

SCIENCE DEPARTMENT KEY STAGE 3 CURRICULUM OVERVIEW

The Science department key stage 3 curriculum is designed to implement the Academy’s vision of “Deepening Learning, Raising Aspiration”, in line with the OAT curriculum strategy of “Teach, Develop, Change”. Our curriculum is carefully designed to build resilience, aspiration and independence in our learners.

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world’s future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Aims

The curriculum for science aims to ensure that all pupils:

- develop **scientific knowledge and conceptual understanding** through the specific disciplines of biology, chemistry and physics
- develop understanding of the **nature, processes and methods of science** through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the **uses and implications** of science, today and for the future.

Diversity

Our Science curriculum covers many of the world’s greatest Scientists including Darwin and Dalton (England), Einstein (Germany), Boyle (Ireland). We introduce a wide range of Scientists during the learning of the three different disciplines in Science, for example in Physics, radioactivity, we learn about Marie Curie (Poland) who discovered radium, Katherine Johnson (African American) whose calculations enabled the USA moon landing. In Biology, we learn about the work of Rosalind E Franklin (England) who, through x-ray crystallography was central to the understanding of the molecular structure of DNA. In Chemistry, we teach about Percy Julian (African American) a renowned research chemist who was a pioneer in the chemical synthesis of medicinal drugs from plants. We discuss innovations with related subjects and this includes Mary Jackson, NASA’s first black female engineer and Ada Lovelace a mathematician and pioneer of computing.

We introduce the students to new and emerging technologies from around the world in the context of their wider learning and celebrate events such as Earth Day and National Technology Day. We encourage our students to discuss and debate views on Science from other religions such as Hinduism and Creationists.

Year

7

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Particles <small>Diversity</small>						Energy <small>Diversity</small>					
	Particle model Solutions Separating mixtures			The Periodic table Metals Keys			Energy types and transfers Heat transfer			Changing state Energy Resources		
Spring	Cells and Infectious Diseases <small>Diversity</small>						Compounds					
	Cells Organisation of cells Cell division Microscope			Pathogens Protection against disease Vaccination Antibiotics			Compounds Bonding			Acids and bases Neutralisation Gas Tests		
Summer	Forces <small>Diversity</small>						Genes and Reproduction <small>Diversity</small>					
	Balanced and unbalanced forces Mass and weight			Motion Moments Pressure			Biodiversity Variation Genes			Reproductive system Menstrual cycle Reproduction in plants		

Autumn Half Term 1**Block 1 – Weeks 1 to 3****Particles**

- The study of particle models
- To describe soluble and insoluble substances
- The methods used to separate mixtures

Block 2 – Weeks 4 to 6**Particles Continued**

- The relevance of the Periodic table
- Classifying elements and compounds
- Properties of metals and non-metals

Notes/Links/Interleaving

- **Particle model is referred to throughout the topic, links to Energy (Year 7), Chemical Reactions (Year 8), Fundamentals of Chemistry 1 (Year 9), Fundamentals of Physics 2 (Year 9) and forms the basis of GCSE Chemistry and GCSE Physics**

Additional Higher Content

- Use of the particle model to explain changes of state, solubility, simple reactions and properties of substances
- Use of the particle model to construct formulae

Autumn Half Term 2**Block 3 – Weeks 7 to 9****Energy**

- The study of energy transfers.
- To name conductors and insulators.
- To apply the particle model to energy transfer

Block 4 – Weeks 10 to 12**Energy Continued**

- The study of renewable and non-renewable energy
- Impacts of both renewable and non-renewable energy types on the environment

Notes/Links/Interleaving

- **Energy types and transfers are referred to throughout the topic, links to the particle model (Year 7), Electricity and Magnetism topic (Year 8), Chemistry Fundamentals 1 (Year 9), Physics Fundamentals 1 (Year 9) and forms the basis of GCSE Chemistry and GCSE Physics**

Additional Higher Content

- Explain how energy transfer in terms of the particle model
- Compare energy types (both renewable and non-renewable), energy costs and energy efficiency

Spring Half Term 1

Block 1 – Weeks 1 to 3

Cells

- The study of plant and animal cells, their specialised features and function
- The study of the microscope, its invention, history and how to use it

Block 2 – Weeks 4 to 6

Infectious Diseases

- The study of infectious diseases and mode of transmission
- The role of viruses, bacteria and fungi in life processes
- The study of vaccines, antibiotics and analgesics

Notes/Links/Interleaving

- **Refers to cells and their structure throughout the topic, links to Reproduction and Genes (Year 7) and The Human Body, Ecology and Plants (Year 8), Biology Fundamentals 1 (Year 9) and forms the basis of GCSE Biology topics**

Additional Higher Content

- Explain differences between viruses and other organisms
- Explain the use of vaccines to provide herd immunity, antibiotics to treat bacterial disease and analgesics to relieve symptoms

Spring Half Term 2

Block 3 – Weeks 7 to 9

Compounds

- The study of elements, compounds and mixtures
- Constructing formulae
- Naming compounds using their formulae

Block 4 – Weeks 10 to 12

Compounds continued

- The study of acids and alkalis
- The use of the pH scale
- Products of chemical reactions and formula equations

Notes/Links/Interleaving

- **Refers to particle model, elements and formula throughout, links to Particles (Year 7), Chemical reactions and Chemistry of the Earth (Year 8), Fundamentals of Chemistry 1 (Year 9) and forms the basis of GCSE Chemistry topics**

Additional Higher Content

- Use the particle model to classify elements, compounds and mixtures
- Use the valance theory to construct more complex word and formula equations

Summer Half Term 1

Block 1 – Weeks 1 to 3

Forces

- The study of forces
- The difference between mass and weight

Block 2 – Weeks 4 to 6

Forces continued

- Use of graphs and data to explain moving objects
- Use of formula and units to calculate speed
- The study of moments, levers and pressure

Notes/Links/Interleaving

- **Refers to forces throughout this topic to explain different types of motion, links into future learning of Waves and Solar System in Year 8 and of GCSE Physics Topics, particularly Forces and Space**

Additional Higher Content

- Explain forces on other planets
- Use units and calculations for moments and pressure
- Explain the concept of force multipliers

Summer Half Term 2

Block 3 – Weeks 7 to 9

Genes

- The study of variation, natural selection and adaptations of organisms
- The study of selective breeding, sexual reproduction and inheritance
- The study of genes and genetic engineering

Block 4 - Weeks 10 to 12

Reproduction

- The study of the human reproductive system and associated health issues
- The study of reproduction in flowering plants
- The understanding and use of continuous and discontinuous data

Notes/Links/Interleaving

- **Refers back to Cells (Year 7) and links to Human Body (Year 8) and forms the basis of GCSE Biology topics Homeostasis and Response and Variation and Evolution**

Additional Higher Content

- Explain biodiversity, trends in population and adaptations in competition
- Understand the theories of Lamarck, Wallace and Darwin
- Ethical issues relating to genetic engineering and selective breeding

Year

8

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	
Autumn	Chemical Reactions						Diversity	Waves and Solar System					Diversity
	Conservation of mass Energy changes			Metals and their reactions Reactivity Series Reactions of Metal Carbonates				Light Sound			Solar system Seasons Gravity		
Spring	Human Body						Chemistry of the Earth						
	Health and diet Organ systems Digestive system			Circulatory system Respiratory system				Pollution Greenhouse gases			Rock types Erosion Rock Cycle Extracting metals		
Summer	Electricity and Magnetism						Diversity	Ecology and Plants					Diversity
	Electrical safety Circuits			Current and voltage (p.d.) in circuits Magnetism				Habitats Classification and adaptations Food chains and webs			Plants Photosynthesis		

Autumn Half Term 1**Block 1 – Weeks 1 to 3****Chemical Reactions**

- The study of chemical reactions
- The study of energy changes and energy release

Block 2 – Weeks 4 to 6**Chemical Reactions continued**

- The study of metals and their properties
- Describing different types of chemical reactions and conservation of mass

Notes/Links/Interleaving

- **Refers back to Particles and Energy (Year 7) and Chemistry of the Earth (Year 8), Chemistry Fundamentals 2 (Year 9) and forms the basis of GCSE Chemistry topics**

Additional Higher Content

- Use word and symbol equations to represent chemical reactions
- Balance formula equations for different types of chemical reaction
- Refer to the particle model to explain conservation of mass

Autumn Half Term 2**Block 3 – Weeks 7 to 9****Waves**

- The study of light and its properties
- The study of sound and its properties
- The study of the human ear, its main parts and functions

Block 4 – Weeks 10 to 12**Solar System**

- The study of our Solar System
- Gravity, force and weight
- Calculations using gravitational field strength

Notes/Links/Interleaving

- **Refers back to Forces (Year 7) and links into future learning of GCSE Physics topics, particularly Waves and Space**

Additional Higher Content

- The use of periscopes and oscilloscopes in relation to light and sound
- Comparisons of scale and calculations of distance in relation to objects in the Solar System

Spring Half Term 1

Block 1 – Weeks 1 to 3

Human Body

- The study of organs, digestion and diet in the human body
- The study of medicinal and recreational drugs

Block 2 – Weeks 4 to 6

Human Body continued

- The study of organ systems in the human body
- Gas exchange and respiration
- Effect of medicinal and recreational drugs on the human body

Notes/Links/Interleaving

- **Organ systems referred to throughout the topic, refers back to Cells (Year 7), Biology Fundamentals 1 (Year 9) and forms the basis of GCSE Biology**

Additional Higher Content

- Enzymes in digestion
- Word and balanced symbol equations for respiration and combustion
- Adaptations of the organs of the respiratory system

Spring Half Term 2

Block 3 – Weeks 7 to 9

Chemistry of the Earth

- The study of atmospheric and environmental pollutants
- The effect humans have on the environment
- The study of the carbon cycle

Block 4 – Weeks 10 to 12

Chemistry of the Earth continued

- The study of the rock cycle
- Chemical, physical and biological weathering
- Smelting and electrolysis

Notes/Links/Interleaving

- **Refers back to the particle model (Year 7) and Chemical Reactions (Year 8) and forms the basis of GCSE Chemistry topics particularly Chemical Changes, Chemistry of the Atmosphere and Using Resources**

Additional Higher Content

- Construct word and symbol equations relating to environmental pollution
- Distinguish between weathering and erosion
- Link extraction methods to reactivity series

Summer Half Term 1

Block 1 – Weeks 1 to 3

Electricity

- The study of electricity
- The study of series and parallel circuits
- Use of components and symbols

Block 2 – Weeks 4 to 6

Magnetism

- The study of magnetic materials and magnetism
- The description and diagrams of magnetic fields

Notes/Links/Interleaving

- **Refers to energy types and electrical definitions throughout, refers back to Energy (Year 7), Physics Fundamentals 1 (Year 9) and links to GCSE Physics topics Electricity and Magnetism**

Additional Higher Content

- Describe current and voltage in series and parallel circuits
- Calculate current
- Explain how electromagnetism works

Summer Half Term 2

Block 3 – Weeks 7 to 9

Ecology

- The study of organisms and habitats
- The study of food chains and food webs

Block 4 – Weeks 10 to 12

Plants

- The study of plants
- Classification
- The photosynthesis equation

Notes/Links/Interleaving

- **Refers back to organ structure and adaptations throughout topic, refers back to Cells and Genes and Reproduction (Year 8) and links into future learning of GCSE Biology topics, particularly Inheritance, Variation and Evolution and Ecology**

Additional Higher Content

- Limitations of the classification system
- Use of data to construct food webs and pyramids of number
- Balanced symbol equation for photosynthesis

Year

9

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Biology Fundamentals 1 <small>Diversity</small>						Chemistry Fundamentals 1 <small>Diversity</small>					
	Cell biology Transport in cells			Animal and plant organ systems Non-communicable diseases			Atoms and atomic structure Periodic table Metals and non-metals			Chemical bonding States of matter Properties of materials		
Spring	Physics Fundamentals 1 <small>Diversity</small>						Biology Fundamentals 2 <small>Diversity</small>					
	Energy stores Energy transfers Power			Electrical circuits Circuit Components Mains electricity			Pathogens, Communicable diseases			Immune system Practical skills in science		
Summer	Chemistry Fundamentals 2 <small>Diversity</small>						Physics Fundamentals 2 <small>Diversity</small>					
	Conservation of mass Balancing equations Reactivity series			Neutralisation Electrolysis Practical skills in science			Particle model Changes of state Internal Energy			Pressure Practical skills in science		

Autumn Half Term 1**Block 1 – Weeks 1 to 3****Biology Fundamentals 1**

- The study and identification of cell biology, both animal and plant cells
- The study of transport of substance in cells including through membranes and movement of water and gases

Block 2 – Weeks 4 to 6**Biology Fundamentals 1 continued**

- Exploring animal and plant organ systems
- Studying the human digestive system
- Studying the circulatory system
- Describing non-communicable diseases including obesity, heart disease and cancer

Notes/Links/Interleaving

- **Refers to and builds on Cells (Year 7) and Human Body (Year 8) with more organelle detail introduced, links to GCSE Biology topics particularly Cell Biology and Organisation**

Additional Higher Content

- Calculating magnification using equations
- Evaluating ethical issues in the use of stem cells
- Using models and analogies to develop explanations of how cells divide

Autumn Half Term 2**Block 3 – Weeks 7 to 9****Chemistry Fundamentals 1**

- Describing how all substances are made from atoms and the sub atomic particles
- In depth knowledge of the periodic table
- Studying the history of the periodic table
- Explaining the difference between metals & non-metals

Block 4 – Weeks 10 to 12**Chemistry Fundamentals 1 continued**

- Studying chemical bonding of elements
- Using the Particle Model to explain the properties of the states of matter
- Describing the properties of various molecules and materials

Notes/Links/Interleaving

- **Refers back to Particles and Compounds (Year 7), Chemical Reactions (Year 8) and links to GCSE Chemistry topics particularly Atomic Structure and The Periodic Table and Bonding Structure and the Properties of Matter**

Additional Higher Content

- Describe how scientific methods and theories have developed over time
- Recognising expression in standard form
- Explain how predictions can support or refute a new scientific idea

Spring Half Term 1

Block 1 – Weeks 1 to 4

Physics Fundamentals 1

- Describe changes in energy stores when a system changes
- Describe energy transfers in a closed system
- Using energy and power equations
- Calculating energy efficiency values

Block 2 – Weeks 5 to 6

Physics Fundamentals 1 continued

- Draw and interpret electrical circuit diagrams
- Studying electrical charge, current, resistance and potential difference
- Describing the characteristics of electrical components
- Mains electricity and how to use it safely

Notes/Links/Interleaving

- **Refers back to Energy (Year 7) and Electricity (Year 8) and links to GCSE Physics topics particularly Energy, Electricity and Magnetism**

Additional Higher Content

- Recalling, applying and rearranging equations
- Investigating relationships in circuit components
- The study of static electricity and electric fields

Spring Half Term 2

Block 3 – Weeks 7 to 9

Biology Fundamentals 2

- The study of pathogens (bacteria, viruses, fungi and protists)
- Describe how communicable diseases are caused by pathogens
- State their symptoms and treatment

Block 4 – Weeks 10 to 12

Biology Fundamentals 2 continued

- The study of the how the body defends itself from pathogens and the immune system
- Practical skills in science

Notes/Links/Interleaving

- **Refers back to Infectious Diseases (Year 7) and Human Body (Year 8) and links to GCSE Biology topics particularly Infection and Response**

Additional Higher Content

- Evaluating vaccination programmes globally
- Understanding peer review on testing and trialling new medication

Summer Half Term 1

Block 1 – Weeks 1 to 3

Chemistry Fundamentals 2

- Using the law of conservation of mass, including balancing equations
- Explaining changes of mass in reactions
- Studying the reactivity series and the reactions of metals
- Explaining metal extraction processes
- Describing oxidation and reduction

Notes/Links/Interleaving

- Refers back to topics **Compounds (Year 7) and Chemical Reactions (Year 8) and links to GCSE Chemistry topics particularly Quantitative Chemistry and Chemical changes**

Block 2 – Weeks 4 to 6

Chemistry Fundamentals 2 continued

- Describing neutralisation and further study of the pH scale
- Studying electrolysis
- Practical skills in science

Additional Higher Content

- Studying and using Avogadro constant
- Using moles to balance equations
- Explaining the effect of limiting reactants
- Writing half equations for reactions

Summer Half Term 2

Block 3 – Weeks 7 to 9

Physics Fundamentals 2

- Further study of the Particle Model
- Studying the density of materials
- Explaining different states of matter

Notes/Links/Interleaving

- Refers back to topics **Particles and Energy (Year 7) and links to GCSE Physics topics particularly Energy and Particle Model of Matter**

Block 4 – Weeks 10 to 12

Physics Fundamentals 2 continued

- Studying temperature changes in systems and the internal energy
- Particle motion and pressure in gases
- Practical skills in science

Additional Higher Content

- Recalling and rearranging equations
- Explaining the effects of varying conditions of a gas
- Evaluation of models