



Year 11 Combined Science Curriculum – 2025-2026

	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
Key Concepts	Ecosystems Fuels	Magnetism and the motor effect Electromagnetic induction Animal coordination and control	Particle model and forces and matter	Revision	Exams	Exams
Knowledge & Understanding (National Curriculum) <i>Skills are across the whole year.</i>	Items highlighted in bold are Higher tier only. In Biology students will know and understand how to: Ecosystems and material cycles - Describe the different levels of organisation from individual organisms, populations, communities, to the whole ecosystem - Explain how communities can be affected by abiotic and biotic factors, including: a temperature, light, water, pollutants b competition, predation - Describe the importance of interdependence in a community - Describe how the survival of some organisms is dependent on other species, including parasitism and mutualism - Core Practical: Investigate the relationship between organisms and their environment using field-work techniques, including quadrats and belt transects - Explain how to determine the number of organisms in a given area using raw data from field-work techniques, including quadrats and belt transects - Explain the positive and negative human interactions within ecosystems and their impacts on biodiversity, including: a fish farming b introduction of non-indigenous species c eutrophication - Explain the benefits of maintaining local and global biodiversity, including the conservation of animal species and the impact of reforestation - Describe how different materials cycle through the abiotic and biotic components of an ecosystem - Explain the importance of the carbon cycle, including the processes involved and the role of microorganisms as decomposers					



- Explain the importance of the water cycle, including the processes involved and the production of potable water in areas of drought including desalination
- Explain how nitrates are made available for plant uptake, including the use of fertilisers, crop rotation and the role of bacteria in the nitrogen cycle

Animal coordination, control and homeostasis

- Describe where hormones are produced and how they are transported from endocrine glands to their target organs
- **Explain that adrenalin is produced by the adrenal glands to prepare the body for fight or flight.,**
- **Explain how thyroxine controls metabolic rate as an example of negative feedback.**
- Describe the stages of the menstrual cycle including the roles of the hormones oestrogen and progesterone.
- **Explain the interactions of oestrogen, progesterone, FSH and LH in the control of the menstrual cycle, including the repair and maintenance of the uterus wall, ovulation and menstruation.**
- Explain how hormonal contraception influences the menstrual cycle and prevents pregnancy.
- Evaluate hormonal and barrier methods of contraception.
- **Explain the use of hormones in Assisted Reproductive Technology (ART) and clomifene therapy**
- Explain the importance of maintaining a constant internal environment in response to internal and external change
- Explain how the hormone insulin controls blood glucose concentration
- **Explain how blood glucose concentration is regulated by glucagon**
- Explain the cause of type 1 diabetes and how it is controlled
- Explain the cause of type 2 diabetes and how it is controlled
- Evaluate the correlation between BMI and type 2 diabetes including waist:hip ration calculations and BMI.

In Chemistry students will know and understand how to:

Fuels and Earth science

- Recall that hydrocarbons are compounds that contain carbon and hydrogen only
- Describe crude oil as: “a complex mixture of hydrocarbons, containing molecules in which carbon atoms are in chains or rings (names, formulae and structure of specific ring molecules not required), an important source of useful substances (fuels and feedstock for the petrochemical industry), a finite resource
- Describe and explain the separation of crude oil into simpler, more useful mixtures by the process of fractional distillation.



- Recall the names and uses of the following fractions: a) gases- used in domestic heating and cooking, b) petrol- used as fuel for cars, c) kerosene, used as fuel for aircraft, d) diesel oil- used as fuel for some cars and trains, e) fuel oil- used as fuel for large ships and in some power stations, f) bitumen- used to surface roads and roofs
- Explain how hydrocarbons in different fractions differ from each other in: a) the number of carbon atoms their molecules contain, b) boiling points, c) ease of ignition, d) viscosity and are mostly members of the alkane homologous series
- Explain an homologous series as a series of compounds which a) have the same general formula, b) differ by CH_2 in molecular formulae from neighbouring compounds; c) show a gradual variation in physical properties, as exemplified by their boiling points; d) have similar chemical properties.
- Describe the complete combustion of hydrocarbon fuels as a reaction in which: a) carbon dioxide and water are produced; b) energy is given out
- Explain why the incomplete combustion of hydrocarbons can produce carbon and carbon monoxide
- Explain how carbon monoxide behaves as a toxic gas
- Describe the problems caused by incomplete combustion producing carbon monoxide and soot in appliances that use carbon compounds as fuels
- Explain how impurities in some hydrocarbon fuels result in the production of sulphur dioxide
- Explain some problems associated with acid rain caused when sulphur dioxide dissolves in rainwater
- Explain why, when fuels are burned in engines, oxygen and nitrogen can react together at high temperatures to produce oxides of nitrogen, which are pollutants
- Evaluate the advantages and disadvantages of using hydrogen rather than petrol, as a fuel in cars
- Recall that petrol, kerosene and diesel oil are non-renewable fossil fuels obtained from crude oil and methane is non-renewable fossil fuel found in natural gas
- Explain how cracking involves the breaking down of larger, saturated hydrocarbon molecules (alkanes) into smaller, more useful ones, some of which are unsaturated (alkenes)
- Explain why cracking is necessary

In Physics students will study:

Particle model:

- Use a simple kinetic theory model to explain the different states of matter in terms of the movement and arrangement of particles
- Recall and use the equation for calculating density
- Core Practical: Investigate the densities of solid and liquids
- Explain the differences in density between the different states of matter in terms of the arrangements of the atoms or molecules



- Describe that when substances change state mass is conserved and that these physical changes differ from some chemical changes because the material recovers its original properties if the change is reversed
- Explain how heating a system will change the energy stored within the system and raise its temperature or produce changes of state
- Define the terms specific heat capacity and specific latent heat and explain the differences between them
- Use the equation to calculate change in thermal energy when a substance is heated up (Specific heat capacity)
- Use the equation to calculate change in thermal energy when a substance changes state (latent heat)
- Explain ways of reducing unwanted energy transfer through thermal insulation
- Core Practical: Investigate the properties of water by determining the specific heat capacity of water and obtaining a temperature-time graph for melting ice
- Explain the pressure of a gas in terms of the motion of its particles
- Explain the effect of changing the temperature of a gas on the velocity of its particles and hence on the pressure produced by a fixed mass of gas at constant volume (qualitative only)
- Describe the term absolute zero, -273°C , in terms of the lack of movement of particles
- Convert between the kelvin and Celsius scales

Forces and matter

- Explain, using springs and other elastic objects, that stretching, bending or compressing an object requires more than one force
- Describe the difference between elastic and inelastic distortion
- Recall and use the equation for linear elastic distortion including calculation of the spring constant.
- Use the equation to calculate the work done in stretching a spring
- Describe the difference between linear and non-linear relationships between force and extension
- Core Practical- Investigate the extension and work done when applying forces to a spring

Magnetism and the motor effect

- Recall that unlike magnetic poles attract and like magnetic poles repel
- Describe the uses of permanent and temporary magnetic materials including cobalt, steel, iron and nickel
- Explain the difference between permanent and induced magnets
- Describe the shape and direction of the magnetic field around bar magnets and for a uniform field, and relate the strength of the field to the concentration of lines
- Describe the use of plotting compasses to show the shape and direction of the field of a magnet and the Earth's magnetic field



- Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic.
- Describe how to show that a current can create a magnetic effect and relate the shape and direction of the magnetic field around a long straight conductor to the direction of the current
- Recall that the strength of the field depends on the size of the current and the distance from the long straight conductor
- Explain how inside a solenoid the fields from individual coils add together to form a very strong almost uniform field along the centre of the solenoid, or cancel to give a weaker field outside the solenoid.
- **Recall that a current carrying conductor placed near a magnet experiences a force and that an equal and opposite force acts on the magnet**
- **Explain that magnetic forces are due to interactions between magnetic fields**
- **Recall and use Flemming's left hand rule to represent the relative directions of the force, the current and the magnetic field for cases where they are mutually perpendicular**
- **Use the equation $F = B \times I \times l$**

Electromagnetic induction

- **Recall the factors that affect the size and direction of an induced potential difference and describe how the magnetic field produced opposes the original change**
- **Explain how an alternating current in one circuit can induce a current in another circuit in a transformer**
- **Recall that a transformer can change the size of an alternating current**
- Explain why, in the national grid, electrical energy is transferred at high voltages from power stations, and then transferred at lower voltages in each locality for domestic uses at it improves the efficiency by reducing heat loss in transmission lines
- Explain where and why step-up and step-down transformers are used in the transmission of electricity in the national grid
- Use the power equation for transformers with 100% efficiency

Maths and scientific skills running throughout the science specifications:

Maths skills used throughout the topics:

- Demonstrate an understanding of number, size and scale and the quantitative relationship between units
- Calculate with numbers written in standard form
- Calculate surface area: volume ratios
- Plot, draw and interpret appropriate graphs
- Translate information between numerical and graphical forms



	• Construct and interpret frequency tables and diagrams, bar charts and histograms • Extract and interpret information from graphs, charts and tables • Extract and interpret data from graphs, charts and tables • Use percentiles and calculate percentage gain and loss of mass • Use orders of magnitude to evaluate the significance of data • Estimate size and scale of atoms and nanoparticles • Use ratios when considering relative sizes and surface area to volume comparisons • Calculate surface areas and volumes of cubes • Make calculations using ratios and proportional reasoning to convert units and to compute rates Apparatus and techniques used throughout the topics: • Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes • Measurement of rates of reaction by a variety of methods, including production of gas, uptake of water and colour change of indicator • Application of appropriate sampling techniques to investigate the distribution and abundance of organisms in an ecosystem via direct use in the field • Use of appropriate apparatus techniques and magnification, including microscopes, to make observations of biological specimens and produce labelled scientific drawings • Safe use and careful handling of gases, liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes and/ or products • Safe use of appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater • Use of appropriate qualitative reagents and techniques to analyse and identify unknown samples or products including gas tests, flame test, precipitation reactions, and the determination of concentrations of strong acids and strong alkalis • Use of appropriate apparatus to make and record a range of measurements accurately, including length, area, mass, time, volume and temperature. Use of such measurements to determine densities of solid and liquid objects.
Skills	 ★ Always striving to improve answers by including key vocabulary and backing up thoughts with scientific explanations.



		★ Working through challenging situations , reflecting as to why a practical might not produce the expected results and adapting their technique to collect accurate results.
	A Possess AMBITION	★ Seeking to answer scientific questions through analysis of experimental results. ★ Devising models and analogies for tricky and abstract scientific concepts. ★ Write effectively and coherently using Standard English appropriately. ★ Using assessment to make progress – designated improvement and reflection time (Green for Growth) is built in following class assessments, summative assessments and any other teacher marked work.
	I Demonstrate INTEGRITY	★ Completing practical work sensibly baring in mind the safety of themselves and others. ★ Taking responsibility for their studies and individual revision ★ Using problem solving skills to work through scientific models.
	S Embed Self-Discovery	★ Sharing their own ideas of scientific questions during class discussions. ★ Asking scientific questions, carrying out investigations to find out the answers to scientific questions. ★ Students must reflect upon real world advancements and consequences of science such as nanoparticles and polymers and the effects of humans on the ecosystems and food chains and webs.
	E Display EMPATHY	★ Respecting the laboratory and others during practical experiments by helping to get equipment for others, compare experimental techniques and keeping the laboratory tidy. ★ Showing respect for the class teacher and other students by listening to and contributing to class discussions. ★ Respecting other people's opinions and ideas.



Curriculum Links	KS3 Links- The ecosystems topic links to year 9 work on ecosystem processes and year 9 work on plants. The fuels topic links to year 7 chemical reactions, year 8 work on chemical reactions and year 9 work on Earth's atmosphere. A level links - A-level biology links: AQA 3.3 Organisms exchange substances with their environment. A-level chemistry links: AQA 3.3 Organic chemistry and Earth's atmosphere	KS3 Links- Magnetism and electromagnetism links to work carried out in year 8. Animal coordination and control links to work carried out in year 7 on body systems, year 8 on healthy lifestyle and year 9 on health.	KS3 Links- The particle model, forces and matter topic relates to particles and behaviour topics taught in year 7 and 9 as well as the forces topic taught at the beginning of year 7.			
Assessment	Per each subject students will experience the following assessments: Curriculum Checkpoint 1	Per each subject students will experience the following assessments	Per each subject students will experience the following assessments:	Per each subject students will experience the following assessments: Quality Mark		



	AP1 Assessment Paper x3 (biology/ chemistry/ physics)	:Curriculum Checkpoint 2	AP2 assessment paper x 3 (biology/ chemistry/ physics) Curriculum checkpoint 3	AP3 assessment x3 (biology/ chemistry/ physics) Curriculum Checkpoint 4		
Aspirations & Careers	Separate science students are invited to participate in small group STEM career events including a marine biology school, Dr for the day and a talk about radioactivity from a company within the local sector.					