



Wightwick Hall High School Science Long Term Plan



2025-2026

Discoverers/Navigators/Pathfinders/Pioneers

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Working scientifically/ Genetics and evolution.	The periodic table/ Chemical changes	Forces, movement and energy	Separation techniques/ Chemistry of the atmosphere	Electricity/ waves and radiation	Health and disease/ Ecology
Pre-Teaching Assessment Suggestions	Multiple choice quiz. Ascertain what misconceptions students may have from the media.	Multiple choice quiz. Ascertain what misconceptions students may have from the media.	Multiple choice quiz. Ascertain what misconceptions students may have from the media.	Multiple choice quiz. Ascertain what misconceptions students may have from the media.	Multiple choice quiz. Ascertain what misconceptions students may have from the media.	Multiple choice quiz. Ascertain what misconceptions students may have from the media.
'Step On' Knowledge- Embedded literacy work and weekly class reading sessions.	"Working scientifically" means using scientific methods and thinking to explore questions and solve problems. It helps students understand how science works in the real world. Key skills include: Planning investigations: Asking questions, making predictions, and deciding what to measure and how. Using equipment safely and accurately: Following instructions and using tools like thermometers, microscopes, and measuring cylinders. Collecting and recording data: Using tables, charts, and graphs to organise results.	The Periodic Table is a chart that organizes all known elements based on their properties. Key points: Elements are pure substances made of one type of atom. Groups are columns in the table; elements in the same group have similar properties. Periods are rows; they show patterns in properties across the table. Metals are found on the left and centre; they are shiny, conduct electricity, and are malleable. Non-metals are on the right; they are often dull, brittle, and poor conductors. Special groups:	<i>Forces are pushes or pulls that can change an object's speed, direction, or shape.</i> Measured in newtons (N). Types of forces include: Gravity – pulls objects towards Earth. Friction – resists motion between surfaces. Air resistance – slows objects moving through air. Contact and non- contact forces – some forces need contact (e.g. friction), others don't (e.g. gravity).	Filtration: Used to separate insoluble solids from liquids (e.g. sand from water). Evaporation: Removes liquid from a solution to leave the dissolved solid behind (e.g. salt from saltwater). Sieving: Separates larger solids from smaller ones using a mesh or sieve (e.g. stones from flour). Magnetism: Separates magnetic materials from non-magnetic ones (e.g. iron filings from sand). Decanting: Gently pouring off a liquid to leave behind a heavier solid (e.g. muddy water). Distillation (introduced simply): Separates liquids based on boiling points (e.g. water from ink).	Electric circuits: Learn how to build and interpret simple circuits using components like batteries, bulbs, switches, and wires. Current and voltage: Understand that <i>current</i> is the flow of electric charge, and <i>voltage</i> is the energy per charge. Resistance: Discover how materials resist the flow of electricity, affecting how bright bulbs shine or how fast motors run. Series and parallel circuits: Compare how components behave in different circuit arrangements. Waves Types of waves: <i>Transverse waves</i> (e.g. light) move perpendicular to the	Health is a state of physical and mental well-being. Communicable diseases are caused by pathogens (bacteria, viruses, fungi, parasites) and can spread between organisms. Non-communicable diseases include lifestyle-related conditions like heart disease and diabetes. Immune system defends the body using white blood cells and antibodies. Vaccinations help prevent disease by triggering immunity. Drugs and medicine treat or prevent illness; antibiotics target bacteria but not viruses. Lifestyle choices (diet, exercise, smoking,



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	<p>Analysing results: Looking for patterns, relationships, and drawing conclusions. Evaluating methods: Thinking about how reliable and accurate the investigation was, and suggesting improvements. Using scientific language: Explaining ideas clearly using correct terms and concepts. Genetics is the study of how traits are passed from parents to offspring. These traits are controlled by genes, which are made of DNA. Key ideas: Inherited characteristics come from parents (e.g. eye colour, blood type). Variation exists between individuals due to genetic differences and environmental factors. Chromosomes carry genes and are found in the nucleus of cells. Evolution explains how living things change over time. It happens through: Natural selection - organisms with traits</p>	<p>Group 1 (Alkali metals): Very reactive, especially with water. Group 7 (Halogens): Reactive non-metals that form salts. Group 0 (Noble gases): Very unreactive gases. Chemical Changes involve reactions that form new substances. Key reactions: Combustion - burning substances in oxygen. Displacement - a more reactive element replaces a less reactive one. Neutralisation - acids react with bases to form salt and water. Oxidation and reduction - gaining or losing oxygen.</p>	<p><i>Movement is described using speed, distance, and time.</i></p> <p><i>The faster an object moves, the more distance it covers in less time.</i></p> <p>Speed = Distance ÷ Time <i>Energy is needed to do work and comes in different forms:</i></p> <p>Kinetic energy - energy of movement. Gravitational potential energy - stored in raised objects. Elastic potential energy - stored in stretched or compressed objects. Thermal energy - related to heat. Energy transfers happen when energy moves from one form to another (e.g. chemical energy in fuel to kinetic energy in a car). Energy is conserved, meaning it's never lost, just transferred or transformed.</p>	<p>Composition of the Atmosphere</p> <p>Modern atmosphere: About 78% nitrogen, 21% oxygen, and small amounts of carbon dioxide, argon, and water vapour. Early atmosphere: Mostly carbon dioxide, with little or no oxygen. Volcanic activity released gases like methane and ammonia. Greenhouse Effect</p> <p>Natural process: Greenhouse gases trap heat, keeping Earth warm enough for life. Main greenhouse gases: Carbon dioxide, methane, and water vapour. Human impact: Burning fossil fuels and deforestation increase greenhouse gases, leading to global warming. Pollutants and Their Effects</p> <p>Carbon monoxide: Toxic gas from incomplete combustion. Sulfur dioxide and nitrogen oxides: Cause acid rain, damaging ecosystems and buildings.</p>	<p>direction of energy transfer. Longitudinal waves (e.g. sound) move parallel to the direction of energy transfer. Wave properties: Key terms include wavelength, frequency, amplitude, and speed. Sound waves: Explore how sound travels through solids, liquids, and gases, and how pitch and volume are affected. Light waves: Learn about reflection, refraction, and how light interacts with different materials. Radiation</p> <p>Electromagnetic spectrum: Understand the range of EM waves from radio waves to gamma rays, including their uses and dangers. Visible light: Study how white light splits into colours and how filters affect what we see. Infrared and ultraviolet: Learn how these invisible forms of radiation are used in remote controls, tanning, and detecting heat.</p>	<p>alcohol) affect long-term health. Ecology</p> <p>Ecosystems consist of living organisms (biotic) and their physical environment (abiotic). Habitats are places where organisms live and reproduce. Adaptations help organisms survive in specific environments. Food chains and webs show how energy flows between producers, consumers, and decomposers. Interdependence means organisms rely on each other for survival. Sampling techniques help study populations and biodiversity. Human impact includes pollution, deforestation, and climate change, which affect ecosystems.</p>
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	<p>that help them survive are more likely to reproduce and pass on those traits.</p> <p>Adaptation – species develop features that help them live in their environment.</p> <p>Extinction – when a species can no longer survive or reproduce. Students also learn about the work of scientists like Charles Darwin, who developed the theory of evolution by natural selection.</p>			<p>Particulates: Tiny particles that can cause <i>respiratory problems</i> and reduce air quality.</p> <p>Climate Change</p> <p>Driven by increased greenhouse gases. Leads to rising temperatures, melting ice caps, extreme weather, and habitat loss.</p>	<p>Safety with radiation: Recognize that some types of radiation (like UV and X-rays) can be harmful and require protection.</p>	
<p>'Extending up' Knowledge</p>	<p>Key areas include:</p> <p><i>1. Scientific Thinking</i></p> <p>Understanding scientific concepts and models</p> <p>Explaining phenomena using evidence and reasoning</p> <p><i>2. Experimental Skills and Investigations</i></p> <p>Planning investigations with clear variables (independent, dependent, control)</p> <p>Using appropriate equipment and techniques</p>	<p>The periodic table arranges elements by atomic number and groups them based on similar properties. Groups are vertical columns; elements in the same group have similar chemical behaviour. Periods are horizontal rows showing trends in properties.</p> <p>Group 1 (Alkali metals): Very reactive, especially with water; reactivity increases down the group.</p> <p>Group 7 (Halogens): Reactive non-metals; reactivity decreases down the group.</p>	<p><i>Forces are measured in newtons (N) and can change an object's speed, direction, or shape.</i></p> <p>Types of forces include:</p> <p>Gravity – pulls objects towards Earth.</p> <p>Friction and air resistance – oppose motion.</p> <p>Contact and non-contact forces – some require physical contact, others (like gravity and magnetism) do not.</p> <p>Resultant force: The overall force acting on an object, which determines its motion.</p>	<p>Filtration</p> <p><i>Purpose:</i> Separates an insoluble solid from a liquid.</p> <p><i>Example:</i> Removing sand from water.</p> <p><i>How it works:</i> A mixture is poured through filter paper; the liquid (filtrate) passes through, while the solid (residue) remains.</p> <p>Crystallisation</p> <p><i>Purpose:</i> Separates a soluble solid from a solution.</p> <p><i>Example:</i> Extracting salt from saltwater.</p> <p><i>How it works:</i> The solution is gently heated to evaporate some solvent, forming crystals as the solute</p>	<p>Electricity</p> <p>Current and voltage: <i>Current</i> is the flow of electric charge; <i>voltage</i> is the energy per charge.</p> <p>Resistance: Opposes current flow; calculated using Ohm's Law: $V=IR$ or $V=IR$.</p> <p>Series and parallel circuits: In series, current is the same everywhere; in parallel, voltage is the same across branches.</p> <p>Power and energy: Power = voltage × current; energy transferred = power × time.</p>	<p>Health and Disease</p> <p>Health is a state of physical and mental well-being. It can be affected by diet, stress, and life situations.</p> <p>Communicable diseases are caused by pathogens (bacteria, viruses, fungi, protists) and can spread between organisms. Non-communicable diseases include conditions like cancer, diabetes, and heart disease, often linked to lifestyle choices. Disease interactions: One disease can make a person more</p>



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<p>Making accurate measurements and observations <i>3. Analysis and Evaluation</i></p> <p>Interpreting data using graphs and calculations</p> <p>Identifying patterns, anomalies, and drawing conclusions</p> <p>Evaluating methods for reliability, accuracy, and validity <i>4. Scientific Vocabulary, Quantities, Units and Symbols</i></p> <p>Using correct scientific terms</p> <p>Applying SI units (e.g. metres, grams, seconds)</p> <p>Understanding standard symbols and equations These skills help students understand how science works in practice and prepare them for further study or careers in science. Genetics is the study of how traits are inherited through genes, which</p>	<p>Group 0 (Noble gases): Very stable and unreactive due to full outer electron shells. <i>Chemical Changes</i></p> <p>Reactivity series: A list of metals ranked by how easily they react, especially with acids and water. Displacement reactions: A more reactive metal can replace a less reactive one in a compound. Acids and bases: Acids react with bases to form salts and water (neutralisation). Electrolysis: A process that uses electricity to break down compounds, especially useful for extracting reactive metals. Oxidation and reduction: Oxidation is gaining oxygen or losing electrons; reduction is losing oxygen or gaining electrons. Students learn to use word equations and balanced symbol equations to describe chemical reactions.</p>	<p><i>Movement</i></p> <p><i>Described using distance, speed, and time.</i></p> <p>Key equation: Speed = Distance ÷ Time</p> <p>Graphs are used to show motion and interpret changes in speed. <i>Energy is measured in joules (J) and comes in forms like:</i></p> <p>Kinetic energy - energy of moving objects. Gravitational potential energy - energy stored in raised objects. Elastic potential energy - stored in stretched or compressed materials. Energy transfers occur in systems (e.g. from chemical to thermal energy). Conservation of energy: Energy cannot be created or destroyed, only transferred or stored. Students also learn about efficiency and how to calculate it.</p>	<p>becomes more concentrated. Simple Distillation <i>Purpose:</i> Separates a liquid from a solution. <i>Example:</i> Purifying water from saltwater. <i>How it works:</i> The solution is heated; the liquid with the lowest boiling point evaporates, condenses, and is collected. Fractional Distillation <i>Purpose:</i> Separates two or more miscible liquids with different boiling points. <i>Example:</i> Separating ethanol from water. <i>How it works:</i> The mixture is heated; the liquid with the lowest boiling point evaporates first and is condensed separately. Chromatography <i>Purpose:</i> Separates components of a mixture based on solubility and movement through paper. <i>Example:</i> Identifying dyes in ink. <i>How it works:</i> A spot of mixture is placed on chromatography paper and dipped in solvent; different substances</p>	<p>Waves</p> <p>Types of waves: <i>Transverse waves:</i> Vibrations are perpendicular to wave direction (e.g. light, EM waves). <i>Longitudinal waves:</i> Vibrations are parallel to wave direction (e.g. sound). Wave properties: Wavelength, frequency, amplitude, and wave speed ($v=f\lambda$ = $f \lambda$). Sound waves: Travel through solids, liquids, and gases; affected by medium density and temperature. Reflection and refraction: Light changes direction at boundaries; used in lenses and mirrors. Electromagnetic Radiation</p> <p>EM spectrum: Includes radio, microwave, infrared, visible light, ultraviolet, X-rays, and gamma rays. Uses and dangers: <i>Microwaves:</i> Cooking, communication. <i>Infrared:</i> Remote controls, thermal imaging.</p>	<p>susceptible to others (e.g. HIV and TB). Immune response: White blood cells defend against pathogens by producing antibodies and antitoxins. Vaccination: Introduces a harmless form of a pathogen to stimulate immunity. Antibiotics: Kill bacteria but not viruses; overuse can lead to resistance. Monoclonal antibodies: Lab-made molecules used to target specific cells, such as cancer cells. Sources: Save My Exams - Health Issues, SimpleStudy - Health & Disease Ecology</p> <p>Adaptations: Structural, behavioural, or functional traits that help organisms survive in their environment. Interdependence: Organisms rely on each other for food, shelter, and reproduction. Competition: Organisms compete for limited resources like food, water, and mates.</p>
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	<p>are sections of DNA found in chromosomes. Key concepts: DNA carries genetic information. Genes control characteristics like eye colour or blood type. Chromosomes are structures in cells that contain DNA. Inheritance explains how traits are passed from parents to offspring. Variation can be genetic (inherited) or environmental (caused by surroundings). Evolution is the gradual change in species over time. Key ideas: Natural selection: Organisms with advantageous traits are more likely to survive and reproduce. Adaptation: Traits that help organisms survive in their environment. Extinction: When a species can no longer survive or reproduce. Darwin's theory of evolution: Explains how species evolve through natural selection. Students also learn how genetic variation</p>			<p>travel at different rates. Evolution of the Atmosphere</p> <p>Early atmosphere: Rich in carbon dioxide, methane, and ammonia from volcanic activity. Oxygen increase: Photosynthesis by algae and plants introduced oxygen, reducing carbon dioxide. Modern composition: ~78% nitrogen, ~21% oxygen, and small amounts of carbon dioxide, argon, and water vapour. Greenhouse Gases and Climate Change</p> <p>Key gases: Carbon dioxide, methane, and water vapour trap heat in the atmosphere. Human impact: Burning fossil fuels, agriculture, and deforestation increase greenhouse gas levels. Consequences: Global warming, rising sea levels, extreme weather, and habitat disruption.</p>	<p><i>UV:</i> Sterilisation, tanning; can damage skin and eyes. <i>X-rays and gamma rays:</i> Medical imaging and cancer treatment; can ionise cells. Ionising radiation: High-energy waves (UV, X-rays, gamma) can remove electrons from atoms, potentially causing mutations.</p>	<p>Ecosystems: Include biotic (living) and abiotic (non-living) components. Biodiversity: The variety of life in an area; high biodiversity supports stable ecosystems. Human impact: Pollution, deforestation, and climate change reduce biodiversity. Conservation: Includes breeding programs, habitat protection, and legislation to reduce environmental damage. Trophic levels: Show energy transfer through food chains and webs.</p>
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	leads to diversity and how evolution explains the development of new species.			<p>Atmospheric Pollutants</p> <p>Carbon monoxide: Toxic gas from incomplete combustion. Sulfur dioxide and nitrogen oxides: Cause acid rain and respiratory issues. Particulates: Tiny particles that damage lungs and reduce visibility. Carbon Cycle and Climate Solutions</p> <p>Carbon cycle: Movement of carbon through respiration, photosynthesis, combustion, and decay. Climate action: Reducing emissions, using renewable energy, and international cooperation (e.g. ozone layer protection). This topic helps students understand how Earth's atmosphere has changed, how human activity affects it, and what can be done to mitigate climate change.</p>		
Cross Curricular Links	Maths	Maths, History	Cooking and heat transfer	Cooking	Cooking and heat transfer	PSHE, Horticulture

