SJBC Curriculum

um Termly Plan: Y10 Science

Term	Topic(s) and links to other subjects	Core Knowledge	Core Vocabulary	Assessment	Resources
Autumn1	**Biology** B5-B6. Infection and Response **B3. Organisation and the Digestive System** (Some basic immune system references and links to health and disease) **B7: Non-communicable Diseases** (For contrast with communicable diseases, and extended understanding of disease and prevention) **B8: Photosynthesis** (Links to TMV and how disease impacts plant function)	**Biology** **B5. Communicable disease** • Pathogens (bacteria, viruses, fungi, and protists) cause communicable diseases and can spread through air, water, direct contact, or vectors. • Viruses live and reproduce inside cells, often causing cell damage; examples include measles, HIV, and tobacco mosaic virus (TMV). • Bacterial diseases like salmonella and gonorrhoea produce toxins and are treated with antibiotics. • Fungal and protist diseases include rose black spot and malaria; these have unique transmission methods and treatments. • The body's defence systems include skin, mucus, stomach acid, and immune responses from white blood cells (phagocytosis, antibodies, antitoxins). • Vaccinations help prevent disease by preparing the immune system to respond quickly to future infections. • The spread of disease can be reduced through hygiene, isolation, vaccination, and controlling vectors.	**Biology: B13. Reproduction** Pathogen Virus Bacteria Fungi Protist Infectious Communicable Transmission Vector Immune system White blood cell Antibody Antigen Antitoxin Phagocytosis Vaccination Immunisation Antibiotic Antibiotic resistance Mutation Salmonella Gonorrhoea Measles HIV Tobacco mosaic virus (TMV) Rose black spot Malaria Hygiene Isolation Immunity	End of topic test consisting of a mix of short and long answers (30- 45 mins) PPE1	Core resources: My GCSE Science Enrichment and extension resources:

	B9: Respiration (Indirect links to how pathogens may affect energy release in cells) **<u>Links to other subjects</u>** **Geography** Global health, disease spread, climate impact Malaria, water-borne disease, sanitation, vectors in different climates **<u>Chemistry</u>** **<u>C4. Chemical Calculation</u>** Links to other units Unit 1: Atomic Structure and the Periodic Table	**<u>B6. Preventing and treating disease</u>** • Vaccination introduces small amounts of dead or inactive pathogens to stimulate the immune system to produce antibodies and memory cells. • Antibiotics kill bacteria but don't work on viruses; overuse or misuse can lead to antibiotic resistance. • Painkillers relieve symptoms but don't kill pathogens or cure infections. • New drugs are developed through preclinical testing on cells, tissues, and animals, followed by clinical trials on human volunteers. • In double-blind trials, neither the patient nor the doctor knows who receives the real drug or placebo, this avoids bias. • Monoclonal antibodies are identical copies of one type of antibody, used in pregnancy tests, cancer treatments, and locating specific substances in the body. • Plants can suffer from diseases and mineral deficiencies; they show symptoms like discolouration, stunted growth, or spots, and have physical, chemical, and mechanical defences. **<u>Chemistry</u>**	**<u>B6. Preventing and treating disease</u>** Vaccine Vaccination (more detailed use in B6, including development and mechanisms) Immunity Placebo Double-blind trial Clinical trial Preclinical testing Toxicity Dosage Monoclonal antibodies Pregnancy test Cancer therapy Hybridoma cell Specificity Mineral deficiency Nitrate Magnesium Physical defence Chemical defence Mechanical defence Chlorosis Plant diseases Detection Diagnosis		Core resources: My GCSE Science Enrichment and extension resources:

	Unit 5: Chemical Changes Unit 10: Using Resources Links to other subjects **Maths** Ratio and proportion – used to interpret and apply mole ratios from balanced equations. Rearranging formulas – needed for calculations such as mass = moles **<u>Physics</u>** **<u>P4. Electric circuits</u>** Link to other Physics Units P2: Energy – Links through electrical work, energy transfers in circuits, and calculations using power and energy formulas.	**<u>C4. Chemical Calculations</u>** • Relative atomic mass (Ar) and relative formula mass (Mr) are calculated using atomic masses from the periodic table. • The mole is the unit used to count particles; 1 mole of a substance has a mass equal to its Mr in grams. • Use the formula mass = moles × Mr to calculate the mass, moles, or formula mass in a chemical reaction. • Balanced chemical equations show the ratio of moles between reactants and products. • Limiting reactants are used up first in a reaction and determine how much product is made. • Percentage yield and atom economy help assess how efficient a chemical reaction is and reduce waste in industrial processes. **<u>Physics</u>** **<u>P4. Electric circuits</u>**	**<u>Physics</u>** **<u>P10. Forces and Motion</u>** Scalar / Vector Speed / Velocity Acceleration **<u>C4. Chemical Calculation</u>** Relative Atomic Mass (Ar) Isotope Mass Number Atomic Number Abundance Relative Formula Mass (Mr) Mole Avogadro's Constant Empirical Formula Molecular Formula Percentage Composition Balanced Equation Limiting Reactant Excess Reactant Mass Concentration		Core resources: My GCSE Science Enrichment and extension resources:

	Unit P5: Electricity in the Home Builds on circuit knowledge with alternating current (AC), mains electricity, power ratings, and electrical safety. Links to other subject (D&T) – KS4 Students apply knowledge of current, voltage, and resistance when designing and building electronic products.	• Electric current is the flow of charge through a circuit, measured in amperes (A), and is the same at all points in a series circuit. • Potential difference (voltage) is the energy transferred per unit charge, measured in volts (V), and drives the current around a circuit. • Resistance opposes the flow of current; it is measured in ohms (Ω) and calculated using V = IR (voltage = current × resistance). • In series circuits, current is the same everywhere, but voltage is shared between components. • In parallel circuits, voltage is the same across each branch, but current splits between branches depending on resistance. • Components like resistors, lamps, diodes, and thermistors behave differently with changes in current, temperature, or direction of flow. • Required practicals include investigating how changing the length of a wire or using different components affects resistance and current.	**P4. Electric circuits** Current Charge Potential Difference Voltage Resistance Series Circuit Parallel Circuit Ohm (Ω) Ampere (A) Volt (V) Resistor Lamp (Bulb) Diode Thermistor LDR (Light Dependent Resistor) Power Supply Circuit Diagram Ohm's Law V = IR Required Practical		

Autumn 2	**Biology** B.7 Non communicable disease Links to science: **Unit:** **B1 – Cell Structure and Transport** -Links to understanding uncontrolled cell division in cancer Unit: **B5-B6 – Infection and Response** **Links** Contrast with communicable diseases and how risk factors differ Links **to other subjects** **PE** **Topic** Exercise and fitness **Links** Understanding cardiovascular health and obesity prevention	**B7. Non communicable disease** • Non-communicable diseases (e.g. cancer, diabetes, cardiovascular disease) are not caused by pathogens and cannot be spread between people. • Lifestyle factors like diet, alcohol, smoking, and lack of exercise increase the risk of developing these diseases. • Smoking is linked to lung disease, cardiovascular problems, and low birth weight in babies. • Alcohol consumption can damage the liver and brain and harm unborn babies during pregnancy. • Diet and obesity influence the risk of developing Type 2 diabetes and heart disease. • Cancer occurs when cells grow and divide uncontrollably; risk factors include smoking, radiation, infections, and genetic links. • These diseases have a global and economic impact, affecting health systems, families, and national productivity.	**B7. Non communicable disease** Non-communicable Disease Lifestyle Factor Cardiovascular Disease Type 2 Diabetes Obesity Carcinogen Risk Factor Morbidity Mortality Incidence	End of topic test (30 mins) PPE1 End of topic test consisting of a mix of short and long answers (30- 45 mins)	Core resources: Enrichment and extension resources:

	B8. Photosynthesis Link **other to science** Unit: B2 – Organisation Link: Chloroplasts in plant cells and their role Unit C2 – Bonding & Structure Link: Carbohydrates like glucose and starch Links **to other subject** Subjects: Environmental Science Impact of limiting factors and greenhouses on crop yields **<u>Chemistry</u>** C5. Chemical Changes	**<u>B8. Photosynthesis</u>** • Photosynthesis is how plants make glucose using carbon dioxide, water, and sunlight in their chloroplasts. • The word equation is: carbon dioxide + water → glucose + oxygen. • Glucose is used for respiration, stored as starch, or turned into cellulose, fats, and proteins. • Photosynthesis rate is affected by light intensity, carbon dioxide, temperature, and chlorophyll levels. • These are called limiting factors. If one is too low, it slows the process • Greenhouses use controlled conditions to maximise photosynthesis and improve crop growth. **<u>C5. Chemical Changes</u>** • Acids react with metals, metal oxides, metal hydroxides, and metal carbonates to form salts; these are called neutralisation reactions. • The pH scale measures acidity and alkalinity; indicators and pH probes can be used to measure it accurately.	**<u>B8. Photosynthesis</u>** Photosynthesis Chloroplast Chlorophyll Glucose Starch Limiting Factor Light Intensity Carbon Dioxide Concentration Temperature Oxygen **<u>C5. Chemical Changes</u>** Acid Alkali Base Neutralisation Salt pH scale Indicator	End of topic test (30 mins) PPE1	

	Links to other Chemistry units 1. Unit C2: Bonding, Structure, and the Properties of Matter – Links through understanding how ions form, the nature of ionic compounds, and why electrolysis works on molten or aqueous ionic substances. **Links to other Subjects** In environmental geography and resource management, students learn about metal extraction and its environmental impact. **<u>Physics</u>**	• Acids in solution release hydrogen ions (H^+), while alkalis release hydroxide ions (OH^-). • A strong acid fully ionises in water; a weak acid only partially ionises. • Reactivity series shows how reactive metals are; it helps predict reactions with water or acid and is used to determine how metals are extracted. • Electrolysis is used to extract reactive metals and to split ionic compounds using electricity; it involves oxidation at the anode and reduction at the cathode. **<u>P5. Electricity in the home</u>** Mains electricity in the UK is an a.c. (alternating current) supply at about 230 V and 50 Hz; battery supply is d.c. (direct current). Three-pin plugs contain live (brown), neutral (blue), and earth (green/yellow) wires, each with specific functions for safety.	Reactivity series Displacement reaction Electrolysis **<u>5. Electricity in the home</u>** Alternating Current (AC) Direct Current (DC) Mains Electricity Live Wire Neutral Wire Earth Wire	End of topic test consisting of a mix of short and long answers (30- 45 mins)	Core resources: My GCSE Science Enrichment and extension resources:

	P5. Electricity in the home Link to other physics unit . P2: Energy – Links through energy transfers in electrical appliances, calculating efficiency, energy transferred (E = Pt), and comparing energy use in everyday contexts. Link to other Subject: Design and Technology (D&T) - Understanding of fuses, circuit breakers, and power ratings is essential for designing safe and energy-efficient systems.	The live wire carries current from the power supply; the neutral wire completes the circuit; the earth wire prevents electric shocks. Fuses and circuit breakers protect appliances by breaking the circuit if the current is too high. Power (P) in an electrical appliance is calculated using $P = IV$ (power = current × voltage) or $P = I^2R$. Energy transferred is calculated using $E = Pt$ or $E = QV$, and is measured in joules or kilowatt-hours (kWh). Understanding efficiency and reducing energy waste is essential when comparing household devices and their energy ratings.	Fuse Circuit Breaker Power (Watt) Energy Transfer		

Spring 1	**Biology** B9. Respiration Unit P2 – Energy Links through the concept of energy transfers and stores. Respiration is an exothermic process that releases energy, which connects to how energy is stored in chemical stores and transferred during physical activity. External Subject Link: Physical Education (PE) – KS4 Links through understanding how the body uses energy during exercise. Topics like aerobic and anaerobic respiration, oxygen debt, and recover **Chemistry** **C6. Electrolysis**	**B9. Respiration** • Respiration is an exothermic reaction that releases energy from glucose, used for muscle contraction, maintaining body temperature, and active transport. • Aerobic respiration requires oxygen and occurs in all cells: • glucose + oxygen → carbon dioxide + water (+ energy) • Anaerobic respiration occurs without oxygen, producing less energy: • In muscles: glucose → lactic acid • Anaerobic respiration in yeast (fermentation) produces ethanol and carbon dioxide and is used in brewing and baking. • Lactic acid buildup during exercise leads to oxygen debt, which must be repaid by continued breathing after activity ends. • The energy demand during exercise increases breathing rate, heart rate, and blood flow to muscles. • The body responds to exercise by increasing respiration rate to supply muscles with more oxygen and glucose. **C6. Electrolysis**	**B9. Respiration** Respiration Aerobic Respiration Anaerobic Respiration Glucose Oxygen Lactic Acid Mitochondria Energy (ATP) Oxygen Debt Metabolism		

	Links to science: C2 – Bonding, Structure & Properties Link: Understanding ionic lattice, why compounds conduct when molten/aqueous Unit C4 – Chemical Changes Links Oxidation and reduction processes Link other subject **Subject** Environmental Science Topic: Metal extraction impacts Links: Sustainability and environmental effects of mining and metal extraction **<u>Physics</u>** P7. Atomic structure-radioactivity **Links to science**	• Electrolysis uses electricity to split ionic compounds into their elements when molten or in solution. • It requires a direct current (d.c.) power supply, with positive ions moving to the cathode (negative electrode) and negative ions to the anode (positive electrode). • Reduction happens at the cathode (gain of electrons), and oxidation happens at the anode (loss of electrons). • In the electrolysis of molten compounds, elements are produced directly at each electrode. • In aqueous solutions, water also ionises, so the products at the electrodes depend on the reactivity of the ions present. • Electrolysis is used to extract reactive metals (e.g. aluminium) from molten ores, especially those too reactive to be extracted by carbon. • Electrolysis of brine (sodium chloride solution) produces chlorine gas, hydrogen gas, and sodium hydroxide, all important in industry. **<u>P7. Atomic structure-Radioactivity</u>**	**<u>C6. Electrolysis</u>** Electrolysis Electrolyte Electrode Anode Cathode Ionic Compound Molten Ion Oxidation Reduction		

	Units P6 – Molecules and Matter Link: Understanding atoms, energy changes during phase changes Links **to other subject** **Subject:** History of Science Topic: Scientific models Links: Development of atomic models through time	• Atoms consist of a nucleus (protons and neutrons) surrounded by electrons in shells; most of the atom's mass is in the nucleus. • The number of protons = electrons in a neutral atom; atomic number = protons, mass number = protons + neutrons. • Isotopes are atoms of the same element with different numbers of neutrons. • Some isotopes are radioactive and emit nuclear radiation as they decay: alpha, beta, and gamma. • Alpha particles are large and least penetrating; beta particles are more penetrating; gamma rays are highly penetrating but weakly ionising. • Nuclear radiation is measured in Becquerels (Bq) and can be detected with a Geiger counter. • Radioactive decay is random; half-life is the time taken for the radioactivity of a substance to halve.	**<u>P7. Atomic structure-Radioactivity</u>** Atom Nucleus Proton Neutron Electron Isotope Radioactive Decay Alpha Particle Beta Particle Gamma Ray		

Spring 2	**<u>Biology</u>** B10. Human nervous system **Links** to science **Unit:** B2 – Cell Division **Links**: Neurons are specialised to transmit signals **Unit:** B7 – Non-Communicable Diseases **Links:** Understanding neurological damage as part of disease impact Links **to other subject** Computer Science **Topic** Input/output systems **Links** Comparison to digital signal processing and machine responses Maths **Topic:** Data analysis	**B10. Human nervous system** • The nervous system allows the body to detect and respond to stimuli using receptors, sensory neurons, the brain/spinal cord (CNS), and effectors. • A reflex arc is a fast, automatic response that bypasses conscious brain involvement — it includes sensory, relay, and motor neurons. • Effectors are muscles or glands that carry out a response to a stimulus (e.g. contracting or secreting hormones). • Synapses are gaps between neurons where signals are transmitted chemically using neurotransmitters. • The brain controls complex behaviours and contains areas responsible for different functions such as memory, coordination, and senses. • Scientists study the brain using MRI scans, electrical stimulation, and case studies of brain damage. • The eye is a sense organ that focuses light onto the retina; it adjusts to light using the iris and focuses using the lens and ciliary muscles. **C7. Energy changes** • Energy changes occur in all chemical reactions and can be either exothermic (release energy) or endothermic (absorb energy). • Exothermic reactions include combustion and many oxidation reactions; they cause a temperature increase in the surroundings. • Endothermic reactions include thermal decomposition and some neutralisations; they result in a temperature drop. • Reaction profiles show the energy changes during a reaction and include activation energy and energy difference between reactants and products.	**B10. Human nervous system** Neuron Synapse Neurotransmitter Reflex Arc Sensory Neuron Motor Neuron Central Nervous System (CNS) Effector Stimulus Receptor **C7. Energy changes** Exothermic Endothermic Activation Energy Reaction Profile Bond Energy Energy Transfer Combustion Thermal Decomposition Neutralisation Temperature Change		

	Links: Used in required practicals (reaction time averages, interpreting data) **<u>Chemistry</u>** C7. Energy changes Links in Science **C5 – Chemical Changes** Links: These reactions are often exothermic and link to practical measurement of temperature change **C8– Rate and Extent of Chemical Change** Links: Energy changes affect rate of reaction (activation energy and catalyst usage)	• Bond breaking is endothermic and bond making is exothermic — the overall energy change depends on the balance of these. • The energy change in a reaction can be calculated using bond energies from the reactants and products. • Required practical: students investigate temperature changes in reactions (e.g. neutralisation) and measure energy transfer using a thermometer and polystyrene cup. C8. Rate of chemical reaction • A pure substance contains only one element or compound; mixtures have variable compositions and melt/boil over a range of temperatures. • Formulations are carefully designed mixtures (e.g. paints, medicines) made for a specific purpose, containing components in precise amounts.			

	Links to other subjects **Geography** Topic: Combustion and energy resources Links: Combustion and energy resources **Math:** Topic: Calculations, averages, algebra **Links**: Used in bond energy calculations and interpreting reaction profiles C8. Rate of reaction Links **in other science** Unit: **C1 – Atomic** Structure and the Periodic Table **Link:** Lays foundational	**P8. Forces in balance**	**C8. Rate of chemical reaction** Rate of Reaction Catalyst Collision Theory Activation Energy Surface Area Concentration Temperature Pressure Reversible Reaction Equilibrium		

	understanding of pure vs. mixed substances **KS4 Biology** **Topic:** Enzymes, DNA, plant pigments Link: Chromatography appears in **practical enzyme/pigment separation** **<u>Physics</u>** P8. Forces in balance **Links** In science: **Unit. P1 – Energy** Reinforces **Work = Force × Distance** as energy is transferred via forces **Unit. P9 – Motion** Builds on understanding how forces change speed/direction	• A force is a push or pull acting on an object due to interaction; it can change an object's shape, speed, or direction. • Contact forces (e.g. friction, air resistance) and non-contact forces (e.g. gravity, magnetic, electrostatic) act in different ways. • Weight = mass × gravitational field strength (W = mg); weight is measured in newtons using a calibrated spring balance. • Resultant force is the single force that has the same effect as all the forces acting on an object combined. • Work done = force × distance (W = Fd); work transfers energy and is measured in joules. • Elastic objects follow Hooke's Law up to the limit of proportionality: force = spring constant × extension (F = kx). • Required practical: students investigate the relationship between force and extension using a spring and measure whether Hooke's Law applies.	**P8. Forces in balance** Force Mass Weight Resultant Force Contact Force Non-contact Force Friction Newton (N)		

	Unit. P10 – Force and Motion Uses **resultant force** in **F = ma**; links to force diagrams **Geography** **Topic:** Natural forces, gravity, erosion Links: Forces in Earth systems — gravity, friction, etc., play roles in shaping landscapes		Hooke's Law Extension		

Summer 1	**<u>Biology</u>** **Links** in science **Unit** **C2 – Structure and Bonding** **Link:** Explains why metal ions form characteristic colours/precipitates **KS4 Physics:** **Topic:** Emission spectra (in Atomic Structure) **Link** Flame colours explained using electron energy levels (linked to photons) **Links** to other subject **Engineering & D&T** **Topic:** Materials testing, quality control **Links:** Analytical methods applied in industry for material testing	**B11: Hormonal Coordination** • The endocrine system is made up of glands that release hormones into the blood to control body processes. • Hormones are chemical messengers that travel in the blood to target organs, acting more slowly but for longer than nerves. • The pituitary gland is the master gland, releasing hormones that regulate other glands and control growth, water balance, and reproduction. • Blood glucose regulation involves insulin (lowers glucose levels) and glucagon (raises glucose levels), both released by the pancreas. • Type 1 diabetes is treated with insulin injections; Type 2 is managed through diet, exercise, and sometimes medication. • Hormones control the menstrual cycle — including FSH, LH, oestrogen, and progesterone — which regulate ovulation and uterine lining changes. • Contraceptive methods include hormonal (e.g. pill, patch) and non-hormonal (e.g. condoms, IUDs); fertility treatments like IVF use artificial FSH and LH.	**B11: Hormonal Coordination** Hormone Endocrine Gland Insulin Glucagon Homeostasis Menstrual Cycle Ovulation Contraception Diabetes Negative Feedback		

	<u>Chemistry</u> C8. Rate of chemical reaction Links other science: **Unit** **C2 – Structure and Bonding** Understanding why metal ions behave differently in flame/precipitate tests **Unit** C5 – Chemical Changes **Link:** Supports understanding of ionic reactions and gas formation **Link to other subject** **Physics** Topic: Light and flame colours (emission spectra) **Link:** Flame tests link to electron excitation and emission spectra,	**C8. Rate of chemical reaction** • Chromatography separates mixtures and helps identify substances; substances travel different distances depending on solubility and attraction to the paper. • The Rf value (distance moved by substance ÷ distance moved by solvent) helps identify components in mixtures. • Tests for gases include: • Hydrogen: squeaky pop with lit splint • Oxygen: relights glowing splint • Carbon dioxide: turns limewater cloudy • Chlorine: bleaches damp litmus paper white • Flame tests identify metal ions by colour: e.g. lithium (crimson), sodium (yellow), potassium (lilac), calcium (orange-red), copper (green). • Sodium hydroxide tests form coloured precipitates with some metal ions; further tests detect halides and carbonates.	**C8. Rate of chemical reaction** Rate of Reaction Catalyst Collision Theory Activation Energy Surface Area Concentration Temperature Pressure Reversible Reaction Dynamic Equilibrium		

	developed further in atomic physics **C9. Crude Oil and Fuels** **Unit.** C1 – Atomic Structure **Links:** Understanding that hydrocarbons are made of hydrogen and carbon atoms **Unit** C8 – Chemical Analysis **Links:** Supports combustion testing and identification of combustion products **Citizenship / PSHE** **Topic:** Environmental ethics, global responsibility **Links:** Fossil fuel consumption and	**C9.Crude Oil and Fuels** • Crude oil is a finite resource found in rocks; it's a mixture of hydrocarbons formed from ancient biomass. • Hydrocarbons are molecules made of hydrogen and carbon, most are alkanes, which are saturated and follow the general formula C_nH_{2n+2}. • Crude oil is separated by fractional distillation, where different fractions are collected based on their boiling points. • The properties of hydrocarbons (e.g. viscosity, flammability, boiling point) depend on chain length, shorter chains are more useful as fuels. • Combustion of hydrocarbons in oxygen releases energy, producing carbon dioxide and water; incomplete combustion also produces carbon monoxide and soot. • Cracking breaks long-chain hydrocarbons into shorter alkanes and alkenes; this is done thermally or catalytically to meet fuel demand. • Alkenes are unsaturated hydrocarbons with a double bond, more reactive than alkanes, and useful for making polymers.	**C9.Crude Oil and Fuels** Crude Oil Hydrocarbon Alkane Alkene Fractional Distillation Viscosity Flammability Combustion Cracking Saturated		

	climate ethics discussions	Required practical: students investigate the relationship between force and extension using a spring and measure whether Hooke's Law applies.			

SJBC Curriculum Termly Plan: Y11 Science

Term	Topic(s) and links to other subjects	Core Knowledge	Core Vocabulary	Assessment	Resources
Autumn 1	**Biology** B13. Reproduction B14. Variation and Evolution **Chemistry** C12. Chemical Analysis C13. The Early Atmosphere **Physics** P10. Forces and Motion	**Biology** **B13. Reproduction** • Sexual and asexual reproduction in plants and animals. • Meiosis: the process, importance in producing variation. • Advantages and disadvantages of sexual and asexual reproduction. • DNA structure: double helix, polymer of nucleotides, base pairing (A-T, C-G). • Human genome project: applications and implications. • Inheritance: dominant and recessive alleles, genotype vs phenotype. • Genetic disorders: cystic fibrosis, polydactyly. • Punnett squares and family trees. **Chemistry** **C12. Chemical Analysis** • Pure substances vs mixtures. • Formulations: mixtures with a specific purpose. • Chromatography: Rf values, identifying substances. • Test for gases: hydrogen, oxygen, carbon dioxide, chlorine. • Flame tests: identifying metal ions. • Tests for anions: carbonates, halides, sulfates. • Precipitation tests for metal ions. **Physics**	**Biology: B13. Reproduction** Meiosis Mitosis Gametes Zygote Chromosomes Allele Dominant / Recessive Genotype / Phenotype Homozygous / Heterozygous Inherited disorder Carrier DNA / Gene / Genome Base pairs **Chemistry** **C12. Chemical Analysis** Pure substance Mixture Formulation Chromatography Rf value Flame test Precipitate Ion tests Halide	End of topic test (45 mins) PPE1	Core resources: My GCSE Science Enrichment and extension resources:

		P10. Forces and Motion • Scalars and vectors: speed is scalar, velocity is vector. • Distance–time and velocity–time graphs: calculating speed, acceleration. • Acceleration: change in velocity / time. • Newton's laws of motion: - First: object stays at rest or in motion unless acted on. - Second: F = ma. - Third: equal and opposite reaction forces. • Stopping distance = thinking + braking distance. • Factors affecting braking distance: speed, road conditions, car condition. • Momentum: conservation of momentum, collisions.	Sulfate / Carbonate Anion / Cation **C13. The Earth's Early** Atmosphere Volcanic activity Greenhouse gases Photosynthesis Algae Atmosphere Carbon dioxide Oxygen Nitrogen Carbon capture Fossil fuels **Physics** **P10. Forces and Motion** Scalar / Vector Speed / Velocity Acceleration Distance–time graph Velocity–time graph Newton's Laws Resultant force Inertia Momentum Stopping distance Thinking distance Braking distance		

Autumn 2	**Biology** B15. Genetics and Evolution B16. Adaptations and Interdependence **Physics** P12. Wave properties P13. Electromagnetic Spectrum	**B14. Variation and Evolution** • Causes of variation: genetic, environmental, both. • Evolution by natural selection (Darwin's theory). • Selective breeding (artificial selection). • Genetic engineering: basic principles, applications. • Cloning: methods (cuttings, embryo transplants, adult cell cloning). • Benefits and risks of genetic technologies. • Theories of evolution: Darwin, Lamarck. • Evidence for evolution: fossils, antibiotic resistance. • Speciation and extinction. **P12. Wave properties** • Wave behaviour is common in both natural and man-made systems. • Waves carry energy from one • place to another and can also carry information. Designing comfortable and safe structures such • as bridges, houses and music performance halls requires an understanding of mechanical waves. • Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves. **P13. Electromagnetic Spectrum** • Electromagnetic waves are transverse waves that transfer energy from the source of the waves to an absorber. • Electromagnetic waves form a continuous spectrum and all types of electromagnetic wave travel at the same velocity through a vacuum • (space) or air. • The waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency. • Going from long to short wavelength (or from low to high frequency) the groups are: radio,	**B14. Variation and Evolution** Variation Mutation Natural selection Evolution Selective breeding Genetic engineering Cloning Embryo transplant Adult cell cloning Speciation Fossil Extinction **P12. Wave properties**	End of topic test (45 mins) PPE1	Core resources: Enrichment and extension resources:

		microwave, infrared, visible light (red to violet), ultraviolet, Xrays and gamma rays.			
Term	**Topic(s) and links to other subjects**	**Core Knowledge**	**Core Vocabulary**	**Assessment**	**Resources**
Spring 1	**B15: Adaptations, interdependence and competition.** **B16: Organising an ecosystem** **Links to** Geography field trip. Math- graph and data handling	***P12. Wave properties*** • *Wave behaviour is common in both natural and man-made systems.* • *Waves carry energy from one* • *place to another and can also carry information. Designing comfortable and safe structures such* • *as bridges, houses and music performance halls requires an understanding of mechanical waves.* • *Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves.* ***P13. Electromagnetic Spectrum*** • *Electromagnetic waves are transverse waves that transfer energy from the source of the waves to an absorber.* • *Electromagnetic waves form a continuous spectrum and all types of electromagnetic wave travel at the same velocity through a vacuum* • *(space) or air.*	***P12. Wave properties*** **P13. Electromagnetic Spectrum** Abiotic Abundance Biodiversity Biomass Biotic Community	End of topic test (45 mins) PPE2	Knowledge organizer. My GCSE Science (for those who purchased it.)

	<u>Chemistry</u> **C13. The Earth's Early Atmosphere**	• *The waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency.* • *Going from long to short wavelength (or from low to high frequency) the groups are: radio, microwave, infrared, visible light (red to violet), ultraviolet, Xrays and gamma rays.* **<u>B15 & B16: Adaptations, interdependence and competition</u>.** • The Sun is the main source of energy for ecosystems, with energy passing through food chains and webs. • Materials such as carbon and water are recycled through ecosystems via processes like photosynthesis, respiration, and decomposition. • An ecosystem is the interaction between living (biotic) organisms and non-living (abiotic) environmental factors. • Species within ecosystems are interdependent; removing one species can affect the entire community. • Plants and animals compete for resources such as light, water, nutrients, food, mates, and territory. • Human activities threaten biodiversity and ecosystem stability, so sustainable actions are needed to protect the environment and our future. **<u>C11 OR 13. The Earth's Early Atmosphere</u>** • Earth's early atmosphere: volcanic activity, composition (CO_2, N_2, water vapour). • Formation of oceans and removal of CO_2. • Development of oxygen: photosynthesis by algae/plants. • Current atmosphere composition: ~78% N_2, 21% O_2, small CO_2. • Effects of photosynthesis on CO_2 and O_2 levels.	Ecosystem Interdependence Population Predator Quadrat Species Transect **<u>C11 OR 13. The Earth's Early Atmosphere</u>** Atmosphere Carbon Footprint Condensation Greenhouse Effect Greenhouse layer 'Locked up' carbon Permafrost Photosynthesis Precipitate		

		• Carbon capture and storage, fossil fuels and greenhouse gases.			
Spring 2	**<u>Chemistry</u>** **C12 OR 14. The Earth's Resources**	**<u>C12 OR 14. The Earth's Resources</u>** • Finite resources (such as fossil fuels and metal ores) are used faster than they are replaced and will eventually run out, whereas renewable resources are naturally replenished but can still be depleted if they are overused or poorly managed. • Sustainable development means meeting the needs of the present without compromising the ability of future generations to meet their own needs, and chemistry plays a key role by reducing waste, improving efficiency, and developing alternative materials and processes. • Crude oil is a mixture of hydrocarbons that is separated into useful fractions by fractional distillation, which works because different hydrocarbons have different boiling points and therefore condense at different levels in the fractionating column. • Potable water is safe to drink but is not chemically pure, and it is produced by treating fresh water through filtration and sterilization; in areas where fresh water is scarce, desalination using distillation or reverse osmosis can be used, although these processes are energy intensive. • Wastewater must be treated before release into the environment using screening, sedimentation,	**<u>C12 OR 14. The Earth's Resources</u>** Hydrocarbon Fractional distillation Fractionating column Finite resource Renewable resource Sustainable development Potable water Filtration Sterilization Desalination Sedimentation Anaerobic digestion Metal ore Bioleaching Phytomining Life Cycle Assessment (LCA) Environmental impact Reduce Reuse Recycle Viscosity Volatility Chlorination Ozonation	End of topic test (45 mins) PPE2	Knowledge organizer. My GCSE Science (for those who purchased it.)

		and biological treatment, and this process can produce useful resources such as biogas and fertilizer from sewage sludge. • High-grade metal ores are becoming increasingly scarce, and traditional mining methods have significant environmental impacts, making the efficient use of resources and recycling of metals increasingly important. • As metal ores decline in quality, alternative extraction methods such as bioleaching and phytomining can be used, particularly for copper, with metals extracted by displacement or electrolysis depending on their reactivity and environmental considerations.	Ultraviolet (UV) radiation Reverse osmosis Sewage sludge Biogas Effluent		