem is	
	B.7.1.1.b	I can describe which resources animals and plants compete for, and why they do this	
	B.7.1.1.c	I can explain the terms 'interdependence' and 'stable community'	
	B.7.1.2.a	I can name some abiotic and biotic factors that affect communities	
	B.7.1.2.b	I can explain how a change in an abiotic or biotic factor might affect a community given appropriate data or context	
	B.7.1.4.a	I can describe structural, behavioural and functional adaptations of organisms	
	B.7.1.4.b	I can describe what an extremophile is	
7.2 ORGANISATION OF AN ECOSYSTEM	B.7.2.1.a	I can represent the feeding relationships within a community using a food chain, including the use of scientific terms to describe these relationships	
	B.7.2.1.b	I can explain how and why ecologists use quadrats and transects	
	B.7.2.1.c	I can understand and interpret predator-prey cycles	
	B.7.2.2.a	I can describe the processes involved in the carbon cycle	
	B.7.2.2.b	I can describe the processes involved in the water cycle	
7.3 BIODIVERSITY AND THE EFFECT OF HUMAN INTERACTION ON ECOSYSTEMS	B.7.3.1.a	I can describe what biodiversity is, why it is important, and how human activities affect it	
	B.7.3.2.a	I can describe the impact of human population growth and increased living standards on resource use and waste production	
	B.7.3.2.b	I can explain how pollution can occur, and the impacts of pollution	
	B.7.3.3.a	I can describe how humans reduce the amount of land available for other animals and plants	
	B.7.3.3.b	I can explain the consequences of peat bog destruction	
	B.7.3.4.a	I can describe what deforestation is and why it has occurred in tropical areas	
	B.7.3.4.b	I can explain the consequences of deforestation	
	B.7.3.5.a	I can describe how the composition of the atmosphere is changing, and the impact of this on global warming	
	B.7.3.5.b	I can describe some biological consequences of global warming	
	B.7.3.6.a	I can describe programmes that aim to reduce the negative effects on ecosystems and biodiversity	

KS4 TRILOGY CHEMISTRY

C1 LEARNING JOURNEY

C1	REF	SKILL	RAG
1.1 SIMPLE MODEL OF ATOMS, SYMBOLS, RELATIVE ATOMIC MASS, ELECTRONIC CHARGE AND ISOTOPES.	1.1.1	I can state that everything is made of atoms, which are the smallest part of an element that can exist, and all elements are shown in the periodic table	
	1.1.4	I can state the relative charge of protons, neutrons and electrons and describe the overall charge of an atom	
	1.1.5	I can state the relative masses of protons, neutrons and electrons and describe the distribution of mass in an atom	
	1.1.5	I can calculate the number of protons, neutrons and electrons in an atom when given its atomic number and mass number	
	1.1.7	I can describe how electrons fill energy levels in atoms, and I can represent the electron structure of elements using diagrams and numbers	
	1.1.3	I can describe how the atomic model has changed over time due to new experimental evidence, including the discovery of the atom and Rutherford and Marsden's scattering experiments	
	1.1.1	I can describe how compounds are made of different elements in fixed proportions, are formed by a chemical reaction and can only be separated into their constituent elements by a chemical reaction	
	1.1.1	I can state that elements and compounds are represented by symbols; and I can use chemical symbols and formulae to represent elements and compounds	
	1.1.5	I can describe isotopes as atoms of the same element with different numbers of neutrons	
	1.1.1	I can write word equations and balanced symbol equations for chemical reactions, including using appropriate state symbols	
	1.1.2	I can describe a mixture as two or more elements or compounds that are not chemically combined, where the properties of each substance are unchanged	
	1.1.2	I can name and describe the physical processes used to separate mixtures and suggest suitable separation techniques	

C1	REF	SKILL	RAG
1.2 THE PERIODIC TABLE	1.2.1	I can state that the elements in the periodic table are arranged by atomic (proton) number from left to right in rows, called periods	
	1.2.1	I can describe how elements with similar properties are placed in columns, called groups, and elements in the same group in the periodic table have the same number of electrons in their outer shell	
	1.2.1	I can explain that elements in the same group have similar properties and the reactions of elements are related to the arrangement of electrons in their atoms, and I can use the periodic table to predict the reactivity of elements	
	1.2.3	I can identify metals and non-metals on the periodic table, compare and contrast their properties and explain that metals react to form positive ions and non-metals do not	
	1.2.2	I can describe the early attempts to classify elements by arranging them in order of atomic weight, problems with this approach, and how the discovery of isotopes explained why ordering by atomic weight was not always correct	
	1.2.2	I can explain the creation and attributes of Mendeleev's periodic table	
	1.2.3	I can explain how the atomic structure of metals and non-metals relates to their position in the periodic table	
	1.2.5	I can describe the reactivity and properties of group 1 alkali metals with reference to their electron arrangement and predict their reactions	
	1.2.6	I can describe the properties of group 7 halogens and how their properties relate to their electron arrangement, including trends in molecular mass, melting and boiling points and reactivity	
	1.2.6	I can describe the reactions of group 7 halogens with metals and non-metals, and explain how a more reactive halogen can displace a less reactive halogen in an aqueous solution of its salt	
	1.2.4	I can describe nobel gases (group 0) as being unreactive and explain that this is because they have a full outer shell of electrons	
	1.2.4	I can describe the properties of noble gases, including boiling points, predict trends down the group and describe how their properties depend on the outer shell of electrons	

KS4 TRILOGY CHEMISTRY

C2 LEARNING JOURNEY

C2	REF	SKILL	RAG
2.1 CHEMICAL BONDS: IONIC, COVALENT, METALLIC	2.1.1	I can describe the three main types of bonds: ionic bonds, covalent bonds and metallic bonds in terms of electrostatic forces and the transfer or sharing of electrons	
	2.1.2	I can describe how the ions produced by elements in some groups have the electronic structure of a noble gas and explain how the charge of an ion relates to its group number	
	2.1.3	I can describe the structure of ionic compounds, including the electrostatic forces of attraction, and I can represent ionic compounds using dot and cross diagrams	
	2.1.4	I can describe covalent bonds and identify different types of covalently bonded substances, such as small molecules, large molecules and substances with giant covalent structures	
	2.1.4	I can represent covalent bonds between small molecules, repeating units of polymers and parts of giant covalent structures using diagrams, including dot and cross, ball and stick, and line diagrams	
	2.1.5	I can describe the arrangement of atoms and electrons in metallic bonds and draw diagrams the bonding in metals	
2.2 HOW BONDING AND STRUCTURE ARE RELATED TO THE PROERTIES OF SUBSTANCES	2.2.1	I can name the three states of matter, identify them from a simple model and state which changes of state happen at melting and boiling points	
	2.2.1	I can explain changes of state using particle theory and describe factors that affect the melting and boiling point of a substance, including the strength of the forces between particles, the type of bonding and the structure of the substance	
	2.2.1	**I can discuss the limitations of particle theory**	
	2.2.3	I can explain how the structure of ionic compounds affects their properties, including melting and boiling points and conduction of electricity	
	2.2.4	I can explain how the structure of small molecules affects their properties	
	2.2.5	I can explain how the structure of polymers affects their properties	
	2.2.6	I can explain how the structure of giant covalent structures affects their properties	
	2.2.7 2.2.8	I can explain how the structure of metals and alloys affects their properties, including explaining why they are good conductors	
2.3 STRUCTURE AND BONDING OF CARBON	2.3.1 2.3.2	I can explain the properties of graphite, diamond and graphene in terms of their structure and bonding	
	2.3.3	I can describe the structure of fullerenes, and their uses, including Buckminsterfullerene and carbon nanotubes	

KS4 TRILOGY CHEMISTRY

C3 LEARNING JOURNEY

C3	Ref	SKILL	RAG
3.1 CONSERVATION OF MASS AND THE QUANTITATIVE INTERPRETATION OF CHEMICAL EQUATIONS	3.1.1	I can state that mass is conserved and explain why, including describing balanced equations in terms of conservation of mass	
	3.1.2	I can describe that the relative formula mass (M_r) of a compound is the sum of the relative atomic masses of the atoms in the compound and calculate the relative formula mass of a compound, given its formula	
	3.1.2	I can calculate the relative formula masses of reactants and products to prove that mass is conserved in a balanced chemical equation	
	3.1.3	I can explain observed changes of mass during chemical reactions in non-enclosed systems using the particle model when given the balanced symbol equation	
3.2 USE OF AMOUNT OF SUBSTANCE IN RELATION TO MASSES OF PURE SUBSTANCES	3.2.1	I can state that chemical amounts are measured in moles (mol) and explain what a mol is with reference to relative formula mass and Avogadro's constant	
	3.2.1	I can use the relative formula mass of a substance to calculate the number of moles in a given mass of the substance	
	3.2.2	I can calculate the masses of reactants and products when given a balanced symbol equation	
	3.2.3	I can use moles to write a balanced equation when given the masses of reactants and products	
	3.2.4	I can explain the effect of limiting the quantity of a reactant on the amount of products in terms of moles or masses in grams	

KS4 TRILOGY CHEMISTRY

C4 LEARNING JOURNEY

C4	REF	SKILL	RAG
4.1 REACTIVITY OF METALS	4.1.1	I can state that metals react with oxygen to produce metal oxides and describe this process as an oxidation reaction, which is a gain of oxygen	
	4.1.2	I can describe the arrangement of metals in the reactivity series, including carbon and hydrogen,use the reactivity series to predict the outcome of displacement reactions	
	4.1.3	I can explain how metals can be extracted from the compounds in which they are found in nature by reduction with carbon	
	4.1.3	I can evaluate specific metal extraction processes when given appropriate information and identify which species are oxidised or reduced	
	4.1.4	I can describe oxidation as the loss of electrons and reduction as the gain of electrons	
	4.1.4	I can write ionic equations for displacement reactions, and I can identify which species are oxidised and reduced from a symbol or half equation	
4.2 REACTIONS OF ACIDS	4.2.1	I can explain in terms of gain or loss of electrons that the reactions between acids and some metals are redox reactions, and identify which species are oxidised and which are reduced	
	4.2.2	I can explain that acids can be neutralised by alkalis (soluble metal hydroxides), bases (insoluble metal hydroxides and metal oxides) and metal carbonates and list the products of each of these reactions	
	4.2.2	I can predict the salt produced in a neutralisation reaction based on the acid used and the positive ions in the base, alkali or carbonate and use the formulae of common ions to deduce the formulae of the salt	
	4.2.3	I can describe how soluble salts can be made from acids and how pure, dry samples of salts can be obtained	
	4.2.4	I can state that the pH scale is a measure of acidity and that a pH of 7 is neutral, a pH of less than 7 is acidic and a pH of greater than 7 is alkaline, and I can use a universal indicator to measure pH	
	4.2.4	I can state that acids produce hydrogen ions (H^+) in aqueous solutions and alkalis produce hydroxide ions (OH^-) and describe neutralisation reactions using the equation: $H^+ (aq) + OH^- (aq) \rightarrow H_2O (l)$	
	4.2.5	I can use and explain the terms dilute and concentrated (in terms of amount of substance) and weak and strong (in terms of the degree of ionisation) in relation to acids	
	4.2.5	I can explain how the concentration of an aqueous solution and the strength of an acid affects the pH of the solution and how pH is related to the hydrogen ion concentration of a solution	

C4	REF	SKILL	RAG
4.3 ELECTROLYSIS	4.3.1	I can describe how ionic compounds can conduct electricity when dissolved in water and describe these solutions as electrolytes	
	4.3.1	I can describe the process of electrolysis, including how positive and negative ions are attracted to the negative electrode (cathode) and positive electrode (anode) respectively	
	4.3.2	I can describe the electrolysis of molten ionic compounds and predict the products at each electrode of the electrolysis of binary ionic compounds	
	4.3.3	I can explain how metals are extracted from molten compounds using electrolysis and use the reactivity series to explain why some metals are extracted with electrolysis instead of carbon	
	4.3.4	I can describe the electrolysis of aqueous solutions and predict the products of the electrolysis of aqueous solutions containing single ionic compounds	
	4.3.5	**I can describe the reactions at the electrodes during electrolysis as oxidation and reduction reactions and write balanced half equations for these reactions**	

KS4 TRILOGY CHEMISTRY

C5 LEARNING JOURNEY

C5	REF	SKILL	RAG
5.1 EXOTHERMIC AND ENDOTHERMIC REACTIONS	5.1.1	I can describe how energy is transferred to or from the surroundings during a chemical reaction, how energy is transferred during exothermic and endothermic reactions, and some uses of exothermic and endothermic reactions	
	5.1.2	I can describe activation energy as the minimum amount of energy that particles must have to react when they collide with each other	
	5.1.2	I can interpret and draw reaction profiles of exothermic and endothermic reactions, including identifying the relative energies of reactants and products, the activation energy and the overall energy change	
	5.1.3	I can explain that breaking bonds in reactants takes an input of energy and forming bonds in the products releases energy during a chemical reaction, and I can calculate the overall energy change using bond energies	

KS4 TRILOGY CHEMISTRY

C6 LEARNING JOURNEY

C6	REF	SKILL	RAG
6.1 RATE OF REACTION	6.1.1	I can calculate the rate of a chemical reaction over time, using either the quantity of reactant used or the quantity of product formed, measured in g/s, cm^3/s or mol/s	
	6.1.1	I can draw and interpret graphs showing the quantity of product formed or reactant used up against time and use the tangent to the graph as a measure of the rate of reaction	
	6.1.1	I can calculate the gradient of a tangent to the curve on the graph of the quantity of product formed or reactant used against time and use this as a measure of the rate of reaction at a specific time	
	6.1.2	I can describe how factors affect the rate of a chemical reaction, including the concentration of reactants in solution, the pressure of reacting gases, the surface area of solid reactants, temperature and the presence of catalysts	
	6.1.3	I can use collision theory to explain changes in the rate of reaction, including discussing activation energy	
	6.1.4	I can describe the role of a catalyst in a chemical reaction, and I can state that enzymes are catalysts in biological systems	
	6.1.4	I can draw and interpret reaction profiles for catalysed reactions	
6.2 REVERSIBLE REACTIONS AND DYNAMIC EQUILIBRIUM	6.2.1	I can explain what a reversible reaction is, including how the direction can be changed, and represent it using symbols: A + B ⇌ C + D	
	6.2.2	I can explain that, for reversible reactions, if a reaction is endothermic in one direction, it is exothermic in the other direction	
	6.2.3	I can describe the state of dynamic equilibrium of a reaction as the point when the forward and reverse reactions occur at exactly the same rate	
	6.2.4	I can explain that the position of equilibrium depends on the conditions of the reaction, and the equilibrium will change to counteract any changes to conditions	
	6.2.5 6.2.6 6.2.7	I can explain and predict the effect of a change in concentration of reactants or products, temperature, or pressure of gases on the equilibrium position of a reaction	

KS4 TRILOGY CHEMISTRY

C7 LEARNING JOURNEY

C7	REF	SKILL	RAG
7.1 CARBON COMPOUNDS AS FUELS AND FEEDSTOCK	7.1.1	I can describe what crude oil is and where it comes from, including the basic composition of crude oil and the general chemical formula for the homologous series of alkanes (C_nH_{2n+2})	
	7.1.1	I can state the names of the first four members of the alkanes, and I can recognise substances as alkanes from their formulae	
	7.1.2	I can describe the process of fractional distillation and state the names and uses of fuels that are produced from crude oil by fractional distillation	
	7.1.3	I can describe trends in the properties of hydrocarbons, including boiling point, viscosity and flammability, and I can explain how their properties influence how they are used as fuels	
	7.1.3	I can describe and write balanced chemical equations for the complete combustion of hydrocarbon fuels	
	7.1.4	I can describe the process of cracking and state that the products of cracking include alkanes and alkenes, which are another type of hydrocarbon and more reactive than alkanes	

KS4 TRILOGY CHEMISTRY

C8 LEARNING JOURNEY

C8	REF	SKILL	RAG
8.1 PURITY, FORMATIONS, CHROMATOGRAPHY	8.1.1	I can define a pure substance and identify pure substances and mixtures from data about melting and boiling points	
	8.1.2	I can describe a formulation, and identify formulations given appropriate information	
	8.1.3	I can describe chromatography, including the terms stationary phase and mobile phase, and identify pure substances using paper chromatography	
	8.1.3	I can explain what the R^f value of a compound represents, how the Rf value differs in different solvents, and interpret and determine Rf values from chromatograms	
8.2 IDENTIFICATION OF COMMON GASES	8.2.1, 8.2.2, 8.2.3, 8.2.4	I can explain how to test for the presence of hydrogen, oxygen, carbon dioxide and chlorine	

KS4 TRILOGY CHEMISTRY

C9 LEARNING JOURNEY

C9	REF	SKILL	RAG
9.1 COMPOSITION AND EVOLUTION OF EARTH'S ATMOSPHERE	9.1.1	I can describe the makeup of Earth's atmosphere using percentages, fractions or ratios, including nitrogen, oxygen and other gases, such as carbon dioxide, water vapour and noble gases	
	9.1.2	I can describe how early intense volcanic activity may have helped form the early atmosphere and water vapour that condensed to form oceans, including the build up of nitrogen from the volcanoes	
	9.1.3	I can explain how, at the beginning of Earth's existence, oxygen was produced by photosynthesis and use the word and chemical equation for photosynthesis	
	9.1.3	I can state the approximate time in Earth's history when algae started producing oxygen and describe the effects of a gradually increasing oxygen level	
	9.1.4	I can explain ways that atmospheric carbon dioxide levels decreased, including photosynthesis, the formation of sedimentary rocks and the creation of crude oil from the remains of plankton	
9.2 CARBON DIOXIDE AND METHANE AS GREENHOUSE	9.2.1	I can name some greenhouse gases and describe how they cause an increase in Earth's temperature	
	9.2.2	I can list some human activities that produce greenhouse gases	
	9.2.2	I can evaluate arguments for and against the idea that human activities cause a rise in temperature that results in global climate change	
	9.2.3	I can state some potential side effects of global climate change, including discussing scale, risk and environmental implications	
	9.2.4	I can define a carbon footprint as the total amount of carbon dioxide and other greenhouse gases emitted over the life cycle of a product, service or event and list some actions that could reduce the carbon footprint	
9.3 COMMON ATMOSPHERIC POLLUTANTS AND	9.3.1	I can describe the combustion of fuels as a major source of atmospheric pollutants and name the different gases that are released when a fuel is burned	
	9.3.2	I can describe the properties and effects of carbon monoxide, sulfer dioxide and particulates in the atmosphere	

KS4 TRILOGY CHEMISTRY

C10 LEARNING JOURNEY

C10	REF	SKILL	RAG
10.1 USING EARTH'S RESOURCES, OBTAINING POTABLE WATER	10.1.1	I can give some examples of natural resources and describe how they are used by humans	
	10.1.1	I can explain that Earth's resources are finite, and they are processed to provide energy and materials for consumption, and I can give examples of finite and renewable resources	
	10.1.1	I can explain what sustainable development is and discuss the role chemistry plays in sustainable development, including improving agricultural and industrial processes	
	10.1.2	I can discuss the importance of water quality for human life, including defining potable (drinkable) water	
	10.1.2	I can describe methods to produce potable water, including desalination of salty water or sea water and the potential problems of desalination	
	10.1.3	I can describe waste water as a product of urban lifestyles and industrial processes that includes organic matter, harmful microbes and harmful chemicals	
	10.1.3	I can describe the process of sewage treatment and compare the ease of obtaining potable water from waste water as opposed to ground or salt water	
	10.1.4	I can name and describe alternative biological methods for extracting metals, including phytomining and bioleaching	
	10.1.4	I can evaluate alternative methods for extracting metals	
10.2 LIFE CYCLE ASSESSMENT AND RECYCLING	10.2.1	I can describe, carry out and interpret a simple comparative LCA of materials or products	
	10.2.1	I can discuss the advantages and disadvantages of LCAs, including the difficulty in quantifying pollutant effects and the misuse or misinterpretation of abbreviated LCAs	
	10.2.2	I can discuss how to reduce the consumption of raw resources by reducing use, reusing, and recycling products and explain how reusing and recycling reduces energy use	

KS4 TRILOGY PHYSICS

P1 LEARNING JOURNEY

P1	REF	SKILL	RAG
1.1 ENERGY CHANGES IN A SYSTEM	P.1.1.1a	I can define a system as an object or group of objects, and I can state examples of changes in the way energy is stored in a system	
	P.1.1.1b	I can describe all the energy changes involved in an energy transfer, and calculate relative changes in energy when the heat, work done or flow of charge in a system changes	
	P.1.1.1c	I can use calculations to show on a common scale how energy in a system is redistributed	
	P.1.1.2a	I can calculate the kinetic energy of an object by recalling and applying the equation: [$E_k = 0.5mv^2$]	
	P.1.1.2b	I can calculate the amount of elastic potential energy stored in a stretched spring by applying, but not recalling, the equation: [$E_e = 0.5ke^2$]	
	P.1.1.2c	I can calculate the amount of gravitational potential energy gained by an object raised above ground level by applying, but not recalling, the equation: [$e_p = mgh$]	
	P.1.1.3a	I can calculate the amount of energy stored in or released from a system as its temperature changes by applying, but not recalling, the equation: [$\Delta E = mc\Delta\theta$]	
	P.1.1.3b	I can define the term 'specific heat capacity'	
	P.1.1.4a	I can state that a force does work on an object only when it causes a displacement, but that work is also done when charge flows in a circuit	
	P.1.1.4b	I can calculate work done by recalling and applying the equation: [$W = Fs$]	
	P.1.1.5a	I can define power as the rate at which energy is transferred or the rate at which work is done, and the watt as an energy transfer of 1 joule per second	
	P.1.1.5b	I can calculate power by recalling and applying the equations: [$P = E/t$ [and [$P = W/t$]	
	P.1.1.5c	I can explain, using examples, how two systems transferring the same amount of energy can differ in power output due to the time taken	

P1	REF	SKILL	RAG
1.2 CONSERVATION AND DISSIPATION	P.1.2.1a	I can state that energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed, and so the total energy in a system does not change	
	P.1.2.1b	I can explain that only some of the energy in a system is usefully transferred, with the rest 'wasted', giving examples of how this wasted energy can be reduced	
	P.1.2.1c	I can explain the correlation between the thermal conductivity of a material and the higher rate of energy transfer by conduction across it, relating this to examples such as heat escaping a building's walls	
	P.1.2.2a	I can calculate efficiency by recalling and applying the equation: [efficiency = useful power output / total power input]	
	P.1.2.2b	**I can suggest and explain ways to increase the efficiency of an intended energy transfer**	
1.3 NATIONAL AND GLOBAL ENERGY RESOURCES	P.1.3.1a	I can list the main renewable and non-renewable energy resources, and define a renewable energy resource as one that is replenished as it is used	
	P.1.3.1b	I can compare ways that different energy resources are used, including uses in transport, electricity generation and heating	
	P.1.3.1c	I can explain why some energy resources are more reliable than others, explaining patterns and trends in their use	
	P.1.3.1d	I can evaluate the use of different energy resources, taking into account any ethical and environmental issues which may arise	
	P.1.3.1e	I can justify the use of energy resources, with reference to both environmental issues and the limitations imposed by political, social, ethical or economic considerations	

KS4 TRILOGY PHYSICS

P2 LEARNING JOURNEY

P2	REF	SKILL	RAG
2.1 CURRENT, POTENTIAL DIFFERENCE AND RESISTANCE	P.2.1.1a	I can draw and interpret circuit diagrams, including all common circuit symbols	
	P.2.1.2a	I can define electric current as the rate of flow of electrical charge around a closed circuit	
	P.2.1.2b	I can calculate charge and current by recalling and applying the formula: [Q = It]	
	P.2.1.2c	I can explain that current is caused by a source of potential difference and it has the same value at any point in a single closed loop of a circuit	
	P.2.1.3a	I can describe and apply the idea that the greater the resistance of a component, the smaller the current for a given potential difference (p.d.) across the component	
	P.2.1.3b	I can calculate current, potential difference or resistance by recalling and applying the equation: [V = IR]	
	P.2.1.4a	I can define an ohmic conductor as one for which current through it is directly proportional to the potential difference across it (at a constant temperature)	
	P.2.1.4b	I can explain that the resistance of components such as lamps, diodes, thermistors and LDRs is not constant, and sketch/interpret IV graphs of their characteristic electrical behaviour	
	P.2.1.4c	I can explain how to measure the resistance of a component by measuring the current through, and potential difference across, the component, drawing an appropriate circuit diagram using correct circuit symbols	
2.2 SERIES AND PARALLEL CIRCUITS	P.2.2.1a	I can show by calculation and explanation that components in series have the same current passing through them, and the total potential difference shared between them	
	P.2.2.1b	I can show by calculation and explanation that components connected in parallel have the same the potential difference across each of them, and the total current through the circuit shared between them	
	P.2.2.1c	I can calculate the total resistance of two components in series as the sum of the resistance of each component using the equation: [$R_{total} = R_1 + R_2$]	
	P.2.2.1d	I can explain qualitatively why adding resistors in series increases the total resistance whilst adding resistors in parallel decreases the total resistance	
	P.2.2.1e	I can solve problems for circuits which include resistors in series using the concept of equivalent resistance	

P2	REF	SKILL	RAG
2.3 DOMESTIC USES AND SAFETY	P.2.3.1a	I can explain the difference between direct and alternating voltage and current, stating that UK mains is an a.c. supply of 50 Hz and 230 V	
	P.2.3.2a	I can identify and describe the function of each wire in a three-core cable	
	P.2.3.2b	I can state that the potential difference between the live wire and earth (0 V) is about 230 V, and that both neutral wires and our bodies are at, or close to, earth potential (0 V)	
	P.2.3.2c	I can explain that a live wire may be dangerous even when a switch in the mains circuit is open by explaining the danger of providing any connection between the live wire and earth	
2.4 ENERGY TRANSFERS	P.2.4.1a	I can calculate power by recalling and applying the equations: [$P = VI$] and [$P = I^2R$]	
	P.2.4.2a	I can describe how appliances transfer energy to the kinetic energy of motors or the thermal energy of heating devices because work is done when charge flows in a circuit	
	P.2.4.2b	I can calculate and explain the amount of energy transferred by electrical work by recalling and applying the equations: [$E = Pt$] and [$E = QV$]	
	P.2.4.3a	I can identify the National Grid as a system of cables and transformers linking power stations to consumers	
	P.2.4.3b	I can explain why the National Grid system is an efficient way to transfer energy, with reference to change in potential difference reducing current and therefore heat loss, for a given electrical power	

KS4 TRILOGY PHYSICS

P3 LEARNING JOURNEY

P3	REF	SKILL	RAG
3.1 CHANGES IN STATE	P.3.1.1a	I can calculate the density of a material by recalling and applying the equation: [$\rho = m/V$]	
	P.3.1.1b	I can recognise/draw simple diagrams to model the difference between solids, liquids and gases	
	P.3.1.1c	I can use the particle model to explain the properties of different states of matter, and differences in the density of materials	
	P.3.1.2a	I can recall and describe the names of the processes by which substances change state	
	P.3.1.2b	I can use the particle model to explain why a change of state is reversible and affects the properties of a substance, but not its mass	
3.2 INTERNAL ENERGY AND ENERGY TRANSFERS	P.3.2.1a	I can state that the internal energy of a system is stored in the atoms and molecules that make up the system	
	P.3.2.1b	I can explain that internal energy is the total kinetic energy and potential energy of all the particles in a system, and that heating increases the energy of these particles, either raising the temperature of the substance, or changing its state	
	P.3.2.3a	I can calculate the specific latent heat of fusion/vaporisation, or the energy required for a certain mass to change state by applying, but not recalling, the equation: [$E = mL$]	
	P.3.2.3b	I can interpret and draw heating and cooling graphs that include changes of state, recognising and representing that internal energy can continue to increase when the temperature doesn't	
3.3 PARTICLE MODEL AND PRESSURE	P.3.3.1a	I can explain that the molecules of a gas are in constant random motion, and that the higher the temperature of a gas, the greater the particles' average kinetic energy	
	P.3.3.1b	I can explain, with reference to the particle model, the effect of changing the temperature of a gas held at constant volume on its pressure	

KS4 TRILOGY PHYSICS

P4 LEARNING JOURNEY

P4	REF	SKILL	RAG
4.1 ATOMS AND ISOTOPES	P.4.1.1a	I can describe the basic structure of an atom as consisting of a positively charged nucleus surrounded by negatively charged electrons at different distances from the nucleus, which vary with the absorption or emission of electromagnetic radiation	
	P.4.1.2a	I can define electrons, neutrons, protons, isotopes and ions	
	P.4.1.2b	I can relate differences between isotopes to differences in conventional representations of their identities, charges and masses	
	P.4.1.3a	I can describe why the evidence from Rutherford's scattering experiment led to a change in the atomic model, describing differences between the plum pudding model of the atom and the nuclear model of the atom	
4.2 ATOMS AND NUCLEAR RADIATION	P.4.2.1a	I can describe and apply the idea that the activity of a radioactive source is the rate at which its unstable nuclei decay, measured in becquerel (Bq), or counts per second, by a Geiger-Muller tube	
	P.4.2.1b	I can describe the penetration through materials, the range in air and the ionising power for alpha particles, beta particles and gamma rays	
	P.4.2.1c	I can apply knowledge of the uses of radiation to evaluate the best sources of radiation to use in a given situation	
	P.4.2.2a	I can use the names and symbols of common nuclei and particles to complete balanced nuclear equations, by balancing the atomic numbers and mass numbers	
	P.4.2.3a	I can define half-life of a radioactive isotope as the average time it takes for the number of decaying nuclei in the isotope, or the activity of the isotope, to halve	
	P.4.2.3b	**I can determine the half-life of a radioactive isotope from given information and calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives**	
	P.4.2.4a	I can compare the hazards associated with contamination and irradiation, and outline suitable precautions taken to protect against any hazard the radioactive sources may present	
	P.4.2.4b	I can discuss the importance of publishing the findings of studies into the effects of radiation on humans, and sharing findings with other scientists so that they can be checked by peer review	

KS4 TRILOGY PHYSICS

P5 LEARNING JOURNEY

P5	REF	SKILL	RAG
5.1 FORCES AND THEIR INTERACTIONS	P.5.1.1a	I can identify scalar quantities, and describe vector quantities as those with both magnitude and an associated direction, representing them with arrows	
	P.5.1.2a	I can identify and give examples of forces as contact or non-contact forces	
	P.5.1.2b	I can describe the interaction between two objects and the force produced on each as a vector	
	P.5.1.3a	I can describe weight as the force acting on an object due to gravity, and explain that its magnitude at a point depends on the gravitational field strength, for which I can state the units	
	P.5.1.3b	I can calculate weight by recalling and using the equation: [W = mg]	
	P.5.1.3c	I can represent the weight of an object as acting at a single point which is referred to as the object's 'centre of mass'	
	P.5.1.4a	I can calculate the resultant of two forces that act in a straight line	
	P.5.1.4b	**I can use free body diagrams to qualitatively describe examples where several forces act on an object, and explain how that leads to a single resultant force or no force**	
	P.5.1.4c	**I can use free body diagrams, and accurate vector diagrams to scale, to resolve multiple forces and show magnitude and direction of the resultant, or represent one force as two component forces at right angles**	
5.2 WORK DONE	P.5.2.1a	I can describe energy transfers involved when work is done, and calculate the work done by recalling and using the equation: W = Fs	
	P.5.2.1b	I can state that one joule of work is done when a force of one newton causes a displacement of one metre, stating that the Nm is an equivalent unit to the joule	
	P.5.2.1c	I can explain why work done against the frictional forces acting on an object causes a rise in the temperature of the object	
5.3 FORCES AND ELASTICITY	P.5.3.1a	I can describe examples of the forces involved in stretching, bending or compressing an object	
	P.5.3.1b	I can describe the extension of an elastic object below the limit of proportionality, such as a spring, to be directly proportional to the force applied, and calculate it by recalling and applying the equation: [F = ke]	
	P.5.3.1c	I can explain why a change in the shape of an object only happens when more than one force is applied and that the work done by the force on a spring is equal to the elastic potential energy the spring stores	
	P.5.3.1d	I can describe the difference between and interpret data from an investigation to explain possible causes of a linear and non-linear relationship between force and extension	
	P.5.3.1e	I can calculate the work done in stretching a spring by recalling or applying the equation: [E = 0.5ke2]	

P5	REF	SKILL	RAG
5.6 FORCES AND MOTION	P.5.6.1a	I can identify displacement as a vector quantity, and express displacement in terms of both its magnitude and direction	
	P.5.6.1b	I can explain that the speed at which a person can walk, run or cycle depends on a number of factors and can recall some typical speeds for walking, running, cycling and other common transportation systems	
	P.5.6.1c	I can explain that the speed of wind and of sound through air varies and why (recalling a typical value of around 330 ms-1). I can measure distance travelled and time taken in an experiment to calculate speed by recalling and applying the equation: [s = vt]	
	P.5.6.1d	**I can explain, giving examples, that when an object moves in a circle at a constant speed, the direction of the object is continually changing, as is the velocity**	
	P.5.6.1e	I can represent an object moving along a straight line using a distance-time graph, describing its motion and calculating its speed from the graph's gradient	
	P.5.6.1f	**I can calculate the speed of an accelerating object at any point by drawing a tangent to the distance-speed graph and measuring its gradient**	
	P.5.6.1g	I can describe an object which is slowing down as having a negative acceleration, and estimate the magnitude of everyday accelerations, recalling that acceleration due to gravity is about 10 ms-2	
	P.5.6.1h	I can calculate the average acceleration of an object by recalling and applying the equation: [a = Δv/t]	
	P.5.6.1i	I can represent motion using velocity–time graphs, finding the acceleration from gradient & distance travelled from area	
	P.5.6.1j	I can apply, but not recall, the equation: [v2 – u2 = 2as]	
	P.5.6.2a	I can explain the motion of an object moving with a uniform velocity, and identify that forces must be in effect if its velocity is changing, by stating & applying Newton's First Law	
	P.5.6.2b	I can explain that the acceleration of an object is proportional to the resultant force acting on the object, and calculate the force or acceleration by recalling and applying [F = ma]	
	P.5.6.2c	**I can describe inertia as the tendency of objects to continue in their state of rest or of uniform motion, and inertial mass as a measure of how difficult it is to change the velocity of an object, defining it as the ratio of force over acceleration**	
	P.5.6.2d	**I can estimate the speed, accelerations and forces of large vehicles involved in everyday road transport**	
	P.5.6.2e	I can apply Newton's Third Law to examples of equilibrium situations	

P5	REF	SKILL	RAG
5.6 FORCES AND MOTION	P.5.6.3a	I can describe stopping distance of a vehicle as the sum of the driver's reaction time and vehicle's braking distance	
	P.5.6.3b	I can explain that, for a given braking force, the braking distance increases dramatically with an increase in speed	
	P.5.6.3c	I can estimate the distance required for an emergency stop in a vehicle over a range of typical speeds	
	P.5.6.3d	I can interpret graphs relating speed to stopping distance for a range of vehicles	
	P.5.6.3e	I can state typical reaction times and describe how reaction time (and therefore stopping distance) can be affected by different factors	
	P.5.6.3f	I can explain methods used to measure human reaction times, and I can take, interpret and evaluate measurements of the reaction times of students	
	P.5.6.3g	I can explain how the braking distance of a vehicle can be affected by different factors, including implications for road safety	
5.7 MOMENTUM	P.5.7.1a	I can calculate momentum by recalling and applying the equation: [p = mv]	
	P.5.7.2a	I can explain and apply the idea that, in a closed system, the total momentum before an event is equal to the total momentum after the event	
	P.5.7.2b	I can describe examples of momentum in a collision	

KS4 TRILOGY PHYSICS

P6 LEARNING JOURNEY

P6	REF	SKILL	RAG
6.1 WAVES IN AIR, FLUIDS AND SOLIDS	P.6.1.1a	I can describe waves as either transverse or longitudinal, defining these waves in terms of the direction of their oscillation and energy transfer, and giving examples of each	
	P.6.1.1b	I can define waves as transfers of energy from one place to another, carrying information, and therefore explain that for water and sound waves it is the wave itself and not the water or air that travels	
	P.6.1.2a	I can define amplitude, wavelength, frequency, period and wave speed, and identify them where appropriate on diagrams	
	P.6.1.2b	I can state examples of methods of measuring wave speeds in different media and identify the suitability of apparatus of measuring frequency and wavelength	
	P.6.1.2c	I can calculate wave speed, frequency or wavelength by applying, but not recalling, the equation: [$v = f\lambda$], and I can calculate wave period by recalling and applying the equation: [$T = 1/f$]	
6.2 ELECTROMAGNETIC WAVES	P.6.2.1a	I can state that electromagnetic waves are transverse waves that travel at the same velocity through a vacuum and transfer energy from a source to an absorber, and that they are grouped in terms of their wavelength and their frequency	
	P.6.2.1b	I can list the groups of electromagnetic waves in order of wavelength: radio, microwave, infrared, visible light (red to violet), ultraviolet, X-rays and gamma rays, illustrating the transfer of energy, with examples	
	P.6.2.1c	I can explain that because our eyes only detect a limited range of electromagnetic waves, they can only detect visible light	
	P.6.2.2a	I can explain how different wavelengths of electromagnetic radiation are reflected, refracted, absorbed or transmitted differently by different substances and types of surface	
	P.6.2.2b	I can illustrate the refraction of a wave at the boundary between two different media by constructing ray diagrams	
	P.6.2.2c	**I can describe that refraction is due to the difference in velocity of waves in different substances, and illustrate this using wave front diagrams**	
	P.6.2.3a	**I can explain that radio waves can be produced by oscillations in electrical circuits, or absorbed by electrical circuits, inducing an alternating current with the same frequency**	
	P.6.2.3b	I can explain that changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed over a wide frequency range	
	P.6.2.3c	I can state examples of the dangers of each group of electromagnetic radiation, and discuss the effects of radiation as depending on the type of radiation and the size of the dose, measured in sieverts	
	P.6.2.4a	I can state examples of the uses of each group of electromagnetic radiation, explaining why each type of electromagnetic wave is suitable for its applications	

KS4 TRILOGY PHYSICS

P7 LEARNING JOURNEY

P7	REF	SKILL	RAG
7.1 PERMENANT AND INDUCED MAGNETISM	P.7.1.1a	I can describe the attraction and repulsion between unlike and like poles of permanent magnets and explain the difference between permanent and induced magnets	
	P.7.1.2a	I can draw the magnetic field pattern of a bar magnet, showing how field strength and direction are indicated, and change from one point to another	
	P.7.1.2b	I can explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic	
	P.7.1.2c	I can describe how to plot the magnetic field pattern of a magnet using a compass	
7.2 THE MOTOR EFFECT	P.7.2.1a	I can state examples of how the magnetic effect of a current can be demonstrated, and explain how a solenoid arrangement can increase the magnetic effect of the current	
	P.7.2.1b	I can draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field)	
	P.7.2.2a	I can state and use Fleming's left-hand rule and explain that the size of the induced force depends on the magnetic flux density, current in, and length of, the conductor in the magnetic field	
	P.7.2.2b	I can calculate the force on a conductor carrying a current at right angles to a magnetic field by applying, but not recalling, the equation: [F = BIL]	
	P.7.2.3a	I can explain how rotation is caused in an electric motor	