**Subject: Science year 9**

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|  | **Year 9 - Novice** | **Year 9 - Capable** | **Year 9 - Expert** |
| **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 |