Science

We intend to equip our young people with the knowledge needed to understand the world and technology around them. We aim to encourage curiosity in the natural, physical and chemical world around them; and to foster critical thinking. We strive to provide our young people with a chance to broaden their horizons and provide multiple routes into STEM careers.

Year 9 Science

Term One

Content of study	*Physics transition unit*	Moja Island Skills Unit

What are the aims and objectives of this term?	*Introduction to forces,*
	Describe some starting ideas about forces.
	A force is a push or pull that acts on an object due to the interaction with another object. All forces between objects are either: • contact forces – the objects are physically touching • non-contact forces – the objects are physically separated.
	Describe forces as being balanced or unbalanced.
	Scalar quantities have magnitude only. Vector quantities have magnitude and an associated direction. A vector quantity may be represented by an arrow. The length of the arrow represents the magnitude, and the direction of the arrow the direction of the vector quantity.
	Students should be able to apply Newton's First Law to explain the motion of objects moving with a uniform velocity and objects where the speed and/or direction changes.
	Newton's Second Law: Students should be able to estimate the speed, accelerations and forces involved in large accelerations for everyday road transport. Students should recognise and be able to use the symbol that indicates an approximate value or approximate answer;~
	Students should be able to apply Newton's Third Law to examples of equilibrium situations
	Students should be able to: • explain methods used to measure human reaction times and recall typical results • interpret and evaluate measurements from simple methods to measure the different reaction times of students
	Students should be able to recognise/draw simple diagrams to model the difference between solids, liquids and gases.
		Skills topic linking together the following ideas through the scenario of shipwreck and consequential discovery of an island and it's inhabitants:
		• Ecology
		  ○ Food chains and webs
		  ○ Human effects on the environment
		• Circuits
		  ○ Series and Parallel Circuits
		  ○ Building Plugs
		  ○ Safety in Electricity
		• Energy
		  ○ Renewable Energy Resources
		• Density
		• Separating techniques
		  ○ Distillation
		• Other
		  ○ Human requirements for survival
		  ○ Critical thinking skills
		  ○ Practical skills
		  ▪ Density
		  ▪ Circuits
		  ▪ Plug building
		  ▪ Distillation

	Students should be able to explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules. Students should be able to: • explain how the motion of the molecules in a gas is related to both its temperature and its pressure.	
What previous knowledge is required?	*Year 7 Unit 2A Particle Model, Year 7 Unit 4A speed and gravity. Year 8 Unit 1A Force and pressure.*	*Variety of content covered in Year 7 and Year 8.*
How will this term's content help with future learning?	*Skills in investigations, data handling, identifying variables and drawing conclusions from presented data are key to exam success at KS4 and KS5, around 35% of all questions will require these skills over actual recalled information. These skills are vital for success at KS4.*	*Skills in investigations, data handling, identifying variables and drawing conclusions from presented data are key to exam success at KS4 and KS5, around 35% of all questions will require these skills over actual recalled information. These skills are vital for success at KS4. Knowledge builds upon the foundations of KS3 to prepare for KS4.*
Links to Specification	*https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study#key-stage-3*	*https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study#key-stage-3*
Resources	• *YouTube —* - *Newtons laws* Newton's 3 Laws of Motion for Kids: Three Physical Laws of Mechanics for Children - FreeSchool - YouTube - Introduction to Forces - YouTube • *BBC BiteSize-* - BBC bitesize forces - KS3 - YouTube *Working Scientifically –* - KS3 SCIENCE FORCES! - YouTube	*BBC Bitesize*
Assessments	*Pupils are assessed through the use of end of topics tests, with questions taken from Exampro for KS3. This occurs at the end of unit and is assessed and graded by teachers.*	*Pupils are assessed through the use of end of topics tests, with questions taken from Exampro for KS3. This occurs at the end of unit and is assessed and graded by teachers.*
Term Two		
Content of study	*Chemistry transition unit*	
What are the aims and objectives of this term?	*Introduction to Chemistry:-* *Students should be able to describe:* why the new evidence from the scattering experiment led to a change in the atomic model.	

	The difference between the plum pudding model of the atom and the nuclear model of the atom. Students should be able to describe these steps in the development of the periodic table. have due regard for accuracy of measurements and health and safety. Be objective, evaluate data in terms of accuracy, precision, repeatability and reproducibility and identify potential sources of random and systematic error. *The relative formula mass (Mr) of a compound is the sum of the relative atomic masses of the atoms in the numbers shown in the formula.* *In a balanced chemical equation, the sum of the relative formula masses of the reactants in the quantities shown equals the sum of the relative formula masses of the products in the quantities shown.* Students should understand the use of the multipliers in equations in normal script before a formula and in subscript within a formula. Students should be able to: • represent the distribution of results and make estimations of uncertainty • use the range of a set of measurements about the mean as a measure of uncertainty. Students should be able to use the nuclear model to describe atoms. Students may answer questions in terms of either energy levels or shells. Students should be able to explain chemical bonding in terms of electrostatic forces and the transfer or sharing of electrons. Students should be able to work out the charge on the ions of metals and non-metals from the group number of the element, limited to the metals in Groups 1 and 2, and non-metals in Groups 6 and 7. Students should be able to: • draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane Students should be able to explain why alloys are harder than pure metals in terms of distortion of the layers of atoms in the structure of a pure metal. Students should be able to predict the products of the electrolysis of binary ionic compounds in the molten state. Students should be able to: • explain why a mixture is used as the electrolyte • explain why the positive electrode must be continually replaced. Students should be able to predict the products of the electrolysis of aqueous solutions containing a single ionic compound.
What previous knowledge is required?	*Year 7 Unit 6A metals and non-metals, Year 8 Unit 5B Periodic table and elements, Unit 6A Chemical energy and types of reaction.*
How will this term's content help with future learning?	*Skills in investigations, data handling, identifying variables and drawing conclusions from presented data are key to exam success at KS4 and KS5, around 35% of all questions will require these skills over actual recalled information. These skills are vital for success at KS4.*
Links to Specification	*https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study#key-stage-3*
Resources	• *YouTube —* -Structure of the atom - YouTube Writing and Balancing Equations - YouTube • *BBC BiteSize-* - Introduction to chemical reactions - BBC Bitesize *Working Scientifically –* - Working scientifically - KS3 Chemistry - BBC Bitesize

Assessments	*Pupils are assessed through the use of end of topics tests, with questions taken from Exampro for KS3. This occurs at the end of unit and is assessed and graded by teachers.*	
Term Three		
Content of study	Reproductive Health	*B1 – Cell Biology*
What are the aims and objectives of this term?	For students to understand more about human reproductive systems and their processes as well as the SMSC of relationships, consent, drugs, unplanned pregnancy, peer pressure, arranged marriages and FGM.	Label diagrams of animal and plant cells. Describe the function of the main organelles. Prepare slides of plant and animal cells and describe the procedure. Correctly use a microscope to observe cells under different magnifications. Describe the order of size of: cell, nucleus, chromosome and gene. Explain the need for differentiation in a multicellular organism. Describe the differences between differentiation in plants and in animals. Explain how specialised cells are adapted for their function. Define the term 'stem cell'. Describe where stem cells can be found in animals and plants. Describe in simple terms how nerve cells genetically identical to a patient could be obtained. Describe how stem cells could be used to help treat some medical conditions. Evaluate risks and benefits, as well as the social and ethical issues concerning the use of stem cells from embryos in medical research and treatments. Stem cells in plants – see 4.6.2.5 Cloning. Identify plant, animal and bacterial cells and classify them as eukaryotic or prokaryotic cells. Label diagrams of bacterial cells. Describe the differences between eukaryotic and prokaryotic cells in terms of structure and size.

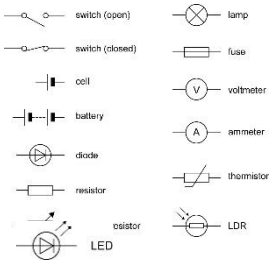
		Describe the differences in magnification and resolution of light and electron microscopes. Explain how electron microscopy has increased understanding of organelles. Calculate the magnification of a light microscope. Carry out calculations using the formula: $real\ size = \frac{image\ size}{magnification}$ Rearrange the equation to calculate image size or magnification. Convert values for the units: cm, mm, µm and nm. Know that bacteria multiply by simple cell division. Know how bacteria can be grown. Know procedure to prepare an uncontaminated culture. Explain why cultures are incubated at a maximum temperature of 25°C. Describe why uncontaminated cultures are necessary in research. Describe what a chromosome is and where chromosomes are found in the cell. Describe simply how and why body cells divide by. Knowledge and understanding of the stages in mitosis are **not** required. Draw simple diagrams to describe mitosis. Draw a simple diagram to describe the cell cycle in terms of: • cell growth, when the number of organelles increases • replication of chromosomes, so the genetic material is doubled • separation of the chromosomes: division of the nucleus division of the cell to form two identical cells. Define the term 'diffusion'. Explain how temperature, concentration

		gradient and surface area affect the rate of diffusion. Give examples of substances that diffuse into and out of cells. Calculate and compare surface area: volume ratios. Explain how the small intestine and lungs in mammals, and roots and leaves in plants, are adapted for exchange of substances. Describe and explain how an exchange surface is made more effective. Define the term 'osmosis'. Apply knowledge of osmosis to unfamiliar situations and make predictions.
What previous knowledge is required?	KS3 reproductive systems (male and female) KS2 relationships education	*Plant and Animal cells are different in appearance and contents.* *Bacteria cells do not have a nucleus* *A basic understanding that a cell has a membrane and a nucleus.*
How will this term's content help with future learning?	This will teach them about their own body and making safe choices. It will provide the students with information on how to prevent pregnancy and the options available if pregnancy were to occur. It breaks down social stigmas associated with discussing sexual intercourse and the topics surrounding it. - Links to KS4 units (B5 Homeostasis and Response and B6 Inheritance, Variation and Evolution).	- *Moving in to A level Biology ideas about cellular function and adaptations of cells are required, as well as a knowledge of heart and lung anatomy and structure. A level Biology has a large focus on cells and organelles as well as their functions. Calculating magnification is a skill for A level also.*
Links to Specification	- *https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study#key-stage-3*	*4.1* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Biology – 4.1* *https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF*
Resources	• BBC Bitesize – Reproduction KS3 https://www.bbc.co.uk/bitesize/topics/zybbkqt • BBC Bitesize – Sex and relationships https://www.bbc.co.uk/bitesize/topics/zqq2pv4/resources/1	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=KjKWmpr7H_Y* • *CGP Revision Guides (various)*

	• Youtube – Reproduction https://www.youtube.com/watch?v=yH3tAXENdRU Youtube – Reproduction https://www.youtube.com/watch?v=QkqDoF9KK60	• *YouTube - Amoeba Sisters* *https://www.youtube.com/playlist?list=PLwL0Myd7Dk1HR9u5jw19E1_Q5u25PKg8v*
Assessments	*Pupils are assessed through an end of unit test paper. There is only one tier for all students at it is graded from ND to a grade 5d.*	*Pupils are assessed through an end of unit exam paper, it is 40 minutes in length.*
Term Four		
Content of study	*C1 – Atomic structure and the periodic table*	
What are the aims and objectives of this term?	Be able to use the names and symbols of the first 20 elements in the periodic table, the elements in Groups 1 and 7, and other elements in this specification Name compounds of these elements from given formulae or symbol equations Write word equations for the reactions in this specification Write formulae and balanced chemical equations for the reactions in this specification. Be able to describe, explain and give examples of the specified processes of separation Suggest suitable separation and purification techniques for mixtures when given appropriate information. Describe why the new evidence from the scattering experiment led to a change in the atomic model. Describe the difference between the plum pudding model of the atom and the nuclear model of the atom. Be able to use the nuclear model to describe atoms. Be able to calculate the numbers of protons, neutrons and electrons in an atom or ion, given its atomic number and mass number. Be able to relate size and scale of atoms to objects in the physical world. Be able to calculate the relative atomic mass of an element given the percentage abundance of its isotopes. Be able to answer questions in terms of either energy levels or shells. Be able to explain how the position of an element in the periodic table is related to the arrangement of electrons in its atoms and hence to its atomic number. Be able to predict possible reactions and probable reactivity of elements from their positions in the periodic table. Be able to describe these steps in the development of the periodic table. Be able to explain the differences between metals and non-metals on the basis of their characteristic physical and chemical properties. Explain how the atomic structure of metals and non-metals relates to their position in the periodic table Explain how the reactions of elements are related to the arrangement of electrons in their atoms and hence to their atomic number.	

	Be able to explain how properties of the elements in Group 0 depend on the outer shell of electrons of the atoms Be able to predict properties from given trends down the group. Be able to explain how properties of the elements in Group 1 depend on the outer shell of electrons of the atoms Be able to predict properties from given trends down the group. Be able to explain how properties of the elements in Group 7 depend on the outer shell of electrons of the atoms Be able to predict properties from given trends down the group.
What previous knowledge is required?	Atoms, elements and compounds, atomic structure – KS3 curriculum.
How will this term's content help with future learning?	Links to revision of previous units, a part within A level Chemistry, very few future learning opportunities outside of A level Chemistry.
Links to Specification	*5.1* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Chemistry – 4.1* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF*
Resources	• *YouTube – primrose kitten –* • (348) The Whole of AQA - ATOMIC STRUCTURE. GCSE 9-1 Chemistry or Combined Science Revision Topic 1 for C1 - YouTube • *CGP Revision Guides (various)* • *YouTube* (348) GCSE Science Revision Chemistry "Elements, Compounds and Mixtures" - YouTube (348) ATOMIC STRUCTURE. AQA C1-Topic 1-Quick Fire Questions. 9-1 GCSE Chemistry Combined Science Revision - YouTube (348) GCSE Chemistry - Electron Arrangement #8 - YouTube (348) GCSE Chemistry - Atoms & Ions #1 - YouTube
Assessments	*Pupils are assessed through an end of unit exam paper, it is 40 minutes in l Pupils are assessed through an end of unit exam paper, it is 40 minutes in length.*

Term Five

Content of study	*C1 – Atomic structure and the periodic table*	*P2 – Electricity*
What are the aims and objectives of this term?	Be able to use the names and symbols of the first 20 elements in the periodic table, the elements in Groups 1 and 7, and other elements in this specification Name compounds of these elements from given formulae or symbol equations Write word equations for the reactions in this specification	Circuit diagrams use standard symbols: 

	Write formulae and balanced chemical equations for the reactions in this specification. Be able to describe, explain and give examples of the specified processes of separation Suggest suitable separation and purification techniques for mixtures when given appropriate information. Describe why the new evidence from the scattering experiment led to a change in the atomic model. Describe the difference between the plum pudding model of the atom and the nuclear model of the atom. Be able to use the nuclear model to describe atoms. Be able to calculate the numbers of protons, neutrons and electrons in an atom or ion, given its atomic number and mass number. Be able to relate size and scale of atoms to objects in the physical world. Be able to calculate the relative atomic mass of an element given the percentage abundance of its isotopes. Be able to answer questions in terms of either energy levels or shells. Be able to explain how the position of an element in the periodic table is related to the arrangement of electrons in its atoms and hence to its atomic number. Be able to predict possible reactions and probable reactivity of elements from their positions in the periodic table. Be able to describe these steps in the development of the periodic table. Be able to explain the differences between metals and non-metals on the basis of their characteristic physical and chemical properties. Explain how the atomic structure of metals and non-metals relates to their position in the periodic table Explain how the reactions of elements are related to the	For electrical charge to flow through a closed circuit the circuit must include a source of potential difference. Electric current is a flow of electrical charge. The size of the electric current is the rate of flow of electrical charge. Charge flow, current and time are linked by the equation: $$charge\ flow = current\ x\ time$$ $$[\ Q\ =\ I\ t\ ]$$ charge flow, *Q*, in coulombs, C current, *I*, in ampere, A time, *t*, in seconds, s The current at any point in a series circuit has the same value as the current at any other point in the same circuit.. The current through a component depends on both the resistance of the component and the potential difference across the component. The greater the resistance of the component the smaller the current for a given potential difference (p.d.) across the component. Current, potential difference or resistance can be calculated using the equation: $$potential\ difference = current\ x\ resistance$$ $$[\ V\ =\ I\ R\ ]$$ potential difference, V, in volts, V current, I, in amperes, A resistance, R, in ohms, Ω Explain the design and use of a circuit to measure the resistance of a component by measuring the current through, and potential difference across, the component. Students should set up and use a circuit to investigate a factor/ the factors that affect the resistance of an electrical component(s). The current through an ohmic conductor (at a constant temperature) is directly proportional to the potential difference across the resistor. This means that the resistance remains constant as the current changes.

	arrangement of electrons in their atoms and hence to their atomic number. Be able to explain how properties of the elements in Group 0 depend on the outer shell of electrons of the atoms Be able to predict properties from given trends down the group. Be able to explain how properties of the elements in Group 1 depend on the outer shell of electrons of the atoms Be able to predict properties from given trends down the group. Be able to explain how properties of the elements in Group 7 depend on the outer shell of electrons of the atoms Be able to predict properties from given trends down the group.	The resistance of components such as filament lamps, diodes, thermistors and LDRs is not constant; it changes with the current through the component. The resistance of a filament lamp increases as the temperature of the filament increases. The current through a diode flows in one direction only. The diode has a very high resistance in the reverse direction. The resistance of a thermistor decreases as the temperature increases. The resistance of an LDR decreases as light intensity increases. There are two ways of joining electrical components, in series and in parallel. Some circuits include both series and parallel parts. For components connected in series: • there is the same current through each component • the total potential difference of the power supply is shared between the components. • the total resistance of two components is the sum of the resistance of each component. $R_{total} = R_1 + R_2$ resistance, R, in ohms, Ω For components connected in parallel: • the potential difference across each component is the same • the total current through the whole circuit is the sum of the currents through the separate components the total resistance of two resistors is less than the resistance of the smallest individual resistor. Students should be able to explain qualitatively why adding resistors in series increases the total resistance, while adding resistors in parallel decreases the total resistance. The potential difference across cells and batteries is always in the same direction. The potential difference does not change polarity.

		The potential difference of mains electricity changes direction. The potential difference changes polarity. Mains electricity is an a.c. supply. In the UK it has a frequency of 50 Hz and is about 230 V. Most electrical appliances are connected to the mains using three-core cable. The insulation covering each wire is colour coded for easy identification: live wire – brown neutral wire – blue earth wire – green and yellow stripes. The live wire carries the alternating potential difference from the supply. The neutral wire completes the circuit. The earth wire is a safety wire to stop the appliance becoming live. The potential difference between the live wire and earth (0 V) is about 230 V. The neutral wire is at or close to earth potential (0 V). The earth wire is at 0 V, it only carries a current if there is a fault. The power of a device is related to the potential difference across it and the current through it by the equation: $$power = potential\ difference\ x\ current$$ $$[P = V\ I\ ]$$ $$power = current\ squared\ x\ resistance$$ $$[P = I^2\ R\ ]$$ power, P, in watts, W potential difference, V, in volts, V current, I, in amperes, A resistance, R, in ohms, Ω Everyday electrical appliances are designed to bring about energy transfers. Describe how different domestic appliances transfer energy from batteries or a.c. mains to the kinetic energy of electric motors or the energy of heating devices. The amount of energy an appliance transfers depends on how long the appliance is switched on for and the power of the appliance.

		Work is done when charge flows in a circuit. The amount of energy transferred by electrical work can be calculated using the equation: $energy\ transferred = power\ x\ time$ $[E = P\,t]$ $energy\ transferred = charge\ flow\ x\ potential\ difference$ $[E = Q\,V]$ energy transferred, E, in joules, J power, P, in watts, W time, t, in seconds, s charge flow, Q, in coulombs, C potential difference, V, in volts, V The National Grid is a system of cables and transformers linking power stations to consumers. Electrical power is transferred from power stations to consumers using the National Grid. Step-up transformers are used to increase the potential difference from the power station to the transmission cables then step-down transformers are used to decrease, to a much lower value, the potential difference for domestic use. This is done because, for a given power, increasing the potential difference reduces the current, and hence reduces the energy losses due to heating in the transmission cables. When certain insulating materials are rubbed against each other they become electrically charged. Negatively charged electrons are rubbed off one material and onto the other. The material that gains electrons becomes negatively charged. The material that loses electrons is left with an equal positive charge. The greater the charge on an isolated object the greater the potential difference between the object and earth. If the potential difference becomes high enough a spark may jump across the gap between the object and any earthed conductor which is bought near it.

		When two electrically charged objects are brought close together they exert a force on each other. Two objects that carry the same type of charge repel. Two objects that carry different types of charge attract. Attraction and repulsion between two charged objects are examples of non-contact force.
What previous knowledge is required?	Atoms, elements and compounds, atomic structure – KS3 curriculum.	*Electricity is conducted by electrons in metals. Non-metals are not conductors (insulators) of electricity. Circuits won't work if broken, they must be complete.* *Current flows around a circuit and various items powered by the current use volts.* *Heat is given off by electrical items.* *Electrical safety from KS3 and at home.*
How will this term's content help with future learning?	Links to revision of previous units, a part within A level Chemistry, very few future learning opportunities outside of A level Chemistry.	*Next required a little at A level physics. Will be most useful to those looking to progress into engineering or STEM degrees/apprenticeships.* *Safety elements crucial for home living.*
Links to Specification	*5.1* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Chemistry – 4.1* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF*	*6.2* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Physics – 4.2* *https://filestore.aqa.org.uk/resources/physics/specifications/AQA-8463-SP-2016.PDF*
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Assessments	*Pupils are assessed through an end of unit exam paper, it is 40 minutes in l Pupils are*	*Pupils are assessed through an end of unit exam paper, it is 40 minutes in length.*

	assessed through an end of unit exam paper, it is 40 minutes in length. Students should use their CGP revision guides or BBC Bitesize: Students are also set regular homework and have the access to EDUCAKE online homework provision. *combined -* *https://www.bbc.co.uk/bitesize/examspecs/z8r997h* *Triple –* *https://www.bbc.co.uk/bitesize/examspecs/z8xtmnb*	
Term Six		
Content of study	*P2 – Electricity - Continued*	*AQA GCSE Trilogy Combined Science/ AQA GCSE Biology – Unit B4 –Bioenergetics*
What are the aims and objectives of this term?	Students should be able to explain qualitatively why adding resistors in series increases the total resistance, while adding resistors in parallel decreases the total resistance. The potential difference across cells and batteries is always in the same direction. The potential difference does not change polarity. The potential difference of mains electricity changes direction. The potential difference changes polarity. Mains electricity is an a.c. supply. In the UK it has a frequency of 50 Hz and is about 230 V. Most electrical appliances are connected to the mains using three-core cable. The insulation covering each wire is colour coded for easy identification: live wire – brown neutral wire – blue earth wire – green and yellow stripes. The live wire carries the alternating potential difference from the supply. The neutral wire completes the circuit. The earth wire is a safety wire to stop the appliance becoming live. The potential difference between the live wire and earth (0 V) is about 230 V. The neutral wire is at or close to earth potential (0 V). The earth wire is at 0 V, it only carries a current if there is a fault.	Write the word and symbol equation for photosynthesis. Explain why photosynthesis is important for the survival of other organisms. Investigate the need for light, carbon dioxide and chlorophyll to make glucose. Explain why plants should be de-starched before photosynthesis experiments and describe how this is done. Describe experiments to show that plants produce oxygen in the light. Test to see if a leaf contains starch. Explain why the leaves are tested for starch and not for sugar. Describe the test for oxygen. Interpret results and relate to photosynthesis equation. State factors that can limit the rate of photosynthesis. Interpret data showing how factors affect the rate of photosynthesis. Required practical: plan a method. Required practical: carry out an investigation, collect, present and analyse the results. Calculate the rate using numerical information or graphs.

	The power of a device is related to the potential difference across it and the current through it by the equation: $power =$ $potential\ difference\ x\ current$ $[P = V I]$ $power =$ $current\ squared\ x\ resistance$ $[P = I^2 R]$ power, P, in watts, W potential difference, V, in volts, V current, I, in amperes, A resistance, R, in ohms, Ω Everyday electrical appliances are designed to bring about energy transfers. Describe how different domestic appliances transfer energy from batteries or a.c. mains to the kinetic energy of electric motors or the energy of heating devices. The amount of energy an appliance transfers depends on how long the appliance is switched on for and the power of the appliance. Work is done when charge flows in a circuit. The amount of energy transferred by electrical work can be calculated using the equation: $energy\ transferred =$ $power\ x\ time$ $[E = P t]$ $energy\ transferred =$ $charge\ flow\ x$ $potential\ difference$ $[E = Q V]$ energy transferred, E, in joules, J power, P, in watts, W time, t, in seconds, s charge flow, Q, in coulombs, C potential difference, V, in volts, V The National Grid is a system of cables and transformers linking power stations to consumers.	Interpret graphs to decide which factor is limiting the rate. Explain how conditions in greenhouses can be controlled to optimise the growth of plants. Relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses, Evaluate the benefits of artificially manipulating the environment in which plants are grown. List ways in which glucose is used by a plant. Describe functions of fats, oils, cellulose, starch and proteins in a plant. Explain how plants obtain nitrate ions and what they are needed for. Interpret data from the results of bicarbonate indicator experiment. State that all animals and plants produce carbon dioxide and water all the time as a by-product of aerobic respiration. Write the word equation for aerobic respiration. Define the term 'aerobic'. Describe what organisms need energy for. Describe tests for carbon dioxide and water. State the site of aerobic respiration and be able to give examples of cells that contain a lot of mitochondria (links with 4.1.1.2). Define the term 'anaerobic'. Explain why anaerobic respiration is less efficient than aerobic respiration. Write the word equation for anaerobic respiration in animal cells. Write the word and symbol equation for anaerobic respiration in yeast cells. State that anaerobic respiration in yeast is called fermentation. Explain why yeast is used to make bread and alcoholic drinks. Interpret data from yeast investigation. Describe and explain the changes that occur in the body during exercise.

	Electrical power is transferred from power stations to consumers using the National Grid. Step-up transformers are used to increase the potential difference from the power station to the transmission cables then step-down transformers are used to decrease, to a much lower value, the potential difference for domestic use. This is done because, for a given power, increasing the potential difference reduces the current, and hence reduces the energy losses due to heating in the transmission cables. When certain insulating materials are rubbed against each other they become electrically charged. Negatively charged electrons are rubbed off one material and onto the other. The material that gains electrons becomes negatively charged. The material that loses electrons is left with an equal positive charge. The greater the charge on an isolated object the greater the potential difference between the object and earth. If the potential difference becomes high enough a spark may jump across the gap between the object and any earthed conductor which is bought near it. When two electrically charged objects are brought close together they exert a force on each other. Two objects that carry the same type of charge repel. Two objects that carry different types of charge attract. Attraction and repulsion between two charged objects are examples of non-contact force.	Design and carry out an investigation about the effects of exercise on the body. Present and interpret data about heart rate, breathing rate and breath volume. Interpret data relating to the effects of exercise on the body, eg spirometer tracings. Describe the effects of long periods of vigorous exercise on the body. Define the term 'oxygen debt'. Explain what happens to lactic acid once exercise stops. Define the term 'metabolism'. Give examples of reactions in metabolism. Name some chemicals formed from glucose molecules (links to 4.4.1.3). Describe lipid formation from a molecule of glycerol and three molecules of fatty acids. Describe the use of glucose and nitrate ions to form amino acids, which form proteins. Describe the formation of urea.
What previous knowledge is required?	*Electricity is conducted by electrons in metals. Non metals are not conductors (insulators) of electricity. Circuits won't work if broken, they must be complete.* *Current flows around a circuit and various items powered by the current use volts. Heat is given off by electrical items.* *Electrical safety from KS3 and at home.*	*Plants undergo photosynthesis* *Energy for living things is released using respiration although terms such as "energy is made…" are acceptable prior to the unit starting.* *Some life processes require energy (movement, warmth etc).*
How will this term's content help with future learning?	*Next required a little at A level physics. Will be most useful to those looking to progress into engineering or STEM degrees/apprenticeships.* *Safety elements crucial for home living.*	*Photosynthesis and respiration are big components for any future study in life sciences and are the processes that are the basis for all life on Earth.* *From gardening to surgery this content will be required in the future.*
Links to Specification	*6.2* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF*	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=1KIAWiHQ4sM*

	Triple Science Physics – 4.2 *https://filestore.aqa.org.uk/resources/physics/specifications/AQA-8463-SP-2016.PDF*	• *CGP Revision Guides (various)* • *YouTube - Amoeba Sisters* *https://www.youtube.com/watch?v=CMiPYHNNg28*
Resources	• *YouTube – primrose kitten –* *https://www.youtube.com/watch?v=cKDbzh9MojY* • *CGP Revision Guides (various)* *YouTube – GCSE Revision –* *https://www.youtube.com/watch?v=EmCGF49Uils*	*4.4* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Biology – 4.4* *https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF*
Assessments	*Pupils are assessed through an end of unit exam paper, it is 40 minutes in length. Students should use their CGP revision guides or BBC Bitesize:* *combined -* *https://www.bbc.co.uk/bitesize/examspecs/z8r997h* *Triple –* *https://www.bbc.co.uk/bitesize/examspecs/z8xtmnb*	*Pupils are assessed through an end of unit exam paper, it is 40 minutes in length. Students should use their CGP revision guides or BBC Bitesize:* *combined -* *https://www.bbc.co.uk/bitesize/examspecs/z8r997h* *Triple –* *https://www.bbc.co.uk/bitesize/examspecs/z8xtmnb*