

Yearly overview

Science : Year 10 Science

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<p>Prior knowledge: Climate and Earth's Resources: Predict the method used for extracting metal based on its position in the reactivity series. There is only a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources. Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals.</p>	<p>Prior knowledge: Wave effects and Properties: Relate the impact of different types of waves on living cells to their frequency and the energy carried by the wave. Use the wave model to explain observations of the reflection, absorption and transmission of waves. When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy. A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, and</p>	<p>Prior knowledge: Variation: Graph data relating to variation and explain how it may lead to the survival of a species. There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment and some is a combination. Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment. Plant and human reproduction: Use models to evaluate the features of various types of seed dispersal. Relate advice to pregnant women to ideas about transfer of</p>	<p>Prior knowledge: Metals and Non metals: Use experimental results to suggest an order of reactivity of various metals. Metals and non-metals react with oxygen to form oxides which are either bases or acids. Metals can be arranged as a reactivity series in order of how readily they react with other substances. Some metals react with acids to produce salts and hydrogen. Acids and Alkalis: Devise an enquiry to compare how well indigestion remedies work. The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids. Mixing an acid and alkali produces a chemical</p>	<p>Prior knowledge: Speed: Investigate variables that affect the speed of a toy car rolling down a slope. If the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction. Contact Forces: Investigate factors that affect the size of frictional or drag forces. When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied.</p>	<p>Prior knowledge: Climate and Earth's Resources: Investigate the contribution that natural and human chemical processes make to our carbon dioxide emissions. Carbon is recycled through natural processes in the atmosphere, ecosystems, oceans and the Earth's crust. Greenhouse gases reduce the amount of energy lost from the Earth through radiation and therefore the temperature has been rising as the concentration of those gases has risen. Scientists have evidence that global warming caused by human activity is causing changes in climate. There is only</p>

<p>Types of Reaction: Investigate changes in mass for chemical and physical processes Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.</p> <p>Particle Model: Relate the features of the particle model to the properties of materials in different states. Properties of solids, liquids and gases can be described in terms of particles in motion but with differences in the arrangement and</p>	<p>describes the properties of speed, wavelength and reflection.</p> <p>Breathing: Investigate a claim linking height to lung volume. In gas exchange, oxygen and carbon dioxide move between alveoli and the blood. Oxygen is transported to cells for aerobic respiration and carbon dioxide, a waste product of respiration, is removed from the body. Breathing occurs through the action of muscles in the ribcage and diaphragm. The amount of oxygen required by body cells determines the rate of breathing.</p> <p>Digestion: Evaluate how well a model represents key features of the digestive system The body needs a balanced diet with carbohydrates, lipids, proteins, vitamins, minerals, dietary fibre</p>	<p>substances to the embryo. Plants have adaptations to disperse seeds using wind, water or animals. Plants reproduce sexually to produce seeds, which are formed following fertilisation in the ovary.</p> <p>Evolution: Review the evidence for theories about how a particular species went extinct Natural selection is a theory that explains how species evolve and why extinction occurs. Biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction. Within an ecosystem, having many different species ensures resources are available for other populations, like humans.</p> <p>Inheritance: Model the inheritance of a specific trait and explore the variation</p>	<p>reaction, neutralisation, forming a chemical called a salt and water.</p> <p>Types of Reaction: Investigate changes in mass for chemical and physical processes Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.</p>	<p>Separating mixtures: Devise ways to separate mixtures, based on their properties. A pure substance consists of only one type of element or compound and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties. The method chosen to separate a mixture depends on which physical properties of the individual substances are different.</p>	<p>a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources. Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals.</p> <p>Interdependence: Use a model to investigate the impact of changes in a population of one organism on others in the ecosystem Organisms in a food web (decomposers, producers and consumers) depend on each other for nutrients. So, a change in one population</p>
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<p>movement of these same particles: closely spaced and vibrating (solid), in random motion but in contact (liquid), or in random motion and widely spaced (gas). Observations where substances change temperature or state can be described in terms of particles gaining or losing energy.</p>	<p>and water, for its cells' energy, growth and maintenance. Organs of the digestive system are adapted to break large food molecules into small ones which can travel in the blood to cells and are used for life processes.</p>	<p>in the offspring produced. Inherited characteristics are the result of genetic information, in the form of sections of DNA called genes, being transferred from parents to offspring during reproduction. Chromosomes are long pieces of DNA which contain many genes. Gametes, carrying half the total number of chromosomes of each parent, combine during fertilisation. Chemical Energy: Investigate a phenomenon that relies on an exothermic or endothermic reaction. During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy). If the energy released is greater than the energy required, the reaction is exothermic. If the</p>			<p>leads to changes in others. The population of a species is affected by the number of its predators and prey, disease, pollution and competition between individuals for limited resources such as water and nutrients.</p>
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<p>This term:</p> <p>Chemical changes Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organising 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</p>	<p>This term:</p> <p>Atomic structure. 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 improved. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.</p> <p>Homeostasis and response. Cells in the</p>	<p>This term:</p> <p>Inheritance, variation and evolution. In this section we will discover how the number of 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</p>	<p>This term:</p> <p>The rate and extent of chemical change. 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</p>	<p>This term:</p> <p>Forces. Engineers analyse forces when designing a great variety of machines and 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.</p> <p>Chemical analysis Analysts have developed a range of qualitative tests to detect specific chemicals. 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</p>	<p>This term:</p> <p>Ecology. 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</p>

<p>compounds react with each other and how easily they can be 'pulled apart'.</p> <p>Particle model of matter. 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!</p>	<p>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 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</p>	<p>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.</p> <p>Energy changes. Energy changes are an</p>	<p>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 a sufficient time, and in an energy-efficient way.</p> <p>Organic chemistry 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</p>	<p>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.</p>	<p>from these services humans need 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.</p> <p>Chemistry of the atmosphere. 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</p>
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	<p>understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.</p>	<p>important part of chemical reactions. The interaction of particles often involves transfers of energy due to the 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</p>	<p>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.</p>		<p>scientists and engineers to develop solutions that help to reduce the impact of human activity.</p>
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<p>Future knowledge: Energy changes. Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the 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</p>	<p>Future knowledge: Forces. Engineers analyse forces when designing a great variety of machines and 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.</p> <p>Inheritance, variation and evolution. In this section we will discover how the number of 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</p>	<p>Future knowledge: Ecology. 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</p>	<p>Future knowledge: Chemical analysis. Analysts have developed a range of qualitative tests to detect specific chemicals. 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.</p>	<p>Future knowledge: Waves. Wave behaviour is common in both natural and man-made systems. Waves carry 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.</p> <p>Chemistry of the atmosphere. The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of</p>	<p>Future knowledge: Key ideas. 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.</p> <p>Key ideas in biology:</p> <ul style="list-style-type: none"> • life processes depend on molecules whose structure is related to their function. • the fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling living

<p>used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way.</p> <p>Atomic structure</p> <p>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 improved. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.</p>	<p>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</p>	<p>humans need 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.</p> <p>The rate and extent of chemical change</p> <p>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</p>		<p>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.</p>	<p>processes to be performed effectively.</p> <ul style="list-style-type: none"> • living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways. • living organisms are interdependent and show adaptations to their environment. • life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen. • organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life.
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	<p>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.</p>	<p>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 a sufficient time, and in an energy-efficient way.</p>			<ul style="list-style-type: none"> • the chemicals in ecosystems are continually cycling through the natural world. • the characteristics of a living organism are influenced by its genome and its interaction with the environment. • evolution occurs by a process of natural selection and accounts both for biodiversity and how organisms are all related to varying degrees. <p>Using resources 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</p>
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					<p>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.</p>
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