Science Curriculum Overview

Part of the Truro and Penwith Academy Trust

Year 7	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6
Biology	**Topic: Cells** Resources:Observing cells practical Focus: Microscopy and observational skills Outcome: Students will identify parts of a cell, be able to differentiate between animal and plant cells, and use a microscope to observe cells. Duration: 6 lessons	**Topic: Respiration** Resources: Heart dissection & heart rate and exercise investigation, fermentation practicals Focus: Range and intervals Outcome: Students will know the word equations for aerobic and anaerobic respiration and will be able to discuss the impact of anaerobic respiration in muscles during vigorous exercise. Duration: 6 lessons	**Topic: Photosynthesis** Resources: Is light needed for photosynthesis practical. Focus: Analysing data Outcome: Students will know the structure and function of leaf tissues and be able to explain the factors that can affect the rate of photosynthesis. Duration: 6 lessons	**Topic: Human Reproduction** Resources: BBC Bitesize and Seneca Focus: Descriptive writing Outcome: Students will be able to use the correct scientific terminology to discuss the reproductive organs, fertilisation and pregnancy. Duration: 6 lessons	**Topic: Plant reproduction** Resources: Flower dissection and seed dispersal investigation Focus: Planning Outcome: Students will be able to explain how pollination and fertilisation occur in plants. Duration: 6 lessons	**Topic: Ecology and Interdependence** Resources: Sampling investigation Focus: Descriptive writing Outcome: Students will be able to explain how energy gained by photosynthesis is passed through a food chain. Duration: 6 lessons
Chemistry	**Topic: Particle model** Practicals: Effect of temperature on diffusion investigation Focus: Modelling Outcome: Students will be able to use particle theory to explain the properties of matter and changes of state. Duration: 6 lessons	**Topic: Atoms, elements & compounds** Resources: BBC Bitesize and Seneca Focus: Chemical formula and equations Outcome: Students will be introduced to the concept of atoms, elements and compounds and should gain an insight into the use of symbols, formula and equations. They should be able to recognise particle diagrams of atoms, elements and compounds. Duration: 6 lessons	**Topic: Separating techniques** Resources: Filtration, distillation, chromatography, solubility, evaporation practicals Focus: Drawing scientific diagrams Outcome: Students will be able to carry out various practical techniques and explain how they work. Duration: 6 lessons	**Topic: Acids and Alkalis** Resources: Identifying the pH with universal indicator, making a salt and which is the best indigestion tablet? Focus: Variables and planning Outcome: Students will be able to identify acids and alkalis using the pH scale and recognise pH by colour and number. They will know what an independent, dependent and control variable is. Duration: 6 lessons	**Topic: Climate** Resources: Decomposition investigation Focus: Sources of information/evidence Outcome: Students will be able to explain the causes and effects of climate change, whilst understanding the need to use reliable sources of data and evidence. Duration: 6 lessons	

The Curriculum Overview covers the skills focus in each year across all the years in the Key Stage

Physics	**Topic: Energy store** Resources: BBC Bitesize and Seneca Focus: Maths skills Outcome: Students will have a good understanding of energy stores and energy transfers. They will be able to apply their understanding to the context of heat loss in houses and insulation. Duration: 6 lessons	**Topic: Forces** Resources: Friction on surfaces practical Focus:Maths skills Outcome: Students will be able to discuss contact and non-contact forces with confidence and be able to discuss resultant forces when there is an imbalance. They should be able to apply their understanding to the context of boat or car design. Duration: 6 lessons	**Topic: Space** Resources: BBC Bitesize and Seneca Focus: Significant figures and standard form Outcome: Students can describe the arrangement of the solar system and the motion of Earth. They should have a broader understanding of other cosmic structures and how far away they are. Duration: 6 lessons	**Topic: Waves** Resources: Speed of sound practical Focus: Using a protractor Outcome: Students describe the law of reflection and can explain absorption.. Students will explain how sound travels and how you hear sound. Students will apply the speed equation to analyse their results for the speed of sound. Duration: 6 lessons	**Topic: Fuels and resources** Resources: Burning fuels practical Focus: Evaluating Outcome: Students will compare fossil fuels to renewable energy sources and evaluate their advantages and disadvantages. Duration: 6 lessons	

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Year 8	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6
Biology	**Topic: Healthy Diet** Resources: Food and fuels practical Focus: Repeat readings and anomalies Outcome: Students will know the structure and function of the digestive system and be able to explain how an enzyme increases the rate of digestion. Duration: 6 lessons	**Topic: Infections** Resources: Microbiology investigation Focus: Aseptic technique Outcome: Students continue their learning about cells and living organisms through the world of microbiology, pathogens and diseases. Students will be able to describe how the immune system protects us from infection and explain how vaccinations work. Duration: 6 lessons	**Topic: Body Systems** Resources: Human reaction time practical Focus: Dissection skills Outcome: Students build on their understanding of cells and organisation to learn about specific organs and organ systems within the body. Their main focus will be the skeletal, muscular and nervous systems. Students should be able to name bones and describe how muscles work as antagonistic pairs when moving the skeleton. Duration: 6 lessons	**Topic: Inheritance and variation** Resources: DNA extraction practical Focus: Ratios and percentages Outcome: Students begin their journey into the science of genetics by observing the variation of features in organisms and why they occur.Students will be able to describe where genetic material is found and relate the structure to magnitude of size. They will also be able to construct a punnett square diagram. Duration: 6 lessons	**Topic: Natural selection** Resources: Seeds vs beaks investigation Focus: Calculating a mean/anomalous results Outcome: Students will know how the work of Charles Darwin led to the theory of evolution and natural selection and be able to explain how 'survival of the fittest' led to adaptations in species. Duration: 6 lessons	**Topic: Plant reproduction** Resources: Flower dissection and seed dispersal investigation Focus: Planning Outcome: Students will be able to explain how pollination and fertilisation occur in plants. Duration: 6 lessons

The Curriculum Overview covers the skills focus in each year across all the years in the Key Stage

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Chemistry	**Topic: Periodic table** Resources: Metals vs nonmetals practical Focus: Observations and tables Outcome: Students will know that elements are arranged in the periodic table as metals and non-metals. They will be able to recognise the patterns of reactivity down group 1 and in metals generally. They will also know some properties of the Halogens. Duration: 6 lessons	**Topic: Chemical reactions** Resources: Metals in acid, gas tests, flame tests practicals Focus: Hazards and risks Outcome: Students will be able to identify the products formed when metals react with acid. Students will know what a combustion reaction is. They will also be able to explain what thermal decomposition is and describe how to identify a chemical change. Duration: 6 lessons	**Topic: Metal Extraction** Resources: displacement reactions and reduction of metal ores practicals Focus: Ethics and the environment Outcome: Students will know some of the raw materials used by humans and how they are extracted. They will also be able to discuss the impact of human activity on the environment. Duration: 6 lessons	**Topic: Energetics** Resources: Identifying endothermic and exothermic reactions practical. Focus: Precision of equipment Outcome: Students will be able to define and identify endothermic and exothermic reactions. Students will also be able to explain what a catalyst is. Duration: 6 lessons	**Topic: Rocks and Earth** Resources: Rock observations practical Focus: Observational skills Outcome: Students will be able to describe features of sedimentary, Igneous and metamorphic rock and explain how they were formed. Duration: 6 lessons	
Physics	**Topic: Speed** Resources: Acceleration investigation, parachute egg drop Focus: Constructing line graphs and calculating means. Outcome: Students will use practical data to calculate a mean, plot a line a graph and will analyse a distance-time graph to tell a story. They will be able to use key terminology when discussing speed and acceleration. Duration: 6 lessons	**Topic: Forces in action** Resources: Work, energy and machines and Hooke's law investigations Focus: Rearranging equations Outcome: Students will investigate the amount of work done in moving objects and use their measurements to apply a mathematical calculation. Students will be able to describe how energy is transferred by conduction, convection and radiation and give examples of when these transfers occur in real life. Duration: 6 lessons	**Topic: Particle motion** Resources: Density, surface area of shoes practicals Focus: Area calculations and rearranging equations Outcome: Students will combine their mathematical skills with their practical investigation skills to explain how pressure and density change in real life scenarios. Students will also be able to explain why your ears pop as you ascend or descend in an aeroplane. Duration: 6 lessons	**Topic: Fuels and resources** Resources: Burning fuels practical Focus: Evaluating Outcome: Students will compare fossil fuels to renewable energy sources and evaluate their advantages and disadvantages. Duration: 6 lessons	**Topic: Domestic electricity and magnetism** Resources: Does the number of coils affect the strength of an electromagnet investigation and wiring a plug practical Focus: Investigation skills Outcome: Students will be able to discuss magnets using keywords and explain how to make an electromagnet. They will also know the uses of magnets and electromagnets in real life scenarios.	**Topic: Electricity** Resources: Investigating the resistance of a wire. Focus: Rearranging equations Outcome: Students will continue their learning about electricity, which they started at primary school. Recalling the circuit symbols, constructing circuits and investigating the differences of current, potential difference and resistance in series and parallel circuits. Duration: 6 lessons

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					Duration: 6 lessons	

Year 9	Topic 1	Topic 2
Biology	**Topic: Forensics** Resources: Microscopy, Separating mixtures, Fingerprinting, Extracting DNA, Chromatography, identifying unknown substances Focus: Laboratory skills and basic chemistry techniques and genetics Outcome: The students will know the names of pieces of scientific equipment and will be able to draw and label experimental diagrams. The students will use evidence from practical activities to form a conclusion about the suspect of a crime. They will also be able to describe the structure of DNA and explain where in a cell genetic information is found. Duration: 24 lessons	**Topic: Into the wild** Resources: Decay investigation, Field work techniques Focus: Mean, median, mode and estimating a population size Outcome: Students will be able to define the keywords: Species, population, ecosystem, adaptation and competition. They will use their understanding of the keywords to describe the interdependent and interdependent relationships between organisms in the natural world. Students will also develop their field work techniques of using a quadrat or a transect. Duration: 24 lessons
Chemistry	**Topic: Process & profit** Resources: Distillation of ink, the rock salt challenge and making salts Focus: % yield calculations, error, explaining and evaluating Outcome: Students will build on their prior knowledge of the particle theory and chemistry techniques to explain why methods are effective at separating substances and to describe what they are used for. They will then apply their knowledge to industrial processes to ensure that the manufacturing of their product is as efficient as possible to avoid loss of profit. They should be able to describe where errors or losses were made. Duration: 24 lessons	**Topic: Material science** Resources: The strength of carrier bags and specific heat capacity Focus: Investigation skills Outcome: Students will build on their prior knowledge of the particle theory to be able to describe how particles in polymers, ceramics, metals and composites are structured. They will be able to relate the structure to the properties of materials. This knowledge will then be applied to the ergonomics of choosing materials to make specific products. Duration: 18 lessons

Physics	**Topic: Out of this world** Resources: Modelling the solar system Focus: Data analysis and drawing graphs, standard form and significant figures Outcome: Students will compare the heliocentric and geocentric models of the solar system and will be able to explain why models used in science develop over time. They will use data from NASA to analyse differences in size and distance, whilst applying mathematical principles. Case studies will be used to look at the history of our knowledge in space and how new technology in space is used for telecommunication and GPS. Duration: 24 lessons	**Topic: The future is green** Resources: Investigating turbine blade size and power Focus: Climate, the atmosphere and producing energy Outcome: Students will be able to explain how the atmosphere and climate has changed over time. They will be able to describe how electricity (energy) is made using a variety of renewable and non-renewable techniques. Students will know how to calculate the cost of electricity from a household bill and evaluate which form of energy is most efficient. Students will also be able to discuss the impact of plastic production on the planet. Duration: 21 lessons

10	Topic 1	Topic 2	Topic 3	Topic 4
Biology	**Topic: Cell Biology** Resources: Microscopy, Microbiology, and osmosis investigations Focus: Magnitude of size, rearranging an equation, standard form, Percentage change and plotting a line graph Outcome: Students should be able to identify and give the function of cell organelles. They should know the parts of a microscope and be able to measure cell size and calculate magnification. Students will be able to compare and contrast light microscopes with electron microscopes. Students will also be able to describe the 3 forms of cell transport. Duration: 12 lessons	**Topic: Organisation** Resources:, Food tests and Enzymes investigations Focus: Plotting a line graph Outcome: Students will learn about the digestive system and circulatory system, how they work and what happens when they go wrong. Students should be able to discuss coronary heart disease, cancer and lifestyle related diseases. This topic also looks at the organisation of tissues and organs in plants and how they transport substances. Duration: 9 lessons	**Topic: Infection and response** Resources: BBC Bitesize and Seneca Focus: Magnitude of size and standard form Outcome:Students should be able to confidently discuss the symptoms, causes and treatments of malaria, salmonella, gonorrhoea, rose black spot, tobacco mosaic virus, HIV and measles. They should know the difference between communicable and non communicable diseases and how the body responds to an infection. They should be able to describe how drugs are developed to treat diseases and explain how plants defend against disease. Duration: 9 lessons	**Topic: Bioenergetics** Resources: Photosynthesis investigation Focus: Plotting a line graph Outcome: Students will be able to explain the factors that affect the rate of photosynthesis and will investigate the effect of light intensity on pondweed. Students will develop their graph analysis skills during this topic.. Students should also be able to discuss the uses of glucose in plants and in humans and understand the relationship between photosynthesis and respiration. They should be able to recall the equations for the bioenergetic reactions and distinguish between the different forms of anaerobic respiration. Duration: 8 lessons

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Chemistry	**Topic: Atomic structure and the periodic table** Resources: BBC Bitesize and Seneca Focus: Magnitude of size and standard form Outcome:Students will know the structure of an atom and should be able to describe the properties of subatomic particles. Students should be able to give the electron configuration of the first 20 elements in the periodic table and discuss how the model of the atom developed. They should also be able to describe the trends and patterns in group 1, 7, 0 and the transition metals from the periodic table. Students should be able to describe how the current periodic table developed and why it was a good design. Duration: 8 lessons	**Topic: Structure and bonding** Resources: BBC Bitesize and Seneca Focus: Magnitude of size and standard form Outcome:Students should be able to explain ionic, covalent and metallic bonding and construct dot and cross diagrams to represent examples of these. Students should be able to apply their understanding of bonding to the states of matter, polymers, small and giant structures and the properties of ionic and covalent compounds. Students should also be able to discuss nanoparticles and confidently use standard form when discussing the size of small objects. Duration: 9 lessons	**Topic: Chemical changes** Resources: Making a salt and electrolysis of a solution practical Focus: Percentage changes, accuracy, precision and resolution Outcome: Students should be able to explain reduction and oxidation in terms of loss or gain of oxygen. Students should also be able to recall and describe the reactions, if any, of potassium, sodium, lithium, calcium, magnesium, zinc, iron and copper with water or dilute acids and where appropriate, to place these metals in order of reactivity. They should be able to explain how the reactivity of metals with water or dilute acids is related to the tendency of the metal to form its positive ion and deduce an order of reactivity of metals based on experimental results. Duration: 15 Lessons	**Topic: Energy changes** Resources: Temperature changes investigation Focus: Enthalpy change calculations and percentage change Outcome:Students should know the difference between exothermic and endothermic reactions and be able to identify these using a reaction profile diagram. Students should be able to sketch and label reaction profile diagrams. Using data, students should be able to calculate the energy change of reactions and conclude if they are exothermic or endothermic. They should also understand how fuel cells and batteries work and be able to evaluate their function. Duration: 5 lessons
Physics	**Topic: Energy** Resources:Specific heat capacity and Insulation investigations(completed in year 9) Focus: Rearranging equations and converting units Outcome:Students should know the equations for kinetic energy, gravitational potential energy and elastic energy and be able to rearrange and apply them. They should have a good understanding of energy transfers, power and efficiency and apply this knowledge to national and global energy resources (what we use and how they work). Students should be able to compare and contrast the renewable forms of energy. Duration: 8 lessons	**Topic: Electricity** Resources: IV characteristics and the resistance of a wire investigations. Focus: Rearranging equations, units and plotting a line graph Outcome: Students should be able to draw and interpret circuit diagrams. Students should also be able to explain that, for some resistors, the value of R remains constant but that in others it can change as the current changes. Students should be able to use graphs to explore whether circuit elements are linear or non-linear and relate the curves produced to their function and properties. Duration: 7 Lessons	**Topic: Particle model of matter** Resources: Density investigation Focus: Plotting a line graph and rearranging/combining equations Outcome:Students will be able to compare the properties of alpha, beta and gamma radiation and be able to represent radioactive decay in each form as an equation. Students should be able to interpret a half life graph and predict when a radioactive substance is safe. Students will know the hazards associated with radiation and be able to describe some uses. Students should know the difference between fusion and fission and be able to describe how the model of the atom developed. Duration: 8 lessons	**Topic: Radioactivity** Resources: BBC Bitesize and Seneca Focus: Magnitude of size, standard form and significant figures Outcome: Students should be able to describe why the new evidence from the scattering experiment led to a change in the atomic model and the difference between the plum pudding model of the atom and the nuclear model of the atom. Students should be able to apply their knowledge to the uses of radiation and evaluate the best sources of radiation to use in a given situation. Duration::7 Lessons

The Curriculum Overview covers the skills focus in each year across all the years in the Key Stage

	Topic 5
Biology	
Chemistry	**Topic: Quantitative chemistry** Resources: Neutralisation practical Focus: Rearranging equations, units and uncertainty. Outcome: Students should be able to calculate the percentage by mass in a compound given the relative formula mass and the relative atomic masses. Students should also be able to explain any observed changes in mass in non-enclosed systems during a chemical reaction given the balanced symbol equation for the reaction and explain these changes in terms of the particle model. Students should be able to use the relative formula mass of a substance to calculate the number of moles Duration: 9 lessons

Physics	

11	Topic 1	Topic 2	Topic 3	Topic 4
Biology	**Topic: Ecology** Resources: Field investigations and Decay investigation. Focus: Graph interpretation and bias Outcome: Students should be able to extract and interpret information from charts, graphs and tables relating to the interaction of organisms within a community. Students should also be able to explain the role of microorganisms in cycling materials through an ecosystem by returning carbon to the atmosphere as carbon dioxide and mineral ions to the soil. Duration: Trilogy: 9 lessons. Triple: 14 lessons	**Topic: Inheritance, genetics and evolution** Resources: BBC Bitesize and Seneca Focus: Probability, ratios and percentages Outcome: Students should understand the difference between mitosis and meiosis. Students should also be able to describe the structure of DNA and define the genome. Students will understand the concept of probability in predicting the results of a single gene cross, but recall that most phenotype features are the result of multiple genes rather than single gene inheritance. They should be able to apply the concepts of genetics and inheritance to disorders, selective breeding, natural selection and evolution. Duration: Trilogy: 10 lessons. Triple: 13 lessons		

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Chemistry	**Topic: Chemical analysis** Resources: Chromatography, Identifying ions investigations Focus: Significant figures and calculating Rf values Outcome: Students should be able to use melting point and boiling point data to distinguish pure from impure substances. Students should also be able to explain how paper chromatography separates mixtures, suggest how chromatographic methods can be used for distinguishing pure substances from impure substances and interpret chromatograms and determine Rf values from chromatograms. Triple students will also know the uses of instrumental methods. Duration: Trilogy: 4 lessons. Triple: 9 lessons	**Topic: Organic chemistry** Resources: BBC Bitesize and Seneca Focus: Outcome: Students should be able to recognise substances as alkanes given their formulae. Students should also be able to explain how fractional distillation works in terms of evaporation and condensation. Students will be able to describe in general terms the conditions used for catalytic cracking and steam cracking. Triple science students will know the functional group and properties of alkenes, alcohols, esters and carboxylic acids. Duration: Trilogy: 3 lessons. Triple: 9 lessons	**Topic: Chemistry of the atmosphere** Resources: BBC Bitesize and Seneca Focus: Uncertainty and reliability Outcome: Students should be able to interpret evidence and evaluate different theories about the Earth's early atmosphere. Students should also be able to evaluate the quality of evidence in a report about global climate change given appropriate information, describe uncertainties in the evidence base and recognise the importance of peer review of results and of communicating results to a wide range of audiences. Duration: Trilogy: 6 lessons. Triple: 6 lessons	**Topic: Using resources** Resources: Water purification and Identifying ions practicals Focus: Orders of magnitude Outcome: Students should be able to state examples of natural products that are supplemented or replaced by agricultural and synthetic products. They should also be able to distinguish between finite and renewable resources. Students will be able to extract and interpret information about resources from charts, graphs and tables and use orders of magnitude to evaluate the significance of data. Students will know the meaning of an LCA and how it is used. Duration: Trilogy: 5 lessons. Triple: 10 lessons
Physics	**Topic: Forces** Resources: Force and extension and acceleration investigations Focus: Rearranging equations, units and graph interpretation Outcome: Students should be able to identify forces as scalar or vector and as contact or non-contact. They should also be able to calculate weight, work done, the force on an extended spring, speed, acceleration and apply many other equations. Students should be able to describe and explain velocity-time graphs and distance-time graphs and relate Newton's laws of motion to various scenarios. Duration: Trilogy: 7 lessons. Triple: 19 lessons	**Topic: Space** Resources: BBC Bitesize and Seneca Focus: Orders of magnitude, standard form and significant figures Outcome: Students should be able to explain how, at the start of a star's life cycle, the dust and gas drawn together by gravity causes fusion reactions and that fusion reactions lead to an equilibrium between the gravitational collapse of a star and the expansion of a star due to fusion energy. Students should be able to discuss the Big Bang and red shift. Duration: Triple: 4 lessons	**Topic: Magnets and electromagnetism** Resources: The strength of a solenoid practical Focus: Drawing magnetic fields (FT), applying equations and Fleming's Left hand rule (HT) Outcome: Students should be able to describe the attraction and repulsion between unlike and like poles for permanent magnets and the difference between permanent and induced magnets. They should also be able to draw the magnetic field pattern of a bar magnet showing how strength and direction change from one point to another and explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic. Some students will look into the uses of magnets. Duration: Trilogy: 4 lessons. Triple: 10 lessons	**Topic: Waves** Resources: Waves and radiations practical and absorption and Light investigations. Focus: Standard form and rearranging equations Outcome: Students should be able to describe the difference between longitudinal and transverse waves. Students should also be able to describe wave motion in terms of their amplitude, wavelength, frequency and period. They should be able to give examples that illustrate the transfer of energy by electromagnetic waves and be able to construct ray diagrams to illustrate the refraction of a wave at the boundary between two different media. Duration: Trilogy: 5 lessons. Triple: 14 lessons

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