**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
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| **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
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| **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
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