



Eastlea
COMMUNITY SCHOOL

LONG TERM PLAN

TRIPLE SCIENCE

KS4

(Year 10 & Year 11)

M Aziz

2026 - 27

SCIENCE DEPARTMENT KS4

Vision and Intent

Eastlea's Science Curriculum strives for exceptional student progress, fostering critical thinking, problem-solving, innovation, and teamwork for success beyond the classroom.

To enable all students to achieve, our subject curriculum is underpinned by the following principles:



Ambitious -The Eastlea Triple Science Curriculum is ambitiously designed to integrate scientific inquiry, cross-curricular skills, and diverse explorations, fostering students' curiosity and passion for understanding the natural world.



Sequenced / Spiral - Our science curriculum employs a sequenced/spiral approach, systematically reinforcing fundamental concepts throughout Key Stage 3, thereby laying a robust foundation for Key Stage 4, where students delve deeper into advanced topics, ensuring a deep and interconnected understanding of scientific principles.



Literacy - Literacy forms the cornerstone of our scientific education, empowering students to confidently articulate precise scientific concepts verbally and in writing, fostering fluency in scientific vocabulary and enriching communication across all aspects of our curriculum.



Cultural Capital - The science curriculum empowers students with vital knowledge and skills for their future endeavours, offering immersive experiences like field trips to museums and research institutions, fostering a deeper appreciation for the relevance of science in our modern world.



KS4 SCIENCE CURRICULUM BASED ON:

10 BIG IDEAS

- | | |
|---------------------|---------------|
| 1. Force | 2. Reactions |
| 3. Electromagnetism | 4. Earth |
| 5. Energy | 6. Organisms |
| 7. Waves | 8. Ecosystems |
| 9. Matter | 10. Genes |

Biology

Chemistry

Physics

P4 Electric Circuits

Electricity is a challenging concept to teach. Concepts like potential difference and current are incredibly abstract – these ideas are novel and not easily linked to the concrete world. Secondly, many concepts go against children's naive ideas e.g. current is used up when it passes through a component. It is important that ideas are introduced with real caution and that the ideas of current, voltage and energy are dealt with separately first.

P5 Electricity in the home

Mains electricity is an alternating current (a.c.) supply In the UK, the domestic electricity supply

has a frequency of 50 Hz and a potential difference of about 230 V

A frequency of 50 Hz means the direction of the current changes back and forth 50 times every second

Mains electricity, being an alternating current, does not have positive and negative sides to the power source

The equivalent to positive and negative are called live and neutral and these form either end of the electrical circuit

B8 Photosynthesis

Key Points to Cover in GCSE AQA B8 Photosynthesis

The Process of Photosynthesis

Photosynthesis Equation: Students should understand the balanced chemical equation for photosynthesis: $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$.

Factors Affecting Photosynthesis

Limiting Factors: Discuss how light intensity, carbon dioxide concentration, and temperature affect the rate of photosynthesis.

B10 The human Nervous System

Diagrams and Models: Use diagrams and 3D models to illustrate the structure and function of the nervous system.

Interactive Activities: Incorporate activities like building neuron models or virtual lab simulations.

Experiments: Conduct simple experiments to demonstrate reflex actions and reaction times.

Real-World Applications:

Everyday Relevance: Relate the nervous system to everyday activities like responding to stimuli and coordinating movements.

Health and Disease: Discuss common nervous system disorders (e.g., multiple sclerosis, Parkinson's disease) and their impact.

Assessment and Feedback:

Quizzes and Worksheets: Use to reinforce understanding and assess knowledge.

Class Discussions: Facilitate discussions to clarify concepts and address misconceptions.

Practical Assessments: Include lab activities and experiments to assess practical understanding.

By combining clear explanations, visual aids, interactive activities, and real-world examples, students can develop a comprehensive understanding of the human nervous system.

B11 Hormonal Coordination

Visual Aids: Use diagrams, charts, and videos to illustrate the endocrine system and hormone functions.

Interactive Activities: Incorporate activities like hormone role-play or building models of feedback mechanisms.

Case Studies: Use real-life scenarios to explain hormone imbalances and their effects (e.g., diabetes, hyperthyroidism).

Practical Applications:

Practical Investigations: Encourage students to conduct experiments to observe the effects of these factors, such as using pondweed (e.g., Elodea) to measure oxygen production under different conditions.

Application of Photosynthesis

Role in Ecosystems: Highlight the significance of photosynthesis in producing oxygen and as the basis of food chains. Explain how it contributes to the carbon cycle and supports life on Earth.

B9 Respiration

Tips for Effective Teaching

Use Analogies: Compare respiration to familiar processes (e.g., a car engine burning fuel to produce energy).
Relate to Daily Life: Connect the concept to everyday activities and phenomena.

Encourage Questions: Foster a classroom environment where students feel comfortable asking questions and exploring the topic further.

Practical Applications and Implications Relate respiration to real-world scenarios and implications for health and exercise.

Assessment and Review

Consolidate understanding and assess student learning.

Quizzes and Worksheets: Use a mix of multiple-choice, short answer, and diagram-labelling questions.

P6 Molecules and Matter

Key Points to Cover in GCSE AQA P6 Molecules and Matter

States of Matter: Teach the characteristics of solids, liquids, and gases. Describe how the arrangement and movement of particles differ in each state. Highlight key properties such as fixed shape and volume for solids, fixed volume but variable shape for liquids, and variable shape and volume for gases.

Particle Model: Use the particle model to explain changes of state (melting, boiling, freezing, condensation, sublimation). Discuss the energy changes involved during these transitions and how temperature remains constant during a change of state.

Density and Its Determination

Health Context: Discuss the importance of hormones in health and disease, such as diabetes management.

Everyday Examples: Relate hormonal effects to everyday experiences like stress responses and menstrual cycles.

Assessment and Feedback:

Quizzes and Worksheets: Use these to reinforce concepts and assess understanding.

Class Discussions: Encourage discussions to clarify doubts and deepen understanding.

Experiments: Conduct simple experiments or simulations to illustrate hormonal effects (e.g., using model organisms).

By using a mix of visual aids, interactive activities, practical applications, and regular assessments, students can gain a clear and comprehensive understanding of hormonal coordination.

B12 Homeostasis in action

Homeostasis is all about trying to keep internal conditions in the body constant. Students will be familiar with thermostats and heating systems and so this can be a great place to start. The concepts of negative and positive feedback are really useful.

B13 Reproduction Thinking

deeper

Why don't DNA changes always change the phenotype? Why is DNA stored inside the nucleus in eukaryotic cells?

How does the genome differ across different species? Refer to plants, bacteria and animals in your answer.

B14 Variation and Evolution,

When teaching evolution, it can be helpful to distinguish between (i) evolution i.e. change in populations and species over time and (ii) natural selection, the mechanism behind evolution. Evolution by natural selection really involves three key ideas:

There is variation in the population of a trait The trait is heritable

Definition and Calculation of Density: Define density as mass per unit volume ($\rho = m/V$). Teach students how to calculate the density of regular and irregular objects by measuring mass and volume. Use the formula in problem-solving exercises.

Practical Applications: Conduct experiments to determine the density of different materials. Discuss the significance of density in real-world contexts, such as why objects float or sink, and its relevance in designing ships, submarines, and hot air balloons. By focusing on these key points, students will gain a thorough understanding of the fundamental concepts related to molecules and matter, along with their practical applications.

P7 Radioactivity

Key points to Cover in GCSE AQA P7 Radioactivity
Types of Radiation and Their Properties

Alpha, Beta, and Gamma Radiation: Teach the differences between alpha particles (helium nuclei), beta particles (high-energy electrons or positrons), and gamma rays (electromagnetic waves). Cover their relative masses, charges, and penetrating powers.

Radioactive Decay and Half-Life

Radioactive Decay: Explain the concept of unstable nuclei emitting radiation to become more stable. Describe how this process leads to the transformation of elements.

Half-Life: Define half-life as the time taken for half the nuclei in a radioactive sample to decay. Use examples and calculations to show how to determine the half-life of a substance.

These points will provide students with a fundamental understanding of radioactivity and its key concepts.

C4 Chemical Calculations

Key Points to Cover in GCSE AQA C4 Chemical Calculations

1. The Mole and Avogadro's Constant

Understanding the Mole: Teach the concept of the mole as a unit for measuring the amount of substance, and introduce Avogadro's constant (6.02×10^{23} particles per mole). Explain how the mole relates to the mass of a substance and its molecular or atomic mass.

2. Calculating Reacting Masses and Empirical Formulae
Reacting Masses: Show how to use balanced chemical equations to calculate the masses of reactants and products in a chemical reaction. Provide step-by-step methods for converting between moles and masses.

There are differences in the reproductive success of individuals with that trait

B15 Genetics and Evolution

(Why is it incorrect to say that humans evolved from chimps?)

Bats and butterflies both have wings. Is this evidence for them being

B16 Adaptation, Interdependence and Competition

Energy from the sun is captured by plants through photosynthesis and used to make glucose which is then used in respiration or to make new cells (biomass). Some of this biomass is passed along a food chain when one organism eats another.

B17 Organising an Ecosystem Thinking

deeper

Have the number of carbon atoms on Earth increased, decreased or stayed the same over the past 4.5 billion years?

B18 Biodiversity and Ecosystems

Where to start?

This [ecosystem in a bottle](#) is a useful framework to begin thinking about ecosystems.

Key ecological terms – using the Frayer model

Empirical Formulae: Explain how to determine the empirical formula of a compound from the masses or percentages of its constituent elements. Practice with examples to reinforce the calculation methods.	
ASSESSMENT At the end of every unit that varies from 2-3 weeks: End of unit test on P4,P5,P6,P7,B8,B9,C4 Assessment Objectives	ASSESSMENT: At the end of every unit that varies from 2-3 weeks: End of unit test on B12 Homoeostasis in action;B13 Reproduction,B14 Variation and evolution,B15 Genetics and evolution,B16 Adaptation,independence and competition,B17 Organising an ecosystem,B18 Biodiversity Assessment Objectives

Biology

Chemistry

Physics

C5 Chemical Changes

Interactive Learning:

Lab Activities: Conduct hands-on experiments to observe chemical changes firsthand.

Simulations: Use digital simulations to visualise reactions that are difficult to perform in the classroom.
Real-World Applications:

Everyday Chemistry: Relate chemical changes to everyday life, such as cooking and cleaning.

Industrial Processes: Discuss the role of chemical reactions in industry, like manufacturing and pharmaceuticals.

Assessment and Feedback:

Quizzes and Worksheets: Use these tools to reinforce key concepts and check for understanding.

Class Discussions: Encourage students to discuss and explain the reactions they observe.

By combining theoretical explanations with practical experiments and real-life examples, students can develop a thorough understanding of chemical changes.

C6 Electrolysis

Key Points to Cover in GCSE AQA C6 Electrolysis

The Process of Electrolysis

Teach the definition of electrolysis as the process of using electrical energy to drive a non-spontaneous chemical reaction. Explain the setup of an electrolytic cell, including the roles of the anode (positive electrode) and cathode (negative electrode).

Electrolysis of Molten and Aqueous Compounds:

Discuss the electrolysis of molten ionic compounds (e.g., molten sodium chloride) to extract metals. Also, cover the electrolysis of aqueous solutions (e.g., copper(II) sulphate solution) to understand the preferential discharge of ions and the products formed at each electrode.

C12 Chemical Analysis

Flame tests and chemical tests are used to detect and identify ions in samples. Instrumental methods of analysis are faster, and more accurate and sensitive than simple chemical tests.

C13 The Earth's atmosphere

The early atmosphere was mainly carbon dioxide and water vapour. Water vapour condensed to form the oceans. Photosynthesis caused the amount of carbon dioxide to decrease and oxygen to increase.

C14 The Earth's resources

Many of the Earth's resources are finite. Chemists have a role in estimating the amount of reserves remaining and ensuring that the use of resources is sustainable.

C15 Using Resources Potable

water

All humans rely on safe drinking water. Salt can be removed from sea water to make it safe to drink. Waste water must be treated before being released into the environment.

These points provide a foundation for understanding the principles and applications of electrolysis in various contexts.

C7 Energy Changes

Definitions and Examples: Teach the difference between exothermic reactions (which release energy to the surroundings, e.g., combustion) and endothermic reactions (which absorb energy from the surroundings, e.g., thermal decomposition). Discuss common examples of each type.

Energy Profiles and Bond Energy Calculations

Energy Profile Diagrams: Show how to draw and interpret energy profile diagrams for exothermic and endothermic reactions, highlighting the activation energy and overall energy change.

Bond Energy Calculations: Explain how to calculate the energy changes in reactions using bond energies. Provide practice problems to calculate the energy required to break bonds and the energy released when new bonds form.

C8 Rates and Equilibrium

The key point is to help students understand that bond breaking is endothermic and bond making is exothermic.

C9 Crude oil and fuels

Find out how different lengths of string can be used to model fractional distillation alongside other models to boost understanding.

Use these differentiated worksheets to assess learners' knowledge and explore the topic of crude oil, including fractional distillation, fuels and other products from oil.

Try this class practical or demonstration to simulate the industrial fractional distillation of crude oil.

C10 Organic Reactions

In alkenes, the high electron density of the carbon-carbon double bond leads to attack on these molecules by electrophiles. This section also covers the mechanism of addition to the double bond and introduces additional polymers, which are

commercially important and have many uses in modern society. C11 Polymers Going deeper: Suggest why life evolved to use condensation polymers and non addition polymers. How would life be different if humans were made from additional polymers? Why are plastic bags inert? What are the disadvantages of a plastic bag tax? Interactive Activities and Practice: Group Activities: Organise group activities where students can simulate polymerisation by connecting paper chains or using other craft materials to represent monomers and polymers. This fosters collaboration and reinforces learning through doing. Problem-Solving Exercises: Provide worksheets with polymerisation problems and questions. Include exercises that ask students to identify monomers, predict the properties of resulting polymers, and draw structural diagrams. Quizzes and Games: Use quizzes and educational games to test understanding and make learning fun. Platforms like Kahoot! can be employed for interactive quizzes that reinforce key concepts in an engaging manner.	
ASSESSMENT Biology: Chemistry : Physics At the end of every unit that varies from 2-3 weeks: End of unit test on C5,C6,C7,C8,C9,C10 Assessment Objectives	ASSESSMENT: Biology: Chemistry : Physics At the end of every unit that varies from 2-3 weeks: End of unit test on C12,C13,C14, C15 Assessment Objectives

Biology

Chemistry

Physics

P8 Forces in balance

Why does the moon not fall into Earth? Hint, think about Newton's first law.

Why does coffee spill when the car stops?)

P9 Motion

Freefall through a fluid (gas, like air, or a liquid)

Free Falling object initially accelerate due to gravity, but friction (/air resistance)

increases with speed until the forces are balanced (resultant force = 0 N). Then,

the object is falling at its terminal velocity

P10 Forces and Motion

It's really important that teachers spend time helping students to understand Newton's Laws of Motion – and can use his framework to help scaffold thinking and explanations.

P11 Force & Pressure

Calculating pressure

Every living thing on Earth is in balance with the pressure of the air or water around it. Pressure helps blood to move around the body and allows organisms to breathe.

P12 Wave Properties

Electromagnetic radiation is a really great topic to teach. It's important that students realise that EM waves are simply characterised according to their wavelength. Because all waves travel at the same speed ($3.00 \times 10^8 \text{ m/s}$) and we know that wave speed = frequency $\times$ wavelength, if the wavelength increases then the frequency must decrease. Going from long to short wavelength (or from low to high frequency) the

Revision

groups are: radio, microwave, infrared, visible light (red to violet), ultraviolet, X-rays and gamma rays.

P13 Electromagnetic waves

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P14 Light

Why is the sky blue?

This is a great question to explore when teaching light. It could be posed as a question at the start of a unit and then returned to at the end. It brings together ideas of scattering, particles and colours of visible sunlight

P15 Electromagnetism

After a demonstration introducing students to electromagnets, students compete to build an electromagnet that can transport exactly 5 paper clips a distance of 1 m. By doing this they will explore the relationships between current, coils and magnetic field strength

P16 Space

Life cycle of a star

1. Cloud of gas (nebula): Begins to collapse due to gravity and heat up
2. Protostar: formed as fusion begins
3. Main sequence star: Stable star when gravity is balanced by expansion.

Hydrogen fuses into Helium

Interactive Simulations and Virtual Tours:

Utilise online simulations and virtual reality tours of the solar system and beyond to help students visualise and explore space in an immersive and engaging way.

Hands-On Activities: Conduct experiments and model-building activities, such as creating scale models of the solar system, to provide tangible learning experiences and reinforce spatial relationships and distances. Incorporate Current Events: Discuss recent space missions, discoveries, and news to connect classroom learning to real-world applications and inspire interest through the latest advancements in space exploration.	
ASSESSMENT Biology: Chemistry : Physics At the end of every unit that varies from 2-3 weeks: End of unit test on P15 Electromagnetism;P8 Forces in balance; P9 Motion; P10 Forces and motion; P11 Force and pressure; P16 space Assessment Objectives	

			ASSESSMENT
Biology	Chemistry	Physics	
ASSESSMENT Biology: Chemistry : Physics At the end of every unit that varies from 2-3 weeks: Formative assessments Exam practice End of units test: P7 Radioactivity; P12 wave properties; P13 Electromagnetic waves; P14 Light; C14 The earth's resources; C15 Using resources All assessments are linked to AQA Assessment Objectives <u>Resources</u> Textbook - Kerboodle Biology for practical equipment Free Science Video Maths skills <u>Extended Learning Opportunity</u> After school clubs, STEM Trips, STEM careers		ASSESSMENT Biology: Chemistry : Physics At the end of every unit that varies from 2-3 weeks: Formative assessments Exam practice End of units test: C8 Rates and equilibrium; C9 Crude oil and effects; C10 Organic reactions; C11 Polymers All assessments are linked to AQA Assessment Objectives <u>Resources</u> Textbook - Kerboodle Physics for practical equipment Free Science Videos Maths skills <u>Extended Learning Opportunity</u> After school clubs, STEM Trips, STEM careers	