Year 10-11 Curriculum skeleton – Triple Science

		Biology		Chemistry		Physics	
		Year 10	**Year 11**	**Year 10**	**Year 11**	**Year 10**	**Year 11**
Autumn 1	**Focus**	**Photosynthesis**	**Homeostasis**	**Structure and Bonding**	**Using resources**	**Energy and The National Grid**	**Forces**
	Theory	Explain the structure and function of plants and relate this to the process of photosynthesis.	Explain how information transferred through the body using the nervous system and endocrine system. Describe the role of plant hormones.	Draw and explain ionic, covalent and metallic structures. Relate their structures to their uses and properties. Understand the uses and properties of nanoparticles.	Explore the relationship between the earth's natural resources and chemistry. Explain how the properties of alloys, ceramics, composites and polymers are linked to their uses. Understand the haber process conditions and the use of NPK fertilisers.	Explain what energy systems and energy stores are. Compare renewable and non-renewable energy resources and investigate energy efficiency and how energy is distributed.	Investigate forces and their interactions including resultant forces, weight and elasticity.
	Required Practical	Investigate how different limiting factors affect the rate of photosynthesis.	Investigate the reaction time of a subject Investigate the effect of light or gravity on the growth of newly germinated seedlings.		Purify water samples by distillation or pH or dissolved solids.	Investigate the specific heat of a copper block. Investigate the effectiveness of different materials as thermal insulators.	Investigate hooks law – the extension of a spring
	Skills	Record the rate of photosynthesis whilst taking into account different sources of error. Understand that different variables can be investigated. Draw and interpret a line graph. Calculate means and inverse square law as well as identify anomalous data.	Measure the reaction time, comparing 2 different methods. Identify the pros and cons of each method including the sources of error and understand that different variables can be investigated. Calculate a mean from the result as well as identifying anomalous results Measure the growth of seedlings in different environments. Understand that there are different ways to measure the seedlings and how explain how to make the investigation valid.	Understanding and drawing diagrams to model electron behaviour in bonding. Evaluation of strengths and limitations of bonding models. Link structures to their properties and uses. Use standard form to express small numbers and link this to nanotechnology. Calculate surface area and volume. Understand the applications of nanotechnology in society.	Be able to carry out simple comparative LCAs for plastic and paper bags. Relate the properties of materials to uses. Evaluate data about resources and extraction methods. Recall steps to produce potable water and treat waste water. Recall the names of salts and compare laboratory preparation with industrial processes.	Record the temperature increase of a copper block using continuous data collection. Draw a graph from the results and use this to calculate the specific heat capacity using the equation. Be able to rearrange equations. Safely measure the temperature decrease of water using a continuous method. Explain how to obtain valid results. Plot and interpret graphs that show which material is the best.	Accurately record the length of a spring whilst considering potential errors. Plot force-extension graphs.
Autumn 2	**Focus**	**Organisation**	**Genetics**	**Chemical Changes**	**Organic Chemistry**	**Electricity**	**Forces and Motion**
	Theory	Describe three different types of cell transport and describe the digestive system including the role of enzymes, circulatory and respiratory systems.	Explain the role of DNA and how genes are passed onto the next generation including proteinsynthesis.	Study chemical reactions and patterns of metal reactivity, acids and bases. Make predictions about behaviour based on knowledge of the reactivity series.	Learn about the structures, properties and uses of carbon-based compounds.	Investigate the difference between series and parallel circuits. Understand the relationship between current, resistance and potential difference as well as describe the features of mains electricity including energy, power. and static electricity.	Describe motion along a line. Investigate acceleration and Newtons 3 laws and momentum including stopping distances.

	Required Practical	Investigate osmosis in plant tissue (potato). Investigate the effect of temperature on enzymes Use different reagents to identify different food groups.		Preparation of a pure, dry sample of a Investigate the variables that affect temperature changes in acid plus metals, acid plus carbonates, neutralisations and displacement of metals. Preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate. Determine reacting volumes of a strong acid and a strong alkali using a titration.		Use circuit diagrams to set up and check circuits to investigate the factors affecting the resistance of electrical circuits in series and parallel. Investigate the resistance of a wire when you change the length of the wire. Use circuit diagrams to construct circuits to investigate the I–V characteristics of a variety of circuit elements.	Investigate how force and mass affect acceleration.
	Skills	Calculate the percentage mass change of potato in different solutions and identify sources of error. Draw graphs with negative axis and use a line of best fit to extrapolate data. Calculate surface area to volume ratio and apply this to exchange surfaces. Using continuous sampling technique investigate the effect of temperature on enzymes. Use graphs to determine the optimum enzyme activity. Using different reagents to determine food groups. Take into account the safety precautions for the different reagents and the difficulty of colour being subjective and not a precise result.	Use models to explain how genetic information is passed on from one generation to the next. Use Punnet squares to calculate the probability of inheriting certain traits.	Link chemical patterns and observations to the reactivity series. Understand pH scale and the advantages of other indicators. Describe how to investigate temperature changes. Identify opportunities to improve accuracy. Plot and interpret bar charts and line graphs. Describe how to prepare salts from different chemicals and be able to explain the advantages of the stages used. Describe how to carry out titrations and understand appropriate equipment for variable and set volumes. Be able to calculate a mean titre volume, range and uncertainty.	Balance combustion equations. Recognise structures, models and formulae of alkanes. Explain how fractional distillation and cracking works. Link properties of hydrocarbons to fractional distillation and usefulness to society. Recognise the first four structures and reactions of alkenes, alcohols, carboxylic acids. Name and draw the structures of natural and synthetic polymers.	Measure current, potential difference, and resistance in parallel and series circuits. Be able to rearrange the formulas to calculate resistance. Calculate the resistance of a wire by measuring the current and potential difference of a wire at different lengths. Plot a line graph from the results collected. Use circuit diagrams to construct and check series and parallel circuits including a variety of common circuit elements such as filament light bulbs. Construct line graphs to show how the resistance changes as current increases.	Observe the effect of force on a object. Consider errors that may arise during the investigation. Know the correct equation to calculate acceleration.
Spring 1	**Focus**	**Cell Biology**	**Variation**	**Chemical Changes**	**Chemical Analysis**	**Atomic Structure**	**Space**
	Theory	Describe cell structure and function, cell division and respiration.	Describe how organisms vary and what causes these variations.	Using the reactivity series to predict products of molten and aqueous ionic electrolytes. Understand and describe redox reactions during the process of electrolysis. Link electrolysis to metal extraction.	Describe qualitative tests to detect specific chemicals. Understand the limitations and advantages of techniques including instrumental methods. Identify ions by chemical and spectroscopic means.	Describe the structure including subatomic particles including isotopes and how the atom has developed over time.	Describe the Solar system; stability of orbital motions and satellites. Explain what Red-shift is and how it provides evidence for the big band. Describe the life-cycle of the star.
	Required Practical	Use a microscope to observe and identify different cell structures.		Investigate what happens when aqueous solutions are electrolysed using inert electrodes.	Use paper chromatography to separate different soluble substances. Use chemical tests to identify ions in unknown single ionic compounds.		

	Skills	Make a temporary slide and use a light microscope to observe cells and produce labelled scientific drawings. Use standard form and be able to convert units into micrometres.	Compare continuous and dissentious data.	Describe how to electrolyse ionic compounds. Use knowledge of electrolysis and the reactivity series to predict the products of solutions. Use gas tests for hydrogen, oxygen and chlorine electrode products. Be able to balance half redox equations.	Describe how chromatography separates mixtures and identify potential errors in methods. Be able to interpret chromatogram results and calculate Rf values to an appropriate number of significant figures. Use melting point and boiling point data to distinguish pure from impure substances. Deduce ions from chemical test results. Evaluate chemical and spectroscopic techniques.	Calculate half-life and complete half equations. Use graphs to predict the half-life of a radioactive source.	Describe the different pathways in the life cycle of a star and justify why a star takes the route it does. Describe orbital motion. Explain the evidence we have for the big bang theory and the models for the universe.
Spring 2	**Focus**	**Health Matters**	**Evolution**	**Quantitative Chemistry**	**Earth and atmosphere**	**Particles**	**Magnets and Electromagnets**
	Theory	Explain the difference between health and disease including looking at risk factors. Explain patterns in diseases incidences and how immune response and vaccinations protect the population.	Explain Darwin's theory of evolution and how we classify living organisms. Understand how to read an evolutionary tree.	Apply ideas about conservation of mass to experimental data. Understand formula, subscripts and multipliers to balance equations. Use relative formula mass to calculate the mole in a given mass. Use the mole to calculate amounts and change the subject of the equations to solve problems in reactions involving solids, solutions and gases. Calculate atom economy and yield to understand efficiency in reactions.	Describe key events in the early and current earth's atmosphere. Explain the causes and effects of climate change and the limitations of models.	Describe the changes of state linking to the particle model including pressure in gases and specific latent heat. Investigate the density of different materials	Describe permanent and induced magnetism, magnetic forces and fields including electromagnets and their uses, motors and transformers.
	Required Practical	Investigate the effect of antiseptics or antibiotics on bacterial growth.				Investigate the specific heat of a copper block. Calculate the density of regular shapes, irregular shapes, and liquids.	
	Skills	Culture bacteria to show the effect antiseptics have on the growth. Use aseptic techniques to culture uncontaminated cultures and measure the effectiveness by measuring clear zones and calculating the area of a circle.	Use models to explain the theory of evolution. Evaluate evidence and know what makes scientific theories valid.	Give answers using standard form and to the correct number of significant figures. Recall and rearrange expressions to change the subject. Successfully convert units e.g. cm^3 to dm^3	Understand the limitations of theories about the earth's early atmosphere and be able to link key events to the gases carbon dioxide and oxygen. Evaluate the quality of evidence in a global climate change report. Describe uncertainties and the importance of peer review.	Record the temperature increase of a copper block using continuous data collection. Draw a graph from the results and use this to extrapolate the specific heat capacity using the equation. Be able to rearrange equations. Rearrange the equation for density to make other values the subject. Explain how to measure the density of different shaped objects. Explain the errors that may be encountered during the investigation.	Be able to use Fleming's left-hand rule and manipulate equations to make different values the subject. Apply equations to transformers.
Summer 1	**Focus**	**Ecology**	**Revision**	**Energy Changes**	**Revision**	**Waves**	**Revision**

	Theory	Describe the habitat and how organisms depend on each other linking to interdependence and adaptations.		Identify and describe energy changes in chemical reactions. Calculate breaking and formation of bonds. Explain how cells and batteries use chemical reactions to provide electricity.		Compare waves in air, fluids and solids.	
	Required Practical	Investigate the distribution of organisms using quadrats and transects.		Investigate temperature changes in neutralisation reactions. Draw and describe intersecting graphs. Use graphical data to identify neutralisation.		Observe and measure the frequency, wavelength, and speed of waves in a ripple tank and waves in a solid.	
	Skills	Describe the features that make up an ecosystem and how they all interact with one another. Use transect and quadrats to sample habitats. Handle the data by completing means, modes, medians and range and be able to estimate population abundance.		Identify endothermic and exothermic reactions from data. Recall and rearrange equations to calculate bond energies. Draw and label reaction profiles. Link ideas about the reactivity series to voltage in simple cells. Describe how to investigate temperature changes in neutralisation and be able to identify possible sources of error. Plot and interpret bar charts and line graphs.		Observe waves in fluids and solids and measure speed, frequency, and wavelength. Consider errors that may occur and different methods to take these measurements. Be able to rearrange equations to make different values the subject. Interpret wave diagrams.	
Summer 2	**Focus**	**Ecology**	**Exams**	**Rates of Reaction**	**Exams**	**Waves**	**Exams**
	Theory	Describe how the environment changes including both the water and carbon cycle. Describe the impact humans have on the environment And the technology they can use to improve the environment.		Know which factors which affect reaction rates and be able to explain them in terms of collision theory and their effect on dynamic equilibrium. Identify catalysts in reactions and explain their effect on rate. Draw and interpret graphs and data linked to the rate of a chemical reaction. Understand the link to industrial reactions and the need for compromise.		Describe the properties of waves and electromagnetic waves, including wave for detection and exploration (sound, ultrasound, seismic waves)	
	Required Practical	Investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.		Investigate how changes in concentration affect the rates of reactions by either measuring the volume of a gas produced or a change in colour or turbidity.		Investigate the reflection and refraction of light by different types of surfaces. Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.	

	Skills	Record the rate of decay at different temperatures by measuring the time for indicator to change colour. Explain why data is subjective for this investigation.		Describe how to investigate rates of reaction by measuring product formation e.g. loss of mass, measuring cylinders, gas syringes and formation of a precipitate. Calculate means from repeat data. Drawing and interpreting rate graphs with proportional and inversely proportional relationships. Using tangents and gradients to calculate rates. Drawing reaction profiles for catalysed reactions.		Use light beams and mirrors and glass blocks to investigate reflection and refraction. Accurately record data and measure angles. Explain the errors that could arise during this investigation. Safely heat a Lesley cube and measure the radiation emitted from each surface.	