Subject: Science Year 9

	Year 9 - Emerging	Year 9 - Secure	Year 9 - Exceeding
Term 1	**Students should be able to:** • Draw food chains for organisms living in a particular habitat • Describe factors which affect the size of population of a species • Identify energy stores in a closed system • Identify energy transfers when a system changes • Explain how energy transfers take place in terms of convection, conduction and radiation • Describe which factors need to be included in calculating the thermal energy of an object • Explain the advantages and disadvantages of some renewable and non-renewable energy resources • Calculate the size of different energy stores given data and equations • Calculate work done, energy, power and energy efficiency using given formula • analyse data for patterns	**Students should be able to:** • Combine food chains to make a food web • Describe how a species' population changes as its predator or prey population changes • Suggest better ways to control variables • Suggest alternative methods to an investigation • Apply the law of conservation of energy to a closed system and link this to energy transfers • Analyse energy transfers taking place in terms of conduction, convection and radiation • Calculate the thermal energy of an object given appropriate data • Evaluate the social, economic and environmental consequences of using a resource to generate electricity, from data • Use an appropriate strategy to manipulate values in equations in order to calculate values that are not the subject of the equation	**Students should be able to:** • Suggest what might happen when an unfamiliar species is introduced into a food web • Suggest how toxic substance can accumulate in human food • Suggest better ways to control variables • Suggest alternative methods to an investigation • Apply the law of conservation of energy to a closed system and use this to carry out calculations requiring multiple equations • Suggest ways of minimising energy transfer by conduction, convection and radiation including ideas about thermal conductivity of materials • Evaluate calculations for the thermal energy of an object given appropriate information • Consider and justify your own energy choices • Carry out conversions, then use an appropriate strategy to manipulate values in equations in order to calculate values that are not the subject of the equation
Term 2	**Students should be able to:** • Describe the components of the circulatory system including the structure of the heart • Describe the medical treatments available for cardiovascular disease • Recall example of non-communicable disease and link these to their risk factors • Describe effects upon the body of recreational drugs including smoking and alcohol • Identify the key features of valid scientific studies and analyse studies that we find in the news • Describe the effects of our life choices on our health including diet, physical activity and drugs • Identify data which supports a conclusion and evidence that does not • Identify some components of validity given data • Define an element, compound, mixture and molecule • Represent atoms, molecules and elements, mixtures and compounds using particle diagrams • Describe the subatomic particles found in the atom along with their properties, link this to the periodic table and electronic structure. • Describe the trends in physical and chemical properties of groups 1 and 7 of the periodic table • Name compounds using their chemical formulae • Choose a suitable technique for separating a mixture of substances • Convert unit values in standard form • Evaluate the effectiveness of a method, including suggesting ways of obtaining more accurate results	**Students should be able to:** • Explain how the components of the circulatory system including the structure of the heart and blood vessels link to respiration and exercise • Analyse descriptions of cardiovascular disease and explain appropriate treatments • Explain how risk factors may link to an increased incidence of non-communicable diseases • Explain the effects upon the body of recreational drugs including smoking and alcohol • Analyse scientific studies for validity and consider improvements for factors such as bias, sample size and experimental method • Explain the physiological and psychological effects of our life choices on our health including diet, physical activity and drugs • Understand and use the symbols =, <, >, ~ • Evaluate validity evidence from studies • Explain complex trends in data, considering the limitations of the data • Identify elements, compounds, mixtures and molecules from their diagrams and descriptions • Link the subatomic particles found in the atom to the periodic table and electronic structure • Identify elements from groups 1 and 7 of the periodic table based upon their macroscopic observed behaviour • Given chemical formulae, name the elements present in a compound and their relative proportions. • Describe a combination of methods to separate a complex mixture • Use values given in standard form in an equation • Evaluate the effectiveness of a method, including suggesting ways of obtaining more accurate, repeatable and reproducible results	**Students should be able to:** • Link together ideas about cardiovascular disease and the components of the circulatory system to symptoms • Explain how risk factors may link to an increased incidence of non-communicable diseases and suggest how to reduced them • Link ideas about recreational drugs including smoking and alcohol to national data about their impact • Analyse scientific studies for validity and suggest and explain improvements for factors such as bias, sample size and experimental method • Explain the physiological and psychological effects of our life choices on our health including diet, physical activity and drugs and suggest the impact on society of these choices • Understand and use the symbols <<, >>, ∝ , ~ • Critically interpret and evaluate conflicting evidence • Evaluate the use of particle diagrams as a model for elements, compounds and mixtures • Link the subatomic particles found in the atom to the periodic table and electronic structure • Explain the trends in physical and chemical properties of groups 1 and 7 of the periodic table based upon their electron arrangements • Given chemical formulae, name the elements present and their relative percentage by mass • Use values given in standard form to carry out equations which require rearranging • Evaluate the effectiveness of a method, linking accuracy, repeatability and reproducibility to experimental method or techniques
Term 3	**Students should be able to:** • Draw simple circuit diagrams to represent a number of different circuits and components • Describe simply what is meant by current in a circuit • Describe how to measure voltage in a circuit and predict values in series and parallel circuits • Describe the link in an electrical component between current, resistance and energy transfer to the surroundings • Calculate current, potential difference, charge and resistance given data and equations • Describe the relationship between current and voltage for different electrical components • Describe the key characteristics of UK domestic electricity • Identify examples of permanent and non-permanent magnets and label their key features • Draw magnetic field lines on both permanent magnets, solenoids and electromagnets • Describe the structure of an electromagnet and the factors that determine its strength • Describe relationships in line graphs including identifying if a relationship is directly proportional	**Students should be able to:** • Analyse circuit diagrams in order to describe their arrangement or identify faults • Link ideas about the nature of current to energy, resistance, conductors and the properties of different electrical components • Use ideas about energy to predict how changing electrical components in a circuit such as batteries, bulbs or resistors may affect values in a circuit • Use an appropriate strategy to manipulate values in equations in order to calculate values that are not the subject of the equation • Explain the relationship between current and voltage for different electrical components • Explain the features of UK domestic electricity • Interpret diagrams of permanent magnets and electromagnets to decide whether they repel, attract or otherwise influence non-permanent magnets • Analyse magnetic field lines for key features such as strength and direction • Explain using ideas about electromagnetism how an electromagnet works • Describe trends and relationships in line graphs with two y axis including identifying if a relationship is directly proportional	**Students should be able to:** • Construct circuit diagrams in order to collect data for different components • Link ideas about the nature of current to ideas about static charge, electrons and conventional current flow • Use ideas about energy transfers to link voltage in a circuit and across components • Carry out conversions, then use an appropriate strategy to manipulate values in equations in order to calculate values that are not the subject of the equation • Analyse mathematical relationships between current and voltage for different electrical components • Link ideas about energy transfers and efficiency to the features of UK domestic electricity and the national grid • Explain how electromagnets can be used in devices and suggest improvements in their use • Carry out calculations related to magnetic field lines • Apply principles of electromagnetism and the interaction of magnetic fields to different devices including the motor effect • Describe trends and relationships in line graphs with two y axis including identifying if a relationship is directly proportional or inversely proportional