Science

We intend to equip our young people with the knowledge needed to understand the world and technology around them. We aim to encourage a 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 10 Science

Term One

Content of study	*AQA GCSE Trilogy Combined Science – Unit B2 –Organisation*	*AQA GCSE Trilogy Combined Science/ AQA GCSE Biology – Unit B3 –Infection and Response*
What are the aims and objectives of this term?	*Describe organisms are constructed from cells, tissues, organs and organ systems and describe these components.* *Describe the digestive system and relate knowledge of enzymes to metabolism.* *Carry out an investigation into the rate of an enzyme reaction.* *Explain how enzymes work using Lock and Key theory.* *Describe and carry out food tests for sugars, fats and proteins.* *Understand the structures and functions of the human heart and lungs, linking structure of lungs to their ability to function.* *Know the components of the blood and their functions.* *Describe coronary heart disease* *Evaluate advantages and disadvantages of treating cardiovascular disease through drugs, transplant or mechanical devices.* *Describe the relationship between health and disease and the interactions between different types of disease.* *Discuss the human and financial cost on non-communicable diseases to an individual, a community and globally.* *Describe cancer as the result of changes in cells that lead to uncontrolled cell growth and division.* *Explain how structures of plant tissues are related to their functions, focusing on the superstructure of the leaf tissues.* *Explain how the structure of xylem, phloem and root hair cells allow them to perform their functions.*	Define the term pathogen and state the four main groups of pathogen. Explain how pathogens can be spread to plants or animals and cause infection. Describe the main differences between bacteria and viruses. Explain how the spread of disease can be reduced Describe how microorganisms can be safely grown on agar plates. Explain the safety precautions you must take when growing microorganisms. Explain why cultures are incubated at a maximum temperature of 25ºC in schools Recognise bacterial and fungal colonies growing on agar plates. Describe safety precautions for microbial investigations. Describe the optimum conditions for bacterial growth. Calculate the number of bacteria in a population after a given time, when given the mean division time. Describe the symptoms, mode of transmission, prevention and treatment for measles, HIV and AIDS, salmonella and gonorrhoea. Describe colds and flu as viral diseases. Describe athlete's foot as a fungal disease. Describe the life cycle of the malarial protist. Describe the symptoms, mode of transmission, prevention and treatment for malaria. Describe the body's first line defences.

		Explain how microbes make us feel ill and how viruses damage cells. Explain how the immune system defends against disease. Describe what white blood cells do. Explain why antibodies are specific for one pathogen/ antigen. Describe what a vaccine contains. Explain how vaccines prevent disease. Explain the idea of 'herd immunity'. Explain how antibiotics treat only bacterial diseases and how this has saved lives. Describe the problems associated with antibiotic resistance. See 4.6.3.7 Explain the difficulty in developing drugs that kill viruses without damaging body tissues. Plan and carry out a safe investigation into the effect of disinfectants or antibiotics on bacterial growth. Calculate the cross-sectional areas of clear zones around disinfectant/ antibiotic discs using πr^2. Present and analyse the results. Give examples of painkillers and other medicines used to treat symptoms. Interpret data about painkillers and other medicines. Describe Fleming's discovery and explain its importance. State which drugs come from plants and microorganisms. Explain why drugs need to be tested before they can be prescribed. Describe the main steps in the development and testing of a new drug. Give reasons for the different stages in drug testing. Explain the terms placebo and double-blind trial. Describe what MABs are, and how they are produced. (Biology H only)

		Describe the uses of MABs and explain how these work when given appropriate information: (Biology H only) Explain why MABs are not yet widely used in the body. (Biology H only) Evaluate the advantages and disadvantages of MABs. (Biology H only) Describe the symptoms and effects of Tobacco mosaic virus and its effects. (Biology only) Describe the symptoms and effects of Rose black spot fungal infection (Biology only) Explain how aphids affect plant growth. (Biology only) Carry out a controlled investigation into the effects of nitrate and magnesium ion deficiencies and link to active transport (4.1.3.3 and see alternative investigations in 4.2.3.2). (Biology only) Describe visual indications of plant disease, as described in the specification. (Biology H only) Describe methods that gardeners and scientists can use to identify the disease causing pathogen (Biology H only). Describe the physical and chemical ways plants can resist microorganisms. Describe mechanical adaptations to deter animals.
What previous knowledge is required?	*Knowledge of the anatomy of the immune system and which order food passes through these organs.* *Location of heart and lungs in the body* *Recall that blood carries oxygen and nutrients around the body and carries waste products to be excreted.* *Cell structure from B1as well as the structure of specialised cells in the plant (xylem, phloem and root hair cell).*	*Knowledge of disease being caused by bacteria or virus and that these can be passed on in a variety of ways.* *White blood cells fight disease.* *Vaccines can give us immunity to a disease.* *Medicines can be used to treat diseases.* *Plants are living organisms.*
How will this term's content help with future learning?	*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 enzymes including those in digestion, knowledge of the digestive system is required.*	*Links to B6 unit at GCSE with health and with B5 with STDs and cancer.* *A level Biology, unit 2 will require this units knowledge to underpin further learning. Those wishing to move to A level biology will*

		need to be bale to recall this learning in year 12 and 13.
Links to Specification	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=6bxmIxPFO4s* • *CGP Revision Guides (various)* • *YouTube - Amoeba Sisters* *https://www.youtube.com/watch?v=1UvuBYUbFk0*	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=m7pxdTJ9NPI* • *CGP Revision Guides (various)* • *YouTube - Amoeba Sisters* *https://www.youtube.com/watch?v=fSEFXl2XQpc*
Resources	*4.2* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Biology – 4.2* *https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF*	*4.3* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Biology – 4.3* *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*
Term Two		
Content of study	*AQA GCSE Trilogy Combined Science – Unit C2 – Bonding, structure and the properties of matter*	*AQA GCSE Trilogy Combined Science/ AQA GCSE Chemistry – Unit C3 – Quantitative Chemistry*
What are the aims and objectives of this term?	*Explain metallic, ionic and covalent bonding in terms of electrostatic forces and the transfer or sharing of electrons* *Be able to form dot and cross diagrams for the formation of ionic compounds formed between metals of group 1 and 2 with non-metals of groups 6 and 7.* *Be able to deduce a compound is ionic from its structure and work out the empirical formula of an ionic compound*	Explain the use of the multipliers in equations in normal script before a formula and in subscript within a formula. Calculate the relative formula mass of a compound. Explain any observed changes in mass in non-enclosed systems during a chemical reaction given the balanced symbol equation

	Recognise and construct dot and cross diagrams of simple covalent compounds. *Recognise and construct structural diagrams of covalent compounds.* *Recall metals consist of giant structures of atoms arranged in a regular pattern with delocalised electrons.* *predict the states of substances at different temperatures given appropriate data* *explain the different temperatures at which changes of state occur in terms of energy transfers and types of bonding* *(HT only) explain the limitations of the particle theory in relation to changes of state when particles are represented by solid inelastic spheres which have no forces between them.* *Describe the properties of ionic compounds.* *Recall Substances that consist of small molecules are usually gases or liquids that have relatively low melting points and boiling points, and link this to their intermolecular forces.* *recognise polymers from diagrams showing their bonding and structure.* *recognise giant covalent structures from diagrams showing their bonding and structure.* *Explain why alloys are harder than pure metals in terms of distortion of the layers of atoms in the structure.* *Explain using their bonding why metals are good conductors.* *Explain the properties of diamond and graphite in terms of its structure and bonding.* *Recognise graphene and fullerenes from diagrams and descriptions of their bonding and structure* *Give examples of the uses of fullerenes, including carbon nanotubes*.	for the reaction and explain these changes in terms of the particle model. Represent the distribution of results and make estimations of uncertainty Be able to use the range of a set of measurements about the mean as a measure of uncertainty. Be able to use the relative formula mass of a substance to calculate the number of moles in a given mass of that substance and vice versa. Be able to calculate the masses of substances shown in a balanced symbol equation and calculate the masses of reactants and products from the balanced symbol equation and the mass of a given reactant or product. Be able to balance an equation given the masses of reactants and products. Explain the effect of a limiting quantity of a reactant on the amount of products it is possible to obtain in terms of amounts in moles or masses in grams. Explain how the mass of a solute and the volume of a solution is related to the concentration of the solution. Be able to calculate the percentage yield of a product from the actual yield of a reaction •• (HT only) calculate the theoretical mass of a product from a given mass of reactant and the balanced equation for the reaction. Be able to calculate the atom economy of a reaction to form a desired product from the balanced equation •• (HT only) explain why a particular reaction pathway is chosen to produce a specified product given appropriate data such as atom economy (if not calculated), yield, rate, equilibrium position and

		usefulness of by-products. Students should be able to: •• calculate the volume of a gas at room temperature and pressure from its mass and relative formula mass •• calculate volumes of gaseous reactants and products from a balanced equation and a given volume of a gaseous reactant or product •• change the subject of a mathematical equation.
What previous knowledge is required?	*Students should understand atomic structure, chemical symbols, and basic particle theory. They need to know how elements form compounds, recognise simple formulae, and understand states of matter. This foundation helps them explain bonding types and the properties of materials based on particle arrangement and bonding strength.*	Structure of the atom from C1. Bonding and properties of materials C2 How to read a periodic table including mass number, atomic number and group number and how that relates to atomic structure. (C1)
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 revision of previous units, a part within A level Chemistry, very few future learning opportunities outside of A level Chemistry.
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Resources	*5.2* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Chemistry – 4.2* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF*	*5.2* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Chemistry – 4.3* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-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 l 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: 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 Three		
Content of study	*AQA GCSE Trilogy Combined Science/ AWA GCSE Physics – Unit P1 – Energy*	*AQA GCSE Trilogy Combined Science/ AQA GCSE Physics – Unit P3 –Particle Model of Matter*
What are the aims and objectives of this term?	A system is an object or group of objects. Describe, for common situations, the changes involved in the way energy is stored when a system changes. For example: • an object projected upwards • a moving object hitting an obstacle • an object accelerated by a constant force • a vehicle slowing down • an electric kettle boiling water. Calculate how energy is redistributed in a system when it changes. Work is done when charge flows in a circuit. Calculate the kinetic energy of a moving object, stored by a stretched spring and an object raised above ground level.	The density of a material is defined by the equation: $$density = \frac{mass}{volume}$$ $$\left[\rho = \frac{m}{V}\right]$$ density, ρ, in kilograms per metre cubed, kg/m^3 mass, m, in kilograms, kg volume, V, in metre cubed, m^3 The particle model can be used to explain the different states of matter. The differences in density between the different states of matter to be explained in terms of the arrangements of the particles (atoms or molecules).

	The kinetic energy of a moving object can be calculated using the equation: $K.E. =$ $0.5\ x\ mass\ x\ (speed)^2$ $[EK\ = \frac{1}{2}\ m\ v^2]$ Kinetic energy, E_K, in joules, J Mass, m, in kilograms, kg Speed, v, in metres per second, m/s The amount of elastic potential energy stored in a stretched spring can be calculated using the equation: $Elastic\ potential\ energy\ =$ $0.5\ x\ spring\ constant\ x$ $(extension)^2$ $[Ee\ = \frac{1}{2}\ k\ e^2]$ The amount of gravitational potential energy gained by an object raised above the ground level can be calculated using the equation: $g.p.e\ =\ mass\ x$ $gravitational\ field\ strength$ $x\ height$ $[Ep\ =\ m\ g\ h\ ]$ Calculate changes in the way energy is stored when a system is changed by heating. Use calculations to show how the overall energy in a system is redistributed when the system is changed. The amount of energy stored in or released from a system as its temperature changes can be calculated using the equation: $Change\ in\ thermal\ energy\ =$ $mass\ x$ $specific\ heat\ capacity\ x$ $temperature\ change$ $[\Delta E\ =\ m\ c\ \Delta\theta]$ change in thermal energy, ΔE, in joules, J mass, m, in kilograms, kg specific heat capacity, c, in joules per kilogram per degree Celsius, J/kg°C temperature change, Δθ, in degrees Celsius, °C	When substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved. Changes of state are physical changes; the change does not produce a new substance. If the change is reversed the substance recovers its original properties. Energy is stored inside a system by the particles (atoms and molecules) that make up the system. This is called internal energy. Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system. Heating changes the energy stored within the system by increasing the energy of the particles that make up the system. And, either the temperature of the system increases, or changes of state happen. If the temperature of the system increases: the increase in temperature depends on the mass of the substance heated, what the substance is and the energy input to the system. The following equation applies: $change\ in\ thermal\ energy\ =$ $mass\ x$ $specific\ heat\ capacity\ x$ $temperature\ change$ $[\Delta E\ =\ m\ c\ \Delta\theta\ ]$ change in thermal energy, ΔE, in joules, J mass, m, in kilograms, kg specific heat capacity, c, in joules per kilogram per degree Celsius, J/kg °C temperature change, $\Delta\theta$, in degrees Celsius, °C The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius. If a change of state happens: The energy needed for a substance to change state is called latent heat. When a change of state occurs, the energy supplied changes the energy stored (internal energy), but not the temperature.

	The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius. Power is defined as the rate at which energy is transferred or the rate at which work is done. $$Power = \frac{energy\ transferred}{time}$$ $$[P = E / t]$$ $$Power = \frac{work\ done}{time}$$ $$[P = W / t]$$ Power, P, in watts, W Energy transferred, E, in joules, J Time, t, in seconds, s Work done, W, in joules, J An energy transfer of one joule per second is equal to a power of 1 watt. Energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed. Where energy transfers in a closed system occur there is no net change to the total energy. Whenever there are energy transfers in a system only part of the energy is usefully transferred. The rest of the energy is dissipated so that it is stored in less useful ways. This energy is often described as being wasted. Unwanted energy transfers can be reduced in a number of ways, for example, through lubrication and the use of thermal insulation. The rate of cooling of a building is affected by the thickness and thermal conductivity of its walls. The higher the thermal conductivity of a material; the higher the rate of energy transfer by conduction across the material. The energy efficiency for any energy transfer can be calculated using the equation: $$efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$$ Efficiency may also be calculated using the equation: $$efficiency = \frac{useful\ power\ output}{total\ power\ input}$$	The specific latent heat of a substance is the amount of energy required to change the state of one kilogram of the substance with no change in temperature: $$energy\ for\ a\ change\ of\ state = mass\ x\ specific\ latent\ heat$$ $$[E = m L]$$ energy, *E*, in joules , J mass, *m*, in kilograms, kg specific latent heat, *L*, in joules per kilogram, J/kg Specific latent heat of fusion – change of state from solid to liquid. The molecules of a gas are in constant random motion. The temperature of the gas is related to the average kinetic energy of the molecules. The higher the temperature, the greater the average kinetic energy and so the faster the average speed of the molecules. When the molecules collide with the wall of their container they exert a force on the wall. The total force exerted by all of the molecules inside the container on a unit area of the walls is the gas pressure Changing the temperature of a gas, held at constant volume, changes the pressure exerted by the gas (known as the Pressure law). A gas can be compressed or expanded by pressure changes. The pressure produces a net force at right angles to the wall of the gas container (or any surface). (Physics, H only) Increasing the volume in which a gas is contained, at constant temperature, can lead to a decrease in pressure (known as Boyle's law). (Physics, H only) For a fixed mass of gas held at a constant temperature: $$pressure\ x\ volume = constant$$ $$[p V = constant]$$ pressure, *p*, in Pascals, Pa volume, *V*, in metres cubed, m^3 (Physics, H only) Work is the transfer of energy by a force. (H only)

	Describe ways to increase the efficiency of an intended energy transfer.HT only Describe the main energy resources available for use on Earth. These include: • fossil fuels (coal, oil and gas) • nuclear fuel • bio-fuel • wind • hydro-electricity • geothermal • the tides • the Sun • water waves. Distinguish between energy resources that are renewable and energy resources that are non-renewable. Compare the ways that different energy resources are used. The uses to include transport, electricity generation and heating. Understand why some energy resources are more reliable than others.	Doing work on a gas increases the internal energy of the gas and can cause an increase in the temperature of the gas.(H only)
What previous knowledge is required?	*Energy cannot be created or destroyed* *When an object gets hotter its particles vibrate* *Very little else, most content here is new and is presented as the first time learning any of it as it is a fairly abstract concept.*	Students should understand the particle model of solids, liquids, and gases, changes of state, and conservation of mass. They should know how to calculate density using mass and volume, and understand basic temperature and energy concepts from earlier science and maths learning. This supports understanding of internal energy, specific heat capacity, and gas behaviour.
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.* •	• Links to revision of previous units, a part within A level Physics, very few future learning opportunities outside of A level Physics.
Links to Specification	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=tDkBhy-Y1Z8* • *CGP Revision Guides (various)* • *YouTube – GCSE Revision – https://www.youtube.com/watch?v=UyeFNz7sHYg*	• YouTube Primrose kitten The Whole of AQA - PARTICLE MODEL OF MATTER. GCSE Physics Combined Science Revision. Topic 3 for P1 - YouTube • *CGP Revision Guides (various)* • *YouTube* GCSE Physics Revision "Density" - YouTube

		PARTICLE MODEL OF MATTER - GCSE Physics (AQA Topic P3 & Other Boards) - YouTube GCSE Physics - Particle Theory & States of Matter GCSE Physics - Factors Affecting Gas Pressure GCSE Physics - Pressure and Volume - How to use the "PV = Constant" Equation GCSE Exam Question Walkthrough - Particle Model of Matter
Resources	*6.1* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Physics – 4.1* *https://filestore.aqa.org.uk/resources/physics/specifications/AQA-8463-SP-2016.PDF*	*6.3* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Biology – 4.3* *https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF*
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Term Four		
Content of study	*AQA GCSE Trilogy Combined Science/ AQA GCSE Chemistry – Unit C4 – Chemical changes*	*AQA GCSE Trilogy Combined Science/ AQA GCSE Chemistry – Unit C5 – energy changes*
What are the aims and objectives of this term?	Be able to explain reduction and oxidation in terms of loss or gain of oxygen. Recall and describe the reactions, if any, of potassium, sodium, lithium, calcium, magnesium, zinc, iron and copper with water or dilute acids and where appropriate, to place these metals in order of reactivity	Distinguish between exothermic and endothermic reactions on the basis of the temperature change of the surroundings. Evaluate uses and applications of exothermic and endothermic reactions given appropriate information. *Limited to measurement of temperature change. Calculation of energy changes or ΔH is not required.*

	Explain how the reactivity of metals with water or dilute acids is related to the tendency of the metal to form its positive ion Deduce an order of reactivity of metals based on experimental results. Be able to interpret or evaluate specific metal extraction processes when given appropriate information Able to identify the substances which are oxidised or reduced in terms of gain or loss of oxygen. Be able to write ionic equations for displacement reactions Identify in a given reaction, symbol equation or half equation which species are oxidised and which are reduced. Explain in terms of gain or loss of electrons, that these are redox reactions. Identify which species are oxidised and which are reduced in given chemical equations. Predict products from given reactants Use the formulae of common ions to deduce the formulae of salts. Be able to describe how to make pure, dry samples of named soluble salts from information provided. Describe the use of universal indicator or a wide range indicator to measure the approximate pH of a solution. Use the pH scale to identify acidic or alkaline solutions. Use and explain the terms dilute and concentrated (in terms of amount of substance), and weak and strong (in terms of the degree of ionisation) in relation to acids.	Draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions showing the relative energies of reactants and products, the activation energy and the overall energy change, with a curved arrow to show the energy as the reaction proceeds. Use reaction profiles to identify reactions as exothermic or endothermic. Explain that the activation energy is the energy needed for a reaction to occur. Be able to calculate the energy transferred in chemical reactions using bond energies supplied. Be able to interpret data in terms of the relative reactivity of different metals and to evaluate the use of cells. *Students do not need to know details of cells and batteries other than those specified.* Be able to evaluate the use of hydrogen fuel cells in comparison with rechargeable cells and batteries. (HT only) Be able to write the half equations for the electrode reactions in the hydrogen fuel cell.

	Describe neutrality and relative acidity in terms of the effect on hydrogen ion concentration and the numerical value of pH (whole numbers only). Be able to write half equations for the reactions occurring at the electrodes during electrolysis, and may be required to complete and balance supplied half equations. Be able to predict the products of the electrolysis of binary ionic compounds in the molten state. Explain why a mixture is used as the electrolyte Explain why the positive electrode must be continually replaced. Be able to predict the products of the electrolysis of aqueous solutions containing a single ionic compound.	
What previous knowledge is required?	Structure of the atom from C1. Bonding and properties of materials C2 C3 Quantitative chemistry How to read a periodic table including mass number, atomic number and group number and how that relates to atomic structure. (C1) Ionic bonding and formation of ions (C2)	How to balance chemical equations How to use a periodic table and relate to atomic structure Understanding of chemical bonding from c2
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 revision of previous units, a part within A level Chemistry, very few future learning opportunities outside of A level Chemistry.
Links to Specification	• *YouTube – primrose kitten –* • (348) The Whole of AQA - CHEMICAL CHANGES. GCSE 9-1 Chemistry or Combined Science Revision Topic 4 for C1 - YouTube • *CGP Revision Guides (various)* • *YouTube* AQA GCSE Chemistry - Electrolysis - Bing video	• *YouTube – primrose kitten –* *https://www.youtube.com/watch?v=L7829UGifpM* • *CGP Revision Guides (various)* • *YouTube* *https://www.youtube.com/watch?v=dstRL5xB0Sk*

	(348) Reactivity Series of Metals | Environmental | Chemistry | FuseSchool - YouTube (348) Reactions Of Metals With Water | Reactions | Chemistry | FuseSchool - YouTube (348) GCSE Chemistry - Acids and Bases #27 - YouTube	
Resources	*5.4* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Chemistry – 4.4* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF*	*5.5* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Chemistry – 4.5* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF*
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Term Five		
Content of study	*AQA GCSE Trilogy Combined Science/ AQA GCSE Physics – Unit P4 – Atomic Structure*	*AQA GCSE Trilogy Combined Science – Unit B7 – Ecology*
What are the aims and objectives of this term?	Atoms are very small, having a radius of about 1 x 10^{-10} metres. The basic structure of an atom is a positively charged nucleus composed of both protons and neutrons surrounded by negatively charged electrons. The radius of a nucleus is less than 1/10,000 of the radius of an atom. Most of the mass of an atom is concentrated in the nucleus. The electrons are arranged at different distances from the nucleus (different energy levels). The electron arrangements may change with the absorption of electromagnetic radiation (move further from the nucleus; a higher energy level)	Classify organisms based on their similarities. Describe classification using: • Kingdom • Phylum • Class • Order • Family • Genus • Species. Explain why the importance of the binomial system to name organisms.

	of by the emission of electromagnetic radiation (move closer to the nucleus; a lower energy level). In an atom the number of electrons is equal to the number of protons in the nucleus. Atoms have no overall electrical charge. All atoms of a particular element have the same number of protons. The number of protons in an atom of an element is called its atomic number. The total number of protons and neutrons in an atom is called its mass number. Atoms of the same element can have different numbers of neutrons. These atoms are called isotopes of that element. Atoms can be represented as shown in this example: $^{(\text{Mass number})23}_{(\text{Atomic number})11}\text{Na}$ Atoms turn into positive ions if they lose one or more outer electron(s) New experimental evidence may lead to a scientific model being changed or replaced. Before the discovery of the electron, atoms were thought to be tiny spheres that could not be divided. The discovery of the electron led to the 'plum-pudding model' of the atom. The 'plum-pudding model' suggested that the atom was a ball of positive charge with negative electrons embedded in it. The results from the alpha scattering experiment led to the conclusion that the mass of an atom was concentrated at the centre (nucleus) and that the nucleus was charged. The alpha scattering experiment led to the 'plum-pudding model' being replaced by the nuclear model. Neils Bohr adapted the nuclear model by suggesting that electrons orbit the nucleus at specific distances. Later experiments led to the idea that the positive charge of any nucleus could be subdivided into a whole number of smaller particles, each particle having the same amount of positive charge. The name 'proton' was given to these particles. Lastly, in 1932, the experimental work of James Chadwick provided the evidence to show the	Explain how modern technologies have affected how organisms are classified today. Describe Carl Woese's system of classification and classify organisms into the three mains Understand and use the terms ecosystem, community, competition, habitat, interdependence. Describe factors that affect the survival of organisms in their habitat. Explain how one species depends on others for survival. Describe a stable community as one where all the species and environmental factors are in balance, so population sizes remain fairly constant. Give an example of a stable community. Describe resources that plants and animals compete for in a given habitat. Name biotic factors in a habitat and explain how a change in a biotic factor might affect a community, eg: • availability of food • new predators arriving • new disease organisms • one species out-competing another so the numbers are no longer sufficient to breed. Name abiotic factors in a habitat and explain how a change in a biotic factor might affect a community, eg: • light intensity • temperature • moisture levels • soil pH and mineral content • wind intensity and direction • carbon dioxide levels for plants • oxygen levels for aquatic animals. Describe how to carry out random sampling of organisms using a quadrat. Describe when and how a transect should be used. Evaluate data gathered by using a quadrat and transect. Calculate area, mean, median, mode and range. Explain why sample size is important to obtain valid results. Required practical: plan and carry out a valid method to estimate a plant population. Present and analyse the results.

	existence within the nucleus of the neutron. This was about 20 years after the nucleus became an accepted scientific idea. Some atomic nuclei are unstable. The nucleus gives out ionising radiation as it changes to become more stable. This is a random process called radioactive decay. Activity is the rate at which a source of unstable nuclei decays and is measured in Becquerel. The nuclear radiation emitted may be: • an alpha particle (α) – this consists of two neutrons and two protons, it is identical to a helium nucleus • a beta particle (β) – a high speed electron ejected from the nucleus as a neutron turns into a proton • a gamma ray (γ) – electromagnetic radiation from the nucleus. a neutron (n) Properties of alpha particles, beta particles and gamma rays limited to their penetration through materials and their range in air. Nuclear equations are used to represent radioactive decay. In a nuclear equation an alpha particle may be represented by the symbol: $^{4}_{2}He$ and a beta particle by the symbol: $^{0}_{-1}e$ The emission of the different types of ionising radiation may cause a change in the mass and/or the charge of the nucleus. For example: $^{219}_{86}\text{radon} \rightarrow {}^{215}_{84}\text{polonium} + {}^{4}_{2}\text{He}$ Alpha decay causes both the mass and charge of the nucleus to decrease. $^{14}_{6}\text{carbon} \rightarrow {}^{14}_{7}\text{nitrogen} + {}^{0}_{-1}\text{e}$ Beta decay does not cause the mass of the nucleus to change, but it does cause the charge of the nucleus to increase. The emission of a gamma ray does not cause the mass or the charge of the nucleus to change. Radioactive decay is random so it is not possible to predict which individual nucleus will decay next. But with a large enough number of nuclei it	Describe and explain how structural, behavioural and functional adaptations, in a range of organisms, help them to survive in their habitat. Define the term extremophile and give general examples. Explain that photosynthetic organisms are the producers of biomass for life on Earth. Explain what a food chain shows. Identify producers, primary, secondary and tertiary consumers in a food chain. Interpret and explain population curves, eg hare and lynx, red and grey squirrels, and native and American crayfish. Use and explain the terms: producer, consumer, decomposer, herbivore, carnivore and omnivore. Consider the effect on absorption of light, of plants being green in colour and often having a shiny surface. Describe how decomposers secrete external enzymes to digest dead plants and animals, then the small molecules diffuse into the microorganism. Identify the trophic levels on food chains and pyramids of biomass. Construct and interpret pyramids of biomass from data. Calculate the efficiency of biomass transfer between trophic levels. Explain what losses of biomass are due to. Interpret and explain the processes in diagrams of the carbon, water and decay cycles. Explain the importance of these cycles to living things. Explain the carbon cycle. Explain the water cycle. Explain the role of microorganisms in cycling materials through an ecosystem. Describe the factors which affect the rate of decay as: • temperature • availability of oxygen • availability of moisture • availability of microorganisms to carry out decay • pH • build-up of toxic substances.

	is possible to predict how many will decay in a certain amount of time. The half-life of a radioactive isotope is the time it takes for the number of nuclei of the isotope in a sample to halve, or the time it takes for the count rate from a sample containing the isotope to fall to half of its initial level. Students should be able to calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives. HT only. Radioactive contamination is the unwanted presence of materials containing radioactive atoms on other materials. The hazard from contamination is due to the decay of the contaminating atoms. The type of radiation emitted affects the level of hazard. Irradiation is the process of exposing an object to ionising radiation. The irradiated object does not become radioactive. Suitable precautions must be taken to protect against any hazard the radioactive source used in the process of irradiation may present. Background radiation is around us all of the time. It comes from: • natural sources such as rocks and cosmic rays from space man-made sources such as the fallout from nuclear weapons testing and nuclear accidents. The level of background radiation and radiation dose may be affected by occupation and/ or location. Radiation dose in measured in Sieverts (Sv). Radioactive isotopes have a very wide range of half-life values. Sources containing nuclei that are most unstable have the shortest half-lives. The decay is rapid with a lot of radiation emitted in a short time. Sources with nuclei that are least unstable have the longest half-lives. These sources emit little radiation each second but emit radiation for a long time. The hazards associated with radioactive materials differ according to the half-life of the material involved. Uses of nuclear radiations in medicine include: • as tracers	Interpret data showing how factors affect the rate of decay. Calculate the rate of decay using data. Required practical: plan and carry out a controlled investigation. Identify variables; record, present and analyse result; calculate rates of decay. Explain how decay is useful to plants (links with 4.4.1.3). Evaluate the necessity and effectiveness of recycling organic kitchen or garden wastes. Describe how gardeners and farmers try to provide optimum conditions for rapid decay of wastes. Explain the difference between aerobic and anaerobic decay. Define the term biogas. Evaluate the use of biogas generators. Explain why the output from a biogas generator is affected by climatic conditions. Define the term biodiversity. Explain how great biodiversity maintains food supplies and shelter for organisms, and maintains the physical environment. Describe examples of how a reduction in biodiversity can affect climate, food supplies for humans, useful chemical for the future etc. Describe the problems associated with an increasing human population. Interpret graphs showing human population growth. Describe how water can be polluted with sewage, fertiliser or toxic chemicals. Analyse and interpret data about water pollution. Describe examples of air pollutants and where they come from. Describe the effects of smoke on buildings, humans and plant photosynthesis. Describe how acid rain is formed and the effects of acid rain on living organisms. Analyse and interpret data about air pollution. Evaluate the use of fertiliser on plant growth and oxygen levels.

	• exploration of internal organs control or destruction of unwanted tissue. Nuclear fission is the splitting of a large and unstable nucleus (eg uranium or plutonium). Spontaneous fission is rare. Usually for fission to occur the unstable nucleus must first absorb a neutron. The nucleus undergoing fission splits into two smaller nuclei, roughly equal in size, and emits two or three neutrons plus gamma rays. Energy is released by the fission reaction. All of the fission products have kinetic energy. The neutrons that are released during fission may go on to start a chain reaction. The chain reaction is controlled in a nuclear reactor to control the energy released. The explosion caused by a nuclear weapon is caused by an uncontrolled chain reaction. Nuclear fusion is the joining of two light nuclei to form a heavier nucleus. In this process some of the mass of the smaller nuclei is converted into energy. Some of this energy may be the energy of emitted radiation.	Describe what herbicides and pesticides are used for. Explain what peat is and why it is important to preserve areas of peat. Explain why peat should not be burnt. Define the term deforestation. Explain why vast tropical areas have been cleared of trees. Explain how deforestation increases the amount of carbon dioxide in the atmosphere and leads to a reduction in biodiversity Explain the terms greenhouse effect and global warming. Explain with the aid of a diagram how levels of carbon dioxide and methane contribute to global warming. Describe the possible effects of global warming. Describe programmes introduced to maintain biodiversity: • breeding programmes for endangered species • protection and regeneration of rare habitats, eg coral reefs, mangroves, heathland • reintroduction of field margins and hedgerows in agricultural areas • reduction of deforestation and carbon dioxide emissions by some governments • recycling resources rather than dumping waste in landfill. Explain and evaluate conflicting pressures on maintaining biodiversity. Describe how environmental changes, such as water availability, temperature and atmospheric gases may be seasonal, geographic or caused by human interaction. Explain the possible impact of each environmental change on the distribution of species in an ecosystem. Explain how factors affect food production and food security locally and globally. Interpret population and food production statistics to evaluate food security. Explain how restricting the movement of animals and controlling the temperature of their surroundings improves efficiency of food production.

		Define the term factory farming and give examples of animals farmed in this way. Evaluate modern farming techniques. Explain why some fish stocks are declining and why this is a problem. Describe ways that fish stocks can be conserved. Give an example of sustainable food production Describe how microorganisms can be grown in large vats to produce useful products. Explain how the conditions in the vat are monitored and controlled for optimal growth. Describe how the fungus Fusarium can be grown to produce mycoprotein that can be eaten. Evaluate the use of mycoprotein as a food. Describe the process of genetic engineering to produce better crops. Describe what Golden rice is and how it was produced. Interpret information about genetic engineering Make informed judgements about the economic, social and ethical issues concerning genetic engineering.
What previous knowledge is required?	Structure of the atom from C1. Idea that radiation is dangerous and damages cells, without context of how or why. Heat energy is due to vibrating particles (P1 knowledge) How to read a periodic table including mass number, atomic number and group number and how that relates to atomic structure.	*Predator and prey definitions with examples of animals that fit these descriptions.* *Species is defined as similar organisms that can interbreed to produce fertile offspring.*
How will this term's content help with future learning?	Links to revision of previous units, a part within A level Physics, very few future learning opportunities outside of A level Physics.	*Sampling and quadrats form part of both A level biology and applied science level 3 BTEC. Environmental awareness is a big part of modern life and forms part of many future career paths, from building and property development to ecology and climate studies.*
Links to Specification	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=YFVYUSvUBoo* • *CGP Revision Guides (various)* • *YouTube - cognito https://www.youtube.com/watch?v=YFVYUSvUBoo*	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=SKDn90HK98Q* • *CGP Revision Guides (various)* • *YouTube - Amoeba Sisters https://www.youtube.com/watch?v=f8G7IulYxiA&list=PLwL0Myd7Dk1GGOPNLiAod6tzrN_1An-4t*
Resources	*6.3*	*4.7*

	https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF *Triple Science Biology – 4.3* https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF	https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF *Triple Science Biology – 4.7* 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
Term Six		
Content of study	*AQA GCSE Trilogy Combined Science – Unit C7 – Organic Chemistry*	*AQA GCSE Trilogy Combined Science/ AQA GCSE Chemistry – Unit C8 – Chemical analysis*
What are the aims and objectives of this term?	*To be able to describe and name simple hydrocarbons* *To distinguish between alkanes and alkenes* *To describe and explain fractional distillation of crude oil* *To link properties of hydrocarbons to their chain length* *(Triple Science Only) – Describe reactions of alkenes, alcohols and carboxylic acids* *(Triple Science Only) – Explain how to produce a polymer from a feedstock molecule.* *(Triple Science Only) recall the structure of amino acids and DNA molecules.*	Be able to use melting point data to distinguish pure from impure substances. Identify formulations given appropriate information. Students do **not** need to know the names of components in proprietary products. Explain how paper chromatography separates mixtures. Suggest how chromatographic methods can be used for distinguishing pure substances from impure substances. Interpret chromatograms and determine R_f values from chromatograms. Provide answers to an appropriate number of significant figures. Identify species from the results of the tests in 8.3a to 8.3e. *Flame colours of other metal ions are **not** required knowledge.* Be able to write balanced equations for the reactions to produce the insoluble hydroxides. *Students are **not** expected to write equations for the production of sodium aluminate.*

		State advantages of instrumental methods compared with the chemical tests in this specification. Interpret an instrumental result given appropriate data in chart or tabular form, when accompanied by a reference set in the same form, limited to flame emission spectroscopy.
What previous knowledge is required?	*Fossil fuels include coal, oil and gas.* *Fossil fuels are finite resources.* *Combustion is where energy is released by burning something in oxygen.*	Changes of state from P1 KS3, how the particle arrangements differ between solids, liquids and gasses. Elements, mixtures and compounds definitions and ability to draw particle diagrams of each.
How will this term's content help with future learning?	*If continuing on to A level, organic chemistry is a large part of the chemistry course.*	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	• *YouTube – primrose kitten - https://www.youtube.com/watch?v=ZeUNWY7YDAo* • *CGP Revision Guides (various)* • *YouTube – Cognito - https://www.youtube.com/watch?v=ykIFTtTjoso*	• *YouTube – primrose kitten – https://www.youtube.com/watch?v=YyUQiUddBA4* • *CGP Revision Guides (various)* • *YouTube https://www.youtube.com/watch?v=-OtJI-R-4rU*
Resources	*4.7.1* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *(Triple Science Only) 4.7.2 and 4.7.3* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF*	*5.8* *https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF* *Triple Science Chemistry – 4.8* *https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-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 l 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: 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*