Curriculum Mapping: Science Year 10-11

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Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 10	***Cell Biology*** ***Atomic structure and the periodic table***	***Energy*** *Organisation* *Chemistry of the atmosphere*	*Bonding, structure and the properties of matter* *Electricity*	*Infection and response* *Quantative chemistry* Magnetism and electromagnetism	***Particle model*** ***Bioenergetics*** Chemical changes	Atomic structure Energy changes Ecology
	Cell structure Eukaryotes and prokaryotes Animal and plant cells Cell specialisation Cell differentiation Microscopy Cell division Chromosomes Mitosis and the cell cycle Stem cells Transport in cells Diffusion Osmosis Active transport A simple model of the atom, symbols, relative atomic mass, electronic charge and isotopes Atoms, elements and compounds Mixtures The development of the model of the atom Relative electrical charges of subatomic particles Size and mass of atoms Relative atomic mass Electronic structure The periodic table Development of the periodic table Metals and non-metals Group 0 Group 1 Group 7	Energy changes in a system, and the ways energy is stored before and after such changes Energy stores and systems Changes in energy Energy changes in systems Power Conservation and dissipation of energy Energy transfers in a system Efficiency National and global energy resources Principles of organisation Animal tissues, organs and organ systems The human digestive system The heart and blood vessels Blood Coronary heart disease: a non-communicable disease Relationship between health and disease The effect of lifestyle on some non-communicable diseases Cancer Plant tissues, organs and systems The composition and evolution of the Earth's atmosphere The proportions of different gases in the atmosphere The Earth's early atmosphere How oxygen increased	Chemical bonds, ionic, covalent and metallic Chemical bonds Ionic bonding Ionic compounds Covalent bonding Metallic bonding How bonding and structure are related to the properties of substances The three states of matter State symbols Properties of ionic compounds Properties of small molecules Polymers Giant covalent structures Properties of metals and alloys Metals as conductors Structure and bonding of carbon Diamond Graphite Graphene and fullerenes Current, potential difference and resistance Standard circuit diagram symbols Electrical charge and current Current, resistance and potential difference Resistors Series and parallel circuits Domestic uses and safety Direct and alternating potential difference	Communicable diseases Viral diseases Bacterial diseases Fungal diseases Protist diseases Human defence systems Vaccination Antibiotics and painkillers Discovery and development of drugs Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations Conservation of mass and balanced chemical equations Relative formula mass Mass changes when a reactant or product is a gas Chemical measurements Use of amount of substance in relation to masses of pure substances Moles Amounts of substances in equations Using moles to balance equations Limiting reactants Concentration of solutions Permanent and induced magnetism, magnetic forces and fields Poles of a magnet Magnetic fields The motor effect	Particle model of matter Changes of state and the particle model Density of materials Changes of state Internal energy and energy transfers Temperature changes in a system and specific heat capacity Changes of state and specific latent heat Particle model and pressure Particle motion in gases Photosynthesis Photosynthetic reaction Rate of photosynthesis Uses of glucose from photosynthesis Respiration Aerobic and anaerobic respiration Response to exercise Metabolism Reactivity of metals Metal oxides The reactivity series Extraction of metals and reduction Oxidation and reduction in terms of electrons Reactions of acids Reactions of acids with metals Neutralisation of acids and salt production Soluble salts	Atoms and isotopes The structure of an atom Mass number, atomic number and isotopes The development of the model of the atom Atoms and nuclear radiation Radioactive decay and nuclear radiation Nuclear equations Half-lives and the random nature of radioactive decay Radioactive contamination Exothermic and endothermic reactions Energy transfer during exothermic and endothermic reactions Reaction profiles The energy change of reactions Adaptations, interdependence and competition Communities Abiotic factors Biotic factors Adaptations Organisation of an ecosystem Levels of organisation How materials are cycled Biodiversity and the effect of human interaction on ecosystems Waste management Land use Deforestation Global warming

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		How carbon dioxide decreased Carbon dioxide and methane as greenhouse gases Greenhouse gases Human activities which contribute to an increase in greenhouse gases in the atmosphere Global climate change The carbon footprint and its reduction Common atmospheric pollutants and their sources Atmospheric pollutants from fuels Properties and effects of atmospheric pollutants	Mains electricity Energy transfers Power Energy transfers in everyday appliances The National Grid	Electromagnetism Fleming's left-hand rule Electric motors	The pH scale and neutralisation Strong and weak acids The process of electrolysis Electrolysis of molten ionic compounds Using electrolysis to extract metals Electrolysis of aqueous solutions Representation of reactions at electrodes as half equations	Maintaining biodiversity
	Justification: Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. The arrangement of elements in the modern periodic table can be explained in terms of	***Justification:*** The concept of energy emerged in the 19th century. The idea was used to explain the work output of steam engines and then generalised to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. Limits to the use of fossil fuels and global warming are critical problems for this century. Physicists and engineers are working hard to identify ways to reduce our energy usage. In this section we will learn about the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. We will	***Justification:*** Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies Electric charge is a fundamental property of matter everywhere. Understanding the difference in the microstructure of conductors,	***Justification:*** Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of	***Justification:*** The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft. It also explains why it is difficult to make a good cup of tea high up a mountain! In this section we will explore how plants harness the Sun's energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen	***Justification:*** Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently 138 Visit aqa.org.uk/8464 for the most up-to-date specification, resources, support and administration improved. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation. Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the

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	atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.	also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis. The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity.	semiconductors and insulators makes it possible to design components and build electric circuits. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we all continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future?	antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. Unfortunately many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics. Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas. Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a	to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue. Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically. Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. The extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'.	breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way. The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need

				magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this.		to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being.
	Assessment: *End of unit tests for each section*	***Assessment:*** - *End of unit tests for each section*	***Assessment:*** *End of unit tests for each section*	***Assessment:*** *End of unit tests for each section*	***Assessment:*** *End of unit tests for each section*	***Assessment*** *End of unit tests for each section*
	Wider reading/Cultural capital					
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Year 11	***Inheritance, variation and evolution*** ***Organic chemistry***	**Forces** **Homeostasis**	**Rates of reaction** **Waves**	***Chemical analysis*** ***Using resources***	**Revision**	
	Concepts/Tier 3 vocabulary Reproduction Sexual and asexual reproduction	***Concepts/Tier 3 vocabulary*** Forces and their interactions Scalar and vector quantities	***Concepts/Tier 3 vocabulary*** Rate of reaction Calculating rates of reactions	***Concepts/Tier 3 vocabulary*** Purity, formulations and chromatography Pure substances	***Concepts/Tier 3 vocabulary***	***Concepts Tier 3 vocabulary***

	Meiosis DNA and the genome Genetic inheritance Inherited disorders Sex determination Variation and evolution Variation Evolution Selective breeding Genetic engineering The development of understanding of genetics and evolution Evidence for evolution Fossils Extinction Resistant bacteria Classification of living organisms Carbon compounds as fuels and feedstock Crude oil, hydrocarbons and alkanes Fractional distillation and petrochemicals Properties of hydrocarbons Cracking and alkenes	Contact and non-contact forces Gravity Resultant forces Work done and energy transfer Forces and elasticity Forces and motion Describing motion along a line Distance and displacement Speed Velocity The distance–time relationship Acceleration Forces, accelerations and Newton's Laws of motion Newton's First Law Newton's Second Law Newton's Third Law Forces and braking Stopping distance Reaction time Factors affecting braking distance Momentum Momentum is a property of moving objects Conservation of momentum Homeostasis The human nervous system Hormonal coordination in humans Human endocrine system Control of blood glucose concentration Hormones in human reproduction Contraception The use of hormones to treat infertility Feedback systems	Factors which affect the rates of chemical reactions Collision theory and activation energy Catalysts Reversible reactions and dynamic equilibrium Reversible reactions Energy changes and reversible reactions Equilibrium The effect of changing conditions on equilibrium The effect of changing concentration The effect of temperature changes on equilibrium The effect of pressure changes on equilibrium Waves in air, fluids and solids Transverse and longitudinal waves Properties of waves Electromagnetic waves Types of electromagnetic waves Properties of electromagnetic waves Uses and applications of electromagnetic waves	Formulations Chromatography Identification of common gases Test for hydrogen Test for oxygen Test for carbon dioxide Test for chlorine Using the Earth's resources and obtaining potable water Using the Earth's resources and sustainable development Potable water Waste water treatment Alternative methods of extracting metals Life cycle assessment and recycling Ways of reducing the use of resources		
	Justification: In this section we will discover how the number of	***Justification*** Engineers analyse forces when designing a great variety of machines and	***Justification:*** Wave behaviour is common in both natural and man-made systems. Waves carry	***Justification:*** Analysts have developed a range of qualitative tests to detect specific chemicals.	***Justification:***	***Justification:***

	chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and introduce them in to the genome of another by a process called genetic engineering. In spite of the huge potential benefits that this technology can offer, genetic modification still remains highly controversial.	instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible. Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to 42 Visit aqa.org.uk/8464 for the most up-to-date specification, resources, support and administration do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.	energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves. Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. Understanding energy changes that accompany chemical reactions is important for this process. In industry, chemists and chemical engineers determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within	The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work. Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised.		

	The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.		a sufficient time, and in an energy-efficient way.			

	Assessment: *End of unit tests for each section*	***Assessment:*** *End of unit tests for each section*	***Assessment:*** *End of unit tests for each section*	***Assessment:*** *End of unit tests for each section*	***Assessment:*** ***GCSE examinations***	***Assessment:***
	Wider reading/Cultural capital The complex and diverse phenomena of the natural world can be described in terms of a small number of key ideas in biology. These key ideas are of universal application, and we have embedded them throughout the subject content. They underpin many aspects of the science assessment. The complex and diverse phenomena of the natural world can be described in terms of a small number of key ideas in chemistry. These key ideas are of universal application, and we have embedded them throughout the subject content. They underpin many aspects of the science assessment and will therefore be assessed across all papers. The complex and diverse phenomena of the natural and man-made world can be described in terms of a small number of key ideas in physics. These key ideas are of universal application, and we have embedded them throughout the subject content. They underpin many aspects of the science assessment and will therefore be assessed across all papers.					