

Year 7	Substantive Knowledge	Disciplinary Knowledge	Assessment
Half-term 1	<p><b><u>Introduction to Science</u></b></p> <ul style="list-style-type: none"> <li>• Know the names of key pieces of scientific equipment</li> <li>• Know the hazard symbols for toxic, long term health hazard, flammable, explosive, dangerous to environment, corrosive, oxidising, gas under pressure and harmful/irritant.</li> <li>• Know how to Label a Bunsen burner</li> <li>• Know the stages in planning and reviewing an investigation (Introduction, hypothesis, variables, equipment list, diagram, method, table, graph, conclusion and evaluation)</li> <li>• Know which type of data requires a line graph and which requires a bar chart</li> </ul> <p><b><u>Organisms 1 (movement and cells)</u></b></p> <ul style="list-style-type: none"> <li>• Know the hierarchy of organisation in multicellular organisms: cells→tissues→organs→organ systems→organism; and give</li> </ul>	<ul style="list-style-type: none"> <li>✓ Be able to use key pieces of scientific equipment safely and accurately, including a Bunsen burner</li> <li>✓ Be able to use chemicals safely considering their hazard symbols</li> <li>✓ Be able to identify the 3 types of variable in an investigation</li> <li>✓ Be able to plan, carry out and evaluate an investigation</li> <li>✓ Be able to construct a graph</li> <li>✓ Explore how the skeletal system and muscular system in a chicken wing work together to cause movement</li> <li>✓ Be able to prepare a sample of cheek cells.</li> <li>✓ Be able to focus a microscope</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Practical write up</li> <li><input type="checkbox"/> IA on Organisms 1 key knowledge</li> <li><input type="checkbox"/> KA on Organisms 1</li> </ul>

	<p>examples of each in both animals and plants.</p> <ul style="list-style-type: none"> <li>• Know that the skeleton is made of bones that work together to provide support, protection, movement, and making blood cells.</li> <li>• Know examples of hinged, fixed, and ball and socket joints (elbow/knee and hip) and be able to label them on a skeleton.</li> <li>• Know that muscle cells work together as antagonistic pairs to cause movement. Label bicep/triceps (and tendons) and explain how the muscles work together as an antagonistic pair to move bones.</li> <li>• Know that living organisms are made of cells, and that cells can be viewed under a microscope. Know how to calculate the magnification of a microscope and the different parts of a light microscope.</li> <li>• Know that an animal cell consists of a nucleus, cell membrane, cytoplasm and mitochondria. State the function of these parts and label them on a diagram.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Be able to identify and label cell diagrams</li> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	
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	<ul style="list-style-type: none"><li>• Know that in addition to a nucleus, cell membrane, cytoplasm and mitochondria, plant cells also contain a cell wall, vacuole, and often chloroplasts. State the function of these parts and label them on a diagram. Know how to prepare a sample of onion cells.</li><li>• Know that a specialised cell has structural adaptations to make it better suited to carry out a particular job. Explain how nerve, sperm, red blood, root hair, and palisade (leaf) cells are adapted to their function.</li><li>• Know that oxygen, carbon dioxide, glucose and water travel into and out of cells by diffusion. Explain what diffusion is, how to carry out the gel experiment to investigate diffusion and why multicellular organisms need organ systems to get nutrients to where they are needed.</li><li>• Know what a unicellular organism is. Label the parts of an amoeba and euglena and compare to the structure of an animal cell.</li></ul>		
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<p>Half-term 2</p>	<p><b><u>Matter 1- particle model and separating mixtures</u></b></p> <ul style="list-style-type: none"> <li>• Know that substances are made from particles</li> <li>• Know the properties of a substances, according to the arrangement and movement of particles</li> <li>• Know how the properties of a substance change as it changes state, and how energy effects this change</li> <li>• Know the process of diffusion and factors which effect it</li> <li>• Know how to describe gas pressure</li> <li>• Know the difference between solute, solvent, soluble and insoluble</li> <li>• Know how and why we separate mixtures using filtration, evaporation, distillation and chromatography</li> <li>•</li> </ul> <p><b><u>Energy 1 – costs and transfers</u></b></p> <ul style="list-style-type: none"> <li>• Know that food contains energy</li> <li>• Know that different foods have different energy content, and different situations have different energy requirements</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul> <ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on Particle model and separating mixtures</li> <li><input type="checkbox"/> KA on Particle model and separating mixtures</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul> <ul style="list-style-type: none"> <li><input type="checkbox"/> IA on energy 1</li> <li><input type="checkbox"/> KA on energy 1</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>
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	<ul style="list-style-type: none"> <li>• Know the difference between renewable and non-renewable energy resources</li> <li>• Know the advantages and disadvantages of fossil fuels, hydroelectric power, tidal, wave, solar, nuclear, biomass</li> <li>• Know the difference between energy and power</li> <li>• Know how to calculate power, what units it has and be able to compare the power of different appliances</li> <li>• Know what the law of conservation of energy states</li> <li>• Know the difference between energy stores and energy transfers</li> <li>• Know the meaning of energy dissipation</li> <li>• Know how to calculate energy efficiency</li> </ul>		
<p>Half-term 3</p>	<p><b><u>Genes 1 – variation and human reproduction</u></b></p> <ul style="list-style-type: none"> <li>• Know there are 2 types of <b>variation</b> &amp; to be able to categorise observations of variations</li> <li>• (<b>inherited</b> and <b>environmental</b>)</li> </ul>	<p>.</p> <ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on genes 1</li> <li><input type="checkbox"/> KA on genes 1</li> <li><input type="checkbox"/> Homework</li> </ul>

	<ul style="list-style-type: none"> <li>• To plot variations appropriately using a range of graphs linked to <b>continuous</b> and <b>discontinuous</b> data. (bar charts, line graphs &amp; histograms)</li> <li>• Know that animals have <b>adaptations</b> to a variety of habitats, and changes within that <b>habitat</b>.</li> <li>• Know the terms <b>adolescence</b> and <b>puberty</b> and the changes that occur during these times.</li> <li>• To identify and describe the male and female <b>reproductive systems</b>. (ovaries, oviducts, cervix uterus, vagina, Testes scrotum, sperm tube, penis)</li> <li>• To define the term <b>fertilisation</b> and understand why some people are <b>infertile</b>.</li> <li>• To know what occurs during <b>gestation</b> and birth.</li> <li>• To know the effects of drugs (cigarettes and alcohol) on a foetus.</li> <li>• To know the key events of the human <b>menstrual cycle</b> (menstruation, ovulation, lining building, lining maintaining)</li> <li>• To know how <b>contraception</b> methods are used to prevent unwanted pregnancies.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> In class assessment</li> <li><input type="checkbox"/> Mid year Assessment</li> </ul>
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<p>Half-term 4</p>	<p><b><u>Forces 1 – speed and gravity</u></b></p> <ul style="list-style-type: none"> <li>• Name and describe forces as <b>contact</b> or <b>non-contact</b>.</li> <li>• Know that forces are measured in <b>newtons</b></li> <li>• Describe what '<b>interaction pair</b>' means</li> <li>• Identify forces as balanced or unbalanced</li> <li>• Describe situations that are in <b>equilibrium</b></li> <li>• Draw a force diagram</li> <li>• Calculate <b>resultant force</b></li> <li>• State the speed equation and use it to calculate <b>speed</b></li> <li>• Choose equipment to make appropriate measurements for time and distance to calculate <b>speed</b></li> <li>• Describe relative motion</li> <li>• Describe and use a distance time graph</li> <li>• Use a distance–time graph to describe a journey qualitatively</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on forces 1</li> <li><input type="checkbox"/> KA on forces 1</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>

	<ul style="list-style-type: none"> <li>• Calculate speed from a distance time graph</li> <li>• Plot a distance time graph</li> <li>• State the force that holds planets and moons in orbit around larger bodies</li> <li>• State g on the Earth and the moon</li> <li>• Use the formula weight = mass × g</li> </ul> <p><b><u>Reactions 1 – metals and non-metals, and acids and alkalis.</u></b></p> <ul style="list-style-type: none"> <li>• Know the difference between a chemical reaction and a physical change and be able to give examples of each (burning / melting)</li> <li>• Know the difference between an acid and an alkali. Name examples of each. Understand the difference between the terms ‘concentrated’ and ‘dilute’</li> <li>• Know what an indicator is (Universal, phenolphthalein). Understand how the pH scale can tell you how strong/weak and acid/alkali is. Know that pH7 is neutral.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on reactions 1</li> <li><input type="checkbox"/> KA on reactions 1</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>
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	<ul style="list-style-type: none"><li>• Know the difference between a strong and a weak acid, stating examples of each (hydrochloric / ethanoic)</li><li>• Know what happens in a neutralisation reaction and how they are useful (indigestion tablets)</li><li>• Know what a salt is and be able to describe a method to prepare a sample of a salt using a neutralisation reaction. Know that the type of salt produced is determined by the reactants it is made from.</li><li>• Know what an element is. Give examples of both metal and non-metal elements</li><li>• Know that a metal oxide is formed from the reaction between a metal and oxygen. Write word equations for the reaction. Know that the metal has been oxidised.</li><li>• Know that when a metal reacts with an acid a salt and hydrogen are formed. Be able to name the salt produced. Compare the reactivity of different metals using rate of bubbles produced.</li></ul>		
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	<ul style="list-style-type: none"> <li>• Know the products of the reaction between a metal and water. Compare the reactions of metals with water. Use the reactivity series to predict reactions.</li> <li>• Know what a displacement reaction is and why they happen. Be able to predict whether a reaction will happen or not using the reactivity series.</li> </ul>		
<p>Half-term 5</p>	<p><b><u>Ecosystems1 – interdependence and plant reproduction</u></b></p> <ul style="list-style-type: none"> <li>• Describe how a <b>food web</b> shows the feeding relationship within the habitat, using key words such as producer, prey and predator</li> <li>• Know the term <b>interdependence</b>, and explain how toxins such as DDT or mercury can affect a <b>food chain</b> known as Bioaccumulation.</li> <li>• Use <b>pyramids of biomass and number</b> to represent data from food chains.</li> <li>• Know that organisms co-exist within their own <b>niche</b> within a habitat</li> <li>• Know that <b>quadrats</b> can be used to take measurements in an ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on ecosystems 1</li> <li><input type="checkbox"/> KA on ecosystems 1</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> <li><input type="checkbox"/> End of Year Assessment</li> </ul>

	<ul style="list-style-type: none"> <li>• Know organisms compete for resources such as food, territory, light, minerals .</li> <li>• Describe the main parts of a flower and how <b>pollination</b> occurs</li> <li>• Describe fertilisation and <b>germination</b> in plants</li> <li>• Be able to use observations to collect data and complete calculations (percentage germination and averages)</li> <li>• Know why seeds and fruit are formed</li> <li>• Describe how the shape of seeds effect their <b>dispersal</b></li> </ul>	<p>✓</p>	
<p>Half-term 6</p>	<p><b><u>Electromagnets 1 -voltage and resistance and current</u></b></p> <ul style="list-style-type: none"> <li>• Know the symbols for the following circuit components; Cell, Battery, Bulb, Switch, Voltmeter, Ammeter, Resistor, Buzzer, Motor</li> <li>• Know the difference between a series and parallel circuit</li> <li>• Know what electrical conductors and insulators are and be able to give an example of each</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on electromagnets 1</li> <li><input type="checkbox"/> KA on electromagnets 1</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> <li><input type="checkbox"/> IA on waves 1</li> <li><input type="checkbox"/> KA on waves 1</li> </ul>

	<ul style="list-style-type: none"><li>• Know what is meant by voltage – describe it, state its units and explain what happens if more cells added</li><li>• Know what is meant by current- describe it, state its units and explain what happens if the voltage or resistance change</li><li>• Know what is meant by resistance –describe it, be able to calculate it using <math>R=I/V</math>, state its units and explain how it affects current</li><li>• Know what causes static electricity</li><li>• Know what happens when 2 positively charged objects interact and when a positive and negative objects interact</li></ul> <p><b><u>Waves 1 – sound and light</u></b></p> <ul style="list-style-type: none"><li>• Know sources of sound and how it travels</li><li>• Know how to define amplitude, frequency and wavelength, and link loudness and amplitude</li><li>• Know what auditory range means</li><li>• Know the difference between frequency and pitch</li><li>• Know how to label the ear, and how it works</li></ul>		<ul style="list-style-type: none"><li><input type="checkbox"/> Homework</li><li><input type="checkbox"/> In class assessment</li></ul>
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	<ul style="list-style-type: none"><li>• Know the speed of light and how it interacts with different materials</li><li>• Know how to construct and use ray diagrams to show how light reflects off mirrors</li><li>• Know how to describe refraction, and explain what happens when light is refracted through a convex and a concave lens</li><li>• Know how to label the eye with: optic nerve, iris, pupil, retina, lens and a cornea</li><li>• Know what happens to light when it passes through a prism</li><li>• Know how frequency affects colours or light, and the effect of coloured filters on light</li></ul>		
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Year 8	Substantive Knowledge	Disciplinary Knowledge	Assessment
Half-term 1	<p><u>Earth 1 - Earths structure and universe</u></p> <ul style="list-style-type: none"> <li>• Name and describe the different layers in Earth (Crust, mantle, core (inner and outer). State what a rock and a mineral are and give examples e.g. limestone is made of calcium carbonate.</li> <li>• Know the name of a sedimentary rock (limestone), describe how it was formed (weathering, erosion and transport, deposition, compaction and cementation), and state its structure / properties (layers, porous, soft, separate grains).</li> <li>• Know the name of an igneous rock (granite and basalt), describe how it was formed (magma / lava cooling), describe structure and properties (interlocking crystals, hard, durable, non-porous).</li> <li>• Know the name of a metamorphic rock (marble), describe how it was formed (from limestone being heated in Earth’s crust), describe structure and properties (non-porous, crystals)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on Earth 1</li> <li><input type="checkbox"/> KA on Earth 1</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>

	<ul style="list-style-type: none"><li>• Describe the stages in the rock cycle.</li><li>• Give examples (glass, pottery) and describe the properties of ceramics (hard, brittle, stiff, high melting points, electrical insulators, unreactive). Link properties of ceramics to uses. Plan a method to compare the strength of different ceramics.</li><li>• Name objects that can be seen in the night sky (stars, moons, planets, satellites). State that distances in space are measured in light years and know that a light year is the distance that light travels in one year. Explain why light years are used rather than, for example, metres. Describe and give examples of a: planet, star, galaxy, Universe.</li><li>• Know the structure of the Solar System (Sun (a star) at the centre, Mercury, Venus, Earth, Mars, <b>asteroid belt</b>, Jupiter, Saturn, Uranus, Neptune) and that planets orbit the Sun in elliptical orbits.</li><li>• Name the four seasons we have on Earth. Explain why we have</li></ul>		
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	<p>seasons (Earths tilted axis). Describe and explain the motion of the Sun, stars, and Moon across the sky. Use data to describe and explain changes in day length throughout the year in different hemispheres.</p> <ul style="list-style-type: none"> <li>Name and describe the phases of the moon (new, crescent, first quarter, gibbous, full, gibbous, third quarter, crescent). Name the current model of the Solar system (heliocentric) and compare it to other models throughout history (geocentric, Ptolemy, Galileo)</li> </ul> <p><u>Matter 2 – Periodic table and Elements</u></p> <ul style="list-style-type: none"> <li>Know what makes an element</li> <li>Know the first 16 elements names and symbols</li> <li>Know the difference between an element, a mixture and a compound</li> <li>Know how to represent elements, compounds and mixtures using particle models</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on matter 2</li> <li><input type="checkbox"/> KA on matter 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>
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	<ul style="list-style-type: none"> <li>• Know how to identify elements and their proportions in chemical formulae.</li> <li>• Know the structure of the periodic table, including the horizontal periods and vertical groups</li> <li>• Know how to describe trends in the periodic table</li> <li>• Know how and why group 1 elements change in reactivity as you go down the group</li> <li>• Know how and why group 7 elements change in reactivity as you go down the group</li> <li>• Know why group 0 elements are unreactive</li> </ul>		
<p>Half-term 2</p>	<p><b><u>Electromagnets 2 – Electromagnets and magnetism</u></b></p> <ul style="list-style-type: none"> <li>- Know that the strongest parts of a magnet are the poles and the magnetic field lines will be closer together here</li> <li>- Know how to draw the magnetic field lines around a bar magnet</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on electromagnets 2</li> <li><input type="checkbox"/> KA on electromagnets 2</li> <li><input type="checkbox"/> Homework</li> </ul>



	<p>Explain how to, and carry out, a lung volume test.</p> <ul style="list-style-type: none"><li>• Describe the differences between recreational and medicinal drugs. Name, and describe the effects of, two medicinal and two recreational drugs.</li><li>• Name and describe the effects of tobacco smoke and alcohol on the health of 'normal' and pregnant people.</li><li>• Name the nutrients needed for a healthy diet and why we need them. Describe a healthy diet and interpret food labels to plan a healthy menu.</li><li>• State and describe how you would test foods for the presence of: starch, lipids, sugar and proteins. Know positive and negative experimental results for each test.</li><li>• State that people require different amounts of energy. State and describe some health issues caused by an unhealthy diet. Calculate energy requirements for different people.</li></ul>		
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	<ul style="list-style-type: none"> <li>Name and describe the structure and function of the main parts of the digestive system.</li> <li>State what an enzyme and bacteria are and describe the role they play in digestion. Carry out an experiment to investigate enzyme action.</li> </ul>		
<p>Half-term 3</p>	<p><u>Reactions 2 –Chemical energy and types of reaction</u></p> <ul style="list-style-type: none"> <li>Know that in a chemical reaction, atoms are conserved – the atoms in the reactants rearrange to form the products. Be able to write word equations for a reaction and label the reactants and products (nitrogen + oxygen → nitrogen dioxide). Draw particle diagrams to show what happens to atoms in a reaction.</li> <li>State what a fuel is and give examples of renewable (wood)and non -renewable (fossil) fuels.</li> <li>State what a combustion reaction is and be able to write and draw particle diagrams for the</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on reactions 2</li> <li><input type="checkbox"/> KA on reactions 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li>   <li><input type="checkbox"/> IA on energy 2</li> <li><input type="checkbox"/> KA on energy 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> <li><input type="checkbox"/> Mid Year Assessment</li> </ul>

	<p>combustion of carbon and methane.</p> <ul style="list-style-type: none"><li>• State what a thermal decomposition reaction is, giving calcium carbonate as an example.</li><li>• State and explain what is meant by the conservation of mass, giving examples.</li><li>• Describe what an exothermic and endothermic reaction are. Know how to identify an exo or endo thermic reaction experimentally.</li><li>• Be able to draw energy profile diagrams for both endo and exo thermic reactions.</li><li>• State that in a chemical reaction bonds in the reactants are broken and new bonds are formed to form the products. Breaking bonds requires energy, making bonds releases energy. Be able to carry out simple bond energy calculations for a given chemical reaction to determine if a reaction is going to be endo or exo thermic.</li><li>• State what a catalyst is. Describe how a catalyst affects the reaction in relation to activation</li></ul>		
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	<p>energy. Be able to draw the alternate pathway on the energy profile diagram</p> <p><b><u>Energy 2 – Work and heating and cooling</u></b></p> <ul style="list-style-type: none"><li>• Know how to calculate energy transferred/work done</li><li>• Know how machines can change the size of a force</li><li>• Know the law of conservation of energy</li><li>• Know the difference between energy and temperature</li><li>• Know how energy is transferred in conduction, and what state conduction takes place through</li><li>• Know how energy is transferred in convection and that it only takes place in fluids</li><li>• Know how to explain the formation of a convection current</li><li>• Know the difference between insulators and conductors</li><li>• Know some sources and properties of infra-red radiation</li></ul>		
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<p>Half-term 4</p>	<p><b><u>Genes 2 – Evolution and inheritance</u></b></p> <ul style="list-style-type: none"> <li>• State that organisms have changed over time, giving examples</li> <li>• Describe the process of natural selection</li> <li>• Describe the evidence that Darwin used to develop his theory of natural selection</li> <li>• State what is meant by biodiversity</li> <li>• Describe some factors that may lead to extinction</li> <li>• Interpret evidence provided in scientific texts</li> <li>• State what is meant by an endangered species</li> <li>• Name one way of protecting endangered species</li> <li>• Explain some of the advantages and disadvantages of captive breeding</li> <li>• Describe the relationship between DNA, genes, and chromosomes</li> <li>• State what is meant by a mutation</li> <li>• Name four scientists who worked on the structure of DNA</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul> <ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on genes 2</li> <li><input type="checkbox"/> KA on genes 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>
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	<ul style="list-style-type: none"> <li>• Describe the structure of DNA</li> <li>• Complete a Punnett square to state how many offspring will have a particular characteristic</li> <li>• Describe the difference between dominant and recessive alleles</li> <li>• State what is meant by genetic modification</li> <li>• Describe how an organism can be genetically modified to display a desired characteristic</li> </ul>		
<p>Half-term 5</p>	<p><b><u>Forces 2 – Contact forces and Pressure</u></b></p> <ul style="list-style-type: none"> <li>• Describe the effect of drag forces and friction</li> <li>• Write down two things an object can do when the resultant force on it is zero</li> <li>• Plan and carry out an experiment to investigate friction, selecting suitable equipment</li> <li>• Describe how forces deform objects</li> <li>• Present data in a graph and identify a quantitative relationship in the pattern</li> <li>• Describe what is meant by a moment</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on forces 2</li> <li><input type="checkbox"/> KA on forces 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> <li><input type="checkbox"/> End of Year Assessment</li> </ul>



	<ul style="list-style-type: none"><li>• State the equation to calculate a turning force</li><li>• Calculate the moment of a force</li><li>• Describe the motion of particles in liquids and gases</li><li>• Calculate fluid pressure with support</li><li>• State the cause of atmospheric pressure</li><li>• Explain why fluids exert a pressure</li><li>• State simply what happens to pressure with depth</li><li>• Use the equation for calculating fluid pressure</li><li>• Explain why some things float and some things sink, using force diagrams</li><li>• State the equation of stress</li><li>• Calculate stress</li><li>• Predict qualitatively the effect of changing area and/or force on stress</li> <li>•</li></ul>		
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		<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Planning investigations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/></li> </ul>
<p>Half-term 6</p>	<p><b><u>Ecosystems 2 – Respiration and Photosynthesis</u></b></p> <ul style="list-style-type: none"> <li>• Describe the process of anaerobic and aerobic respiration</li> <li>• Plan an investigation to measure the effect of exercise on breathing rates</li> <li>• State the word equation for anaerobic respiration Describe the differences between aerobic and anaerobic respiration</li> <li>• Write the word equation for fermentation</li> <li>• Describe how bread, beer, and wine are made</li> <li>• Carry out an investigation into temperature on fermentation</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on waves 2</li> <li><input type="checkbox"/> KA on waves 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li>   <li><input type="checkbox"/> IA on ecosystems 2</li> <li><input type="checkbox"/> KA on ecosystems 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>

	<ul style="list-style-type: none"><li>• State how to test for the presence of oxygen</li><li>• State where photosynthesis occurs in a plant</li><li>• State the word equation for photosynthesis</li><li>• List the factors that affect the rate of photosynthesis</li><li>• Carry out and record observations for an experiment to test for the presence of starch in a leaf</li><li>• List the factors that affect the rate of photosynthesis</li><li>• Carry out and record observations for an experiment to test for the presence of starch in a leaf</li><li>• Name the minerals required by plants</li><li>• Describe how a plant uses minerals for healthy growth</li><li>• Explain deficiency symptoms in plants</li></ul> <p><b><u>Waves 2 – Wave effects and properties</u></b></p> <ul style="list-style-type: none"><li>• Know how to define frequency and amplitude</li></ul>		
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	<ul style="list-style-type: none"><li>• Know how to describe how a microphone and loudspeaker work and be able to label both</li><li>• Know the waves involved in the electromagnetic spectrum and be able to order them according to frequency and wavelength</li><li>• Know the difference between transverse and longitudinal waves</li><li>• Know what happens when waves superpose</li></ul>		
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Year 9	Substantive Knowledge	Disciplinary Knowledge	Assessment
Half-term 1	<p><b><u>Earth 2 – climate and Earths resources</u></b></p> <ul style="list-style-type: none"> <li>• State what the greenhouse effect and global warming are. Know that the percentage of gases in the present-day atmosphere is: nitrogen 78%, oxygen 21%, 1% argon, 0.04% carbon dioxide</li> <li>• Describe the stages in the carbon cycle. C added to atmosphere via respiration, combustion, coming out of solution. Carbon removed from atmosphere via photosynthesis and dissolving in oceans. Know what a carbon sink is and use oceans, soil, forest as examples.</li> <li>• Know why the level of CO<sub>2</sub> in the atmosphere remained relatively constant, but has increased in the last 100 years (industrialisation/burning more fossil fuels)</li> <li>• State what climate change is. Give three effects of climate change (rising sea levels/flooding, extreme weather patterns e.g. drought). Know reasons why</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on Earth 2</li> <li><input type="checkbox"/> KA on Earth 2</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>

	<p>scientists think humans are causing climate change (compare data from graphs etc)</p> <ul style="list-style-type: none"> <li>• Know what an ore is and be able to name two examples-bauxite and haematite. Name and briefly describe the processes of carbon reduction (including general equation) and electrolysis. Know that the method of extraction depends on the reactivity of the metal.</li> <li>• Know the meanings of the terms ‘reduce, reuse, recycle’ and that reducing is the best way to minimise the impact of humans on the environment. Use a plastic bottle to demonstrate the three Rs. Describe why recycling metals like aluminium are better for the environment than extracting more from ores.</li> </ul> <p><b><u>Forensics Science</u></b></p> <ul style="list-style-type: none"> <li>• Know how to observe a crime scene and to avoid cross-contamination</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> IA on Forensics</li> <li><input type="checkbox"/> KA on Forensics</li> </ul>
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	<ul style="list-style-type: none"> <li>• Know how to use forensic techniques to collect valid evidence at a crime scene</li> <li>• Know how to use various techniques to analyse evidence collected including:             <ol style="list-style-type: none"> <li>1. Blood pattern analysis</li> <li>2. Chemical analysis – flame tests</li> <li>3. Chromatography</li> <li>4. Soil analysis – pH</li> <li>5. Fibre analysis – microscopes</li> <li>6. Fingerprinting</li> </ol> </li> <li>• Collect witness evidence and describe limitations of this</li> <li>• Evaluate evidence collected and surmise from findings</li> <li>• Understand bias and limitations of forensic evidence</li> </ul>	<ul style="list-style-type: none"> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Linking Science to real life application</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>
<p>Half-term 2</p>	<p><b><u>Prep for GCSE Biology</u></b></p> <ul style="list-style-type: none"> <li>• I can label an animal cell</li> <li>• I can label a plant cell</li> <li>• I can describe the function of the nucleus, cell membrane and cytoplasm in an animal/plant cell</li> <li>• I can describe the function of the chloroplasts and starch in plant cells</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Assessment on Biology section prep course</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>





<p>Half-term 3</p>	<ul style="list-style-type: none"> <li>• I can represent the following simple molecules as formula; Water, Calcium carbonate, Carbon dioxide and hydrochloric acid.</li> <li>• I can name the salts produced by the 3 main acids we use in Science.</li> <li>• I can write simple word equations and know the difference between a reactant and a product</li> <li>• I can balance simple symbol equations</li> <li>• I can work out how many protons, neutrons and electrons any atom has on the periodic table</li> <li>• I can draw the basic structure of an atom and give the electron configuration</li> <li>• I can name the 3 types of bond and what they are between</li> <li>• I can describe how global warming and acid rain are caused and the negative effects of these</li> </ul> <p><b><u>Prep for GCSE Physics</u></b></p> <ul style="list-style-type: none"> <li>• Be able to select an appropriate equation from an equation sheet</li> <li>• Use the equation <math>\text{Speed} = \frac{\text{distance}}{\text{time}}</math> and rearrange</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> </ul>	
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	<ul style="list-style-type: none"><li>• Be able to put any 3 item equation into a formula triangle</li><li>• Know about the different types of renewable and non-renewable fuels</li><li>• Be able to state the units of the following things; energy, potential difference, current and resistance</li><li>• Be able to convert simple units including:<ul style="list-style-type: none"><li>• minutes into seconds or hours</li><li>• Kilo and milli into standard units and back</li></ul></li><li>• Draw what particles in a solid, liquid and gas look like and give the names for the main state changes.</li><li>• Be able to state 7 different forms of energy and be able to draw Sankey diagrams showing energy transfer</li><li>• I should be able to recall the EM spectrum in order and give a use for each wave in the spectrum.</li></ul>	<ul style="list-style-type: none"><li>✓ Analysing data and patterns</li><li>✓ Linking Science to real life application</li></ul>	
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<p>Half-term 4</p>	<p><b><u>AQA GCSE B1 – Cells and Transport</u></b></p> <ul style="list-style-type: none"> <li>• Describe the differences between prokaryotic cells and eukaryotic cells.</li> <li>• Describe and label eukaryotic cells (plant and animal).</li> <li>• Describe the adaptations of specialised plant (root hair, xylem and phloem) and animal (sperm, muscle and nerve) cells.</li> <li>• Describe what a stem cell is.</li> <li>• State the differences between embryonic and adult stem cells.</li> <li>• Describe how a range of illnesses and injuries can be treated using stem cells.</li> <li>• Describe the uses of, and risks involved in, cloning animals and plants.</li> <li>• State what cell differentiation means and explain why it is important.</li> <li>• Describe what happens during each of the three stages of the cell cycle.</li> <li>• Describe the procedure for preparing a microscope slide and how to view the slide under the microscope.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Linking Science to real life application</li> <li>✓ Compare cells</li> <li>✓ Explain why the development microscopes (light and electron) has improved our understanding of the structure of cells.</li> <li>✓ Rearrange and solve mathematical equations</li> <li>✓ Construct and Interpret data and graphs showing the results of osmosis investigations.</li> </ul>	<p>☐</p>
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	<ul style="list-style-type: none"><li>• Recall the magnification equation and use it to calculate the actual size of an object by measuring the size of its image under a microscope.</li><li>• Explain what surface area to volume ratio means and how to calculate it. Explain why it is important to some cells</li><li>• Describe what diffusion is and recognise diffusion gradients.</li><li>• List some substances that diffuse into and out of cells.</li><li>• Describe what osmosis is and the factors that affect its rate.</li><li>• Describe how to investigate osmosis in potato cells.</li><li>• Describe what active transport is and link it to diffusion gradients.</li><li>• State examples of active transport in plants (root hair cells) and animals (intestinal) cells.</li></ul>		
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<p>Half-term 5</p>	<p><b><u>AQA GCSE C1 – Atomic Structure and the periodic table</u></b></p> <ul style="list-style-type: none"> <li>• State what a mixture is and describe the correct process of separation to use when given an example of a mixture.</li> <li>• Give a simple description of an atom, including the typical size of an atom or nucleus.</li> <li>• Describe both the plum pudding and nuclear models of the atom.</li> <li>• Describe how Rutherford used the gold leaf experiment to replace the plum pudding model of the atom with his nuclear model.</li> <li>• State the different masses and charges of protons, neutrons and electrons.</li> <li>• Describe what the atomic mass and atomic number tell you about the number of protons, neutrons and electrons in an atom.</li> <li>• State where electrons are found in atoms and how the electron configuration is written.</li> <li>• Describe how scientists first ordered the elements in the</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Linking Science to real life application</li> <li>✓ Explain why mixtures can be separated.</li> <li>✓ Able to identify any of the first 20 elements from various information using the periodic table</li> <li>✓ Explain why Scientists use models and why models change overtime</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Exam style Assessment at the end of the unit</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>
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	<p>periodic table and the problem they encountered.</p> <ul style="list-style-type: none"><li>• Describe how Mendeleev solved this problem and how he was proven to be correct.</li><li>• Describe how the elements are ordered in the periodic table today and explain why.</li><li>• State what the group number and period number tell you about the structure of an atom.</li><li>• State where metals and non-metals are found on the periodic table.</li><li>• Explain why atoms form either positively or negatively charged ions.</li><li>• List the group 1 elements. State their properties and what happens to the reactivity as you move down group 1. Explain why the reactivity changes.</li><li>• Use word equations and balanced chemical equations to describe the reactions of lithium, sodium and potassium with oxygen, chlorine and water.</li><li>• List the group 7 elements and state the appearances of chlorine, bromine and iodine at room</li></ul>		
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	<p>temperature. State how the reactivity changes as you go down group 7 and explain why.</p> <ul style="list-style-type: none"> <li>• Describe how displacement reactions can be used to compare the reactivity of halogens.</li> <li>• Describe the nature of the compounds formed when chlorine, bromine and iodine react with metals and non-metals (ionic or covalent compounds?).</li> <li>• List the group 0 elements and state their properties? State how the boiling point changes as you move down group 0. Explain why the group 0 elements are unreactive.</li> </ul>		
<p>Half-term 6</p>	<p><b><u>AQA GCSE P1 – Energy</u></b></p> <ul style="list-style-type: none"> <li>• Describe the meaning of the conservation of energy.</li> <li>• Describe and calculate the following energy types; Kinetic energy, Gravitational potential energy, Elastic potential energy, Thermal energy (link to specific heat capacity).</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of substantive knowledge within different scenarios</li> <li>✓ Problem solving</li> <li>✓ Constructing explanations</li> <li>✓ Analysing data and patterns</li> <li>✓ Linking Science to real life application</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Exam style Assessment at the end of the unit</li> <li><input type="checkbox"/> Homework</li> <li><input type="checkbox"/> In class assessment</li> </ul>

	<ul style="list-style-type: none"><li>• Describe some other energy stores, specifically chemical energy and nuclear energy.</li><li>• Describe what work done means.</li><li>• From specific examples describe which energy store is emptying, the energy pathway that's transferring the energy, and then which energy store is filling.</li><li>• Describe what energy dissipation means.</li><li>• Describe what power means giving an example of the same energy transfer happening but with different power.</li><li>• Describe what specific heat capacity means.</li><li>• Calculate the specific heat capacity of one or more materials.</li><li>• Link ideas about the thermal conductivity of a material, the thickness of the material and the rate of thermal energy transfer by conduction through the material.</li><li>• Describe what efficiency means and state in what form is energy usually wasted</li></ul>		
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	<ul style="list-style-type: none"><li>• Describe ways to increase the efficiency of a given energy transfer.</li><li>• Describe the main energy resources that are available for electricity production.</li><li>• Identify resources that are renewable or non-renewable and give reasons why.</li><li>• State the three main uses of energy resources.</li><li>• Describe the environmental issues associated with different energy resources.</li><li>• Explain why some energy resources are more reliable than others.</li></ul>		
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