Curriculum rationale & design	**Rationale** The Astrea Science Subject Community crafts our Astrea Science Common Curriculum. This curriculum follows a core set of beliefs and values that are the entitlement for all scholars in our Trust, these guide us in our decisions so that we can deliver a curriculum that creates confident, and competent scientists for life, removing barriers to their health and wellbeing. Human progress throughout history has largely rested on advances in science – from our knowledge of gravity to innovative medicines, *students of science* have shaped our modern world. All these advances can trace their origin back to individuals learning about science as pupils. That is why it is in the interests of governments, companies, and wider society to promote science; it ensures the next wave of progress in all the fields that affect our daily lives. A strong scientific understanding is imperative to understand the world in which we live. **Sequencing** We believe in the potential of our scholars, and we want to unlock that. Our curriculum leads scholars through scientific knowledge, through direct instruction of the substantive and disciplinary knowledge. Knowledge is explained carefully and explicitly, scholars are questioned to ensure understanding, and independent practice is prioritised. This is then carefully retrieved to maximise the generation of long-term memory. Our fluency framework supports scholars recall of substantive knowledge with tools such as knowledge organisers to support frequent quizzing. Assessment is used to check that scholars can retrieve knowledge from the whole domain and to provide purposeful intervention where needed. We provide carefully structured opportunities for purposeful practical work and application of knowledge only when the fundamental content knowledge is secure. We sequence knowledge to build on each element of the discipline so that prerequisite knowledge is taught first or minimised. For example, we teach cell biology and the functions of the organelles as well as chemical reactions before we teach respiration and photosynthesis at the start of year 8. We have worked beyond the Science Subject Community and collaborated with Subject Communities of Maths, PD, Geography and DT to compliment the development of schema, and embrace opportunities. We ensure mathematical concepts are carefully sequenced to align with the maths curriculum to allow our scholars to access the wide range of complex calculations within our curriculum.

SCIENCE CURRICULUM MAP: Y7-11

Curriculum aims	• Build Disciplinary Knowledge First: Scholars begin with the Scientific Method, learning to think, speak, and write like scientists through deliberate, structured teaching that underpins all future scientific learning. • Develop Scientific Literacy and Communication: Emphasis is placed on reading scientific texts, mastering tier 3 vocabulary, and developing extended writing and verbal communication skills, culminating in real-world experiences like a Year 8 scientific conference. • Deliver a Coherent Five-Year Journey: The curriculum spans five years without rigid key stage divisions, allowing for deep mastery and progression of powerful scientific knowledge aligned with the National Curriculum. • Foster Cross-Curricular and Real-World Connections: Collaboration with other subjects (e.g., Maths, DT, Geography) and local industries enhances schema development and career relevance, bringing science to life beyond the classroom. • Enrich with Context, Culture, and Curiosity: Each unit begins with real-world context and cultural capital, encouraging curiosity and helping scholars see themselves in science through stories, applications, and local relevance. • Ensure Purposeful and Flexible Practical Work: Practical activities are designed with clear disciplinary goals, progressing from guided instruction to independent application, promoting problem-solving, independence, and scientific competence.
Assessment	As per the Astrea Fluency framework, regular and repeated practice is built into curriculum delivery to help students develop fluency and confidence. Regular guided practice in lessons as well as opportunities for independent practice through extended writing and homework opportunities will be utilised to help students apply their learning and draw on long-term memory. Fluency quizzes and Mastery knowledge tests will be used to identify gaps as per individual academy policies. Carousel quizzes and study packs will be in place for each KS3 unit to support students in retrieval practice and are centrally provided. The Teacher guides for each unit will include examples of questions to support ongoing retrieval practice and to support early identification of misconceptions. In Years 7, 8 and 9, Each unit will end with a knowledge test to support ongoing assessment of students understanding. There will however be two formal summative assessments, with January and June assessments these will be core knowledge assessments set centrally. In Year 10, scholars will sit paper 1 exam for biology, chemistry and physics in the summer mock exam period. (mock 1) In Year 11, scholars will sit paper 1 exam for biology, chemistry and physics in the autumn mock exam period (mock 2) and a full suite of exams in the spring mock period- 2 papers for each biology, chemistry and physics. (mock 3)

SCIENCE CURRICULUM MAP: Y7-11

Year	Autumn	Spring	Summer
Year 7	7.1: The scientific Method 7.2: Movement & Organisation	7.3: Matter & Mixtures 7.4: Forces & Motion	7.5: Genes & Reproduction 7.6: Elements & The Periodic Table
Year 8	8.1: Respiration & Photosynthesis 8.2: Energy	8.3: Reactions 8.4: Electricity	8.5: Waves 8.6: Earth & the Universe
Year 9	B1: Cell Biology C1: Atomic Structure & The Periodic Table	P1: Energy B2: Organisation	C2: Structure, Bonding & Properties P3: Particle Model of Matter P4: Atomic Structure
Year 10	B3: Infection & Response C3: Quantitative Chemistry P2: Electricity B4: Bio Energetics	B5: Homeostasis and Response C4: Chemical Changes C5: Energy Changes P5: Forces & Motion	B6: Inheritance C6: Rate & Extent of Chemical Change P6: Waves
Year 11	B7: Ecology C7: Organic Chemistry C8: Chemical Analysis P7: Magnets & Electromagnets	C9: The Atmosphere C10: Using Resources P8: Space Physics (Separate Science only) Revision	Revision

SCIENCE CURRICULUM MAP: Y7-11

Year 7	Subject: Science	Unit title: 7.1: The Scientific Method	Term: Autumn

Knowledge:

- Describe what science is.
- Describe how science has developed across the world.
- Describe what an observation, hypothesis and theory is.
- Describe the difference between a hypothesis and theory.
- Design a hypothesis to test
- Describe the three scientific variables.
- Identify the types of variables in an experiment.
- Explain the importance of controlling variables which are not being tested
- Describe what makes a method scientific.
- Identify elements of scientific methods
- Design scientific methods
- Describe the conventions of scientific drawing.
- Make scientific drawings in 2D from 3D images.
- Describe that a scientific drawing is there to aid communication
- State the definition of hazards, risks and precautions.
- Recognise common hazard symbols
- Practice the procedures of a lab, movement, ownership of equipment during a practical.
- Know the rules of a lab and safety precautions.
- Follow a method accurately.
- Work as a team to maximise efficiency.
- Know how to measure volumes and masses accurately with a mass balance and measuring cylinder.
- Now how to check accuracy of a measuring cylinder using a mass balance (1 mL = 1 g)
- Know the conventions of table design and completion
- IV on the left / DV to follow / consistent DPs per column / repeats and means / units in titles
- Know the origins of the Bunsen.
- Describe the uses of a Bunsen.
- Safely use the Bunsen to transition between flames, ignite and turn off. • Know the fuel (methane) and that it burns in oxygen from the air.
- Know the safely precautions when using a Bunsen
- Practice the procedural use if a method to accurately measure mass, volume and temperature.
- Use a Bunsen to heat water to boiling point.
- Practice clearing up lab equipment with consideration for others.
- Identify hazards and embed safety precautions.

Core Vocabulary:

accuracy
anomaly
area
balance
beaker
boss
Bunsen burner
categoric variables
clamp
conical flask
continuous data
control variable
corrosive
decimal
dependent variable
environmental hazard
experimental error
explosive
fair test
flammable
forceps
gauze
goggles
hazard
hypothesis
independent variable
integer
length
mass
mean average
measuring cylinder
observation
oxidising
pipette
precision

Teaching Sequence:

- What is Science?
- Observation,
- Variables
- Methods
- Scientific Drawing
- Hazards & Risk
- Practical work – Like a Scientist
- Tables
- The Bunsen Burner
- PRACTICAL 1.0: Testing a Hypothesis
- Quality of Data
- Errors
- Communicating Results
- Bar Charts
- Line Graphs
- Conclusions

- State the definition of accuracy / precision and resolution.
- Identify accuracy, precision and resolution within data.
- Identify anomalous data.
- Define random, systematic and zero errors.
- Identify errors from experimental descriptions.
- Identify errors in data.
- Determine data type as categoric or continuous.
- Determine the scale on a Y-axis.
- Identify the appropriate graph to plot based on data (limited to scatter/line or bar at this point).
- Know the conventions of bar charts.
- Practice plotting data into a bar chart
- Know the conventions of line graph.
- Practice plotting data into a line graph.
- Learn how to determine an appropriate line of best fit.
- Know what components go into a conclusion (state the hypothesis / describe the results / explain the science of the results / accept or reject the hypothesis).

precaution
quantitative
range
repeatable
resolution
risk
science
spatula
stopwatch
systematic error
test tube
theory
thermometer
tripod
validity
volume
zero error

Disciplinary aims:
The Scientific Method is taught first, this is a unit which guides the learner through the fundamental tools by which scientists 'do science' i.e. the Scientific Method. This disciplinary knowledge is repeated with increasing degrees of independence and competence throughout all units that follow. This disciplinary knowledge is so often underemphasized in curricula (Ofsted Subject Report: Finding the optimum). We teach this first so that we can focus on using this disciplinary knowledge as a tool to apply to the substantive in future lessons, and so this reduces the extraneous cognitive load in future lessons, opening up the cognitive bandwidth for developing the desired knowledge.

Links to other units:
Prior Knowledge
It builds on KS2 prior knowledge where scholars should have learnt:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

Future knowledge
The knowledge gained from 7.1 The Scientific Method will be applied in every unit scholars study from Y7-11. Scholars will look at how to identify variables, write methods, record

and present data and analyse data in the context of a wide range of topics across Biology, Chemistry and Physics disciplines.

Links to the National Curriculum:
This KS3 lesson sequence supports the National Curriculum by introducing students to the foundational principles of scientific enquiry. It covers key elements such as observation, variables, method writing, risk assessment, and data presentation through tables, bar charts, and line graphs. Students also learn to use equipment like the Bunsen burner and engage in practical work that develops their understanding of how to test hypotheses and draw conclusions, fulfilling the curriculum's emphasis on working scientifically.
The sequence goes beyond the statutory requirements by embedding disciplinary knowledge and scientific literacy from the outset. Lessons on scientific drawing, communicating results, and evaluating data quality and errors promote deeper analytical thinking and precision. The curriculum's focus on modelling scientific behaviours—thinking, speaking, and writing like a scientist—ensures students develop transferable skills and confidence in scientific communication, preparing them for more advanced study and real-world scientific contexts.

Year 7	Subject: Science	Unit title: 7.2: Movement & Organisation	Term: Autumn

Knowledge:

- Define the term cell and identify organelles from diagrams to include nucleus, cell membrane, cell wall, mitochondria, cytoplasm, chloroplast, vacuole.
- Describe the differences between an animal and plant cell
- Describe the functions of organelles
- Name specialised cells to include root hair, red blood, sperm, palisade.
- Describe how specialised cells are adapted for their function
- Describe the developments in microscopes
- Describe the discoveries of early microscopy
- Draw cells following biological conventions
- Identify parts of a microscope
- Describe the function of each part of the microscope.
- Describe how to use a microscope to include selection of objective lenses.
- Calculate total magnification of a compound microscope.
- Carry out microscopy of onion cells, including knowledge of preparing the slide.
- Draw onion epithelial tissue as observed under the microscope, following biological convention.
- Write a method for the onion tissue microscopy practical.
- Define unicellular organisms
- Deduce whether a unicellular organism is a prokaryote or eukaryote based on their internal structures.

Core Vocabulary:

Antagonistic
Archaea
Arthritis
Bacteria
Ball and socket
Biconcave
Bone marrow
Cartilage
Cell
Cell membrane
Chloroplast
Clavicle
Collagen
Cover slip
Cranium
Cytoplasm
Dissection
Domain
Eukaryotic
Eye piece

Teaching Sequence:

- Animal & Plant Cells
- Specialised Cells
- Development of the Microscope
- Biological Drawing
- Microscopy
- PRACTICAL 2.1: Onion Microscopy
- Unicellular Organisms
- Biological Organisation
- Deliberate Practice – Organisation
- Skeletal system
- Muscles & Joints
- PRACTICAL 2.2: Antagonistic Pairs
- Orthopaedics
- Deliberate Practice – Movement
- PRACTICAL 2.3: Cheek cell microscopy

- Order the hierarchy of biological organisation. (Organelle, cell, tissue, organ, organ system, organism)
- Define each tier of biological organisation.
- State examples of each level of organisation.
- Consolidate and apply knowledge of cells and organisation
- Name a range of key bones in the skeletal system
- Describe the role of the skeletal system
- Compare the structure of different bones
- Describe the function of tendons, ligaments and muscles
- Describe the different types of joints
- Follow a method to complete a chicken wing dissection, identifying antagonistic pairs.
- Describe medical problems linked to the skeletal system
- Describe the use of technology in diagnosing medical problems linked to the skeletal system
- Consolidate and apply knowledge of movement
- Know the method for cheek cell microscopy
- Follow a method accurately
- Draw cheek cells as observed under the microscope

Disciplinary aims:

Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Method writing will be practiced for both onion cell and cheek microscopy. Building on scientific drawing of laboratory equipment, scholars will be exposed to the conventions of biological drawings of cells.

Flagellum
Focus
Forceps
Fracture
Fungi
Haemoglobin
Hinge
Iodine solution
Iris diaphragm
Joint
Kingdom
Lens
Ligament
Macroscopic
Magnification
Methylene blue
Microscope
Microscopic
Mitochondrion
Multicellular
Multicellular
Nerve
Nucleus,
Objective
Organ system
Organelle
Osteoporosis
Palisade
Permanent vacuole
Pivot
Prokaryotic
Protist
Root hair
Scapula
Skeleton
Slide
Specialised
Sperm
Stage
Starch

	Surface area Tendon Tissue Unicellular Vertebrae X-ray	

Links to other units:

Prior Knowledge

It builds on KS2 prior knowledge where scholars should have learnt:

- recognise that living things can be grouped in a variety of ways.
- identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.

Future knowledge

The knowledge gained from 7.2 Movement & Organisation will be built upon in 7.5 Genes & Reproduction where students should have a secure understanding of cell structures and functions to allow them to explore genetics further. The reproductive system is introduced in 7.5, as an additional organ system to those studied previously. Specialised cells from 7.2 are also key prior knowledge for 7.5, specifically the adaptations of gametes for their function.

It will also be essential for 9.1 Cell Biology, where students will explore further cell organelles and use their prior knowledge on microscopes to allow them to complete magnification calculations.

Links to the National Curriculum:

Covers the KS3 NC content for Cells and Organisation and Movement, including practical skills, conceptual understanding, and historical context.

SCIENCE CURRICULUM MAP: Y7-11

Year 7	Subject: Science	Unit title: 7.3: Matter & Mixtures	Term: Spring

Knowledge:

- Draw and describe the arrangement of particles in the three states of matter
- Describe the movement and energy of particles in the three states of matter
- Describe the relative strength of interparticle forces in different states of matter
- Describe the properties of the different states of matter
- Describe and explain the properties of metals
- Compare the properties of metals and alloys
- Describe what viscosity is
- Explain why gases can be compressed
- Explain what causes gas pressure
- To make a hypothesis
- Follow a method accurately
- Record data in a table
- Draw conclusions from data
- Describe how particles move by diffusion
- Explain how changing temperature affects the rate of diffusion
- Know the method to test the rate of diffusion
- Write a method to test a hypothesis
- Follow a method accurately
- Record data in a table
- Follow a method accurately
- Record data in a table
- Write a conclusion using scientific conventions
- Name the changes of state
- Explain the difference between evaporation and boiling
- Consolidate knowledge of matter
- Define key terms solvent/solute/solution
- Describe factors that affect solubility
- Identify substances are pure or mixtures
- Describe how substances can be separated by filtration
- Describe how immiscible liquids can be separated
- Know the method for filtration
- Follow a method accurately
- Identify filtrate and residue from practical
- Know the method for evaporation
- Follow a method accurately

Core Vocabulary:

Absolute zero
Alloy
Boil
Boiling point
Brittle
Chromatogram
Chromatography
Compression
Concentration
Concentration gradient
Condense
Condense
Conduct
Density
Diffusion
Distillation
Ductile
Evaporate
Filter
Filtrate
Freeze
Gas pressure
Hardness
Insoluble
Internal energy
Interparticle forces
Magnetic
Malleable
Matter
Melt
Melting point / freezing point
Mixture
Particle
Pure substance

Teaching Sequence:

- States of Matter
- Interparticle Forces
- Solids
- Fluids
- PRACTICAL 3.0: Viscosity
- Diffusion
- PRACTICAL 3.1: Rate of Diffusion
- Rate of Diffusion: Conclusion
- Changes of State
- The Particle Model Deliberate Practice
- Solutions
- Separating Mixtures
- PRACTICAL 3.2: Filtration
- PRACTICAL 3.3: Evaporation
- DEMO: Distillation
- Chromatography
- PRACTICAL 3.4: Chromatography
- PRACTICAL 3.5: Separating Mixtures Challenge
- PRACTICAL 3.6: Chromatography Crime Scene

- Explain how evaporation can be used to separate a solute from a solvent
- Name equipment needed for distillation
- Describe the process of distillation
- Describe the method for chromatography
- Interpret information on a chromatogram
- Calculate Rf values
- Know the method for chromatography
- Follow a method accurately
- Interpret information on a chromatogram
- Apply knowledge of separating techniques to separate a mixture of substances.
- Apply knowledge of chromatography to solve a problem

Purify
Residue
Solubility
Soluble
Solute
Solution
Solvent
Solvent front
State
Strength
Sublime
Vapour
Viscosity

Disciplinary aims:
Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Scholars will complete a range of practical science including foundational chemistry techniques such as filtration and evaporation. Through this, they will deepen their understanding of how to form a hypothesis and what the variables are that will allow them to test it. Scholars will write methods, such as that to complete chromatography, and draw conclusions from data. This unit builds scientific curiosity by giving the scholars the opportunity to problem solve through practical methods and the real life applications of this for example in solving crimes.

Links to other units:
This unit provides scholars with a fundamental understanding of particles, the basic building block of all matter. Scholars will explore how particles change arrangement between states of matter and how, depending on their properties, particles can be separated.

Prior Knowledge
It builds on KS2 prior knowledge where scholars should have learnt:

- compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating
- demonstrate that dissolving, mixing and changes of state are reversible changes

Future Knowledge
The knowledge gained from 7.3 Matter & Mixtures will be built upon in 7.6 (Elements and the periodic table) and 9.2 (Atomic Structure). In 7.6, scholars will further explore the properties of materials and so will need a secure understanding of the properties of solids, liquids and gases. In 9.2, scholars will further develop ideas about particles to explore atomic structure (including development of atomic theory) and so will need a secure knowledge of the particle model of matter. In 9.2, scholars will also explain how the different separating techniques work and so will need a secure knowledge of the practical methods explored in 7.3.

SCIENCE CURRICULUM MAP: Y7-11

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Links to the National Curriculum:
The objectives outlined provide comprehensive coverage of the KS3 Science National Curriculum for Chemistry and Working Scientifically. They fully address content on the particle model, states of matter, changes of state, diffusion, solubility, and methods of separating mixtures, alongside practical skills such as planning investigations, recording data, and drawing conclusions. In addition, the scheme goes beyond KS3 expectations in several areas, including introducing viscosity, comparing metals and alloys, calculating Rf values in chromatography, and requiring learners to deduce whether a unicellular organism is prokaryotic or eukaryotic. It also extends into enrichment topics such as medical problems linked to the skeletal system, the use of diagnostic technology, and detailed historical developments in microscopy. These elements provide stretch and challenge beyond the statutory requirements, supporting deeper understanding and preparation for GCSE content

Year 7	Subject: Science	Unit title: 7.4: Forces & Motion	Term: Spring

Knowledge:

- Recall and use the equation for calculating speed
- Convert between different units of measure
- Follow a method accurately
- Identify variables in an investigation
- Record data in a table
- Calculate speed from distance-time graphs
- Describe motion from distance-time graphs
- Define acceleration
- Calculate relative speed
- Define what forces and resultant forces are
- Predict the effect of resultant forces on motion
- Construct force diagrams for objects and correctly identify the forces acting
- Describe motion from force diagrams
- Describe friction and air resistance
- Construct force diagrams showing friction and air resistance
- Consolidate knowledge of forces & motion
- Describe what gravity is and the factors that affect it
- Explain why gravitational field strength is different on different planets
- Describe the difference between mass and weight
- Recall and use the equation for calculating weight
- Describe the factors that affect air resistance
- Explain the effects of a vacuum on air resistance
- Know the method to investigate the relationship between force and extension of a spring

Core Vocabulary:

Acceleration
Air resistance
Area
Balanced
Compression
Contact
Deceleration
Directly proportional
Distance
Drag
Elastic
float
Force
Free body diagram
Friction
Gravity
Lift
Motion
Newton
Non-contact
Pressure
Pull
Push
Speed

Teaching Sequence:

- Speed
- PRACTICAL 4.0: Investigating Motion
- Distance-time
- Acceleration & Relative Speed
- Forces
- Force Diagrams
- Friction
- Forces & Motion: Deliberate Practice
- Gravity
- Mass & Weight
- Gravity & Air Resistance
- PRACTICAL 4.1: Hooke's Law
- Pressure
- Pressure in Fluids
- Buoyancy
- Forces & Motion: Deliberate practice
- PRACTICAL 4.2: Forces Challenge

• Follow a method accurately • Record data in a table • Draw a graph to present data • Describe the relationship between area and pressure • Recall and use the equation for calculating pressure • Describe how pressure in water varies with depth • Describe what causes atmospheric pressure • Describe why some objects can float	Stationary Streamlined Surface area Tension Thrust Time Variable Weight	
Disciplinary aims: Disciplinary knowledge from 7.1: The Scientific Method, will be extended in this unit. Scholars will complete a range of practical science including calculating speed for moving objects and investigating Hooke's law. Through this, they will deepen their understanding of how to form a hypothesis and what the variables are that will allow them to test it. Scholars will analyse methods, such as that to calculate speed, and draw conclusions from data. This unit builds scientific curiosity by giving the scholars the opportunity to problem solve through practical methods and the real life applications of this for example calculating the correct length for a bungee cord.		

Links to other units:

Prior Knowledge

It builds on KS2 prior knowledge where scholars should have learnt:

- To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- To identify the effects of air resistance, water resistance and friction, that act between moving surfaces.
- To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Future Knowledge

The knowledge gained from 7.4 will be essential when scholar study unit 8.6 Earth & the Universe to understand how planets in our solar system are arranged. It will also provide foundational knowledge for GCSE Physics topic 5 Forces where scholars will build on the ideas around motion and Newton's Law of motions to look at speed and velocity-time graphs. Scholars will develop their skills with calculating forces to not only calculate forces but also algebraically solve equations to determine different values.

Links to the National Curriculum:

This lesson sequence fully meets the KS3 Science National Curriculum by covering key concepts in forces and motion, including speed, distance-time relationships, acceleration, gravity, pressure, and the effects of friction and air resistance. It integrates required practicals such as investigating motion and Hooke's Law, ensuring students develop essential experimental and analytical skills. Beyond the statutory requirements, the sequence goes further by embedding deliberate practice sessions for mastery, introducing relative speed and buoyancy for deeper conceptual understanding, and incorporating problem-solving challenges that promote higher-order thinking and application of knowledge in unfamiliar contexts.

SCIENCE CURRICULUM MAP: Y7-11

Year 7	Subject: Science	Unit title: 7.5: Genes & Reproduction	Term: Summer

Knowledge:

- Identify gametes involved in fertilisation
- Describe the processes of sexual and asexual reproduction
- Describe the changes that take place during puberty
- Describe the features of the male and female reproductive system
- Describe the stages of the menstrual cycle
- Describe the process of fertilisation and gestation
- Define zygote
- Describe the stages of development of a fetus
- Describe how features of the mother support pregnancy
- Describe factors that affect the fetus during pregnancy
- Describe the causes of infertility in males and females
- Describe the treatments available for infertility
- Describe the male and female reproductive organs in plants
- Describe the process of pollination
- Describe the different methods of seed dispersal
- Explain how plants are adapted for different methods of seed dispersal
- Consolidate knowledge of the reproductive system and fertilisation
- Describe the difference between inter- and intraspecific variation
- Describe the causes of variation and classify as environmental or inherited
- Describe the structure of DNA
- Describe how DNA was discovered
- Use genetic diagrams to predict the probability of offspring having certain characteristic
- Describe the stages of natural selection
- Apply the stages of natural selection to a range of different species
- Describe what is meant by biodiversity
- Describe the importance of biodiversity and the problems when it is reduced
- Define extinction and give examples of extinct species
- Describe possible causes of extinction

Core Vocabulary:

Adaptation
Allele
Amniotic fluid
Anther
Asexual
Bases
binomial name
Biodiversity
Biodiversity
Carpel
Cervix
Chromosome
Compete
Diploid
Dispersal
DNA
Dominant
Double helix
Ecosystem
Embryo
Embryo
Endangered
Endometriosis
Environmental
Evolution
Extinction
Fallopian tubes
Fertilisation

Teaching Sequence:

- Sexual and Asexual Reproduction
- Puberty and the Reproductive System
- The Menstrual Cycle
- Embryo Development
- Early life development
- Factors affecting development
- Fertility
- Plant Reproduction
- Seed Dispersal
- Deliberate Practice - Reproductive system & Fertilisation
- Variation
- Causes of variation
- Genetic Material
- Modelling Inheritance
- Natural Selection
- Evolution by Natural Selection
- Biodiversity
- Extinction
- Deliberate Practice- Evolution by Natural Selection

Disciplinary aims:
Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Scholars will study a range of different scientists including Darwin and Lamark & Watson and Crick. Through this, they will deepen their understanding of how scientific theories are developed over time and the process of peer review. When looking at extinction and the fossil record, scholars will explore how scientists use evidence and data to inform their work.

Links to other units:
Prior Knowledge
It builds on 7.2 Movement & Organisation where scholars have learnt:

- The features of plant and animal cells, including specialised cells
- Levels of organisation from cells to organisms
- Organ systems such as the reproductive system

Future Knowledge
The knowledge gained from 7.5 Genes & Reproduction will be built upon 9.1 cell biology and GCSE Biologic topic Variation, Genetics & Evolution. In 9.1 Cell Biology, where scholars will explore further cell organelles and use their prior knowledge on microscopes from 7.3 to allow them to complete magnification calculations. In Variation, Genetics & Evolution, scholars will deepen their understanding of the structure of DNA and the process of meiosis to produce gametes studied in 7.5. They will also extend their knowledge of natural selection to explore antibiotic resistance.

nks to the National Curriculum:
This lesson sequence fully meets the KS3 Science National Curriculum by covering key areas of biology such as reproduction in animals and plants, variation, inheritance, and evolution. It ensures students understand fundamental processes like puberty, fertilisation, embryo development, and the menstrual cycle, alongside plant reproduction and seed dispersal, which are explicitly required at KS3. Beyond the statutory content, the sequence extends learning through deeper exploration of genetic material, modelling inheritance, and deliberate practice sessions that strengthen conceptual understanding. It also introduces higher-order ideas such as natural selection, biodiversity, and extinction in greater depth, preparing students for GCSE by embedding analytical thinking and connecting biological concepts to real-world contexts.

Filament
Gametes
Genes
Germinate
Gestation
Habitat
Haploid
Hormone
Hybrid
Infertility
Inherited
Interspecific
Intraspecific
Menstrual
Natural selection
Ovary
Ovulation
Ovum
Period
Placenta
Pollination
Predators
Premature
Producer
Puberty
Recessive
Scrotum
Species
Stamen
Stigma
Style
Testes / Testis
Umbilical cord
Uterus
Vagina
Variation
Zygote

SCIENCE CURRICULUM MAP: Y7-11

Year 7	Subject: Science	Unit title: 7.6: Elements & The Periodic Table	Term: Summer

Knowledge:

- Define elements and give examples
- Represent elements using particle diagrams
- Represent elements using symbols from the periodic table
- To name the subatomic particles and describe their mass, charge and location
- Identify the number of each sub-atomic particle in a given element
- Describe the development of the periodic table over time
- Describe the location of elements in terms of groups and periods
- Identify metals and non-metals on the periodic table and therefore suggest an elements properties
- Describe properties and the pattern in reactivity in group 1
- Describe the properties of group 7 elements
- Describe the properties of group 0 elements
- Describe the properties of polymers, ceramics & composites
- Evaluate materials for use based on their properties
- Consolidate knowledge of the periodic table
- Define compounds
- Represent compounds using particle diagrams
- Identify elements within compounds
- Identify the number of atoms of each element in a compound
- Name compounds
- Identify signs of physical and chemical changes
- Write word equations for reactions
- State the law of conservation of mass
- Calculate the mass of unknown substances from equations
- Explain why reactions must be balanced
- Balance equations
- Identify oxidation from chemical equations

Disciplinary aims:

Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Scholars will complete a range of practical science including investigating chemical and physical reactions and investigating conservation of mass. Through this, they will deepen their understanding of how scientific theories are developed over time and the process of peer review. Scholars will write

Core Vocabulary:

Alkali Metal
Balanced Equation
Chemical formula
Chemical reaction
Chemical Symbol
Combination Reaction
Combustion Reaction
Composite
Compound
Conservation of mass
Diatomic
Electron
Element
Group
Halogen
Malleable
Metal
Molecule
Neutron
newton (N)
Noble Gas
Non-metal
Nucleus
Oxidation Reaction
Period
Periodic Table
Physical reaction
Polymer
Product
Property
Proton
Reactant
Reduction Reaction
Subatomic particle
Strength

Teaching Sequence:

- Elements
- Simple atomic structure
- Periodic Table & its development
- Metals & non-metals
- Group 1
- Group 7
- Group 0
- Polymers, ceramics & composites
- Deliberate Practice- The periodic table
- Compounds
- Formulae & naming compounds
- Practical 6.1: Chemical vs physical changes
- Representing reactions- word equations
- Practical 6.3: Conservation of mass and calculations
- Representing reactions- symbol equations
- Practical 6.2: Elements + Oxygen
- Deliberate Practice- Compounds

chemical symbols and formula to enable them to write word any symbol equations to represent reaction. This unit builds scientific curiosity by giving the scholars the opportunity to problem solve through practical methods and the real life applications of this for example testing materials to ensure suitability for a purpose.		

Links to other units:

Prior Knowledge

It builds on 7.3 Matter & Mixtures prior knowledge where scholars have learnt:

- The particle model of matter to represent atoms in different states
- Physical reactions including a variety of separation techniques

Future Knowledge

The knowledge gained from 7.6 Elements and the periodic table will be built upon in 8.3 (Reactions) and 9.2 (Atomic Structure) as part of our spiral curriculum. In 7.6, scholars will further explore different types of chemical reactions, building on their knowledge of how to represent chemical reactions in equations. In 9.2, scholars will further develop ideas about particles to explore atomic structure (including development of atomic theory) and so will need a secure knowledge of the basic atomic structure. In 9.2, scholars will also explain how the patterns in different groups of the periodic table which they have described in 7.6.

Links to the National Curriculum:

This lesson sequence meets the KS3 Science National Curriculum by addressing core chemistry concepts such as elements, atomic structure, the periodic table, metals and non-metals, and chemical reactions, including conservation of mass. It incorporates required practical work on physical and chemical changes and representing reactions through word and symbol equations, ensuring students develop both conceptual understanding and experimental skills. Beyond the statutory content, the sequence deepens learning through topics like polymers, ceramics, and composites, which introduce material science applications, and deliberate practice sessions that strengthen fluency in chemical representation and calculations. This approach not only secures foundational knowledge but also builds readiness for GCSE by embedding analytical thinking and real-world relevance.

SCIENCE CURRICULUM MAP: Y7-11

Astrea Academy Trust
LEARN, THRIVE, SUCCEED

Year 8	Subject: Science (Biology)	Unit title: 8.1 Respiration & Photosynthesis	Term: Autumn

Knowledge:

- Define aerobic respiration and write a word equation for the process
- Identify where in the cell aerobic respiration occurs
- Describe why we need the energy released in respiration
- Describe the test for carbon dioxide
- Describe the mechanism of breathing
- Describe the process by which gases are exchanged
- Describe the adaptations of alveoli for effective gas exchange
- Define digestion
- Describe the order and the function of the organs in the digestive system
- Describe how enzymes work using the lock and key mechanism
- Describe what happens when enzymes are denatured and in which conditions this occurs
- Describe how large insoluble molecules are digested, specifically starch into glucose using amylase
- Describe how villi are adapted for their function
- Follow a method for investigating the optimum temperature for catalase
- Present data in tables
- Write scientific conclusions
- Accurately draw graphs of scientific data
- Write scientific conclusions
- Write the word and symbol equation for photosynthesis
- Describe how the plant obtains the reactants for photosynthesis
- Describe the structure of carbohydrates and glucose
- Describe how glucose is stored in plants and animals
- Explain how glucose is created
- State the limiting factors of photosynthesis
- Explain why light and temperature are limiting factors of photosynthesis
- Follow a method for investigating the effect of light intensity on the rate of photosynthesis
- Record data in a table
- Accurately draw graphs of scientific data
- Write scientific conclusions

Disciplinary aims:
Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Scholars will complete a range of practical science including investigating the optimum conditions for enzyme action

Core Vocabulary:

Absorption
Active site
Aerobic Respiration
Alveolus
Amylase
Anus
Biological catalyst
Bronchioles
Bronchus
Capillaries
Carbohydrate
Chest cavity
Chlorophyll
Chloroplast
Denature
Diaphragm
Diffusion
Digestion
Enzyme
Enzyme-substrate complex
Exhalation
Gall bladder
Glucose
Glycogen
Guard cell
Insoluble
Inhalation
Large intestine
Limiting factor
Liver
Lock and key model
Lungs
Metabolism
Mitochondrion

Teaching Sequence:

- Aerobic respiration
- Gas Exchange
- Gas exchange: DP
- Digestion
- Enzymes
- Enzymes and absorption
- Enzyme optima
- Enzyme optima: Write-up
- Enzymes & Digestion DP
- Photosynthesis
- Glucose
- Limiting Factors of photosynthesis
- Limiting factors of photosynthesis
- Limiting factors of photosynthesis
- Leaf Microscopy

and investigating the factors affecting the rate of photosynthesis. Through this, they will deepen their understanding how to control variables ensure valid outcomes in experiments. Scholars will write chemical symbols and formula to enable them to write word any symbol equations to represent respiration and photosynthesis.	Oesophagus Optimum Pancreas Photosynthesis Product Products Reactant Rectum Small intestine Soluble Specific Starch Stoma Stomach Stool Substrate Sugar Trachea Villus	
Links to other units: **Prior Knowledge** It builds on 7.2 Movement & Organisation prior knowledge where scholars have learnt: • The features of cells, including specialised cells • How cells are organized to make organisms • The parts and operation of microscopes It also builds on 7.6 Elements & the Periodic table prior knowledge where scholars have learnt: • How to represent reactions as words and symbol equations • How polymers are long chain molecules formed from many monomers **Future Knowledge** The knowledge gained from 8.1 Respiration & Photosynthesis will be built upon in 9.1 (Cell Biology), 9.4 (Organisation) and B4 (Bioenergetics) as part of our spiral curriculum. In 9.1, scholars will further explore the use of microscopes to study cells, including calculating magnification and comparing different types of microscopes. In 9.4, scholars will further develop ideas about enzymes to investigate their role in the digestive system (including a required practical) and so will need a secure knowledge of how enzymes work. In B4, scholars will also look at anaerobic respiration in animals and yeast to see how this reaction differs from aerobic respiration that they have studied in 8.1.		

Links to the National Curriculum:
This KS3 lesson sequence aligns closely with the National Curriculum for Science by covering key biological concepts such as aerobic respiration, gas exchange, digestion, enzymes, and photosynthesis. It ensures students understand the structure and function of body systems, the role of enzymes in digestion, and the process and importance of photosynthesis in plants. The inclusion of microscopy also supports the requirement to observe cells and understand their structure and function.
Beyond the statutory curriculum, the sequence enriches learning through dedicated practical depth lessons, extended scientific writing, and contextual applications. It promotes disciplinary literacy, data analysis, and experimental design, encouraging students to think and communicate like scientists. These elements, along with cross-curricular links and real-world relevance, provide a more holistic and aspirational science education.

SCIENCE CURRICULUM MAP: Y7-11

Year 8	Subject: Science (Physics)	Unit title: 8.2 Energy	Term: Autumn

Knowledge:

- Define energy
- State the law of conservation of energy
- Recall the SI unit for energy
- Name the 8 energy stores and give examples of where each one exists
- Name the 4 energy stores and give examples of where each one exists
- Define work
- Describe factors affecting kinetic store
- Describe factors affecting the gravitational potential store
- Explain why a material sores elastic potential energy
- Suggest applications of elastic materials
- Define power and give the unit
- Recall, rearrange and use the equation power= energy transferred / time
- Calculate the cost of energy from household bills
- Define efficiency
- Draw scale Sankey diagrams to represent energy transfers
- Define conduction
- Explain which materials are good conductors (including solids and metals)
- Define convection
- Describe the role of density in a convection current
- Define radiation and explain how it travels
- Describe how objects cool
- Plot experimental data following the conventions of line graphs
- Explain how temperature varies during a change of state
- Plot experimental data following the conventions of line graphs

Disciplinary aims:
Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Scholars will complete a range of practical science including investigating heating and cooling. Through this, they will deepen their understanding how record data in tables and plot it graphically. Scholars will use the conventions of using equations to solve mathematical problems and there is a focus on SI units and conversions.

Links to other units:
Prior Knowledge
It builds on 7.3 Matter & Mixtures prior knowledge where scholars have learnt:

Core Vocabulary:

Chemical store
Compressed
Condensation
Conduction
Conservation of energy
Convection
Convection current
Cooling curve
Density
Dissipated energy
Elastic potential store
Endothermic
Energy
Energy efficiency
Energy store
Energy transfer
Evaporation
Exothermic
Gravitational field
Gravitational potential Store (GPE)
Gravity
Insulator
Internal energy
joule (J)
kilojoule (kJ)
kilowatt (kW)
kilowatt-hours (kWh)
Kinetic store
Mass
megajoule (MJ)
Molecule
Photons
Power
Power rating

Teaching Sequence:

- What is Energy?
- Energy Stores
- Energy Transfers
- Gravitational Potential and Kinetic Stores
- Elastic Potential Stores
- Power
- Energy in the Home
- Energy Efficiency
- Conduction
- Convection
- Radiation
- Heating & Cooling
- Cooling- Change of State
- Deliberate Practice- Energy Stores
- Deliberate Practice- Conduction, Convection & Radiation

• The particle model of matter • Changes of state It also builds on 7.4 Forces prior knowledge where scholars have learnt: • The effect of gravity and gravitational field strength • Forces and elasticity **Future Knowledge** The knowledge gained from 8.2 Energy will be built upon in: • P1 Energy: Directly assessed in the Energy topic (including stores, transfers, efficiency, and power). • P2 Electricity: Links to power calculations and energy transfer in electrical appliances. • P3 Particle Model of Matter: Heating, cooling, and change of state connect to thermal energy transfer and conservation. • P5 Forces: Gravitational potential energy and kinetic energy are essential for work done and motion calculations. • C5 Energy changes: Energy transfers during chemical reactions, exothermic/endothermic processes. B4 Bioenergetics: Concept of energy transfer and efficiency applies to biological systems.	Quantitative Radiation Sankey diagram System Temperature gradient Thermal energy Vacuum Vibrate watt (W) Work	

Links to the National Curriculum:

This unit covers the KS3 National Curriculum foundations where students learn that energy can be stored and transferred, and that heating occurs through conduction, convection, and radiation. At KS3, students encounter energy qualitatively— recognising common stores, understanding conservation, and describing changes of state using the particle model. They also begin to relate work and power to energy transfer in simple contexts.

This unit extends beyond the KS3 National Curriculum as scholars analyse energy efficiency using Sankey diagrams, explore specific stores in depth, and apply concepts to real-world systems like energy use in the home and sustainability. Thermal transfer is treated in greater detail. This progression ensures students move from descriptive understanding to a rigorous, mathematical approach that underpins advanced topics in physics and beyond.

SCIENCE CURRICULUM MAP: Y7-11

Year 8	Subject: Science (Chemistry)	Unit title: 8.3 Reactions	Term: Spring

Knowledge:

- Define acids
- State the pH of acids
- Name some common acids and state the risks associated with them
- Define alkalis and bases
- State the pH of alkalis and bases
- Give the formula for common alkalis
- Identify acids and alkalis using the pH scale and indicators
- Define neutralisation
- Write word equations for neutralisation reactions
- Write a method for neutralisation
- Follow a method for neutralization
- Write scientific conclusions
- Write word and balanced symbol equations for the reactions of metals with acid
- Recall the test for hydrogen
- Write word and balanced symbol equations for the reactions of metals carbonates with acid
- Recall the test for carbon dioxide
- Define displacement
- Predict if displacement reactions will occur
- Use displacement reactions to deduce the order of reactivity
- Identify oxidation, reduction and redox reactions from word and symbol equations
- Define thermal decomposition
- Write word equations for thermal decomposition
- Define precipitation reactions
- Interpret state symbols
- Define endothermic and exothermic reactions
- Identify reactions as endothermic and exothermic from experimental data
- Define combustion
- Write word and balanced symbol equations for combustion reactions
- Define catalysts
- Explain why catalysts are used in industry

Core Vocabulary:

Acid
Alkali
Antacid
Aqueous
Base
Catalyst
Combustion
Concentration
Corrosion
Corrosive
Displacement reaction
Double Displacement
Endothermic Reaction
Exothermic Reaction
Fuel
Hydrogen ion (H+)
Hydroxide ion (OH-)
Indicator
Indigestion remedy
Irritant
Litmus
Neutral
Neutralisation
Oxidation
pH
Precipitate
Precipitation Reaction
Product
Qualitative
Quantitative
Reactant
Reactivity
Reactivity series
Redox
Reduction

Teaching Sequence:

- Acids
- Alkalis
- Indicators and pH scale
- Neutralisation
- Neutralisation - planning
- Neutralisation – investigation
- Metals with acids
- Metals carbonates with acids
- Deliberate Practice- Acids
- Displacement
- Investigating Displacement
- Metal Oxides
- Heating Carbonates
- Precipitation
- Energy changes in reactions
- Combustion of fuels
- Catalysts
- Deliberate Practice- Reactions
- Displacement challenge

	Repeatable Solution State Symbol Thermal Decomposition Universal Indicator	

Disciplinary aims:
Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Scholars will complete a range of practical science including investigating neutralisation reactions and investigating the reactivity series. Through this, they will deepen their understanding how to control variables ensure valid outcomes in experiments. Scholars will write chemical symbols and formula to enable them to write word any symbol equations to represent reaction. This unit builds scientific curiosity by giving the scholars the opportunity to problem solve through practical methods with the displacement challenge and the real life applications of catalysts.

Links to other units:
Prior Knowledge
It builds on 7.6 Elements & the Periodic table prior knowledge where scholars have learnt:

- The difference between elements and compounds
- The difference between chemical and physical reactions
- How to represent chemical reactions using word & symbol equations

Future Knowledge The knowledge gained from 8.3 Reactions will be built upon in 9.2 (Atomic Structure) and C4 (Chemical Changes) as part of our spiral curriculum. In 9.2, scholars will further explore writing and balancing equations for a range of chemical reactions including those of the elements in group 1 and 7. In C4, scholars will further develop ideas about chemical reactions to explore making salts (including a required practical) and so will need a secure knowledge of acids and alkalis. In C4, scholars will also explain energy changes in reactions and explore reaction profiles and calculating bond enthalpies.

Links to the National Curriculum:
This lesson sequence meets the KS3 Science National Curriculum by covering essential chemical reactions, including acids and alkalis, neutralisation, displacement, combustion, and energy changes, alongside the use of indicators and the pH scale. It incorporates required practical work such as planning and conducting investigations on neutralisation, displacement, and thermal decomposition, ensuring students develop both conceptual understanding and experimental skills. Beyond the statutory content, the sequence extends learning through topics like catalysts and precipitation reactions, which introduce ideas about reaction rates and product formation, and deliberate practice sessions that strengthen mastery of chemical principles. This approach not only secures foundational knowledge but also prepares students for GCSE by embedding analytical thinking and linking chemistry to real-world applications.

SCIENCE CURRICULUM MAP: Y7-11

Year 8	Subject: Science (Physics)	Unit title: 8.4 Electricity	Term: Spring

Knowledge:

- Learn that electricity is the flow of charged particles and that charge can be positive, negative, or neutral.
- Learn that electrons are negatively charged, protons are positively charged, and neutrons have no charge.
- Learn that static electricity occurs when charges build up on insulators and can cause attraction or repulsion.
- Learn that current is the rate of flow of charge, measured in amperes (A) using an ammeter.
- Learn that charge is measured in coulombs (C) and 1 A means 1 coulomb per second.
- Learn that voltage (potential difference) is the energy transferred per coulomb of charge, measured in volts (V) using a voltmeter.
- Learn that series circuits have components in one loop, so current is the same everywhere and voltage is shared.
- Learn that parallel circuits have components in separate loops, so current is shared between branches and voltage is the same in each branch.
- Learn that metals are good conductors because they have delocalised electrons; insulators do not allow charge to flow easily.
- Learn that Ohm's Law states: I=VR , where current depends on voltage and resistance.
- Learn that resistance is how difficult it is for electrons to flow, measured in ohms (Ω).
- Learn that resistance increases with wire length and decreases with wire thickness.
- Learn that adding more components in series increases resistance and decreases current.
- Learn that in a series circuit, voltage is greater across components with higher resistance.
- Learn that in a parallel circuit, current is higher in branches with lower resistance.
- Learn that electromagnets are temporary magnets created by passing current through a coil of wire.
- Learn that the strength of an electromagnet increases by increasing current, number of coils, and adding an iron core.
- Learn that a solenoid is a coil of wire wrapped around a core to make a strong electromagnet.
- Learn that magnets have north and south poles, like poles repel, and opposite poles attract.
- Learn that magnets produce a magnetic field, strongest at the poles, shown by field lines from north to south.

Core Vocabulary:

Ammeter
Ampere (amp) (A)
Atom
Attract
Charge
Conductor
Core
coulomb (C)
Current
Delocalised electron
Electromagnet
Electron
Field
Friction
Insulator
joule (J)
Non-contact
Nucleus
ohm (Ω)
Ohm's Law
Parallel circuit
Pole
Potential Difference
Repel
Resistance
Series circuit
Solenoid
volt (V)
Voltage
Voltmeter

Teaching Sequence:

- Charge
- Current & Voltage
- Drawing Circuits
- PRACTICAL 2.0: Making circuits
- PRACTICAL 2.1: Measuring Current and Voltage
- PRACTICAL 2.2: Measuring current
- PRACTICAL 2.3: Measuring voltage
- Ohm's Law & Resistance
- PRACTICAL 2.4: Resistance investigation
- Resistance investigation cont.
- Resistance in Circuits
- Electricity DP
- PRACTICAL 2.5: Magnetism
- Electromagnets
- Electromagnet investigation
- PRACTICAL 2.6: Electromagnet investigation

SCIENCE CURRICULUM MAP: Y7-11

Disciplinary aims: Disciplinary knowledge from 7.1, The Scientific Method, will be extended in this unit. Scholars will complete a range of practical science involving different circuits and electromagnets. Through this, they will deepen their understanding how to control variables ensure valid outcomes in experiments. Scholars will focus on using correct SI units for quantities such as current and the conversions between units.		

Links to other units:

Prior Knowledge

It builds on 7.6 Elements & the Periodic table and 8.2 Energy prior knowledge where scholars have learnt:

- Metals are good conductors as they have delocalized electrons
- One of the energy transfer pathways is electrically

Future Knowledge

The knowledge gained from 8.4 Electricity will be built upon in P2 electricity and P7 magnetisms.

Links to the National Curriculum:

This electricity unit meets the **KS3 Science National Curriculum** by covering core content such as current, voltage, resistance, series and parallel circuits, and the relationship between energy and power, ensuring students understand how electrical systems work and can apply these principles to everyday contexts. It includes practical investigations on circuit construction and measurements, fulfilling the requirement for hands-on scientific enquiry. Beyond the statutory content, the unit extends learning by introducing concepts such as efficiency, energy transfer calculations, and the role of electricity in modern technologies, which deepen conceptual understanding and prepare students for GCSE. It also embeds problem-solving and analytical skills through deliberate practice and real-world applications, going further than the minimum expectations of KS3.

SCIENCE CURRICULUM MAP: Y7-11

Year 8	Subject: Science (Physics)	Unit title: 8.5 Waves	Term: Summer

Knowledge:

- Learn that waves transfer energy without transferring matter.
- Learn that there are two main types of waves: transverse and longitudinal.
- Learn that in transverse waves, oscillations are perpendicular to the direction of energy transfer.
- Learn that in longitudinal waves, oscillations are parallel to the direction of energy transfer.
- Learn that examples of transverse waves include light and water waves, and examples of longitudinal waves include sound waves.
- Learn that the key properties of waves are wavelength, frequency, amplitude, and wave speed.
- Learn that wave speed can be calculated using the equation: wave speed = frequency × wavelength.
- Learn that sound travels as a longitudinal wave through solids, liquids, and gases.
- Learn that light travels as a transverse wave and does not require a medium.
- Learn that reflection occurs when waves bounce off a surface, and refraction occurs when waves change direction at a boundary.
- Learn that the angle of incidence equals the angle of reflection.
- Learn that diffraction occurs when waves spread out after passing through a gap or around an obstacle.
- Learn that the electromagnetic spectrum includes radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays.
- Learn that different parts of the electromagnetic spectrum have different uses and hazards.
- Learn that sound waves can be represented as compressions and rarefactions in a medium.
- Learn that the speed of sound is faster in solids than in liquids and gases.
- Learn that echoes are caused by the reflection of sound waves.
- Learn that the pitch of a sound depends on its frequency, and the loudness depends on its amplitude.
- Learn that light can be absorbed, transmitted, or reflected by different materials.
- Learn that energy carried by waves can cause effects such as heating, ionisation, or vibration.

Core Vocabulary:

Absorption
Additive colour mixing
Amplitude
Auditory range
Cochlea
Compression
Concave lens
Converge
Convex lens
Cornea
Decibel
Detector
Diffuse reflections
Dissipate
Ear
Ear canal
Ear drum
Echoes
EM spectrum
EM waves
Equilibrium
Eye
Focal length
Focal point
Frequency
Inner ear hair cells
Law of reflection
Lens
Light
Light ray
Longitudinal Wave
Luminous sources
Medium

Teaching Sequence:

- What are Waves?
- Longitudinal and Transverse Waves
- Properties of Waves (Across Distance)
- Properties of Waves (Across Time)
- What is Sound?
- Describing Sounds
- Hearing Sounds
- Reflection and Absorption of Sound
- Deliberate Practice – Waves and Sound
- What is Light?
- Colour and the Electromagnetic Spectrum
- Reflection
- PRACTICAL 6.0 – Reflection
- Refraction
- PRACTICAL 6.1 – Refraction
- Lenses
- Vision
- Deliberate Practice - Light

Disciplinary aims:
The disciplinary aims of the Waves topic are to develop students' understanding of how energy is transferred through different media, using models and representations to explain phenomena such as reflection, refraction, and absorption. It encourages the application of mathematical relationships, such as the wave speed equation, to real-world contexts and experimental data. Students learn to interpret and analyse wave behaviour through practical investigations, fostering skills in observation, measurement, and data handling. Beyond factual knowledge, the topic aims to build conceptual reasoning about the nature of waves, their uses in technology and communication, and their impact on society, promoting critical thinking and scientific literacy.

Links to other units:

Prior Knowledge

- 7.3 Particle model of matter: understanding of solids, liquids, gases and density needed for wave behaviour
- 8.2 Energy transfer: radiation as a pathway for energy transfer
- 7.4 Forces: Speed calculations for wave speed

Future Knowledge:

- P1 Energy transfer: radiation and convection
- P3 Particle model of matter: Heating and cooling

P6 Waves: extending knowledge of wave behaviour including types of waves and the EM spectrum

Microphone
Middle ear bones
Non-luminous
Normal line
Oscilloscope
Peak
Pitch
Pressure wave
Prism
Pupil
Rarefaction
Reflection
Refraction
Retina
Sound wave
Soundproofing
Source
Specular reflection
Speed of light
Speed of Sound
Time period
Transverse Wave
Trough
Vibration
Visible spectrum
Volume
Wave
Wave speed
Waveform
Wavelength

Links to the National Curriculum:
This sequence of lessons fully meets the KS3 National Curriculum by covering core concepts such as wave types, properties, reflection, refraction, diffraction, and the electromagnetic spectrum. They go beyond KS3 by introducing deeper applications and scientific detail, including the wave speed equation, specific uses and hazards of electromagnetic waves, representation of sound as compressions and rarefactions, and the idea that light does not require a medium. They also extend understanding by linking wave energy to effects like heating, ionisation, and vibration, and by comparing sound speed in different states of matter. This progression builds a strong foundation for KS4 physics while enriching KS3 learning with real-world relevance and advanced scientific reasoning.

SCIENCE CURRICULUM MAP: Y7-11

Year 8	Subject: Science	Unit title: 8.6 Earth & Universe	Term: Summer

Knowledge:

- Learn that the Earth is made up of distinct layers: crust, mantle, outer core, and inner core, each with different states and compositions.
- Learn that the lithosphere includes the crust and upper mantle and is divided into tectonic plates that move on the asthenosphere.
- Learn that igneous rocks form from cooling magma or lava and can be intrusive (large crystals) or extrusive (small crystals).
- Learn that weathering, erosion, transportation, and deposition are processes that break down and move rock material.
- Learn that sedimentary rocks form through compaction and cementation of sediments, and metamorphic rocks form from existing rocks under heat and pressure.
- Learn that the rock cycle describes how rocks change between igneous, sedimentary, and metamorphic forms.
- Learn that metals are extracted from ores using methods such as smelting (displacement with carbon) and electrolysis for more reactive metals.
- Learn that the Earth's atmosphere is a mixture of gases, mainly nitrogen and oxygen, with trace gases including carbon dioxide.
- Learn that the atmosphere is layered (troposphere, stratosphere, mesosphere, thermosphere, exosphere) and influences weather and climate.
- Learn that the greenhouse effect traps heat in the atmosphere, maintaining Earth's temperature for life.
- Learn that the carbon cycle moves carbon between stores (atmosphere, plants, animals, oceans, rocks) through processes like photosynthesis, respiration, combustion, and fossilisation.
- Learn that climate change is linked to increased greenhouse gases from human activity and has global impacts.
- Learn that early models of the solar system were geocentric, later replaced by the heliocentric model supported by evidence from Galileo and Kepler.
- Learn that our solar system consists of the Sun, eight planets, dwarf planets, moons, asteroids, and comets.
- Learn that planets orbit the Sun due to gravity, and their day and year lengths depend on rotation and orbital period.
- Learn that seasons occur because of Earth's axial tilt as it orbits the Sun.
- Learn that the Moon is Earth's natural satellite and shows phases due to its position relative to the Sun and Earth.
- Learn that eclipses occur when the Sun, Earth, and Moon align, causing solar or lunar eclipses.

Core Vocabulary:

Artifical Satellite
Asteroid
Atmosphere
Axis
Carbon Cycle
Comet
Combustion
Crust
Day
Deposition
Dwarf Planet
Eclipse
Erosion
Extrusive
Full Moon
Galaxay
Gas Giant Planet
Geocentric Model
Greenhouse Effect
Haematite
Heliocentric Model
Igneous
In situ
Inner core
Intrusive
Light-year (ly)
Lithosphere
Local Group
Lower Mantle
Lava
Mantle
Malachite
Magma
Milky Way

Teaching Sequence:

- Earth's Structure
- Igneous Rocks
- Weathering, Erosion, Transportation and Deposition
- The Rock Cycle
- Extraction of Metals from Ores
- Atmosphere & Greenhouse Effect
- Carbon Cycle
- Climate Change
- History of Understanding of the Solar System
- Our Solar System
- Days, Seasons and Years
- The Moon
- Our Place in the Universe
- The Space Race
- Modern Space Exploration
- Deliberate Practice - Space
- Deliberate Practice - Earth Science

- Learn that the universe contains galaxies, galaxy groups, superclusters, and is expanding from the Big Bang.
- Learn that space exploration has evolved from the Space Race to modern missions using satellites, probes, and space stations.

Disciplinary aims:
The disciplinary aims of this unit are to develop students' understanding of how scientific knowledge is constructed, tested, and communicated within Earth and Space science. It promotes working scientifically by encouraging questioning, evidence-based reasoning, and the use of models to explain complex systems such as the rock cycle, carbon cycle, and greenhouse effect. Students learn that scientific ideas evolve over time through historical case studies like the Space Race and the changing understanding of the solar system, fostering an appreciation of the nature of science. The unit also builds skills in interpreting data, evaluating sources, and applying concepts to real-world contexts such as climate change and resource extraction, while emphasizing ethical and societal implications. Finally, it strengthens scientific communication through precise language and representations, ensuring students can articulate explanations clearly and critically.

Natural Satellite
New Moon
Orbit
Ore
Outer Core
Phase
Photosynthesis
Planet
Rocket
Respiration
Solar System
Space Probe
Terrestrial Planet
Transit
Transportation
Upper Mantle
Universe
Weathering

Links to other units:
Prior Knowledge
- 7.3 Particle model of matter: understanding of solids, liquids, gases and changes of state needed for the rock cycle
- 8.2 Energy transfers needed for the greenhouse effect
- 8.3 Reactions: needed for reactions of metal oxides for extracting metals from ores
- 7.4 Forces and Motion needed to understand the effect of gravity on seasons and tides

Future knowledge
- C4: Chemical changes- extraction of metals
- C9: Chemistry of the atmosphere- Climate change caused by greenhouse gases
- P8: Space physics- Separate science topic on the universe

Links to the National Curriculum:
This lesson sequence aligns closely with the KS3 Science National Curriculum while extending beyond its core requirements to provide depth, context, and interdisciplinary links. It covers all statutory elements related to Earth and space science, including Earth's structure, the rock cycle, and processes such as weathering and erosion, as well as key concepts in space science like the solar system, seasons, and the Moon. Beyond compliance, it enriches learning by integrating historical perspectives (e.g., the Space Race and the evolution of astronomical understanding), contemporary issues such as climate change and modern space exploration, and global challenges like the greenhouse effect and carbon cycle. The deliberate practice lessons reinforce mastery through retrieval and application, ensuring progression and secure understanding. This sequence not only meets curriculum expectations but also cultivates scientific literacy, critical thinking, and awareness of the societal and environmental implications of science, preparing students for future study and informed citizenship.

SCIENCE CURRICULUM MAP: Y7-11

Year 9	Subject: Science (Biology)	Unit title: B1: Cell Biology	Term: Autumn

Knowledge:

Cell Structure

- Learn that plant and animal cells are eukaryotic, with a nucleus, cytoplasm, and cell membrane.
- Learn that bacterial cells are prokaryotic, smaller, and have no nucleus; their DNA is in a loop and may include plasmids.
- Learn that animal cells contain: nucleus, cytoplasm, cell membrane, mitochondria, ribosomes.
- Learn that plant cells contain all animal cell parts plus: cell wall, chloroplasts, permanent vacuole.
- Learn that cell walls in plants and algae are made of cellulose.
- Learn that sub-cellular structures have functions: e.g., mitochondria for respiration, ribosomes for protein synthesis, chloroplasts for photosynthesis.

Cell Specialisation & Differentiation

- Learn that cells become specialised for specific functions (e.g., sperm, nerve, muscle in animals; root hair, xylem, phloem in plants).
- Learn that most animal cells differentiate early, while many plant cells retain the ability to differentiate throughout life.
- Learn that cell differentiation is essential for multicellular organisms.

Microscopy

- Learn that electron microscopes have higher magnification and resolution than light microscopes, allowing detailed study of sub-cellular structures.
- Learn that magnification = size of image ÷ size of real object.
- Learn that microscopy techniques have developed over time, improving understanding of cells.

Cell Division

- Learn that chromosomes are made of DNA and carry genes; body cells have chromosomes in pairs.
- Learn that mitosis produces two identical cells, important for growth and repair.
- Learn that the cell cycle includes growth, DNA replication, and mitosis.

Stem Cells

- Learn that stem cells are undifferentiated cells that can form many types of cells.
- Learn that embryonic stem cells can differentiate into most cell types, while adult stem cells have a more limited range.
- Learn that plant meristem cells can differentiate throughout life.
- Learn that stem cells have potential uses in medicine, but there are risks and ethical issues.

Transport in Cells

- Learn that diffusion is the net movement of particles from high to low concentration.

Core Vocabulary:

Active transport
Adult stem cell
Cell
Cell cycle
Cell membrane
Cell wall
Chloroplast
Chromosome
Concentration gradient
Cytoplasm
Differentiation
Diffusion
DNA
Electron microscope
Embryonic stem cell
Eukaryotic
Gene
Light microscope
Magnification
Meristem
Mitochondria
Mitosis
Muscle cell
Nerve cell
Nucleus
Osmosis
Partially permeable membrane
Phloem
Plasmid
Prokaryotic
Resolution
Ribosome
Root hair cell
Specialised cell
Sperm cell

Teaching Sequence:

- Looking at Cells
- The light microscope
- Microscopy RP
- Maths skills- size and number
- Primitive Cells
- Cell Division
- Cell Differentiation
- Stem Cells
- Uses of Stem Cell
- Separate Only: Growing Microorganisms
- Cells at work
- Diffusion
- Diffusion in Living Things
- Osmosis
- Osmosis RP
- Osmosis RP Analysis
- Active Transport

• Learn that osmosis is the diffusion of water through a partially permeable membrane. • Learn that active transport moves substances against a concentration gradient using energy from respiration. • Learn that surface area to volume ratio affects transport efficiency, and multicellular organisms need exchange surfaces and transport systems.	Stem cell Surface area to volume ratio Vacuole Xylem	
Disciplinary aims: The disciplinary aims of B1 Cell Biology focus on developing scientific thinking and practical skills through understanding cells as the fundamental unit of life. Students learn to explain how cell structures relate to function, use models and diagrams to represent processes like mitosis and osmosis, and apply mathematical skills such as magnification and percentage change calculations. They engage in required practicals, including microscopy and osmosis investigations, while evaluating methods and considering ethical issues around stem cell use. These aims also emphasize applying knowledge to real-world contexts, interpreting data, and developing critical thinking about scientific developments in medicine and biotechnology.		

Links to other units:

Prior Knowledge

- **7.2 Movement & Organisation**
  - Students learn that organisms are made of cells, and cells have basic structures.
  - Use of simple microscopes and magnification.
  - Basic idea that cells have different functions.

Future Knowledge: The knowledge from B1: Cell Biology is a foundation for many other units in AQA GCSE Combined Science.

- **B2: Organisation**
  - Understanding specialised cells (e.g., epithelial, muscle) and diffusion/osmosis is essential for explaining organ systems and exchange surfaces.
- **B3: Infection and Response**
  - Cell structure and the role of membranes underpin how pathogens invade cells and how immune cells function.
- **B4: Bioenergetics**
  - Chloroplasts and mitochondria from B1 link directly to photosynthesis and respiration.
- **B5: Homeostasis and Response**
  - Knowledge of nerve cells and cell communication supports understanding of nervous and hormonal control.
- **B6: Inheritance, Variation and Evolution**
  - Chromosomes, DNA, and cell division (mitosis) from B1 are prerequisites for genetics and meiosis.
- **B7: Ecology**
  - Transport processes (diffusion, osmosis) help explain nutrient cycling and adaptations.
- **C1: Atomic Structure**
  - Understanding molecules and ions helps explain biological molecules in cells.

- **C2: Bonding**
  - Explains why water and other compounds behave as they do in cells.
- **C3: Quantitative Chemistry**
  - Concentration calculations link to osmosis and diffusion experiments.
- **P1: Energy**
  - Respiration and photosynthesis connect to energy transfer concepts.
- **P4: Atomic Structure**
  - Builds on understanding of sub-cellular structures when discussing radiation effects on cells.

Links to the National Curriculum:
B1 Cell Biology in AQA GCSE Trilogy directly supports the National Curriculum for KS4 Science by providing the foundation for understanding living organisms. It covers eukaryotic and prokaryotic cell structures, cell specialisation, and the role of sub-cellular components, aligning with NC requirements to explain life processes at the cellular level. The unit includes microscopy skills, cell division and growth through mitosis, and the significance of stem cells, meeting NC aims for scientific knowledge and practical investigation. Transport processes—diffusion, osmosis, and active transport—link to NC expectations for understanding material exchange and surface area-to-volume relationships. Overall, B1 underpins later topics in biology and reinforces the NC emphasis on applying concepts, developing practical skills, and understanding the structure and function of organisms.

SCIENCE CURRICULUM MAP: Y7-11

Year 9	Subject: Science (Chemistry)	Unit title: C1: Atomic Structure & The Periodic Table	Term: Autumn

Knowledge:

C1.1 – The Particle Model and Atomic Structure

- Learn that atoms are the smallest particles of an element that can exist.
- Learn that elements are made up of only one type of atom.
- Learn that compounds contain two or more elements chemically combined.
- Learn that mixtures contain two or more substances not chemically combined.
- Learn that the nucleus contains protons and neutrons.
- Learn that electrons orbit the nucleus in energy levels (shells).
- Learn that the relative charge of a proton is +1, neutron is 0, and electron is –1.
- Learn that the relative mass of a proton and neutron is 1, and electron is very small.
- Learn that the atomic number equals the number of protons.
- Learn that the mass number equals the number of protons + neutrons.
- Learn that isotopes are atoms of the same element with different numbers of neutrons.
- Learn that the overall charge of an atom is zero because protons and electrons balance.

C1.2 – The Development of the Model of the Atom

- Learn that the atomic model has changed over time as new evidence was found.
- Learn that Dalton suggested atoms were solid spheres.
- Learn that Thomson discovered electrons and proposed the plum pudding model.
- Learn that Rutherford's alpha particle experiment led to the nuclear model.
- Learn that Bohr suggested electrons orbit in fixed energy levels.
- Learn that later experiments showed the nucleus contains protons and neutrons.

C1.3 – Electronic Structure

- Learn that electrons are arranged in shells around the nucleus.
- Learn that the first shell holds up to 2 electrons, the second and third up to 8.
- Learn that the number of electrons in the outer shell determines chemical properties.
- Learn that atoms react to achieve a full outer shell (stable electronic structure).

C1.4 – The Periodic Table

- Learn that elements are arranged in order of increasing atomic number.
- Learn that elements in the same group have similar properties because they have the same number of outer electrons.
- Learn that metals are on the left and non-metals on the right of the periodic table.
- Learn that group number equals the number of electrons in the outer shell.
- Learn that periods show the number of electron shells.
- Learn that the modern periodic table is based on atomic number, not mass.

Core Vocabulary:

Alkali metals
Atom
Atomic number
Atomic radius
Compound
Electron
Electron configuration
Electron shell
Element
Group
Halogens
Ion
Isotope
Mass number
Metal
Mixture
Neutron
Noble gases
Non-metal
Nucleus
Period
Periodic table
Proton
Reactivity
Relative atomic mass
Transition metals

Teaching Sequence:

- Prior Knowledge Review- Elements, Compounds & Mixtures
- The Development of the Atomic Model
- Atomic Structure
- Isotopes and Relative Atomic Mass (RAM)
- Electronic Structure
- Structure of the Atom DP
- The Development of the Periodic Table
- The Modern Periodic Table & Metals and Non-metals
- Group 1
- Group 7 – properties and trends
- Group 7 – displacement reactions
- Group 0
- Transition Metals (Separate Science)
- Periodic Table DP

C1.5 – Metals and Non-Metals • Learn that metals form positive ions and non-metals form negative ions or share electrons. • Learn that metals are good conductors, malleable, and have high melting points. • Learn that non-metals are poor conductors, brittle, and often have low melting points. **C1.6 – Group 0 (Noble Gases)** • Learn that noble gases are unreactive because they have full outer shells. • Learn that noble gases have low boiling points and are gases at room temperature. • Learn that boiling points increase down the group. **C1.7 – Group 1 (Alkali Metals)** • Learn that alkali metals react with water to form hydrogen and an alkali. • Learn that alkali metals form +1 ions. • Learn that reactivity increases down the group. • Learn that alkali metals have low melting points compared to other metals. **C1.8 – Group 7 (Halogens)** • Learn that halogens form –1 ions. • Learn that halogens exist as diatomic molecules. • Learn that reactivity decreases down the group. • Learn that halogens can displace less reactive halogens from compounds.		

Disciplinary aims:
In this unit scholars will explore how new experimental evidence may lead to a scientific model being changed or replaced in both the context of the atomic model and the periodic table.
Scholars will revisit the disciplinary knowledge of drawing graphs, first covered in 7.1 the scientific method. They will also focus on making scientific observations.

Links to other units:
Prior Knowledge
C1 builds on 7.3 Matter and Mixtures where scholars learnt about:
- Basic separating techniques including filtration, crystallization, chromatography and distillation.

C1 also builds 7.6 Elements & the Periodic Table:
- Scholars will not expand ideas about the atom from 7.6 to look at calculating relative atomic mass and what isotopes are.
- Scholars will now explain the patterns in different groups of the periodic table which they have described in 7.6.

C1 also builds on 8.3 Reactions:
- Scholars will apply the basic conventions of writing word and symbol equations from 8.3 to reactions in C1 including those of group 1 and 7 elements.
- Scholars will apply their knowledge of displacement reactions from 8.3 to halogen displacement reactions in C1.

Future Knowledge
The knowledge from AQA Combined Science Unit C1: Atomic Structure and the Periodic Table is foundational and gets reused throughout the course in several ways:
C2: Bonding, Structure, and Properties of Matter
  - Understanding electron configuration and atomic structure helps explain how atoms bond (ionic, covalent, metallic).
  - Knowledge of periodic trends (e.g., group number, reactivity) is essential for predicting bonding behaviour.

C3: Quantitative Chemistry
- Atomic structure underpins relative atomic mass (Ar) and mole calculations.
- The concept of isotopes from C1 is used when calculating average atomic masses.

C4: Chemical Changes
- Reactivity trends in Group 1 and Group 7 (from the periodic table) explain displacement reactions and reactivity series.
- Electron transfer in redox reactions links back to atomic structure.

C5: Energy Changes
- Bond energies rely on understanding bonding and atomic interactions, which stem from C1 principles.

C6: The Rate and Extent of Chemical Change
- Collision theory depends on particle structure and arrangement.

C7: Organic Chemistry
- Knowledge of carbon's bonding capacity comes from atomic structure.

C8: Chemical Analysis
- Identifying elements and compounds often uses periodic trends and atomic properties.

C9: Chemistry of the Atmosphere
- Explains why certain gases behave as they do based on atomic structure.

C10: Using Resources
- Extraction of metals and their properties link back to periodic trends.

P1: Energy
- Atomic structure is key for understanding energy changes at the particle level.

P4: Atomic Structure (Physics)
- Builds directly on C1, going deeper into isotopes, nuclear models, and radiation.

P6: Waves & P7: Magnetism and Electromagnetism
- Electron behaviour in atoms relates to electromagnetic interactions.

B1: Cell Biology
- Understanding elements and compounds helps explain biological molecules.

B3: Infection and Response
- Chemical properties of substances (e.g., antibiotics) rely on atomic interactions.

Links to the National Curriculum:

Outline of how this unit links or moves beyond the National Curriculum.

The C1 unit in AQA Combined Science introduces students to the fundamental concepts of atomic structure and the Periodic Table, directly aligning with the Key Stage 4 National Curriculum. It covers essential knowledge such as the structure of atoms, the development of atomic models, and how elements are arranged and behave in the Periodic Table. These topics help students build a strong foundation for understanding chemical reactions and the properties of materials.

SCIENCE CURRICULUM MAP: Y7-11

Year 9	Subject: Science (Physics)	Unit title: P1 Energy	Term: Spring

Knowledge:

Energy Stores and Systems

- Learn that energy can be stored in different ways: thermal, kinetic, gravitational potential, elastic potential, chemical, magnetic, electrostatic, and nuclear.
- Learn that a system is an object or group of objects, and energy can be transferred into or away from a system.
- Learn that energy can be transferred mechanically, electrically, by heating, or by radiation.

Changes in Energy

- Learn that energy is conserved: it can be transferred usefully, stored, or dissipated, but cannot be created or destroyed.
- Learn that only some energy transfers are useful, and the rest is wasted, often as heat to the surroundings.
- Learn ways to reduce unwanted energy transfers, e.g., lubrication and insulation.

Calculations

- Learn that kinetic energy is calculated using $Ek=0.5mv^2$
- Learn that gravitational potential energy is calculated using $Ep=mgh$
- Learn that elastic potential energy is calculated using $Ee=0.5ke^2$
- Learn that energy change with temperature is calculated using $\Delta E=mc\Delta\theta$
- Learn that power is the rate of energy transfer: $P=E/t$
- Learn that efficiency is calculated as: *efficiency=useful output / total input*

Specific Heat Capacity

- Learn the term specific heat capacity and its role in energy transfer.
- Learn that different materials have different specific heat capacities.
- Learn the required practical: investigate the specific heat capacity of materials.

Energy Resources

- Learn the main renewable and non-renewable energy resources.
- Learn how energy resources are used for transport, electricity generation, and heating.
- Learn to compare reliability, environmental impact, and trends in energy resource use.
- Learn to evaluate energy resources, considering ethical and environmental issues.

Disciplinary aims:

The disciplinary aims for P1 Energy focus on developing scientific thinking and skills by enabling students to use models and representations to explain energy stores, transfers, and conservation; apply mathematical skills for calculations involving work, power, efficiency, and energy changes; analyse and interpret data from practical investigations; evaluate methods and results for reliability; communicate ideas clearly using correct terminology, diagrams, and units; understand the societal impact of energy resources and sustainability; and develop problem-solving skills by applying energy principles to real-world and technological contexts.

Core Vocabulary:

Biofuel
Chemical energy
Conduction
Conservation
Convection
Dissipation
Efficiency
Efficiency equation
Elastic potential energy
Energy
Energy change equation
Energy store
Energy transfer
Fossil fuels
Geothermal
Gravitational potential energy
Hydroelectric
Insulation
Joule
Kinetic energy
Lubrication
Non-renewable energy
Nuclear energy
Power
Power equation
Radiation
Renewable energy
Sankey diagram
Solar
Specific heat capacity
System

Teaching Sequence:

- Energy Stores & Transfers
- The Kinetic Store
- The Elastic Potential Store
- The Gravitational Potential Store
- Power and Efficiency
- Energy Transfers DP
- Non-renewable energy resources
- Renewable Energy resources
- Environmental Impact of Energy Resources
- Reducing Energy Dissipation
- Particles and the Internal Store
- Thermal Conductivity Required Practical

	Temperature Thermal energy Tidal Useful energy Wasted energy Wave Wind Work Work done equation	

Links to other units:

Prior Knowledge:

- **8.1 Energy:** Builds on the qualitative descriptions of energy stores and transfers
- **7.3 Particle Model of Matter:** Builds on understanding of solids liquids and gases and changes of state

Future Knowledge:

- Links to **Biology B1 Cell Biology** – Energy from respiration powers cell processes
- Links to **Biology B4 Bioenergetics** – Photosynthesis and respiration involve energy changes
- Links to **Chemistry C5 Energy Changes** – Exothermic and endothermic reactions transfer energy
- Links to **Physics P2 Electricity** – Power calculations link to electrical energy transfer
- Links to **Physics P3 Particle Model** – Heating and cooling involve energy transfer and efficiency
- Links to **Physics P3 Particle Model** – Thermal energy and temperature changes
- Links to **Chemistry C10 Using Resources** – Renewable and non-renewable energy sources for sustainability
- Links to **Biology B7 Ecology** – Impact of energy choices on ecosystems and environment

Links to the National Curriculum:

P1 Energy in AQA GCSE Combined Science aligns closely with the National Curriculum for Science (KS4) because it addresses core principles of energy transfer and conservation that underpin physics and broader science learning. The NC requires students to understand energy changes in systems, calculate work done, power, and efficiency, and apply these ideas to everyday and technological contexts. P1 covers these through energy stores, pathways, and calculations, as well as the impact of energy resources on sustainability—meeting NC aims for scientific knowledge and application. It also reinforces NC emphasis on working scientifically through required practicals (e.g., investigating specific heat capacity and insulation), developing skills in data analysis, and using models to explain energy flow. Overall, P1 provides the conceptual framework for interpreting energy in physical, chemical, and biological systems, fulfilling the NC goal of linking theory to real-world applications.

SCIENCE CURRICULUM MAP: Y7-11

Year 9	Subject: Science (Biology	Unit title: B2 Organisation	Term: Spring

Knowledge:

Principles of Organisation
- Learn that multicellular organisms have a hierarchical organisation: cells → tissues → organs → organ systems.
- Learn that organ systems work together to form organisms.

The Human Digestive System
- Learn that the digestive system breaks down large insoluble molecules into small soluble molecules for absorption.
- Learn that enzymes catalyse specific reactions in digestion.
- Learn that amylase breaks down starch into sugars, protease breaks down proteins into amino acids, and lipase breaks down lipids into fatty acids and glycerol.
- Learn that bile is produced by the liver, stored in the gall bladder, and emulsifies fats and neutralises stomach acid.
- Learn that the small intestine is adapted for absorption with villi that increase surface area.

The Heart and Blood
- Learn that the heart pumps blood around the body in a double circulatory system.
- Learn that arteries carry blood away from the heart, veins carry blood to the heart, and capillaries allow exchange of substances.
- Learn that blood contains red blood cells, white blood cells, platelets, and plasma.
- Learn that red blood cells carry oxygen using haemoglobin.
- Learn that coronary heart disease is caused by fatty deposits in coronary arteries and can be treated by stents or statins.

The Lungs and Gas Exchange
- Learn that the lungs are part of the respiratory system and exchange gases by diffusion.
- Learn that alveoli provide a large surface area, thin walls, and a rich blood supply for efficient gas exchange.

Plant Tissues and Transport
- Learn that plant tissues include epidermal tissue, palisade mesophyll, spongy mesophyll, xylem, and phloem.
- Learn that xylem transports water and minerals from roots to leaves.
- Learn that phloem transports sugars from leaves to the rest of the plant.
- Learn that transpiration is the loss of water vapour from leaves and is affected by temperature, humidity, air movement, and light intensity.
- Learn that stomata control gas exchange and water loss.

Disciplinary aims:
Students should learn to apply biological principles to understand how multicellular organisms are organised into hierarchical systems that enable life processes. They should develop the ability to interpret and analyse data on the structure and function of cells, tissues, organs, and organ systems, and explain how these systems interact to maintain homeostasis and support survival. Learners should use models and evidence to reason about adaptations, the role of enzymes in digestion, and the transport of substances in plants and animals, while critically evaluating the impact of

Core Vocabulary:

Active site
Aerobic respiration
Amino acids
Amylase
Anaerobic respiration
Aorta
Artery
ATP
Atrium
Bile
Capillary
Carbohydrate
Carbon dioxide
Carbon dioxide
Catalyst
Cell
Chlorophyll
Coronary artery
Differentiation
Emulsification
Energy
Epithelial tissue
Fatty acids
Glandular tissue
Glucose
Glucose
Glycerol
Guard cell
Haemoglobin
Heart
Hydrolysis
Lactic acid
Lipase
Lipid
Lock and key

Teaching Sequence:
- Biological Organisation
- Enzymes
- Enzymes (RP)
- Digestion
- Digestive Enzymes
- Food Tests (RP)
- The Circulatory System
- The Heart
- Blood
- Gas Exchange
- Non-communicable disease
- Heart Disease
- Carcinogens
- Diet & Exercise
- Smoking
- Photosynthesis
- Exchange in plants
- Deliberate practice

lifestyle and disease on health.

Links to other units:
Prior Knowledge:

- **7.2 Movement & Organisation:** Understanding of cell structure and function including some specialised cells.
- **8.1 Respiration & Photosynthesis:** Understanding of the digestive system, respiratory system and circulatory system

Future Knowledge:

- **B3 Infection and Response**
  - Understanding the structure and function of organs (e.g., lungs, circulatory system) helps explain how pathogens invade and spread.
  - Knowledge of blood and the immune system from B2 supports concepts of white blood cells and antibodies.
- **B4 Bioenergetics**
  - Photosynthesis and respiration rely on understanding organ systems like the leaf structure and the human respiratory system introduced in B2.
  - Transport systems (xylem, phloem, circulatory system) underpin energy transfer.
- **B5 Homeostasis and Response**
  - The idea of organ systems working together (e.g., endocrine system interacting with circulatory system) builds on B2's organisation theme.
- **C6 Rates of Reaction**
  - Surface area and diffusion concepts from B2 (e.g., alveoli gas exchange) help explain particle collisions and reaction rates.
- **C2 Bonding and Properties of Matter**
  - Knowledge of water properties and osmosis links to understanding intermolecular forces and solubility.
- **P3 Particle Model of Matter**
  - Understanding diffusion and particle movement in biological systems reinforces particle theory in physics.
- **P4 Atomic Structure & Radiation**
  - Knowledge of medical uses of radiation (e.g., imaging, cancer treatment) connects to organ systems and health from B2.

Mitochondria
Muscle tissue
Optimum pH
Optimum temperature
Organ
Organ system
Organism
Oxygen
Oxygen
Phloem
Photosynthesis
Plasma
Platelet
Protease
Protein
Pulmonary artery
Pulmonary vein
Red blood cell
Root hair cell
Specialised cell
Starch
Stomata
Substrate
Tissue
Translocation
Transpiration
Valve
Vein
Vena cava
Ventricle
White blood cell
Xylem

SCIENCE CURRICULUM MAP: Y7-11

Year 9	Subject: Science (Chemistry)	Unit title: C2 Bonding, Structure & The Properties of Matter	Term: Summer

Knowledge:

Ionic Bonding

- Learn that ionic bonding involves the transfer of electrons from metals to non-metals to form ions.
- Learn that metals form positive ions (cations) and non-metals form negative ions (anions).
- Learn that ionic compounds have a giant lattice structure held together by strong electrostatic forces between oppositely charged ions.
- Learn that these forces are called ionic bonds.

Covalent Bonding

- Learn that covalent bonding involves the sharing of pairs of electrons between atoms.
- Learn that covalent bonds occur between non-metal atoms.
- Learn that molecules can be small (e.g., H_2, O_2, H_2O) or part of giant covalent structures (e.g., diamond, graphite, silica).

Metallic Bonding

- Learn that metallic bonding occurs in metals and alloys.
- Learn that metals consist of a giant structure of positive ions surrounded by a sea of delocalised electrons.
- Learn that metallic bonds are strong due to the electrostatic attraction between positive ions and delocalised electrons.

States of Matter

- Learn that the three states of matter are solid, liquid, and gas.
- Learn that the arrangement and movement of particles differ in solids, liquids, and gases.
- Learn that changes of state occur when energy is transferred to or from a substance.
- Learn that melting and boiling points depend on the strength of forces between particles.

Properties and Structures

- Learn that ionic compounds have high melting and boiling points because of strong ionic bonds.
- Learn that ionic compounds conduct electricity when molten or dissolved because ions are free to move.
- Learn that simple covalent molecules have low melting and boiling points because of weak intermolecular forces.
- Learn that giant covalent structures have very high melting points because of strong covalent bonds throughout the structure.
- Learn that graphite conducts electricity because it has delocalised electrons.
- Learn that metals are malleable and good conductors because of their metallic bonding.

Disciplinary aims:

This unit aims to develop students' understanding of how scientific models explain the structure and bonding of materials, and how these models relate to the properties and uses of substances. It builds scientific thinking by

Core Vocabulary:

Alloy
Anion
Boiling
Boiling point
Cation
Change of state
Condensing
Conductivity
Covalent bond
Delocalised electrons
Diamond
Ductile
Electrostatic attraction
Freezing
Gas
Giant covalent structure
Giant ionic lattice
Giant lattice
Graphite
Intermolecular forces
Ion
Ionic bond
Liquid
Malleable
Melting
Melting point
Metallic bond
Molecule
Particle arrangement
Particle movement
Silica (silicon dioxide)
Simple molecular structure

Teaching Sequence:

- Atomic Structure: Prior Knowledge Review
- Ionic Bonding
- Properties of Giant Ionic Lattices
- Covalent Bonding
- Properties of small molecules
- Properties of Giant Covalent Compounds
- Metals & Alloys
- Polymers

encouraging students to apply, evaluate, and connect chemical concepts to real-world contexts, preparing them for deeper study and informed decision-making in science and beyond.	Solid Strong covalent bonds Sublimation	

Links to other units:

Prior Knowledge

C2 builds on C1 Atomic Structure where scholars learnt about:

Structure of the Atom

- Understanding of protons, neutrons, and electrons
- Atomic number and mass number
- Electron arrangement in shells

Elements and the Periodic Table

- How elements are arranged in the periodic table
- Groups and periods: what they tell us about reactivity and properties
- Metals vs. non-metals

Chemical Symbols and Formulae

- Writing and interpreting chemical symbols and simple formulae
- Understanding the concept of a chemical equation

Future Knowledge

The knowledge gained from C3 will be fundamental and used in every other chemistry unit that scholars will study.

C3 – Quantitative Chemistry

- Understanding moles, formulae, and balanced equations relies on knowing atomic structure and bonding types.

C4 – Chemical Changes

- Reactivity of metals, electrolysis, and acids all depend on ionic bonding and electron transfer concepts.

C5 – Energy Changes

- Bond energies and exothermic/endothermic reactions require knowledge of covalent and ionic bonds.

C6 – Rate and Extent of Chemical Change

- Particle theory and collision theory build on understanding of atomic interactions and molecular structure.

C7 – Organic Chemistry

- Recognising how carbon forms covalent bonds in chains and rings is rooted in bonding and molecular structure.

C8 – Chemical Analysis

- Identifying substances through their properties links back to bonding and structure.

C9 – Chemistry of the Atmosphere

- Understanding gases and their interactions involves knowledge of small molecules and covalent bonding.

C10 – Using Resources

Concepts like alloys, polymers, and nanomaterials directly build on this unit's content.

SCIENCE CURRICULUM MAP: Y7-11

Links to the National Curriculum:
This unit aligns with the KS4 Science National Curriculum by covering essential concepts such as atomic structure, types of chemical bonding (ionic, covalent, and metallic), and how these influence the properties of materials. It also introduces nanoscience for separate science students, fulfilling statutory content requirements and building a strong foundation for understanding chemical reactions and material behaviour.

Beyond the curriculum, the unit encourages deeper thinking by linking abstract models to real-world applications like polymers, alloys, and nanotechnology. It prepares students for future scientific study by developing their ability to explain, predict, and apply chemical principles in both academic and everyday contexts

SCIENCE CURRICULUM MAP: Y7-11

Year 9	Subject: Science (Physics)	Unit title: P3 Particle Model of Matter	Term: Summer

Knowledge:

States of Matter and Particle Model

- Learn that the particle model explains the properties of solids, liquids, and gases in terms of the arrangement and movement of particles.
- Learn that density is the mass per unit volume of a substance.
- Learn that changes of state occur when energy is transferred to or from a substance without changing its temperature during melting, boiling, or condensing.

Density

- Learn that density is calculated using the formula:
  density=mass / volume
- Learn that different materials have different densities because of differences in mass and arrangement of particles.

Internal Energy and Energy Changes

- Learn that the internal energy of a system is the total kinetic and potential energy of the particles.
- Learn that heating changes the internal energy by increasing the kinetic energy of particles, which can lead to a change of state.
- Learn that the temperature of a substance does not change during a change of state because energy is used to break or form bonds.

Specific Heat Capacity

- Learn that the amount of energy needed to change the temperature of a substance depends on its mass, the temperature change, and its specific heat capacity.
- Learn that the formula for energy change is:
  $\Delta E = m \times c \times \Delta \theta$

Latent Heat

- Learn that latent heat is the energy required for a substance to change state without changing temperature.
- Learn that the formula for energy during a change of state is:
  $E = m \times L$

Disciplinary aims:

The disciplinary aims of this unit are to develop students' ability to think and work like scientists by applying models, using evidence, and engaging in practical enquiry. It builds conceptual understanding of matter and energy, strengthens mathematical and analytical skills, and promotes the use of scientific language and reasoning. Through required practicals and real-world applications, students learn to plan investigations, interpret data, and evaluate results, fostering critical thinking and scientific literacy that extend beyond the classroom.

Core Vocabulary:

Brownian Motion
Change of State
Conservation of Mass
Density
Gas
Internal Energy
Latent Heat of Fusion
Latent Heat of Vaporisation
Liquid
Mass
Particle Model
Pressure
Solid
Specific Heat Capacity
Specific Latent Heat
Temperature
Volume

Teaching Sequence:

- Particle Model
- Density
- Density Required Practical
- Changes of State
- Specific Heat Capacity
- Specific Heat Capacity: Required Practical
- Particle Motion
- Deliberate Practice

SCIENCE CURRICULUM MAP: Y7-11

Links to other units:

Prior Knowledge

P3 builds on P1 and C1 where scholars learnt about:
From Chemistry, they should grasp the particle model, states of matter, and atomic structure, which underpin concepts like density and changes of state. From Physics, they need familiarity with energy stores and transfers, basic forces, and mathematical skills such as using equations and interpreting data. This foundational knowledge enables students to connect microscopic particle behavior with macroscopic physical phenomena and apply scientific principles in both theoretical and practical contexts.

Future Knowledge

The concepts covered in this unit provide essential foundations for understanding later physics topics in AQA Combined Science. In **P4 (Atomic Structure)**, the particle model supports understanding of radiation and subatomic particles. In **P5 (Forces)**, ideas about mass, density, and pressure underpin calculations involving force and motion, especially in fluids. **P6 (Waves)** builds on particle motion to explain how energy is transferred through different media. Finally, in **P7 (Magnetism and Electromagnetism)**, understanding energy transfer and particle behavior helps students grasp how electric currents interact with magnetic fields. Overall, this unit equips students with the scientific models and practical skills needed to interpret and apply physics concepts across the curriculum.

Links to the National Curriculum:

his unit directly meets the KS4 National Curriculum by developing students' understanding of the particle model, energy changes, and the behaviour of matter, including density, changes of state, and gas pressure. It supports required practical work, promoting scientific enquiry and mathematical application, as outlined in the curriculum. The inclusion of specific heat capacity and gas pressure (for separate science students) goes beyond the basic curriculum by deepening students' grasp of thermal physics and kinetic theory. These topics also extend students' ability to apply physics in real-world contexts, preparing them for further study and careers in STEM fields.

SCIENCE CURRICULUM MAP: Y7-11

Year 9	Subject: Science (Physics)	Unit title: P4 Atomic Structure	Term: Summer

Knowledge:

Atoms and Isotopes
- Learn that all substances are made of atoms.
- Learn that atoms consist of a nucleus (containing protons and neutrons) surrounded by electrons.
- Learn that the number of protons in the nucleus determines the element.
- Learn that isotopes are atoms of the same element with different numbers of neutrons.
- Learn that the overall charge of an atom is zero because the number of protons equals the number of electrons.

Development of the Model of the Atom
- Learn that the atomic model has changed over time due to experimental evidence.
- Learn that the plum pudding model was replaced by the nuclear model after Rutherford's alpha particle scattering experiment.
- Learn that the nuclear model was refined to include electron shells (Bohr model).
- Learn that later experiments led to the discovery of the neutron by Chadwick.

Radioactivity
- Learn that some nuclei are unstable and emit radiation to become more stable.
- Learn that radioactive decay is a random process.
- Learn that the types of nuclear radiation are alpha, beta, and gamma.
- Learn that alpha particles consist of two protons and two neutrons.
- Learn that beta particles are high-speed electrons.
- Learn that gamma rays are electromagnetic waves.
- Learn that nuclear radiation can be detected using a Geiger–Müller tube.

Half-life and Activity
- Learn that the half-life of a radioactive isotope is the time taken for the activity (or number of nuclei) to halve.
- Learn that activity is measured in becquerels (Bq).
- Learn that radioactive decay cannot be predicted for individual atoms but can be described statistically.

Hazards and Uses
- Learn that radiation can cause ionisation, which may damage cells and DNA.
- Learn that the risk from radiation depends on the type and amount of radiation and exposure time.
- Learn that background radiation comes from natural and artificial sources.
- Learn that radioactive isotopes are used in medicine for diagnosis and treatment.

Core Vocabulary:

Activity
Alpha particle
Atom
Atomic number
Background radiation
Becquerel (Bq)
Beta particle
Chain reaction
Contamination
Electron
Gamma ray
Geiger–Müller tube
Half-life
Ion
Irradiation
Isotope
Mass number
Neutron
Nuclear fission
Nuclear fusion
Nuclear model
Nucleus
Plum pudding model
Proton
Radiation
Radioactive decay
Rutherford scattering
Shielding

Teaching Sequence:
- Atomic Structure
- Radioactive Decay
- Nuclear Equations
- Half Life
- Radioactive Contamination
- Deliberate practice

Disciplinary aims:
The disciplinary aims of this topic are to develop students' understanding of the fundamental principles of atomic and nuclear physics, while fostering scientific thinking through modelling, data interpretation, and evaluation of evidence. It encourages students to apply conceptual knowledge to real-world contexts, critically assess the benefits and risks of nuclear technologies, and communicate scientific ideas with clarity and precision.

SCIENCE CURRICULUM MAP: Y7-11

Links to other units:

Prior Knowledge

To successfully access and engage with the lesson sequence on Atomic Structure, Radioactive Decay, Nuclear Equations, Half-Life, and Radioactive Contamination, students should have the following prior knowledge from the AQA Combined Science Trilogy curriculum:

From C1: Atomic Structure and the Periodic Table

- The structure of the atom: protons, neutrons, electrons, and their relative charges and masses.
- The concept of atomic number and mass number.
- Electron arrangement in shells and how this relates to the periodic table.
- Isotopes: definition and examples.

From P1: Energy

- Basic understanding of energy types and transfers (especially nuclear energy as a store).
- The concept of conservation of energy.
- Introduction to power and energy calculations (helpful for understanding energy released in decay).

From P3: Particle Model of Matter

- The particle model and states of matter.
- Internal energy and changes of state.
- Basic understanding of density and how particles behave in different states (useful when discussing radiation penetration and shielding).

Future Knowledge

P5: Forces

- Understanding atomic structure and radioactive decay supports the concept of **nuclear forces** and **interactions at the subatomic level**, which underpin ideas like momentum and conservation laws in collisions and explosions.

P6: Waves

- Knowledge of **gamma radiation** as a type of electromagnetic wave links directly to this unit. Students will revisit the **properties of waves**, including how gamma rays behave, their uses, and their dangers — reinforcing ideas from radioactive decay and contamination.

P7: Magnetism and Electromagnetism

While less directly connected, the understanding of **atomic particles** and **nuclear processes** helps contextualise how charged particles behave in magnetic fields, especially in applications like particle accelerators or nuclear fusion research.

Links to the National Curriculum:

This lesson sequence aligns with the KS4 National Curriculum by covering essential content such as atomic structure, types of radioactive decay, nuclear equations, half-life, and the risks of radioactive contamination. These topics are fundamental for understanding nuclear processes and their applications in energy, medicine, and environmental science, fulfilling statutory requirements for physics at key stage 4.

It also goes beyond the curriculum by encouraging deeper exploration of real-world contexts, ethical considerations, and current innovations in nuclear science. Students develop transferable skills in data interpretation, risk evaluation, and scientific reasoning, preparing them for further study and informed decision-making in a technology-driven world.

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Biology)	Unit title: B3- Infection & Response	Term: Autumn

Knowledge:

Communicable Diseases
- Learn that pathogens are microorganisms (viruses, bacteria, protists, fungi) that cause infectious disease in plants and animals.
- Learn that diseases can spread by direct contact, water, or air.
- Learn that bacteria reproduce rapidly and produce toxins that damage tissues.
- Learn that viruses reproduce inside cells, causing cell damage.

Viral Diseases
- Learn that measles causes fever and rash, spreads via droplets, and vaccination prevents illness.
- Learn that HIV initially causes flu-like symptoms, attacks immune cells, and can lead to AIDS if untreated.
- Learn that Tobacco Mosaic Virus (TMV) affects plants, causing leaf discolouration and reduced photosynthesis.

Bacterial Diseases
- Learn that Salmonella spreads through contaminated food, causes fever and diarrhoea, and is controlled by poultry vaccination.
- Learn that gonorrhoea is an STD causing discharge and pain, spread by sexual contact, and controlled by antibiotics and barrier contraception.

Fungal Diseases
- Learn that rose black spot causes leaf spots and reduced photosynthesis, spreads by wind/water, and is treated with fungicides or leaf removal.

Protist Diseases
- Learn that malaria is caused by a protist, transmitted by mosquitoes, and controlled by preventing breeding and using nets.

Human Defence Systems
- Learn that the body has non-specific defences (skin, nose, trachea, stomach acid).
- Learn that the immune system uses white blood cells for phagocytosis, antibody production, and antitoxin production.

Vaccination
- Learn that vaccination introduces dead/inactive pathogens to stimulate antibody production and prevent future infection.
- Learn that immunising a large population reduces spread.

Antibiotics and Painkillers
- Learn that antibiotics kill bacteria but not viruses.
- Learn that painkillers relieve symptoms but do not kill pathogens.
- Learn that antibiotic resistance is a major concern.

Core Vocabulary:

AIDS
Antibiotic
Antibiotic resistance
Antibody
Antitoxin
Bacteria
Clinical trial
Communicable disease
Dose
Double-blind trial
Drug discovery
Efficacy
Fungi
Gonorrhoea
HIV
Immune system
Malaria
Measles
Painkiller
Pathogen
Phagocytosis
Placebo
Protist
Rose black spot
Safety
Salmonella
Tobacco Mosaic Virus (TMV)
Transmission
Vaccination
Vector
Virus
White blood cell

Teaching Sequence:
- Health and Disease
- Studying Pathogens
- Viral Disease
- Bacterial Disease
- Fungal Disease
- Protist Disease
- Human Defence Systems
- Analysing Data (Scientific skills)
- Deliberate Practice
- Vaccination
- Antibiotics & painkillers
- Drug discovery
- Drug development
- Monoclonal antibodies (HT) (Biology only)
- Deliberate Practice

SCIENCE CURRICULUM MAP: Y7-11

Discovery and Development of Drugs • Learn that drugs were traditionally extracted from plants and microorganisms (e.g., digitalis, aspirin, penicillin). • Learn that new drugs are tested for safety, efficacy, and dose through preclinical and clinical trials, including double-blind trials.		

Disciplinary aims:
The disciplinary aims for B3 Infection and Response focus on developing scientific thinking and skills by enabling students to use models to explain how pathogens cause disease and how the immune system responds, apply mathematical skills to interpret data on infection rates and drug trials, analyse and evaluate data from practical investigations for reliability, communicate ideas clearly using correct terminology and diagrams, understand the societal impact of issues like antibiotic resistance and vaccination, and develop problem-solving skills by applying knowledge of infection and response to real-world contexts such as disease prevention and control.

Links to other units:
Prior Knowledge

- **B1 Cell Biology** – Pathogens are cells or particles; immune responses involve specialised cells.
- **B2 Organisation** – Links to the circulatory system transporting immune cells and antibodies.

Future Knowledge

- **B4 Bioenergetics** – Illness affects photosynthesis and respiration in plants and animals.
- **B5 Homeostasis** – Fever and immune responses relate to temperature regulation.
- **B7 Ecology** – Disease impacts populations and ecosystems.
- **Chemistry links**
- **C5 Energy Changes** – Drug development involves chemical reactions and energy changes.
- **C8 Chemical Analysis** – Testing purity and composition of medicines.
- **C10 Using Resources** – Production of antibiotics and sustainable drug development.
- **Physics links**
- **P6 Waves** – Use of electromagnetic waves in sterilisation and medical imaging.
- **P7 Magnetism and Electromagnetism** – MRI scans for diagnosing infections.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Chemistry)	Unit title: C3 Quantitative Chemistry	Term: Autumn

Knowledge:

Chemical Measurements and Conservation of Mass

- Learn that the law of conservation of mass means no atoms are lost or made during a chemical reaction, so the mass of products equals the mass of reactants.
- Learn that chemical reactions can be represented by balanced symbol equations, showing equal numbers of each atom on both sides.
- Learn that uncertainty in measurements affects the reliability of data.

Relative Formula Mass

- Learn that relative formula mass (Mr) is the sum of the relative atomic masses of all atoms in a compound.
- Learn that in a balanced equation, the sum of the relative formula masses of reactants equals that of products.

Mass Changes in Reactions

- Learn that mass may appear to change when a gas is involved because it can escape or enter the system.

The Mole and Amount of Substance

- Learn that one mole of a substance contains 6.02×10^{23} particles (Avogadro's number).
- Learn that moles link mass to number of particles using relative atomic or formula mass.
- Learn that moles are used to balance equations and calculate amounts of reactants and products.

Using Moles in Equations

- Learn that balanced equations show the ratio of moles of reactants and products.
- Learn that limiting reactants determine the amount of product formed.

Concentration of Solutions

- Learn that concentration is measured in g/dm^3 or mol/dm^3 and calculated using mass or moles and volume.
- in terms of how many atoms from reactants end up in useful products.

Core Vocabulary:

Avogadro Constant
Balanced Equation
Concentration
Conservation of Mass
Empirical Formula
Excess Reactant
Limiting Reactant
Molar Mass
Molar Volume
Mole
Molecular Formula
Reacting Masses
Relative Atomic Mass (Ar)
Relative Formula Mass (Mr)
Volume of Gas

Teaching Sequence:

- Conservation of Mass
- Balancing equations
- Relative formula mass
- Moles (HT)
- Reacting masses (HT)
- Limiting factors & balancing with moles (HT)
- Concentrations
- Deliberate Practice

Disciplinary aims:

To succeed in this quantitative chemistry topic, students need disciplinary knowledge that includes understanding key scientific principles like the conservation of mass and the mole concept, applying mathematical skills such as rearranging equations and unit conversions, and using chemical symbols and equations to represent reactions. They also need to follow logical procedures for solving problems and interpret scientific representations accurately to communicate their understanding effectively.

SCIENCE CURRICULUM MAP: Y7-11

Links to other units:

Prior Knowledge

C3 builds on C1 Atomic Structure where scholars learnt about:

- Atoms, elements, and compounds: Knowing the structure of atoms, the periodic table, and how elements combine to form compounds.
- Chemical symbols and formulae: Being able to interpret and write chemical symbols and formulae for elements and compounds.
- Chemical equations: Recognising and interpreting word and symbol equations, and understanding the basics of what they represent.
- The concept of conservation of mass: A basic understanding that mass is conserved in chemical reactions, even if they haven't yet applied it mathematically.
- Simple atomic structure and relative atomic mass (Ar): Knowing what relative atomic mass is and how it relates to the periodic table.

Future Knowledge

The knowledge gained from C3 will be fundamental and used in every other chemistry unit that scholars will study.

C4: Chemical Changes

- Reactions of acids: Calculating reacting masses and concentrations is essential for understanding neutralisation and titration.
- Reactivity series and extraction: Students use balanced equations and mole calculations to interpret metal reactions and extraction processes.

C5: Energy Changes

- Exothermic and endothermic reactions: Understanding conservation of mass and balanced equations helps explain energy transfer in reactions.

C6: Rate and Extent of Chemical Change

- Rate calculations: Students apply concentration formulas and unit conversions when investigating how concentration affects reaction rates.

C7: Organic Chemistry

- Combustion and reactions of hydrocarbons: Balancing equations and calculating masses are key to understanding complete and incomplete combustion.

C8: Chemical Analysis

- Purity and formulations: Students use percentage by mass and concentration calculations to assess purity and composition.

C9: Chemistry of the Atmosphere

- Pollutant formation and reactions: Balancing equations and understanding mass changes help explain how pollutants form and react in the atmosphere.

C10: Using Resources

Life cycle assessments and sustainable chemistry: Quantitative skills are used to evaluate resource use, yields, and efficiency in industrial processes

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Physics)	Unit title: P2 Electricity	Term: Autumn

Knowledge:

Current, Charge and Potential Difference

- Learn that electric current is the flow of electric charge through a circuit.
- Learn that current depends on potential difference and resistance.
- Learn that charge flow is measured in coulombs and relates to current and time.
- Learn that potential difference is the energy transferred per unit charge.

Resistance and Ohm's Law

- Learn that resistance opposes the flow of current in a circuit.
- Learn that for a resistor at constant temperature, current is directly proportional to potential difference (Ohm's Law).
- Learn that resistance can change with temperature in components like filament lamps.
- Learn that diodes allow current to flow in one direction only.

Circuit Components

- Learn that series circuits have the same current through each component but potential difference shared.
- Learn that parallel circuits have the same potential difference across each branch but current shared.
- Learn that adding resistors in series increases total resistance, while adding in parallel decreases it.

Electrical Power and Energy

- Learn that power depends on potential difference and current.
- Learn that energy transferred depends on power and time.
- Learn that power can also be calculated using current and resistance.

Domestic Electricity

- Learn that mains electricity in the UK is an alternating current supply at 230 V and 50 Hz.
- Learn that the live wire carries current to the appliance, the neutral wire completes the circuit, and the earth wire is a safety feature.
- Learn that fuses and circuit breakers protect circuits by breaking the circuit if current is too high.
- Learn that step-up and step-down transformers are used in the National Grid to reduce energy losses during transmission.

Core Vocabulary:

Alternating Current (AC)
Charge
Circuit Breaker
Current
Direct Current (DC)
Earth Wire
Energy Transfer
Frequency
Fuse
Live Wire
Mains Electricity
National Grid
Neutral Wire
Ohm's Law
Parallel Circuit
Potential Difference
Power
Resistance
Series Circuit
Step-down Transformer
Step-up Transformer
Voltage
Work Done

Teaching Sequence:

- Electrical Circuits
- Charge, current & potential difference
- Resistance
- Factors Affecting Resistance
- Electrical energy transfers
- Ohmic and non-ohmic conductors
- Deliberate Practice
- Current in series and parallel
- Potential difference in series and parallel
- Resistors in series and parallel
- Resistors in series and parallel Required Practical
- IV Characteristics
- IV Characteristics Required Practical
- Deliberate Practice
- Mains Electricity
- Transmitting Electricity

SCIENCE CURRICULUM MAP: Y7-11

Disciplinary aims:
This lesson sequence aims to develop students' disciplinary understanding of physics by encouraging them to think scientifically—using models, interpreting data, and applying mathematical relationships to explain how electricity behaves in circuits. Through practical investigations and conceptual learning, students build the skills to analyse systems, evaluate evidence, and understand how scientific knowledge is constructed.

It also strengthens their ability to work scientifically by planning and conducting experiments, using circuit symbols and equipment accurately, and interpreting IV graphs and energy transfer data. These experiences prepare students for further study and careers in science and engineering, while deepening their understanding of how electricity powers the modern world.

Links to other units:
Prior Knowledge

Unit P1: Energy
- Energy transfers: Understanding how energy moves between stores (e.g., electrical to thermal) helps students grasp how electrical energy is used in circuits.
- Power and efficiency: These concepts support learning about electrical power and energy calculations in circuits.

Unit P3: Particle Model of Matter
- States of matter and internal energy: Useful when discussing resistance and how temperature affects conductors.
- Heating and cooling: Links to energy transfer in electrical components and the effect of current on temperature.

Unit P4: Atomic Structure
- Electric charge and static electricity: Provides a foundation for understanding electric charge, current, and potential difference.
- Structure of the atom: Supports understanding of how electrons move in a circuit and the role of conductors and insulators.

Future Knowledge

Unit P5: Forces
- Electric fields: Builds directly on understanding of charge and potential difference.
- Forces in action: Concepts like resistance and current help students understand how electrical forces interact with materials and systems.

Unit P6: Waves
- Electromagnetic waves: Mains electricity and transmission link to how energy is carried by waves, especially in power systems and communication.
- Wave behaviour in circuits: Knowledge of alternating current (AC) and direct current (DC) supports understanding of waveforms and signal transmission.

Unit P7: Magnetism and Electromagnetism
- Electric current and magnetic fields: Understanding current flow and circuit design is essential for grasping how electromagnets work.
- Transformers and power transmission: Builds directly on lessons about mains electricity and transmitting electricity, especially in the National Grid context.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Biology)	Unit title: B4 Bioenergetics	Term: Autumn

Knowledge:

Photosynthesis

- Learn that photosynthesis is the process plants use to make glucose using light energy.
- Learn that the word equation for photosynthesis is:
  carbon dioxide + water → glucose + oxygen.
- Learn that photosynthesis requires light, chlorophyll, carbon dioxide, and water.
- Learn that glucose produced in photosynthesis can be used for respiration, converted to starch, cellulose, amino acids, or lipids.
- Learn that the rate of photosynthesis is affected by light intensity, carbon dioxide concentration, and temperature.
- Learn that these factors can be investigated using practical experiments.
- Learn that limiting factors explain why photosynthesis does not increase indefinitely with light, CO_2, or temperature.
- Learn that farmers use knowledge of limiting factors to maximise crop yields.

Respiration

- Learn that respiration releases energy from glucose for cellular processes.
- Learn that aerobic respiration uses oxygen and produces carbon dioxide and water.
- Learn that the word equation for aerobic respiration is:
  glucose + oxygen → carbon dioxide + water.
- Learn that anaerobic respiration occurs without oxygen and produces lactic acid in animals.
- Learn that the word equation for anaerobic respiration in animals is:
  glucose → lactic acid.
- Learn that anaerobic respiration in plants and yeast produces ethanol and carbon dioxide.
- Learn that the word equation for fermentation is:
  glucose → ethanol + carbon dioxide.
- Learn that respiration transfers energy for processes like muscle contraction, active transport, and synthesis of molecules.

Exercise and Metabolism

- Learn that during exercise, the demand for energy increases, so breathing and heart rate rise.
- Learn that lactic acid builds up during anaerobic respiration, causing muscle fatigue.
- Learn that oxygen debt is the extra oxygen needed to remove lactic acid after exercise.
- Learn that metabolism refers to all the chemical reactions in an organism, including respiration and synthesis reactions.

Core Vocabulary:

Aerobic Respiration
Anaerobic Respiration
ATP
Carbon Dioxide
Concentration
Cellulose
Chlorophyll
Chloroplast
Energy Transfer
Exercise
Fermentation
Glucose
Lactic Acid
Light Intensity
Limiting Factor
Metabolism
Mitochondria
Oxygen Debt
Photosynthesis
Rate of Photosynthesis
Respiration
Starch
Temperature

Teaching Sequence:

- Aerobic Respiration
- Exercise and Respiration
- Practical: Investigating muscle fatigue
- Photosynthesis
- Plant adaptations
- Limiting Factors of photosynthesis
- Practical: Investigating photosynthesis
- Deliberate Practice

SCIENCE CURRICULUM MAP: Y7-11

Disciplinary aims:
Students should learn to apply scientific principles to explain how energy is transferred in living organisms through photosynthesis and respiration. They should interpret and analyse data from experiments on factors affecting photosynthesis and respiration, use models to represent energy flow, and apply mathematical skills to calculate rates and interpret graphs. Learners should evaluate methods, identify variables, and suggest improvements in practical work, while considering the implications of bioenergetics for health, exercise, and food production. Clear scientific communication and reasoning based on evidence are essential throughout.

Links to other units:

Prior Knowledge

B1 Cell Biology

- Structure and function of animal and plant cells (including organelles like mitochondria and chloroplasts).
- Role of the nucleus, cytoplasm, and cell membrane.
- Differences between prokaryotic and eukaryotic cells.
- Basics of diffusion, osmosis, and active transport.
- Importance of surface area to volume ratio for exchange.

B2 – Organisation

- Structure and function of the digestive system (especially enzymes and their role in breaking down food).
- Enzyme action: lock and key model, effect of temperature and pH.
- Transport systems in plants (xylem and phloem) and animals (blood and circulation).
- Role of the lungs and gas exchange in humans.
- Importance of the circulatory system for delivering glucose and oxygen to cells.

Future Knowledge

B5 Homeostasis and Response

- Respiration knowledge is essential for understanding how energy supports processes like thermoregulation and active transport.
- Photosynthesis links to plant responses and hormone-controlled growth.

B6 Inheritance, Variation and Evolution

- Energy from respiration underpins growth and reproduction, which are key to variation and evolution.

B7 Ecology

- Photosynthesis is central to food chains and energy transfer in ecosystems.
- Respiration links to decomposition and cycling of matter.

C6 Rates of Reaction

- Enzyme-controlled reactions in photosynthesis and respiration provide biological examples of reaction rates.

C7 Organic Chemistry

- Glucose and carbohydrates discussed in bioenergetics connect to organic molecules.

P3 Particle Model of Matter & P4 Electricity

- Energy transfer concepts (e.g., conservation of energy) reinforce understanding of respiration and photosynthesis as energy conversion processes.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Biology)	Unit title: B5 Homeostasis and Response	Term: Spring

Knowledge:

Principles of Homeostasis

- Learn that homeostasis maintains the internal environment in response to internal and external changes.
- Learn that control systems include receptors, coordination centres, and effectors.
- Learn that negative feedback restores conditions to normal when they change.

The Nervous System

- Learn that the nervous system enables rapid communication between different parts of the body.
- Learn that information is transmitted as electrical impulses along neurones.
- Learn that reflex actions are automatic and rapid to protect the body.
- Learn that synapses transmit signals chemically between neurones.

The Endocrine System

- Learn that hormones are chemical messengers secreted by glands into the blood.
- Learn that the endocrine system coordinates slower, longer-lasting responses than the nervous system.
- Learn that the pituitary gland controls other glands and secretes hormones such as ADH.
- Learn that insulin and glucagon regulate blood glucose concentration.
- Learn that adrenaline prepares the body for fight or flight.
- Learn that thyroxine regulates metabolism.

Control of Blood Glucose

- Learn that blood glucose concentration is controlled by insulin and glucagon from the pancreas.
- Learn that diabetes is a condition where blood glucose control is impaired.

Hormones in Reproduction

- Learn that hormones control the menstrual cycle.
- Learn that FSH, LH, oestrogen, and progesterone regulate ovulation and the uterus lining.
- Learn that hormonal contraception prevents pregnancy by inhibiting ovulation.
- Learn that fertility treatments use hormones to stimulate egg release.

Disciplinary aims:

Students should learn to apply scientific principles to explain how organisms maintain stable internal conditions through homeostasis. They should interpret and analyse data on control systems, reflex actions, and hormonal regulation, using models to represent feedback mechanisms. Learners should develop mathematical skills to calculate changes in variables, evaluate experimental methods (e.g., reaction time investigations), and suggest improvements. They should also consider ethical and societal implications of topics such as fertility treatments and stem cell use, while communicating scientific ideas clearly and using

Core Vocabulary:

Adrenal Gland
Blood Glucose
Brain
Central Nervous System (CNS)
Contraception
Coordination Centre
Diabetes
Effector
Endocrine System
Fertility Treatment
Follicle Stimulating Hormone (FSH)
Glucagon
Homeostasis
Hormone
Insulin
IVF
Luteinising Hormone (LH)
Menstrual Cycle
Motor Neuron
Negative Feedback
Nervous System
Neurotransmitter
Oestrogen
Ovary
Pancreas
Pituitary Gland
Progesterone
Receptor
Reflex
Relay Neuron
Sensory Neuron
Spinal Cord
Stimulus

Teaching Sequence:

- Homeostasis
- The Nervous System
- Reflex Actions
- Investigating Reaction Time: Required Practical B4.1
- The Endocrine System
- Controlling Blood Glucose
- Diabetes & Diabetes Recommendations
- Negative Feedback (Higher Tier)
- Human Reproduction
- In Vitro Fertilisation (Higher Tier)
- Contraception
- Maths Skills: The Spread of Scientific Data

evidence to justify conclusions.	Synapse Testis Thyroid	

Links to other units:

Prior Knowledge

B1**:** Cell Biology

- Cell structure and function:
  - Differences between animal and plant cells. Role of organelles (e.g., nucleus, mitochondria).
- Specialised cells: Nerve cells and their adaptations for communication.

B2: Organisation

- Digestive system basics:
  - Enzymes and their role in breaking down food (links to blood glucose regulation).
- Circulatory system:
  - Structure and function of the heart and blood vessels. Transport of substances in blood (e.g., hormones).
- Homeostasis link:
  - Importance of maintaining stable internal conditions for enzyme activity.

B4: Bioenergetics- Respiration:

  - Aerobic and anaerobic respiration and energy release (needed for understanding metabolic rate and temperature control).

Future Knowledge

B6: Inheritance, Variation and Evolution

- Hormonal control and reproduction:
  - Understanding of the menstrual cycle and hormones from B5 is essential for explaining fertility treatments and contraception.
- Genetic disorders:
  - Links to how hormones influence development and inheritance patterns.

B7: Ecology

- Homeostasis in organisms:
  - Thermoregulation and water balance are key for survival in different environments.
- Adaptations:
  - Nervous and hormonal responses underpin behavioural and physiological adaptations.
- Physics (P6): Nervous system and reflexes link to stopping distances

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Chemistry)	Unit title: C4 Chemical Changes	Term: Spring

Knowledge:

Reactivity of Metals

- Learn that metals react with oxygen to produce metal oxides and that these are oxidation reactions because metals gain oxygen.
- Learn that reduction and oxidation can be explained in terms of loss or gain of oxygen.
- Learn that when metals react with other substances, the metal atoms form positive ions.
- Learn that the reactivity of a metal is related to its tendency to form positive ions.
- Learn that metals can be arranged in a reactivity series based on reactions with water and dilute acids.
- Learn that hydrogen and carbon are often included in the reactivity series.
- Learn that a more reactive metal can displace a less reactive metal from a compound.

Extraction of Metals and Reduction

- Learn that unreactive metals such as gold are found in the Earth as the metal itself.
- Learn that most metals are found as compounds and require chemical reactions to extract.
- Learn that metals less reactive than carbon can be extracted from their oxides by reduction with carbon.
- Learn that reduction involves the loss of oxygen.

Oxidation and Reduction in Terms of Electrons (HT only)

- Learn that oxidation is loss of electrons and reduction is gain of electrons.
- Learn that displacement reactions can be represented by ionic equations.
- Learn that you can identify which species are oxidised and reduced in given reactions.

Reactions of Acids

- Learn that acids react with some metals to produce salts and hydrogen.
- Learn that these reactions are redox reactions (HT only).
- Learn that acids are neutralised by alkalis and bases to produce salts and water, and by carbonates to produce salts, water, and carbon dioxide.
- Learn that the salt produced depends on the acid used and the positive ion in the base, alkali, or carbonate.

Soluble Salts

- Learn that soluble salts can be made by reacting acids with solid insoluble substances such as metals, oxides, hydroxides, and carbonates.
- Learn that excess solid is filtered off and the solution crystallised to produce solid salts.

The pH Scale and Neutralisation

- Learn that acids produce H^+ ions in aqueous solutions and alkalis produce OH^- ions.
- Learn that the pH scale (0–14) measures acidity or alkalinity.
- Learn that neutralisation occurs when H^+ ions react with OH^- ions to produce water.

Strong and Weak Acids (HT only)

- Learn that strong acids are completely ionised in aqueous solution and weak acids are partially ionised.

Core Vocabulary:

Acid
Alkali
Anode
Aqueous solution
Base
Carbon reduction
Cathode
Displacement
Electrolysis
Electrolyte
Half equation
Hydrogen ion (H^+)
Hydroxide ion (OH^-)
Indicator
Ion
Ionic equation
Ionisation
Molten ionic compound
Negative ion
Neutralisation
Ore
Oxidation
pH scale
Positive ion
Reactivity series
Redox reaction
Reduction
Salt
Strong acid
Weak acid

Teaching Sequence:

- Metal Oxides
- Reactivity of metals & displacement
- Extraction of metals
- Acids, alkalis and pH
- Reactions of acids
- Making Salts
- Making Salts Required Practical
- HT ONLY Strong and Weak acids
- Acids and Alkalis DP
- Prior knowledge review: Ionic compounds
- Electrolysis of molten salts
- Electrolysis of aqueous solutions
- Electrolysis Required practical
- Electrolysis of Aluminium
- Electrolysis DP

• Learn that for a given concentration, stronger acids have lower pH. • Learn that each decrease of 1 pH unit increases H^+ concentration by a factor of 10. **Electrolysis** • Learn that ionic compounds conduct electricity when molten or in solution because ions are free to move. • Learn that electrolysis involves ions moving to electrodes: cations to the cathode and anions to the anode. • Learn that electrolysis of molten ionic compounds produces the metal at the cathode and the non-metal at the anode. • Learn that electrolysis is used to extract metals too reactive for reduction with carbon. • Learn that electrolysis of aqueous solutions produces products depending on reactivity and the presence of halide ions. • Learn that reactions at electrodes can be represented by half equations (HT only).		

Disciplinary aims:
This lesson sequence aims to develop students' disciplinary understanding of chemistry by deepening their grasp of chemical reactions, reactivity, and practical techniques. It supports scientific thinking through prediction, analysis, and evaluation, while reinforcing key concepts like ionic bonding, pH, and electrolysis.
Beyond core content, the sequence encourages students to apply their knowledge in real-world contexts, linking chemistry to sustainability, industry, and careers. It builds scientific literacy and prepares learners for future study by integrating practical skills, conceptual depth, and cross-topic connections.

Links to other units:
Prior Knowledge

From Unit C1: Atomic Structure
- Understanding of atoms, elements, compounds, and mixtures
- Familiarity with the periodic table and how elements are grouped
- Basic knowledge of ions and ionic bonding (essential for electrolysis and salt formation)

From Unit C2: Bonding, Structure, and Properties of Matter
- Ionic bonding and the structure of ionic compounds
- Properties of metals and non-metals
- Conductivity and melting points of substances (relevant for electrolysis and extraction)

From Unit C3: Quantitative Chemistry
- Conservation of mass and balancing equations
- Simple calculations involving moles and relative formula mass
- Understanding of concentration and volume (useful for acid reactions and practicals)

Future Knowledge

C7: Energy Changes
- Links to reactions of acids and electrolysis, where energy transfer is key.
- Students explore exothermic and endothermic reactions, often involving metals and acids.

C8: Chemical Analysis
- Builds on understanding of ionic compounds and reactions to identify substances.

- Knowledge of salts and electrolysis supports analytical techniques.

C9: Chemistry of the Atmosphere

- Connects to metal extraction and industrial processes, including environmental impacts.
- Electrolysis and reactivity knowledge help explain pollutant formation and control.

C10: Using Resources

- Strong links to metal extraction, reactivity series, and electrolysis.
- Students explore sustainable use of materials and life cycle assessments, applying earlier chemical principles.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Chemistry)	Unit title: Energy Changes	Term: Spring

Knowledge:

Exothermic and Endothermic Reactions

- Learn that energy is transferred in chemical reactions to or from the surroundings.
- Learn that exothermic reactions transfer energy to the surroundings and usually cause a rise in temperature.
- Learn that endothermic reactions take in energy from the surroundings and usually cause a fall in temperature.
- Learn that examples of exothermic reactions include combustion, many oxidation reactions, and neutralisation.
- Learn that examples of endothermic reactions include thermal decomposition and the reaction between citric acid and sodium hydrogencarbonate.
- Learn that energy changes can be measured by monitoring temperature change.

Reaction Profiles

- Learn that reaction profiles show the relative energies of reactants and products and the activation energy.
- Learn that activation energy is the minimum energy needed for a reaction to occur.
- Learn that in exothermic reactions, products have less energy than reactants.
- Learn that in endothermic reactions, products have more energy than reactants.

The Energy Change of Reactions (HT only)

- Learn that energy is needed to break bonds and energy is released when new bonds are formed.
- Learn that bond breaking is endothermic and bond forming is exothermic.
- Learn that the overall energy change of a reaction depends on the difference between the energy needed to break bonds and the energy released when new bonds form.
- Learn that you can calculate the energy change of a reaction using bond energies.

Core Vocabulary:

Activation energy
Bond breaking
Bond energy
Bond forming
Endothermic
Energy
Exothermic
Overall energy change
Reaction profile
Temperature change

Teaching Sequence:

- Energy Changes in Chemical Reactions
- Energy Changes (RP)
- Making and Breaking Bonds
- Reaction Profiles
- Deliberate Practice

Disciplinary aims:

In C5, students learn that chemical reactions involve energy transfers, and they develop the ability to interpret and represent these changes using reaction profiles and bond energy calculations. They learn that exothermic and endothermic processes underpin many real-world applications, from combustion to thermal decomposition, and that energy changes can be quantified and compared. The topic also introduces electrochemical principles through cells, batteries, and fuel cells, encouraging students to apply concepts of energy conservation and chemical reactivity to technological contexts. These aims build disciplinary thinking by linking abstract ideas of energy and bonding to practical systems and sustainability.

SCIENCE CURRICULUM MAP: Y7-11

Links to other units:

Prior Knowledge

- P1: Energy
  - Learn that energy conservation and transfer principles in C5 reinforce ideas about energy stores and pathways in physics.
  - Exothermic reactions link to thermal energy transfer.
- P3: Particle Model of Matter
  - Learn that endothermic processes relate to changes of state and energy absorption.
- B4: Bioenergetics
  - Learn that respiration and photosynthesis involve energy changes similar to chemical reactions studied in C5.
  - Bond energy ideas help explain why glucose is a good energy store.
- B5: Homeostasis and Response
  - Learn that exothermic reactions in metabolism influence body temperature regulation.

Future Knowledge

- C6: The Rate and Extent of Chemical Change
  - Learn that activation energy and reaction profiles from C5 explain why catalysts lower activation energy and speed up reactions.
  - Endothermic/exothermic ideas help interpret temperature effects on reaction rate.
- C7: Organic Chemistry
  - Learn that combustion of hydrocarbons is an exothermic reaction, linking back to energy transfer concepts.
  - Bond energy calculations from C5 apply when comparing fuels.
- C8: Chemical Analysis
  - Learn that some tests involve energy changes (e.g., flame tests involve energy emission).

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Physics)	Unit title: P5 Forces	Term: Spring

Knowledge:

Scalar and Vector Quantities
- Learn that quantities can be scalar (magnitude only) or vector (magnitude and direction).
- Learn that examples of scalar quantities include speed, distance, mass, and energy.
- Learn that examples of vector quantities include velocity, displacement, force, and acceleration.

Contact and Non-Contact Forces
- Learn that forces arise from interactions between objects.
- Learn that contact forces occur when objects touch (e.g., friction, air resistance, tension).
- Learn that non-contact forces act at a distance (e.g., gravitational, electrostatic, magnetic).

Gravity
- Learn that gravity is a force of attraction between masses.
- Learn that weight is the force acting on an object due to gravity and depends on mass and gravitational field strength.
- Learn that weight = mass × gravitational field strength (W = m × g).

Resultant Forces
- Learn that a single force can replace multiple forces acting on an object (resultant force).
- Learn that if the resultant force on an object is zero, it is in equilibrium.

Work Done and Energy Transfer
- Learn that work is done when a force moves an object through a distance.
- Learn that work done = force × distance moved along the line of action of the force (W = F × d).
- Learn that work done transfers energy from one store to another.

Forces and Elasticity
- Learn that a force can cause an object to stretch or compress.
- Learn that extension is proportional to force up to the limit of proportionality (Hooke's Law).
- Learn that elastic potential energy is stored when an object is stretched or compressed.

Pressure in Fluids
- Learn that pressure in a fluid depends on depth and density.
- Learn that pressure = force ÷ area (p = F ÷ A).
- Learn that pressure in a liquid increases with depth due to weight of liquid above.

Speed and Velocity
- Learn that speed is a scalar quantity and velocity is a vector quantity.
- Learn that typical speeds vary for walking, running, cycling, and vehicles.

Distance–Time and Velocity–Time Graphs
- Learn that distance–time graphs show speed and velocity–time graphs show acceleration.
- Learn that gradients represent speed or acceleration and areas under graphs represent distance travelled.

Acceleration

Core Vocabulary:

Acceleration
Acceleration
Air resistance
Braking distance
Conservation of momentum
Contact force
Displacement
Distance-time graph
Energy transfer
Force
Friction
Gradient
Gravitational field
Impact force
Inertia
Interaction pair
Joule
Mass
Momentum
Newton's First Law
Newton's Second Law
Newton's Third Law
Non-contact force
Normal contact force
Power
Pressure and Moments
Reaction time
Resultant force
Resultant force
Speed
Stopping distance

Teaching Sequence:
- Scalars and Vectors
- Distance and Displacement
- HT: Resolving Vectors
- Forces and Elasticity
- Speed and Acceleration
- Distance-Time Graphs
- Velocity-Time Graphs
- Newton's First Law
- Newton's Second Law
- Investigation Acceleration Required Practical
- Newton's Third Law
- Weight and Terminal Velocity
- Forces and Breaking
- HT: Momentum
- Deliberate Practice

• Learn that acceleration = change in velocity ÷ time taken (a = Δv ÷ t). **Newton's Laws of Motion** • Learn that if the resultant force on an object is zero, it remains at rest or moves at constant velocity (Newton's First Law). • Learn that acceleration is proportional to resultant force and inversely proportional to mass (Newton's Second Law). • Learn that when two objects interact, they exert equal and opposite forces on each other (Newton's Third Law). **Stopping Distance** • Learn that stopping distance = thinking distance + braking distance. • Learn that factors affecting stopping distance include speed, road conditions, and driver reaction time. **Momentum** • Learn that momentum = mass × velocity (p = m × v). • Learn that momentum is conserved in closed systems. • Learn that changes in momentum relate to force and time (F = Δp ÷ t).	Tension Thinking distance Velocity Velocity-time graph Weight Work done	

Disciplinary aims:
The disciplinary aims of this lesson sequence are to develop students' ability to think and work like physicists. It builds their understanding of core principles such as forces, motion, and pressure, while strengthening skills in modelling, interpreting data, and applying mathematical relationships. Through practical investigations and graph analysis, students learn to make predictions, evaluate evidence, and communicate scientific ideas clearly. The sequence also encourages problem-solving and critical thinking, preparing students to apply physics in real-world contexts and future STEM pathways.

Links to other units:

P1: Energy
- Understanding of energy stores and transfers, especially kinetic and elastic potential energy.
- Familiarity with work done and the relationship between force and energy.

P2: Electricity:
- Basic understanding of electrical circuits and current, which supports later links to forces in motors and electromagnetism (though not directly in this sequence, it helps with broader connections).

P3: Particle Model of Matter
- Knowledge of density, states of matter, and pressure in gases—essential for the separate science content on pressure in gases and fluids.
- Understanding of how particles behave under force and pressure.

Future Knowledge

P6: Waves
- Students apply their understanding of motion and energy transfer to wave behaviour.
- Concepts like speed, distance, and time are revisited in the context of wave speed calculations.

P7: Magnetism and Electromagnetism
- Builds on Newton's Laws and force concepts to explain how magnetic fields exert forces on moving charges.
- Understanding of vectors and direction is essential for grasping the motor effect and electromagnetic applications.

SCIENCE CURRICULUM MAP: Y7-11

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Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Biology)	Unit title: B6 Variation, Genetics & Evolution	Term: Summer

Knowledge:

Reproduction

- Learn that sexual reproduction involves the joining of male and female gametes, leading to variation in offspring.
- Learn that asexual reproduction involves one parent and produces genetically identical offspring.
- Learn that meiosis produces gametes with half the normal number of chromosomes.
- Learn that fertilisation restores the full number of chromosomes.
- Learn that gametes are formed by meiosis and body cells by mitosis.

DNA and the Genome

- Learn that DNA is a polymer made of two strands forming a double helix.
- Learn that the genome is the entire genetic material of an organism.
- Learn that genes code for a sequence of amino acids to make proteins.
- Learn that the order of bases determines the protein produced.
- Learn that the human genome has been mapped and this helps in medicine and science.

Genetic Inheritance

- Learn that chromosomes are in pairs and carry genes.
- Learn that alleles are different forms of a gene.
- Learn that dominant alleles control the phenotype if present; recessive alleles only show if both copies are recessive.
- Learn that Punnett squares can predict genetic outcomes.
- Learn that some characteristics are controlled by a single gene, others by multiple genes.
- Learn that sex is determined by X and Y chromosomes.

Variation and Evolution

- Learn that variation can be genetic or environmental.
- Learn that mutations occur randomly and can affect phenotype.
- Learn that evolution occurs through natural selection acting on variation.
- Learn that species evolve over time and may become extinct.

Selective Breeding

- Learn that selective breeding involves choosing parents with desirable characteristics.
- Learn that this can lead to inbreeding and reduced variation.

Genetic Engineering

- Learn that genetic engineering involves modifying an organism's genome using enzymes

Vocabulary to consolidate:

Allele
Antibiotic resistance
Asexual reproduction
Base
Chromosome
DNA
Dominant
Double helix
Enzyme
Evolution
Extinction
Fertilisation
Fossil
Gamete
Gene
Genetic cross
Genetic engineering
Genetic variation
Genetically modified organism (GMO)
Genome
Genotype
Heterozygous
Homozygous
Inbreeding
Meiosis
Mitosis
Mutation
Natural selection
Phenotype
Punnett square
Recessive
Selective breeding
Sex chromosomes (X, Y)
Sexual reproduction

Teaching Sequence:

- DNA
- Sexual and Asexual Reproduction
- Meiosis
- Genetic Inheritance
- Genetic Crosses
- Inherited disorders
- Variation
- Evolution by Natural Selection
- Selective Breeding
- Genetic Engineering
- Evidence for Evolution
- Fossils
- Extinction
- Antibiotic Resistance Bacteria
- Classification
- Deliberate Practice

and vectors. • Learn that crops can be genetically modified for improved yield or resistance. **Evidence for Evolution** • Learn that fossils provide evidence for evolution. • Learn that antibiotic resistance in bacteria is an example of evolution in action.	Variation Environmental variation Vector	

Disciplinary aims:
In B6, students develop an understanding of how genetic information is stored, transmitted, and expressed, and how this underpins variation and evolution. They learn to interpret and use scientific models such as Punnett squares and genetic diagrams, apply probability to predict inheritance patterns, and explain how mutations and selection drive evolutionary change. The topic builds disciplinary thinking by linking molecular biology (DNA and protein synthesis) to population-level processes, encouraging students to evaluate evidence from fossils, antibiotic resistance, and genetic technologies. Students also consider the ethical and practical implications of selective breeding and genetic engineering, applying scientific reasoning to real-world contexts.

Links to other units:
Prior Knowledge

- B5: Homeostasis and Response
  - Learn that understanding of chromosomes and genes explains how hormones influence development and reproduction.
  - Knowledge of meiosis and fertilisation supports understanding of fertility treatments and contraception.
- C2: Structure and Bonding
  - Learn that DNA is a polymer, connecting to ideas about large molecules and chemical bonding.

Future Knowledge

- B7: Ecology
  - Learn that variation and adaptation concepts from B6 underpin natural selection and survival in ecosystems.
  - Genetic diversity links to species resilience and conservation strategies.
- C7: Organic Chemistry
  - Learn that biological molecules (proteins, carbohydrates) relate to genetic coding and inheritance.
- P6: Waves
  - Learn that understanding of electromagnetic radiation is relevant to genetic engineering techniques (e.g., using light in lab processes).
- P7: Magnetism and Electromagnetism
  - Indirect link: technologies for genetic analysis often use principles of physics.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Chemistry)	Unit title: C6 Rate & Extent of Chemical Change	Term: Summer

Knowledge:

Rate of Reaction

- Learn that the rate of a chemical reaction is the speed at which reactants are converted into products.
- Learn that the rate of reaction can be measured by the amount of reactant used up or product formed over time.
- Learn that the units for rate of reaction are usually g/s, cm^3/s, or mol/s.
- Learn that factors affecting the rate of reaction include:
  - Temperature
  - Concentration of solutions
  - Pressure of gases
  - Surface area of solids
  - Presence of a catalyst
- Learn that collision theory explains that reactions occur when particles collide with sufficient energy (activation energy).
- Learn that increasing temperature increases particle energy and collision frequency, speeding up reactions.
- Learn that increasing concentration or pressure increases collision frequency.
- Learn that increasing surface area exposes more particles for collisions.
- Learn that catalysts lower activation energy, speeding up reactions without being used up.

Reversible Reactions and Equilibrium

- Learn that some reactions are reversible, meaning products can react to form reactants.
- Learn that reversible reactions are represented by the symbol ⇌.
- Learn that energy changes occur in reversible reactions:
  - If the forward reaction is exothermic, the reverse is endothermic, and vice versa.
- Learn that dynamic equilibrium occurs in a closed system when the forward and reverse reactions occur at the same rate.
- Learn that at equilibrium, the concentrations of reactants and products remain constant (but not necessarily equal).
- Learn that changing conditions can affect the position of equilibrium (Le Chatelier's Principle):
  - Increasing temperature favors the endothermic direction.
  - Increasing pressure favors the side with fewer gas molecules.
  - Changing concentration shifts equilibrium to oppose the change.

Disciplinary aims:

In C6, students develop key disciplinary skills by investigating how and why the rate of chemical reactions can be changed. They learn to plan and carry out experiments, measure variables accurately, and analyse data to draw evidence-based

Core Vocabulary:

Rate of reaction
Collision theory
Activation energy
Catalyst
Surface area
Concentration
Pressure
Temperature
Reversible reaction
Dynamic equilibrium
Closed system
Le Chatelier's Principle
Forward reaction
Reverse reaction
Exothermic
Endothermic
Energy change
Reaction profile
Frequency of collisions
Successful collisions
Position of equilibrium

Teaching Sequence:

- Measuring the Rate of Reaction
- Rate of Reaction and Temperature
- Rate of Reaction and Surface Area
- Rate of Reaction and Concentration
- Rate of Reaction and Catalysts
- Deliberate Practice: Rate of Reaction
- Reversible Reactions
- Equilibrium (HT)

conclusions. This unit strengthens their ability to think critically about cause and effect, evaluate methods, and apply scientific reasoning to real-world contexts such as industrial processes, environmental impact, and everyday chemical changes.		

Links to other units:

Prior Knowledge

C6 builds on previous units where scholars learnt about:

- C1 and C2: The particle model of matter to support collision theory
- C3 and C5: Interpreting graphs and data.
- C5: Endothermic and exothermic reactions are essential for understanding reversible reactions and equilibrium position. Here scholars also studied reaction profiled which they will apply to explain why catalysts speed up the rate of reaction
- C4 and C5: types of chemical reactions that link to reversible reactions and equilibrium

Future Knowledge

Understanding reaction rates and equilibrium in C6 provides a crucial foundation for interpreting more complex chemical processes in later units. In C7 (Organic Chemistry), students apply collision theory and reaction conditions to explain how hydrocarbons react and are processed. In C8 (Chemical Analysis), knowledge of reaction rates helps in understanding how substances are identified and separated efficiently. C9 (Chemistry of the Atmosphere) builds on reversible reactions and equilibrium to explore how gases interact and change over time, while C10 (Using Resources) relies on understanding reaction conditions and rates to evaluate sustainable chemical processes, such as water purification and life cycle assessments.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 10	Subject: Science (Physics)	Unit title: P6 Waves	Term: Summer

Knowledge:

- Learn that waves transfer energy without transferring matter.
- Learn that waves can be transverse or longitudinal.
- Learn that in transverse waves, oscillations are perpendicular to the direction of energy transfer.
- Learn that in longitudinal waves, oscillations are parallel to the direction of energy transfer.
- Learn that sound waves in air are longitudinal.
- Learn that mechanical waves require a medium to travel through.
- Learn that electromagnetic waves are transverse and can travel through a vacuum.
- Learn that the amplitude of a wave is the maximum displacement from the rest position.
- Learn that the wavelength is the distance between two corresponding points on adjacent waves.
- Learn that the frequency is the number of waves passing a point per second.
- Learn that the wave speed equation is:
  wave speed (m/s)=frequency (Hz)×wavelength (m)
- Learn that waves can be reflected, transmitted, or absorbed at boundaries.

Electromagnetic Waves

- Learn that the electromagnetic spectrum includes radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays.
- Learn that all electromagnetic waves travel at the same speed in a vacuum.
- Learn that different electromagnetic waves have different wavelengths and frequencies.
- Learn that uses and hazards of electromagnetic waves depend on their frequency and energy.
- Learn that high-frequency waves (UV, X-rays, gamma) can cause ionisation and damage cells.

Properties of Waves

- Learn that waves can undergo reflection, refraction, and diffraction.
- Learn that refraction occurs because wave speed changes when entering a different medium.
- Learn that the angle of incidence equals the angle of reflection.
- Learn that the normal is a line at 90° to the surface at the point of incidence.

Sound Waves

- Learn that sound waves cause vibrations in solids, liquids, and gases.
- Learn that sound cannot travel through a vacuum.
- Learn that the human hearing range is approximately 20 Hz to 20 kHz.
- Learn that ultrasound waves have frequencies above 20 kHz and can be used for imaging and industrial purposes.

Disciplinary aims:

The disciplinary aims of P6: Waves are to develop students' ability to model and represent scientific phenomena, apply practical and investigative skills through required experiments, interpret and analyse wave data, and apply wave concepts to real-world contexts such as communication and medical imaging. It also encourages critical thinking and problem-

Core Vocabulary:

Absorption
Amplitude
Angle of incidence
Angle of reflection
Compression
Diffraction
Electromagnetic spectrum
Frequency
Gamma rays
Hertz (Hz)
Infrared
Ionising radiation
Longitudinal wave
Medium
Microwaves
Normal
Oscillation
Period
Radio waves
Rarefaction
Reflection
Refraction
Sound wave
Transmission
Transverse wave
Ultrasound
Ultraviolet
Vacuum
Visible light
Wave
Wave speed
Wavelength
X-rays

Teaching Sequence:

- Longitudinal and Transverse Waves
- Properties of waves
- Ripple tank RP
- Waves on a string RP
- Types of electromagnetic wave
- Reflection and refraction
- Infrared Absorption
- Uses of Electromagnetic waves
- Deliberate Practice

solving, helping students understand how scientific knowledge is constructed and used, while preparing them for further study and informed decision-making.		

Links to other units:
Prior Knowledge

- Energy Transfer (P1): Understanding how energy moves through systems helps students grasp how waves transfer energy without transferring matter.
- Particle Model of Matter (P3): Knowledge of how particles behave in solids, liquids, and gases supports understanding of wave propagation in different media.
- Atomic Structure (P4): Familiarity with electromagnetic radiation and atomic interactions lays the groundwork for exploring the electromagnetic spectrum.
- Electricity (P2): Concepts like frequency and alternating current link to wave properties and applications in communication.
- Forces (P5): Understanding force interactions and motion helps with interpreting wave effects like reflection, refraction, and resonance.

Future Knowledge

Knowledge from P6: Waves directly supports learning in P7: Magnetism and Electromagnetism by reinforcing key physics concepts such as energy transfer, wave-particle duality, and electromagnetic interactions. In P7, students explore how electric currents create magnetic fields and how electromagnetism is used in devices like motors and transformers. Understanding the electromagnetic spectrum from P6 helps students grasp how electromagnetic fields behave and interact with materials. Additionally, the practical skills developed in P6—such as using equipment, measuring wave properties, and analysing results—prepare students for the investigative work in P7, where precision and interpretation are equally important.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 11	Subject: Science (Biology)	Unit title: B7 Ecology	Term: Autumn

Knowledge (Learn that):

Adaptations, Interdependence and Competition

- Learn that organisms live in habitats to which they are adapted.
- Learn that adaptations can be structural, behavioural, or functional.
- Learn that organisms compete for resources such as food, mates, and territory.
- Learn that plants compete for light, water, and mineral ions.
- Learn that animals compete for food, mates, and territory.
- Learn that interdependence means organisms rely on each other for survival.
- Learn that stable communities have balanced populations and resources.

Organisation of an Ecosystem

- Learn that ecosystems include the interaction of living organisms (biotic) and non-living components (abiotic).
- Learn that producers make their own food by photosynthesis.
- Learn that consumers obtain energy by eating other organisms.
- Learn that decomposers break down dead material, recycling nutrients.
- Learn that food chains show feeding relationships and energy transfer.
- Learn that food webs show interconnected feeding relationships.
- Learn that the predator-prey cycle shows how populations affect each other.
- Learn that the distribution of organisms is affected by environmental factors.
- Learn that quadrats and transects are used to sample and measure distribution.

Biodiversity and the Effect of Human Interaction

- Learn that biodiversity is the variety of all living organisms in an ecosystem.
- Learn that high biodiversity helps ecosystems remain stable.
- Learn that human activities can reduce biodiversity through:
  - Deforestation
  - Pollution (air, water, land)
  - Global warming
- Learn that maintaining biodiversity is important for the future of the human species.
- Learn that waste management, land use, and climate change affect ecosystems.

Vocabulary to consolidate:

Abiotic factor
Adaptation
Behavioural adaptation
Biodiversity
Biomass
Biotic factor
Carbon cycle
Climate change
Community
Competition
Consumer
Decay
Decomposer
Deforestation
Distribution
Ecosystem
Food chain
Food web
Functional adaptation
Global warming
Habitat
Interdependence
Land use
Pollution
Population
Predator
Prey
Producer
Pyramid of biomass
Quadrat
Sampling
Structural adaptation
Sustainable
Transect
Trophic level

Teaching Sequence:

- Prior knowledge review
- Communities
- Biotic & abiotic factors
- Adaptations
- RP7: Measuring the population size of a species in a habitat
- How materials are cycled
- Biodiversity
- Preserving Biodiversity
- Pollution & Biodiversity
- Global warming

Deliberate practice

	Water cycle	
Disciplinary aims: The disciplinary aims of **AQA GCSE Trilogy Biology B7 – Ecology** are to develop students' ability to think and work scientifically by applying ecological concepts to real-world contexts. This includes understanding how organisms interact within ecosystems, using mathematical and practical skills to collect and interpret data, and evaluating evidence to draw valid conclusions. Students learn to plan and carry out investigations, control variables, and communicate findings using accurate scientific language. They also explore how ecological knowledge informs decisions about conservation, sustainability, and the impact of human activity, reinforcing the nature of science as a tool for addressing global challenges.	**Vocabulary to retrieve:**	

Links to other units:

- B1 Cell Biology & B2 Organisation
  - Photosynthesis and respiration underpin energy flow in ecosystems.
  - Transport systems in plants and animals relate to nutrient cycling.
- B3 Infection and Response
  - Disease affects population sizes and biodiversity.
- B4 Bioenergetics
  - Photosynthesis and respiration are key processes in food chains and energy transfer.
- B6 Inheritance, Variation and Evolution
  - Natural selection and adaptation link directly to survival in ecosystems.
- C7 Organic Chemistry
  - Carbon compounds and their role in the carbon cycle.
- C10 Using Resources
  - Sustainable use of resources and impact on biodiversity.
- P3 Energy
  - Energy transfer through food chains and efficiency at trophic levels.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 11	Subject: Science (Chemistry)	Unit title: C7 Organic Chemistry	Term: Autumn

Knowledge (Learn that):

Hydrocarbons

- Learn that crude oil is a mixture of hydrocarbons formed from ancient biomass.
- Learn that hydrocarbons are compounds made of hydrogen and carbon only.
- Learn that alkanes are saturated hydrocarbons with single bonds.
- Learn that the general formula for alkanes is **C_nH_{2n+2}**.
- Learn that the properties of hydrocarbons depend on chain length (e.g., boiling point, viscosity, flammability).

Fractional Distillation and Petrochemicals

- Learn that crude oil is separated by fractional distillation into fractions with similar boiling points.
- Learn that fractions are used as fuels and feedstock for the petrochemical industry.
- Learn that the petrochemical industry produces polymers, solvents, lubricants, and detergents.

Cracking and Alkenes

- Learn that cracking breaks long-chain hydrocarbons into shorter alkanes and alkenes.
- Learn that alkenes are unsaturated hydrocarbons with a double bond.
- Learn that the general formula for alkenes is **C_nH_{2n}**.
- Learn that alkenes are more reactive than alkanes and used to make polymers.
- Learn that alkenes react with bromine water, turning it from orange to colourless.

Disciplinary aims:

In C7 Organic Chemistry, students should develop scientific thinking by understanding how hydrocarbons, functional groups, and polymerisation explain real-world materials and processes. They apply mathematical skills to use general formulas, balance equations, and interpret structural representations, while gaining practical experience through experiments such as combustion and cracking. Students evaluate evidence, consider environmental and economic implications of petrochemicals, and communicate findings using accurate chemical terminology. This unit also fosters appreciation of how organic chemistry underpins industry, fuels, and sustainable technologies, and how scientific knowledge informs decisions about resource use and environmental impact.

Core Vocabulary:

Hydrocarbon
Alkane
Alkene
Saturated
Unsaturated
Functional group
Homologous series
General formula
Structural formula
Combustion
Complete combustion
Incomplete combustion
Crude oil
Fractional distillation
Fraction
Viscosity
Volatility
Flammability
Cracking

Teaching Sequence:

- Crude oil, Hydrocarbons & Alkanes
- Fractional distillation
- Properties of hydrocarbons
- Cracking & Alkenes
- Crude oil Deliberate Practice

Links to other units:

- C1 Atomic Structure & C2 Bonding
  - Understanding covalent bonding and molecular structure is essential for hydrocarbons, alcohols, and polymers.
- C3 Quantitative Chemistry
  - Calculating empirical formulas, reacting masses, and combustion equations for hydrocarbons.
- C4 Chemical Changes & C5 Energy Changes

- Combustion of hydrocarbons relates to exothermic reactions and energy transfer.
- C6 Rate and Extent of Chemical Change
  - Cracking and polymerisation involve reaction rates and catalysts.
- C10 Using Resources
  - Organic chemistry underpins petrochemical industries and sustainable alternatives like biofuels.
- B4 Bioenergetics
  - Alcohol fermentation links to respiration and energy production.
- B7 Ecology
  - Impact of fossil fuels and biofuels on ecosystems and biodiversity.
- P3 Energy
  - Energy released during combustion of hydrocarbons connects to energy transfer and efficiency.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 11	Subject: Science (Chemistry)	Unit title: C8 Chemical Analysis	Term: Autumn

Knowledge:

Purity, Formulations and Chromatography

- Learn that a pure substance has a fixed melting point and boiling point.
- Learn that mixtures melt and boil over a range of temperatures.
- Learn that formulations are mixtures designed for a specific purpose (e.g., medicines, paints).
- Learn that chromatography can separate mixtures and identify substances.
- Learn that the Rf value is calculated using:
  Rf=distance moved by substance / distance moved by solvent

Identification of Common Gases

- Learn that hydrogen produces a squeaky pop with a lit splint.
- Learn that oxygen relights a glowing splint.
- Learn that carbon dioxide turns limewater cloudy.
- Learn that chlorine bleaches damp litmus paper white.

Core Vocabulary:

Chromatogram
Chromatography
Formulation
Mixture
Mobile phase
Pure substance
Qualitative analysis
Quantitative analysis
Retention factor (Rf)
Stationary phase

Teaching Sequence:

- Pure substances
- Chromatography
- Tests for gases

Disciplinary aims:

The disciplinary aims of AQA GCSE Trilogy Chemistry C8 – Chemical Analysis focus on developing scientific thinking and practical skills through the study of purity, formulations, and analytical techniques. Students learn to apply the concept of what makes a substance pure, interpret chromatograms, and calculate retention factors, reinforcing mathematical and data-handling skills. They develop practical competence by carrying out chemical tests for gases and ions, controlling variables, and ensuring reliability. The topic also emphasizes evaluating evidence, understanding limitations of methods, and using precise scientific language. Finally, students explore how instrumental techniques like flame emission spectroscopy illustrate the role of science in industry and society, linking chemistry to real-world applications and decision-making.

Links to other units:

C3 Quantitative Chemistry

- Calculating Rf values in chromatography and interpreting data relies on mathematical skills.

C5 Energy Changes & C6 Rates

- Conditions affecting reactions (e.g., temperature, concentration) influence chemical tests.

C10 Using Resources

- Purity and formulations link directly to industrial and everyday applications.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 11	Subject: Science (Physics)	Unit title: P7 Magnets and Electromagnets	Term: Autumn

Knowledge:

Permanent and Induced Magnetism

- Learn that magnets produce a magnetic field around them.
- Learn that magnetic fields can be represented by field lines showing direction and strength.
- Learn that the Earth has a magnetic field and acts like a bar magnet.
- Learn that magnetic materials include iron, steel, cobalt, and nickel.
- Learn that induced magnets become magnetic when in a magnetic field and lose magnetism when removed.

Magnetic Fields and Electric Currents

- Learn that a current in a wire produces a magnetic field around the wire.
- Learn that the strength of the magnetic field depends on the current and distance from the wire.
- Learn that the magnetic field around a solenoid is strong and uniform inside the coil.
- Learn that adding an iron core to a solenoid makes an electromagnet.

The Motor Effect

- Learn that a current-carrying conductor in a magnetic field experiences a force (the motor effect).
- Learn that the size of the force depends on the magnetic field strength, current, and length of conductor.
- Learn that the direction of the force is given by Fleming's left-hand rule.
- Learn that the force is maximum when the conductor is at 90° to the magnetic field.

Disciplinary aims:

The disciplinary aims of AQA GCSE Trilogy Physics P7 – Magnetism and Electromagnetism are to develop students' ability to apply scientific principles to real-world systems involving magnetic fields and electricity. Students learn to understand and represent magnetic fields using diagrams, apply the motor effect and electromagnetic induction to explain devices like motors, generators, and transformers, and use mathematical relationships such as the transformer equation to solve problems. They develop practical skills through investigations of electromagnets and magnetic forces, reinforcing the importance of controlling variables and accurate measurement.

Core Vocabulary:

Conductor
Current
Electromagnet
Fleming's left-hand rule
Force
Generator effect
Induced magnet
Iron core
Magnet
Magnetic field
Magnetic field lines
Magnetic flux density
Magnetic material
Motor effect
Permanent magnet
Solenoid

Teaching Sequence:

- Prior knowledge review
- Magnetism and Magnetic forces
- The magnetic effect of a solenoid
- Electromagnets in action
- Calculating the force on a conductor (HT)
- Electric motors (HT)
- Transformers
- Deliberate Practice

Links to other units:

- P4 Electricity
  - Current in wires and circuits creates magnetic fields; electromagnets rely on electric current.
- P3 Energy
  - Transformers and generators involve energy transfer between electrical and magnetic systems.
- P6 Waves
  - Loudspeakers use the motor effect to produce sound waves, linking magnetism to wave behavior.

- C10 Using Resources
  - Electromagnets and generators are essential in industrial processes and resource extraction.
- C6 Rate and Extent of Chemical Change
  - Magnetic separation techniques in chemical industries.
- B7 Ecology
  - Magnetic sensors and generators are used in environmental monitoring and renewable energy systems.
- B3 Infection and Response
  - MRI scanners use strong magnetic fields for medical imaging.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 11	Subject: Science (Chemistry)	Unit title: C9 Chemistry of the Atmosphere	Term: Spring

Knowledge:

The Composition and Evolution of the Atmosphere

- Learn that the Earth's atmosphere today is approximately 80% nitrogen, 20% oxygen, and small amounts of other gases.
- Learn that the Earth's early atmosphere was formed by volcanic activity and was mainly carbon dioxide, with little or no oxygen.
- Learn that water vapour condensed to form oceans as the Earth cooled.
- Learn that carbon dioxide decreased because it dissolved in oceans and was used by marine organisms to form carbonate rocks.
- Learn that photosynthesis by plants and algae produced oxygen, allowing life to evolve.

Greenhouse Gases

- Learn that greenhouse gases in the atmosphere include carbon dioxide, methane, and water vapour.
- Learn that greenhouse gases maintain temperatures on Earth by absorbing infrared radiation.
- Learn that human activities (burning fossil fuels, agriculture, deforestation) increase greenhouse gas levels.
- Learn that global climate change is linked to increased greenhouse gas emissions.

Human Impact and Atmospheric Pollutants

- Learn that combustion of fuels releases carbon dioxide, water vapour, carbon monoxide, sulfur dioxide, and oxides of nitrogen.
- Learn that carbon monoxide is toxic and produced by incomplete combustion.
- Learn that sulfur dioxide and nitrogen oxides cause acid rain and respiratory problems.
- Learn that particulates from combustion cause global dimming and health issues.

Disciplinary aims:

The disciplinary aims of AQA GCSE Trilogy Chemistry C9 – Chemistry of the Atmosphere are to develop students' ability to apply scientific thinking to global and environmental issues. Students learn to interpret data on atmospheric composition, greenhouse gases, and pollutants, reinforcing analytical and mathematical skills. They develop practical competence through investigations into combustion and gas testing, understanding how to control variables and ensure reliability. The topic emphasizes evaluating evidence, considering uncertainties, and using accurate scientific language when discussing climate change and human impact. It also highlights the role of science in informing decisions about sustainability and environmental protection, linking chemistry to societal challenges.

Core Vocabulary:

Acid rain
Atmosphere
Carbon dioxide
Carbon footprint
Carbon monoxide
Climate change
Combustion
Early atmosphere
Fossil fuels
Global dimming
Global warming
Greenhouse effect
Greenhouse gas
Infrared radiation
Methane
Nitrogen
Nitrogen oxides
Oceans
Oxygen
Particulates
Photosynthesis
Pollution
Sulfur dioxide
Volcanic activity
Water vapour

Teaching Sequence:

- History of the Atmosphere
- Greenhouse Gases
- Climate Change
- Atmospheric Pollutants
- Deliberate Practice

Links to other units:

- C1 Atomic Structure & C2 Bonding
  - Understanding molecules like CO_2, CH_4, and H_2O requires knowledge of bonding and structure.

- C3 Quantitative Chemistry
  - Calculating carbon footprints and interpreting data on greenhouse gases uses mole and mass concepts.
- C6 Rate and Extent of Chemical Change
  - Combustion reactions and factors affecting them link to rates of reaction.
- C10 Using Resources
  - Sustainability and reducing atmospheric pollutants connect directly to resource management.
- B4 Bioenergetics
  - Photosynthesis and respiration are central to the carbon cycle and oxygen production.
- B7 Ecology
  - Climate change impacts ecosystems and biodiversity, linking atmospheric chemistry to ecological balance.
- P3 Energy
  - Energy transfer in combustion and the greenhouse effect relates to thermal energy and radiation.
- P6 Waves
  - Infrared radiation absorption by greenhouse gases connects to wave properties and energy transfer.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification

SCIENCE CURRICULUM MAP: Y7-11

Year 11	Subject: Science (Chemistry)	Unit title: C10 Using Resources	Term: Spring

Knowledge:

Using the Earth's Resources and Obtaining Potable Water

- Learn that humans use the Earth's resources to provide food, shelter, transport, and warmth.
- Learn that natural resources can be supplemented by agriculture and synthetic materials.
- Learn that potable water is water that is safe to drink, not necessarily pure.
- Learn that potable water is produced by:
  - Passing water through filters to remove solids.
  - Sterilising water to kill microbes (e.g., chlorine, ozone, UV).
- Learn that in some areas, desalination of seawater is required using distillation or membranes.

Life Cycle Assessment and Recycling

- Learn that life cycle assessments (LCAs) assess environmental impact of a product from raw material extraction to disposal.
- Learn that LCAs consider energy use, water use, waste, and pollutant production.
- Learn that recycling reduces the use of limited resources and energy consumption.
- Learn that metals, glass, paper, and plastics can be recycled to reduce environmental impact.

Alternative Methods of Extracting Metals

- Learn that low-grade ores can be processed using bioleaching and phytomining.
- Learn that bioleaching uses bacteria to produce solutions containing metal compounds.
- Learn that phytomining uses plants to absorb metal compounds, which are then burned to produce ash containing metals.
- Learn that these methods are less damaging to the environment than traditional mining.

Disciplinary aims:

The disciplinary aims of **AQA GCSE Trilogy Chemistry C10 – Using Resources** are to develop students' ability to apply chemical principles to real-world contexts, critically evaluate the environmental and societal impact of resource use, and make evidence-based decisions about sustainability. Learners should gain practical skills in water analysis and purification, interpret and communicate data effectively, and use scientific terminology accurately. The topic also aims to foster problem-solving and analytical thinking while promoting an understanding of the finite nature of Earth's resources and the role of chemistry in addressing global challenges.

Core Vocabulary:

Bioleaching
Desalination
Distillation
Energy consumption
Extraction
Life cycle assessment (LCA)
Membrane filtration
Natural resource
Ore
Phytomining
Pollutant
Potable water
Raw material
Recycling
Sterilisation
Sustainability
Synthetic material
Waste

Teaching Sequence:

- Using Earth's Resources
- Potable Water
- Required Practical: Analysis & Purification of Water
- Wastewater Treatment
- Alternative Methods of Metal Extraction (HT only)
- Life Cycle Assessment & Recycling
- Deliberate Practice

Links to other units:

- C1 Atomic Structure & C2 Bonding
  - Understanding metals, alloys, and corrosion requires knowledge of bonding and structure.
- C3 Quantitative Chemistry

- Life Cycle Assessments (LCAs) and recycling involve interpreting data and calculations.
- C6 Rate and Extent of Chemical Change
  - Corrosion and extraction methods involve chemical reactions influenced by rate factors.
- C9 Chemistry of the Atmosphere
  - Sustainability and pollution from resource use link directly to atmospheric chemistry.
- B7 Ecology
  - Resource use impacts ecosystems and biodiversity, connecting chemistry to environmental science.
- B4 Bioenergetics
  - Water treatment and resource management affect living organisms and food production.
- P3 Energy
  - Energy consumption in extraction and recycling relates to energy transfer and efficiency.

Links to the GCSE Specification:

AQA GCSE Combined Science Specification