
SCIENCE DEPARTMENT KEY STAGE 4 PHYSICS CURRICULUM OVERVIEW

The Science department key stage 4 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. We carefully design the KS4 curriculum to further develop and build upon prior learning at KS3.

Science in key stage 4 continues with the process of building upon and deepening scientific knowledge and the understanding of ideas developed in earlier key stages in the subject disciplines of biology, chemistry and physics.

For some students, studying the sciences in key stage 4 provides the platform for more advanced studies, establishing the basis for a wide range of careers. For others, it will be their last formal study of subjects that provide the foundations for understanding the natural world and will enhance their lives in an increasingly technological society.

Science is changing our lives and is vital to the world’s future prosperity, and all students should be taught essential aspects of the knowledge, methods, processes and uses of science. They should be helped to appreciate the achievements of science in showing how the complex and diverse phenomena of the natural world can be described in terms of a number of key ideas relating to the sciences which are inter-linked, and which are of universal application.

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
10

	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	Energy						Electricity					
	Energy stores and systems Conservation of Energy			National and global energy resources			Electrical quantities Series and parallel circuit			Domestic uses and safety Energy transfers Static electricity		
Spring	Particle Model of Matter						Atomic structure					
	The particle model Internal energy and energy transfers			Particle model and pressure			Atoms and isotopes Atoms and nuclear radiation			Hazards and uses of radiation Nuclear fission and fusion		
Summer	Forces						Forces					
	Forces and their interactions Work done Forces and elasticity			Moments, levers and gears Pressure in fluids Atmospheric pressure			Motion Newton's laws			Stopping Distance Momentum		

Diversity

Diversity

Diversity

Autumn Half Term 1

Block 1 – Weeks 1 to 3

Energy

- Studying energy stores and systems
- Calculating energy stores, changes, power and efficiency
- Explaining how energy is conserved and dissipated

Block 2 – Weeks 4 to 6

Energy

- Describing the main energy sources available
- Comparing different energy resources, including the environmental impact
- Explain patterns and trends in use of energy resources

Notes/Links/Interleaving

- Refers back to Energy (Year 7) and Physics Fundamentals 1 (Year 9) and links to A Level Physics topics

Additional Higher Content

- Describe ways of increasing efficiency
- Rearranging equations to make a different quantity the subject

Autumn Half Term 2

Block 3 – Weeks 7 to 9

Electricity

- Describing and calculating charge flow, current, resistance and potential difference in both series and parallel circuits
- Studying components in circuits, their characteristics and uses

Block 4 – Weeks 10 to 12

Electricity

- Studying the domestic uses, safety and energy transfer of mains electricity
- Explaining the use of the national grid
- Studying static electricity and electric fields

Notes/Links/Interleaving

- Refers back to Electricity and Magnetism topic (Year 8), Physics Fundamentals 1 (Year 9) and links to A Level Physics topics

Additional Higher Content

- Describing how transformers work
- Rearranging equations to make a different quantity the subject

Spring Half Term 1**Block 1 – Weeks 1 to 3****Particle Model of Matter**

- Explain changes of state using the particle models
- Describing internal energy
- Calculate temperature changes in a system, specific heat capacity and latent heat

Block 2 – Weeks 4 to 6**Particle Model of Matter**

- Using particle model to explain pressure
- Studying pressure in gases
- Calculating volume, pressure and temperature in gases

Notes/Links/Interleaving

- Refers back to Particles (Year 7) and Physics Fundamentals 2 (Year 9) and links to A Level Physics topics

Additional Higher Content

- Studying the relationship between work done, pressure and temperature in gases

Spring Half Term 2**Block 3 – Weeks 7 to 9****Atomic Structure**

- Describing atoms and isotopes
- Describing the properties of alpha particles, beta particles and gamma rays
- Explain the concept of half-life for radioactive decay
- Understand the difference between irradiation and contamination

Block 4 – Weeks 10 to 12**Atomic Structure**

- Studying the hazards and uses of ionising radiation
- Understanding nuclear fission
- Explaining nuclear fusion

Notes/Links/Interleaving

- Refers back to Particles (Year 7), Chemistry Fundamentals 1, Physics Fundamentals 2 and links to Space (Physics GCSE) and A Level Physics

Additional Higher Content

- Calculating the reduction in nuclei in radioactive decay
- Evaluating risks and benefits of using nuclear radiation

Summer Half Term 1**Block 1 – Weeks 1 to 3****Forces**

- Describing forces and their interactions
- Calculating weight
- Calculating work done and energy transferred
- Investigating elasticity and using the relevant equations

Block 2 – Weeks 4 to 6**Forces**

- Defining moment and using the equation for the moment of a force
- Explain how levers and gears work
- Explaining and calculating the pressure at the surface of a fluid
- Explaining how atmospheric pressure varies with height

Notes/Links/Interleaving

- Refers back to Energy, Particles and Forces (Year 7), Physics Fundamentals 2 and links to A Level Physics

Additional Higher Content

- Adding and resolving forces
- Use scaled vector diagrams to represent adding and resolving forces
- Studying pressure in a fluid due to a column of liquid

Summer Half Term 2**Block 3 – Weeks 7 to 9****Forces**

- Describing motion in a straight line
- Draw and interpret graphs of motion
- Recall and apply Newton's laws of motion
- Recall and use the equations of motion

Block 4 – Weeks 10 to 12**Forces**

- Studying stopping distance and factors which affect it
- Evaluate the effect of factors on braking distance
- Evaluate the effect of factors on thinking distance
- Interpret graphs relating to stopping distance

Notes/Links/Interleaving

- Refers back to Forces (Year 7) and links to Space and A Level Physics

Additional Higher Content

- Calculating the distance travelled/displacement by an object from the area under a velocity–time graph
- Use tangents of graphs to calculate appropriate quantities
- Explain circular motion and inertial mass in general terms
- Studying and calculating momentum

**Year
11**

	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	Waves						Magnetism and Electromagnetism					
	Waves in air, fluids and solids Electromagnetic waves			Visible light Black body radiation			Permanent and induced magnetism Magnetic forces and fields			Electromagnetism and the motor effect The generator effect National grid		
Spring	Space						Revision					
	Solar system Life cycle of a star			Red shift Theories of the creation of the universe			All topics Exam skills and practice					
Summer	Revision and Exams						Revision and Exams					
	All topics Exam skills and practice						Physics paper 1 and paper 2					

Diversity

Autumn Half Term 1

Block 1 – Weeks 1 to 3

Waves

- Describe the difference between longitudinal and transverse waves
- Studying properties of waves and wave speed
- Study of the electromagnetic spectrum and the transfer of energy
- Describe the properties and applications of electromagnetic waves

Block 2 – Weeks 4 to 6

Waves

- Studying and investigating the reflection and refraction of waves
- Drawing and interpreting ray diagrams for lenses
- Explaining how visible light allows us to see objects
- Studying black body radiation

Notes/Links/Interleaving

- Refers back to Waves and Solar System (Year 8) and links to Space and A Level Physics

Additional Higher Content

- Explaining why each type of electromagnetic wave is suitable for its practical application
- Describing transmission and detection of radio waves
- Studying sound waves
- Explaining how waves can be used for detection and exploration
- In depth study of the temperature of the earth

Autumn Half Term 2

Block 3 – Weeks 7 to 9

Magnetism and Electromagnetism

- Explain the difference between permanent and induced magnets
- Describe and draw magnetic forces and field
- Brief study of the Earth's magnetic field

Block 4 – Weeks 10 -12

Magnetism and Electromagnetism

- Describe electromagnetism
- Explain the a solenoid can increase magnetic field
- Explain how electromagnetic devices work

Notes/Links/Interleaving

- Refers back to Electricity and Magnetism (Year 8), Physics Fundamentals 1 (Year 9), Electricity and links to A Level Physics

Additional Higher Content

- Using Flemings LHR
- Explaining how electric motors, loudspeaker and headphones work
- Explaining he generator effect and how microphones work
- In depth study of transformers

Spring Half Term 1**Block 1 – Weeks 1 to 3****Space**

- Studying the solar system
- Describing the life cycle of a star
- Explaining how elements are formed in stars
- Describing the motion of satellites

Block 2 – Weeks 4 to 6**Space**

- Explaining red shift
- Studying the Big Bang theory
- Evaluating evidence for such theories

Notes/Links/Interleaving

- Refers back to Waves and Solar System (Year 8), Atomic Structure and Waves and links to A Level Physics

Additional Higher Content

- Explaining the relationship between force, speed, velocity and radius for circular orbits

Spring Half Term 2**Block 3 – Weeks 7 to 9****Paper 1 Revision**

- All topics

Block 4 – Weeks 10 to 12**Paper 1 and Paper 2 Revision**

- All topics

Notes/Links/Interleaving

- Revision of the whole course

Additional Higher Content

- Higher level content as taught throughout the course

Summer Half Term 1	
Block 1 – Weeks 1 to 3	Block 2 – Weeks 4 to 6
<p>Paper 2 Revision</p> <ul style="list-style-type: none"> All topics 	<p>Revision and Exams</p> <ul style="list-style-type: none"> Physics paper 1 and paper 2
<p>Notes/Links/Interleaving</p> <ul style="list-style-type: none"> Revision of the whole course 	<p>Additional Higher Content</p> <ul style="list-style-type: none"> Higher level content as taught throughout the course
Summer Half Term 2	
Block 3 – Weeks 7 to 9	Block 4 – Weeks 10 to 12
<p>Revision and Exams</p> <ul style="list-style-type: none"> Physics paper 1 and paper 2 	<p>Revision and Exams</p> <ul style="list-style-type: none"> Physics paper 1 and paper 2
<p>Notes/Links/Interleaving</p> <ul style="list-style-type: none"> Revision of the whole course 	<p>Additional Higher Content</p> <ul style="list-style-type: none"> Higher level content as taught throughout the course