



## CURRICULUM OVERVIEW – SCIENCE

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<b>Year 7</b>	<b>Matter</b>	<b>Chemical Methods</b>	<b>Systems (1)</b>	<b>Systems (2)</b>	<b>Natural World</b>	<b>Electricity &amp; Magnetism</b>
	<p>The Particle Model of Matter: everything is made of particles and exists in one of three states of matter: solid, liquid or gas. Matter can change between these states. The particles that everything is made of are actually called 'atoms'.</p>	<p>Chemical mixtures can be separated by: filtration, evaporation, distillation &amp; chromatography. A solute will dissolve in a solvent to form a solution.</p>	<p>Respiration is essential for life and is how cells access energy. Glucose and Oxygen react to form Carbon Dioxide and Water. The Digestive System allows us to get the Glucose from our diet. The Respiratory System allows us to get the Oxygen from the air.</p>	<p>The male and female reproductive systems undergo many changes during puberty in response to hormones. In females, an egg is released from the ovary each month. During fertilisation, a sperm cell can join with this egg in the Fallopian Tube.</p>	<p>Plants take in light energy and make Glucose in the process of Photosynthesis. Leaves have adaptations that help this process to happen. Producers carry out photosynthesis and are consumed by animals in an ecosystem. Toxic substances can accumulate through food chains/webs in an ecosystem. Energy is also transferred between organisms in a food chain/web.</p>	<p>Electricity is produced by renewable and non-renewable sources. Components in an electrical circuit are represented by symbols. Circuits can be set up in Series or Parallel – the current &amp; potential difference follow different rules in each. Magnets have poles which create magnetic fields. Magnetism is a non-contact force.</p>
	<b>Atoms &amp; Elements</b>	<b>Bonding &amp; Molecules</b>	<b>Cells</b>	<b>Disease</b>	<b>Energy</b>	<b>Forces</b>
	<p>Atoms have protons, neutrons and electrons. Atoms form elements, compounds and mixtures. Elements &amp; compounds can react to form different elements &amp; compounds. Mixtures can be separated using various chemical methods as they are not chemically bonded.</p>	<p>Molecules contain bonds. In a chemical reaction, bonds are broken, and new bonds are formed.</p> <p style="text-align: center;"><b>Reactions &amp; Energy</b></p> <p>Reactants react to form products. These reactions can be shown in word equations. Reactions can happen in a lab using chemical compounds, mixtures and elements, or they can happen naturally inside cells, for example: respiration.</p>	<p>Every living thing is made of cells. Animal cells contain organelles, as do plant cells. Respiration takes place in the mitochondria. There are specialised animal &amp; plant cells:</p> <ul style="list-style-type: none"> <li>• Sperm &amp; Egg Cells</li> <li>• Red Blood Cells &amp; White Blood Cells</li> <li>• Palisade Cells</li> </ul>	<p>Pathogens are microorganisms that cause disease. Pathogens can be passed on through direct touch, body fluids, coughing and sneezing and contaminated food/drink. The Immune System protects the body against disease. White Blood Cells are the specific part of the Immune System that fights against disease.</p>	<p>Photosynthesis takes in light energy; light energy is one form of energy – there are many different forms of energy stores and transfers. Energy can come from renewable &amp; non-renewable sources.</p>	<p>Forces are categorised into contact and non-contact forces. Forces can be represented by arrows and free body diagrams. Gravity acts on all objects and pulls towards the centre of the Earth.</p> <p style="text-align: center;"><b>Space</b></p> <p>Different planets have different strengths of gravitational pull. Different objects have different weights on different planets due to Gravity. Moon orbit planets and planets orbit the Sun. The Earth's tilt and orbit gives us our seasons and night/day. We are part of a galaxy called "The Milky Way".</p>



	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
	Forces	Bonding & Molecules	Natural World, Earth & Environment	Systems (1)	Drugs	Electricity & Magnetism
Year 8	<p>Forces are categorised into contact and non-contact forces.</p> <p>Forces can be represented by arrows and free body diagrams. Gravity acts on all objects and pulls towards the centre of the Earth.</p>	<p>Some compounds involve non-metals chemically bonding together and some compounds involve a metal and a non-metal bonding together.</p> <p>Metals take part in important reactions with acids and with oxygen.</p>	<p>Plants compete for light, space, water &amp; mineral ions.</p> <p>Animals compete for food, territory &amp; mates.</p> <p>Plants &amp; animals have adaptations which help them to compete.</p> <p>When animals and plants die, they form fossil fuels over millions of years.</p> <p>Fossil fuels, along with other useful resources can be extracted from the Earth for use by an increasingly large human population.</p> <p>Combustion of fossil fuels causes Global Warming.</p>	<p>A fertilised egg produces identical copies of itself to form a Zygote.</p> <p>The placenta exchanges substances between the mother &amp; fetus.</p> <p>During labour, the uterus contracts &amp; the cervix dilates.</p>	<p>Other lifestyle factors (drugs) can also affect other aspects of our health. Alcohol is a depressant that can affect the health of the Liver; recreational drugs can also have many psychological and physiological effects.</p> <p>Medicines also affect the body but are tested to ensure they are safe.</p>	<p>Resistance.</p> <p>Resistance rules in series and parallel circuit.</p> <p>Current through a wire creates a magnetic field.</p> <p>A current through a wire + a magnetic core = an electromagnet.</p>
	Atomic Physics	Reactions & Energy	Cells	Systems (2)	Energy	Forces
	<p>The model of the atom we have today is based on the work of John Dalton but other Scientists have contributed to our knowledge of the atom.</p> <p>Some atoms are stable, some are unstable. The unstable ones give out radiation which can be dangerous.</p>	<p>A metal + acid → salt + hydrogen</p> <p>A metal + oxygen → Metal Oxide</p> <p>Acids and Alkalis have a pH value between 1 – 14</p> <p>Acids &amp; Alkalis neutralise each other in a reaction.</p> <p>Complete combustion releases Carbon Dioxide and Water.</p> <p>Some reactions take in energy (endothermic).</p> <p>Some reactions give out energy (exothermic).</p>	<p>Respiration takes place in all cells. Cells can be prokaryotic or eukaryotic.</p> <p>Specialised Cells have <i>adaptations</i> for their functions: Examples are: Muscle Cells, Nerve Cells, Xylem and Phloem Cells, Root Hair Cells.</p> <p>Stem cells are non-specialised.</p> <p>Diffusion allows substances to move in &amp; out of cells.</p> <p>Microscopes can be used to view cells.</p>	<p>The Alveoli have adaptations to facilitate gas exchange.</p> <p>Asthma is a respiratory condition.</p> <p>Lifestyle factors can affect our health.</p> <p>The Digestive System contains enzymes to break down food.</p> <p>Enzymes can be affected by temperature changes.</p>	<p>Energy resources can be renewable or non-renewable.</p> <p>Energy can be transferred through conduction, convection &amp; radiation.</p> <p>Power = energy transferred / time</p>	<p>Forces are pushes or pulls.</p> <p>Forces can deform objects through stretching or squashing.</p> <p>There is a linear relationship between force and extension; Hooke's Law is a special case.</p> <p>Work done = force x distance.</p> <p>Power is a measure of the energy transferred over time – it is also a measure of the work done over time.</p>
Atoms & Elements						



	<p>In atoms, protons are positive, electrons are negative &amp; neutrons are neutral.</p> <p>The Periodic Table contains all known elements and was developed by Dimitri Mendeleev.</p> <p>The Periodic Table contains elements that are metals and non-metals.</p>					
	<b>Term 1</b>	<b>Term 2</b>	<b>Term 3</b>	<b>Term 4</b>	<b>Term 5</b>	<b>Term 6</b>
	<b>Forces</b>	<b>Cells (1)</b>	<b>Systems (2)</b>	<b>Atoms &amp; Elements</b>	<b>Reactions &amp; Energy</b>	<b>Forces</b>
<b>Year 9</b>	<p>Forces are pushes or pulls.</p> <p>Forces can deform objects through stretching or squashing.</p> <p>There is a linear relationship between force and extension; Hooke's Law is a special case.</p> <p>Work done = force x distance.</p> <p>Power is a measure of the energy transferred over time – it is also a measure of the work done over time.</p>	<p>Photosynthesis requires water; plants get this from the soil via the process of Osmosis. Water moves through the Xylem tissue to the palisade cells in the leaves. Plants contain other cells in their roots called meristem cells which are stem cells.</p> <p>Stem cells in humans are found in adult bone marrow or embryos. Human stem cells can differentiate into any kind of human cell, for example:</p> <ul style="list-style-type: none"> <li>• Sperm and Egg Cells</li> <li>• Muscle Cells</li> <li>• Red Blood Cells</li> </ul>	<p>The musculo-skeletal system contains our muscles and our bones. This system provides support, protection and allows us to move through muscle contraction. Muscle contraction occurs because respiration in muscle cells releases energy.</p> <p>The circulatory system allows blood, containing glucose and oxygen, to circulate around the body to every muscle cell.</p>	<p>Respiration uses Oxygen. Oxygen atoms all contain 8 protons and 8 electrons which orbit the nucleus. Electrons orbit in shells and fill the shell closest to the nucleus first.</p> <p>Molecular formulae contain symbols and numbers. This information can be used to calculate the total mass of the molecule.</p>	<p>Respiration is a chemical reaction. In reactions, atoms cannot be created or destroyed. The rate of any reaction can be increased or decreased. Respiration is irreversible but some reactions are reversible. Other reactions are determined by the reactivity of the elements/compounds involved and the displacement that occurs.</p>	<p>Acceleration and deceleration involve a change in velocity over time. Falling objects reach terminal velocity when the resultant forces are zero meaning they move at a constant speed in a constant direction.</p> <p>Vehicles decelerate on the road by braking and will eventually come to a stop. There are many factors that affect their thinking distance and braking distance, and therefore their overall stopping distance.</p>
	<b>Inheritance</b>			<b>Bonding and Molecules</b>	<b>Energy</b>	
	<p>DNA mutations can be passed between generations via Natural Selection. This leads to variation within, and between, species. Some species are less able to compete</p>			<p>Respiration produces Water which contains non-metals joined by covalent bonds where electrons are shared.</p>	<p>Respiration is a chemical reaction. The rate of a chemical reaction can be increased by heating it. Heating is one example of</p>	



	and can become extinct. Fossils provide evidence of this.			Another type of bonding is metallic bonding which occurs in metals.  Metals and non-metals can be mixed (rather than bonded) together to form alloys, composites and ceramics.	transferring energy. The other ways of transferring energy are mechanical, electrical and radiation.	
	<b>Natural World</b>	<b>Waves</b>	<b>Cells (2)</b>	<b>Organic Chemistry</b>	<b>Electricity &amp; Magnetism</b>	
	Different species occupy different places in a food chain; some species act as predators which affects the population size of their prey. 'Abiotic' factors also affect species populations.  Food chains begin with a photosynthesising species, which can be affected by light intensity and the presence of chlorophyll.  Photosynthesis takes in light, which is a wave. Plant cells contain chlorophyll which appears green because green light is reflected, and the other 6 colours of white light are absorbed. Sound is a different type of wave, which can also be reflected.	Photosynthesis takes in light, which is a wave. Plant cells contain chlorophyll which appears green because green light is reflected, and the other 6 colours of white light are absorbed. Sound is a different type of wave. Both types can be reflected and both types have practical uses in industry.	Respiration requires glucose and oxygen as the reactants. When there is not enough Oxygen available, anaerobic respiration happens instead. In humans, this produces lactic acid in the muscles; in yeast this produces ethanol – this can be utilised in the industrial process of fermentation.	Crude Oil is a mixture of hydrocarbons and is extracted from the Earth. It is separated into smaller hydrocarbons each of which is a polymer. This is done using fractional distillation.	Energy can be transferred electrically, in a circuit.  <b>Recall:</b> power = energy transferred / time. Power can also be calculated by using: Power = potential difference x current. This is used to calculate domestic fuel bills.  When a current passes through a wire it creates a magnetic field around the wire. Putting a magnetic core inside a coil of wire creates an electromagnet. The strength of electromagnets can be changed; electromagnets can also be used to create motors.	
		<b>Systems (1)</b>				
		The normal process of fertilisation involves a sperm cell fusing with an egg cell. There are numerous ways in which contraception prevents this from happening. Some of these are hormonal, others are non-hormonal.				



## KEY STAGE 4 - BIOLOGY

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<b>Year 10</b>	<b>Cells</b>	<b>Systems</b>	<b>Systems</b>	<b>Disease</b>	<b>Natural World</b>	<b>Coordination &amp; Control</b>
	<p>Cells can be eukaryotic or prokaryotic.</p> <p>Some cellular features are shared between animal and plant cells; some cells have unique adaptations because they are specialised.</p> <p>Stem cells, however, are non-specialised and can become any type of cell found within an organism.</p> <p>We can use a microscope to examine cells and sub-cellular structures.</p> <p>Substances can move into and out of cells via the processes of diffusion, osmosis and active transport.</p> <p><b>SEPARATE SCIENCE:</b> Unicellular microorganisms, such as bacteria can be cultured in aseptic conditions so that the effect of antibiotics/antiseptics can be investigated.</p>	<p>Organisms are organised to include cells, tissues, organs and organ systems.</p> <p>The Human Digestive System breaks down large insoluble molecules into smaller soluble molecules.</p> <p>Enzymes are produced to help with digestion. Enzymes can be affected by changes in temperature and pH.</p> <p>The heart contains atria and ventricles and pumps deoxygenated blood to the lungs and oxygenated blood to the body.</p> <p>Blood contains red blood cells, white blood cells, platelets and plasma and circulates the body through arteries, veins and capillaries.</p>	<p>Lifestyle factors can influence the prevalence of non-communicable diseases, including cancer.</p> <p>Plants also contain tissues, organs and organ systems. These play a vital role in the transport of substances around a plant and in gas exchange.</p>	<p>Vaccination can help to reduce the spread of a pathogen if used within a large proportion of the population.</p> <p>Antibiotics can be used to kill bacteria but not viruses. Some bacteria are becoming resistant to antibiotics.</p> <p><b>SEPARATE SCIENCE:</b> Monoclonal antibodies from lymphocytes have numerous industrial uses. There are many ways to spot diseases in plants; some of which can affect plant growth.</p>	<p>Photosynthesis occurs in the chloroplasts of plant cells.</p> <p>The rate of this reaction can be affected by light intensity and carbon dioxide concentration.</p> <p>Respiration occurs in the mitochondria of living cells and transfers energy to the cell from glucose.</p> <p>During exercise, the body reacts to the increased demand for energy; the heart rate, breathing rate and breath volume increase.</p>	<p>Hormones secreted from glands in the endocrine system causes 'slower' changes compared to the nervous system.</p> <p>Blood glucose and the menstrual cycle are regulated by hormones.</p> <p>Some contraceptives contain hormones to control aspects of fertility.</p> <p><b>SEPARATE SCIENCE:</b> The brain controls complex behaviour and the different areas of the brain have different functions.</p> <p>The eye is a sense organ which contains receptors sensitive to light intensity and colour.</p> <p>Body temperature is also controlled by the brain.</p> <p>Plant Hormones can be used as weed killers and for promoting plant growth.</p>
			<b>Disease</b>		<b>Coordination &amp; Control</b>	
			<p>Communicable diseases are infectious diseases caused by bacteria, viruses, protists and fungi.</p> <p>The human body can defend against these pathogens through non-specific defence systems and the immune system.</p> <p>The immune system includes white blood cells which help to defend against pathogens.</p>		<p>Homeostasis maintains optimal conditions for enzyme action and all cell functions.</p> <p>The human nervous system and endocrine system allow the body to respond to stimuli.</p> <p>The reflex arc allows reflex actions to be automatic and rapid.</p>	



	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
	<b>Diseases</b>	<b>Co-ordination and Control</b>	<b>Inheritance</b>	<b>Ecology</b>	<b>Exam Preparation</b>	
<b>Year 11</b>	<p>Vaccination can help to reduce the spread of a pathogen if used within a large proportion of the population.</p> <p>Antibiotics can be used to kill bacteria but not viruses. Some bacteria are becoming resistant to antibiotics.</p> <p><b>SEPARATE SCIENCE:</b> Monoclonal antibodies from lymphocytes have numerous industrial uses. There are many ways to spot diseases in plants; some of which can affect plant growth.</p>	<p>Homeostasis maintains optimal conditions for enzyme action and all cell functions.</p> <p>The human nervous system and endocrine system allow the body to respond to stimuli.</p> <p>The reflex arc allows reflex actions to be automatic and rapid.</p>	<p>Reproduction can be sexual or asexual.</p> <p>Sexual reproduction involves gametes which are produced by meiosis. Variation is introduced in this process.</p> <p>Gametes contain DNA in their nucleus – this is a molecule containing the code to produce and order amino acids into protein.</p> <p>Proteins give people characteristics inherited from their parents.</p> <p>Offspring inherit their biological sex from their parents as well as, in some circumstances, medical conditions such as cystic fibrosis from their parents.</p> <p>Variation can be caused by genes and the environment. Sometimes variation can be caused by mutations in DNA.</p> <p>Mutations that cause variation over a long period of time can contribute to the process of 'Natural Selection' which can lead to the evolution of a species.</p> <p>Fossils and resistant bacteria provide evidence for evolution.</p> <p>Humans can also select genes to breed in a species and can use genetic engineering to insert specific genes into DNA to alter the characteristics of an organism.</p> <p>Variation in organisms (in both phenotype and in their DNA) allows biologists to classify them into groups and to trace common ancestors for species.</p> <p><b>SEPARATE SCIENCE:</b> Cloning is a technique performed through tissue culture, cuttings, embryo transfers and adult cell cloning.</p>	<p>Abiotic and biotic factors affect communities living within ecosystems.</p> <p>Some organisms show adaptations that help them to compete and survive in their communities.</p> <p>Within an ecosystem, materials can cycle through the abiotic and biotic components, for example carbon and water.</p> <p>Biodiversity ensures the stability of an ecosystem and can be influenced by several factors including: waste management, land use, and deforestation.</p> <p>High levels of carbon dioxide and methane can contribute towards Global Warming.</p> <p>Global warming has many biological consequences; these can be countered by measures that aim to maintain biodiversity. These include:</p> <ul style="list-style-type: none"> <li>• Breeding programmes</li> <li>• Regeneration of habitats.</li> <li>• Reducing deforestation.</li> </ul> <p><b>SEPARATE SCIENCE:</b> Temperature, water and oxygen availability can affect the rate of decay of biological material.</p> <p>Organisms within an ecosystem occupy different trophic levels.</p> <p>Biomass is transferred through the trophic levels of an ecosystem; this can be represented through a pyramid of biomass.</p>	<p>Extensive and explicit recall of knowledge to facilitate effective rehearsal of exam technique.</p> <p>Links between different sections of knowledge are embedded further.</p>	
	<b>Natural World 1</b>	<p>Photosynthesis occurs in the chloroplasts of plant cells.</p> <p>The rate of this reaction can be affected by light intensity and carbon dioxide concentration.</p> <p>Respiration occurs in the mitochondria of living cells and transfers energy to the cell from glucose.</p> <p>During exercise, the body reacts to the increased demand for energy; the heart rate, breathing rate and breath volume increase.</p>				



## KEY STAGE 4 - CHEMISTRY

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<b>Year 10</b>	<b>Atoms &amp; Elements</b>	<b>Bonding &amp; Molecules</b>	<b>Reactions &amp; Energy 1</b>	<b>Reactions &amp; Energy 1</b>	<b>Reactions &amp; Energy 2</b>	<b>Quantitative Chemistry</b>
	<p>All substances are made of atoms.</p> <p>The model of the atom was developed over time and included ideas such as the 'plum pudding' model and evidence from alpha scattering.</p> <p>Elements contain only one type of atom. Elements are organised in the Periodic Table.</p> <p>Groups in the Periodic Table have patterns in terms of their reactivity.</p> <p>Compounds contain two or more elements chemically combined in fixed proportions.</p> <p><b>SEPARATE SCIENCE:</b> Transition metals can be compared to Group 1 in terms of their properties.</p>	<p>Ionic, covalent and metallic are all types of chemical bond.</p> <p>Ionic compounds are held together by strong electrostatic forces of attraction between oppositely charged ions.</p> <p>When atoms share pairs of electrons, they form covalent bonds.</p> <p>The sharing of delocalised electrons gives rise to strong metallic bonds.</p> <p>Substances containing the different types of bonds display different properties.</p> <p><b>SEPARATE SCIENCE:</b> Nanoscience refers to structures that are 1-100nm in size.</p> <p>Nanoparticles have different properties to those for the same materials in bulk, meaning that they can have specific uses in medicine, electronics, and research.</p>	<p>Acids produce hydrogen ions in aqueous solutions whereas aqueous solutions of alkalis contain hydroxide ions.</p> <p>In neutralisation reactions between an acid and an alkali, hydrogen ions react with hydroxide ions to produce water.</p> <p>Acids can take part in a variety of useful chemical reactions, some of which involve oxidation and reduction.</p> <p>Oxidation is the loss of electrons and reduction is the gain of electrons.</p> <p><b>SEPARATE SCIENCE:</b> The volume of acid and alkali solutions that react with each other can be measured by titration using a suitable indicator.</p>	<p>Electrolysis can be used to extract metals from molten compounds. It can also be used to produce elements when ions are discharged at the electrodes in electrolyte solutions.</p> <hr/> <p style="text-align: center;"><b>Reactions &amp; Energy 2</b></p> <p>An endothermic reaction is one that takes in energy from the surroundings whereas an exothermic reaction is one that transfers energy to the surroundings.</p>	<p>For a chemical reaction to occur, reacting particles have to have sufficient energy when they collide.</p> <p>Reaction profiles can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction.</p> <p>The rate of a chemical reaction can be found by measuring the quantity of a reactant used or the quantity of product formed over time.</p> <p>Catalysts change the rate of chemical reactions but are not used up during the reaction.</p> <p>Some chemical reactions are reversible; when the forward and reverse reactions occur at exactly the same rate, equilibrium is reached.</p> <p><b>SEPARATE SCIENCE:</b> Batteries and cells contain chemicals which react to produce electricity.</p> <p>The fuel in a fuel cell can be oxidised electrochemically to produce a potential difference.</p>	<p>In the conservation of mass, no atoms are lost or made during a chemical reaction, so the mass of the products equals the mass of the reactants.</p> <p>Many chemical reactions take place in solutions; the concentration of a solution can be measured in mass per given volume of solution.</p> <p>Chemical reactions can therefore be represented by symbol equations which can be balanced.</p>



	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<b>Year 11</b>	<b>Reactions and Energy</b>	<b>Quantitative Chemistry</b>	<b>Organic Chemistry</b>	<b>Earth &amp; The Environment</b>	<b>Exam Preparation</b>	
	<p>For a chemical reaction to occur, reacting particles have to have sufficient energy when they collide.</p> <p>Reaction profiles can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction.</p> <p>The rate of a chemical reaction can be found by measuring the quantity of a reactant used or the quantity of product formed over time.</p> <p>Catalysts change the rate of chemical reactions but are not used up during the reaction.</p> <p>Some chemical reactions are reversible; when the forward and reverse reactions occur at exactly the same rate, equilibrium is reached.</p> <p><b>SEPARATE SCIENCE:</b> Batteries and cells contain chemicals which react to produce electricity.</p> <p>The fuel in a fuel cell can be oxidised electrochemically to produce a potential difference.</p>	<p>In the conservation of mass, no atoms are lost or made during a chemical reaction, so the mass of the products equals the mass of the reactants.</p> <p>Many chemical reactions take place in solutions; the concentration of a solution can be measured in mass per given volume of solution.</p> <p>Chemical reactions can therefore be represented by symbol equations which can be balanced.</p> <p><b>SEPARATE SCIENCE:</b> Percentage yield and atom economy can also be calculated for chemical reactions.</p> <p>mol/dm<sup>3</sup> can also be used as a unit of measurement for concentration of a solution.</p> <div style="text-align: center; border: 1px solid black; padding: 5px;"><b>Chemical Methods</b></div> <p>A pure substance is a single element or compound, not mixed with anything else. A formulation, however, is a mixture – and one that has been designed as a useful product.</p> <p>Chromatography is a method used to separate some mixtures.</p> <p>Other chemical methods of analysis involve the identification</p>	<p>The hydrocarbons in crude oil can be separated using fractional distillation.</p> <p>Some of the properties of hydrocarbons depend on the size of their molecules. These properties influence how hydrocarbons are used as fuels.</p> <p>Hydrocarbons can be broken down to produce smaller, more useful molecules in the process of cracking. The products of cracking are alkanes and alkenes.</p> <p><b>SEPARATE SCIENCE:</b> Alkenes are hydrocarbons with the functional group C=C. Alcohols contain the functional group -OH. Carboxylic acids have the functional group -COOH.</p> <p>'Addition polymerisation' and 'condensation polymerisation' are two types of reaction in which polymers can be made.</p>	<p>For 200 million years, the composition of the Earth's atmosphere has remained much the same as it is today. However, volcanic activity, the formation of oceans and the presence of life all played a part in changing the atmosphere before this time period.</p> <p>Greenhouse gases are present in the atmosphere and the amount of these has increased, largely due to human activity.</p> <p>Many scientists believe that increased human activity is contributing to an increase in the surface temperature of the earth.</p> <p>An increase in the average global temperature is a major cause of climate change.</p> <p>The rising human population depend on the earth's natural resources for food, shelter, warmth and transport.</p> <p>Water is a natural resource; it can be made safe to drink or purified using a range of techniques such as distillation, filtration, sterilisation, desalination and reverse osmosis.</p> <p>The environmental impact of resource use in product manufacturing is evaluated through Life Cycle Assessments.</p> <p>Reducing the use of resources, reusing products and recycling materials can have a positive impact on the environment.</p>	<p>Extensive and explicit recall of knowledge to facilitate effective rehearsal of exam technique.</p> <p>Links between different sections of knowledge are embedded further.</p>	





		<p>of substances such as common gases.</p> <p><b>SEPARATE SCIENCE:</b> Flame tests can be used to identify metal ions. Sodium hydroxide can also be used to identify some metal ions.</p> <p>Instrumental methods can also be used to detect and identify elements and compounds, for example: flame emission spectroscopy</p>				
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## KEY STAGE 4 - PHYSICS

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<b>Year 10</b>	<b>Energy</b>	<b>Electricity &amp; Magnetism (1)</b>	<b>Electricity &amp; Magnetism (1)</b>	<b>Matter</b>	<b>Atomic Physics</b>	<b>Forces (1)</b>
	<p>There are changes in the way energy is stored when a system changes.</p> <p>These energy changes can be calculated using the following as examples:</p> $E_k = \frac{1}{2} m v^2$ $E_e = \frac{1}{2} k e^2$ $E_p = m g h$ <p>The amount of energy stored in or released from a system as its temperature changes can be calculated using:</p> $\Delta E = m c \Delta \theta$ <p>'Power' is the rate at which energy is transferred or the rate at which work is done.</p> <p>Energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed. Efficiency is a measure of how much energy is transferred usefully.</p> <p>Energy resources from the Earth can be renewable or non-renewable; the environmental issues of such use must also be considered.</p>	<p>The size of an electrical current is the rate of flow of electrical charge.</p> <p>Current, resistance or potential difference can be calculated using:</p> $V = I R$ <p>For some resistors, the resistance remains constant but in others it changes as the temperature changes.</p> <p>There are known differences between current and potential difference in series and parallel circuits.</p> <p>Electrical power can be transferred from power stations to consumers using the National Grid. Power can be calculated using:</p> $P = I V$ $P = I^2 R$	<p>Electrical appliances are designed to bring about an energy transfer; the size of which depends on how long the appliance is switched on for and the power of the appliance.</p> <p><b>SEPARATE SCIENCE:</b> When two electrically charged objects are brought close together, they exert a force on each other A charged object creates an electric field around itself. The electric field is strongest close to the charged object.</p> <hr/> <p style="text-align: center;"><b>Matter</b></p> <hr/> <p>The particle model can be used to explain differences in density. It can also be used to describe changes in state.</p> <p>Heating either changes the temperature of a system or produces a change of state.</p> <p>If the temperature of the system increases, the increase in temperature depends on the mass of the substance heated, the type of material and the energy input to the system.</p>	<p>The energy needed for a substance to change state is called latent heat.</p> <p>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.</p> <p><b>SEPARATE SCIENCE:</b> 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).</p>	<p>(Knowledge of the structure of the atom and the development of the model of the atom is common content with Chemistry).</p> <p>Some atomic nuclei are unstable. The nucleus gives out radiation as it changes to become more stable, including:</p> <ul style="list-style-type: none"> <li>• Alpha particles</li> <li>• Beta particles</li> <li>• Gamma rays</li> <li>• Neutrons</li> </ul> <p>Nuclear equations are used to represent radioactive decay. Different radioactive isotopes have different half lives and decay at different rates.</p> <p>Radioactive contamination presents hazards in the form of decaying atoms.</p> <p><b>SEPARATE SCIENCE:</b> Background radiation comes from natural and man-made sources such as rocks, cosmic rays and nuclear weapons.</p> <p>Nuclear fission is the splitting of a large and unstable nucleus.</p> <p>Nuclear fusion is the joining of two light nuclei to form a heavier nucleus.</p>	<p>Scalar quantities have magnitude only. Vector quantities have magnitude and an associated direction.</p> <p>A force is a push or pull that acts on an object due to the interaction with another object. All forces between objects are either:</p> <ul style="list-style-type: none"> <li>• Contact forces</li> <li>• Non-contact forces</li> </ul> <p>Weight is the force acting on an object due to gravity and can be calculated using:</p> $W = m g$ <p>A number of forces acting on an object may be replaced by a single force that has the same effect as all the original forces acting together. This single force is called the resultant force.</p> <p>When a force causes an object to move through a distance work is done on the object.</p> <p><b>SEPARATE SCIENCE:</b> A force or a system of forces may cause an object to rotate.</p> <p>The pressure at the surface of a fluid can be calculated using the equation:</p> $P = F / A$



	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<b>Year 11</b>	<b>Atomic Physics</b>	<b>Forces (2)</b>	<b>Waves</b>	<b>Electricity &amp; Magnetism (2)</b>	<b>Space</b>	
	<p>(Knowledge of the structure of the atom and the development of the model of the atom is common content with Chemistry).</p> <p>Some atomic nuclei are unstable. The nucleus gives out radiation as it changes to become more stable, including:</p> <ul style="list-style-type: none"> <li>• Alpha particles</li> <li>• Beta particles</li> <li>• Gamma rays</li> <li>• Neutrons</li> </ul> <p>Nuclear equations are used to represent radioactive decay. Different radioactive isotopes have different half lives and decay at different rates.</p> <p>Radioactive contamination presents hazards in the form of decaying atoms.</p> <p><b>SEPARATE SCIENCE:</b> Background radiation comes from natural and man-made sources such as rocks, cosmic rays and nuclear weapons.</p> <p>Nuclear fission is the splitting of a large and unstable nucleus.</p>	<p>For an object moving at constant speed the distance travelled in a specific time can be calculated using the equation:</p> $s = v t$ <p>The relationship between distance and time can be shown graphically. This can then be used to calculate values for speed, acceleration and deceleration.</p> <p>Newton's Laws consider what happens to an object's motion depending on the forces acting upon it. The distance it takes for a vehicle to stop is dependent upon the reaction time (thinking distance) and the braking distance. Various external factors influence stopping distance.</p> <p><b>SEPARATE SCIENCE:</b> Momentum can be calculated using:</p> $p = m v$ <p>In a closed system, momentum is conserved. When a force acts on an object that is moving, or able to move, a change in momentum occurs.</p>	<p>Electromagnetic waves transfer energy from the source of the waves to an absorber.</p> <p>The waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency.</p> <p>Whilst some electromagnetic waves have useful applications, they can also present dangers for the human body.</p> <p><b>SEPARATE SCIENCE:</b> A lens forms an image by refracting light. The magnification produced by a lens can be calculated using:</p> $\text{Magnification} = \frac{\text{image height}}{\text{object height}}$ <p>Each colour within the visible light spectrum has its own narrow band of wavelength and frequency.</p> <p>A perfect black body is an object that absorbs all of the radiation incident on it. A black body does not reflect or transmit any radiation.</p>	<p>The poles of a magnet are the places where the magnetic forces are strongest.</p> <p>The region around a magnet where a force acts on another magnet is called the magnetic field. The direction of a magnetic field line is from the north (seeking) pole of a magnet to the south (seeking) pole of the magnet.</p> <p>A magnetic compass contains a small bar magnet. The Earth has a magnetic field. The compass needle points in the direction of the Earth's magnetic field.</p> <p>When a current flows through a conducting wire a magnetic field is produced around the wire. The strength of the magnetic field depends on the current through the wire and the distance from the wire.</p> <p>When a conductor carrying a current is placed in a magnetic field the magnet producing the field and the conductor exert a force on each other. This is called the motor effect.</p> <p><b>SEPARATE SCIENCE:</b> Loudspeakers and headphones use the motor effect to convert variations in current in electrical circuits to the pressure variations in sound waves.</p>	<p><b>THIS COMPONENT IS FOR SEPARATE SCIENCE STUDENTS ONLY</b></p> <p>The Sun (a star) was formed from a cloud of dust and gas (nebula) pulled together by gravitational attraction.</p> <p>Each star goes through a life cycle which is determined by the size of the star.</p> <p>Gravity provides the force that allows planets and satellites (both natural and artificial) to maintain their circular orbits.</p> <p>There is an observed increase in the wavelength of light from most distant galaxies. The further away the galaxies, the faster they are moving and the bigger the observed increase in wavelength. This effect is called red-shift.</p> <p><b>ALL STUDENTS WILL ALSO COMPLETE EXAM PREPARATION:</b> Extensive and explicit recall of knowledge to facilitate effective rehearsal of exam technique.</p>	
		<b>Waves</b>				



	<p>Nuclear fusion is the joining of two light nuclei to form a heavier nucleus.</p>	<p>Waves can be described as either transverse or longitudinal. Their motion can be described in terms of their amplitude, wavelength, frequency and period.</p> <p><b>SEPARATE SCIENCE:</b> Waves can be reflected at the boundary between two different materials.</p> <p>The differences in velocity, absorption and reflection of different waves in solids and liquids allow them to be used for detection and exploration.</p>		<p>The generator effect: this can be used in an alternator to generate ac and in a dynamo to generate dc.</p>	<p>Links between different sections of knowledge are embedded further.</p>	
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