

Physics Curriculum: Mapping of Core Ideas through KS3 & KS4

The Science curriculum at Lutterworth College fosters resilience, curiosity, & critical thinking, encouraging students to question the world, solve problems logically, & evaluate evidence. Through teamwork during investigations, students develop effective communication, respect for diverse perspectives, & a mindset of perseverance & continuous improvement. Practical activities & data analysis tasks provide hands-on experience, building confidence in interpreting information & solving real-world problems. By addressing issues like health inequalities, climate change, & sustainability, students learn to use science as a tool for creating a fairer, more equitable world.

At its core, the curriculum celebrates the intrinsic value of science in helping us understand the world & our place in it. Students are inspired to appreciate the beauty of scientific discoveries & the role they play in shaping our lives. Beyond exams, the program aims to nurture lifelong curiosity, exploring everything from the smallest particles to the vastness of the universe. By engaging with models & investigations, students think scientifically & deepen their understanding of the natural world & human innovation, empowering them to contribute meaningfully to society.

POWERFUL IDEAS IN SCIENCE	Domain 1 Net force is needed to change motion (Newtonian mechanics)	Domain 2 Electric current and magnetism: movement of charge	Domain 3 Gravity: universal attraction between particles	Domain 4 Energy conservation and transfer: energy is neither created nor destroyed
Key Concepts	- Interactions involve matter and energy transfers - Forces act at a distance through fields - Four fundamental forces of nature - Gravity acts between all bodies - Electromagnetic force acts between charged particles - Strong and weak nuclear forces act within nuclei - Cause and effect; deductions in physics - Forces and energy transformations in closed systems	- Interactions involve matter and energy transfers - Forces act at a distance through fields - Electromagnetic force: electric and magnetic fields - Magnetic poles and electric currents - Simplified models for predictions - Theories must be testable	- Gravity acts between all bodies - Forces act at a distance through fields - Matter interacts via forces and energy transfers - Theories explain observed phenomena	- Energy described in terms of different stores - Internal energy and energy transfer - Energy cannot be created or destroyed - Energy propagates via waves - Longitudinal and transverse waves - Electromagnetic waves (visible light, radio, etc.) - The particle model of matter - Properties of matter: mass, charge, protons, neutrons, electrons
End Points	- Everything in the universe interacts through forces. When objects push or pull on each other, energy is transferred and movement changes in predictable ways. - All matter is made of extremely tiny particles that are always moving. Heating things makes these particles move faster. How closely the particles are packed and how fast they move explains why substances can be solids, liquids, or gases, and why they behave as they do. - Atoms themselves are made of even smaller particles. How these particles are arranged explains why different materials have different properties and why some reactions release a lot of energy. - Energy can be stored in different ways and transferred from one place to another, but it is never lost. Energy can cause things to move or change, even when we can't see it directly. - Waves (like light, sound, and water waves) carry energy from one place to another without carrying matter along with them. Waves can interact with materials and each other in surprising but predictable ways. - Electricity and magnetism are deeply linked. When electric charges move, they create magnetic effects — which is the basis for many everyday devices, from motors to speakers. - Physicists use models to explain how the world works. These models are based on evidence and are tested to see how well they predict real results. As we learn more, models improve. - Maths helps us describe and predict how physical systems behave. Students learn how to use numbers and formulas to understand and solve scientific problems.			

POWERFUL IDEAS IN SCIENCE	Domain 1 Net force is needed to change motion (Newtonian mechanics)	Domain 2 Electric current and magnetism: movement of charge	Domain 3 Gravity: universal attraction between particles	Domain 4 Energy conservation and transfer: energy is neither created nor destroyed
Year 7 KS3	P1.1 Forces & Motion Broken down knowledge covered: • Introduction to Forces • Balanced & Unbalanced Forces • Frictional Forces • Investigating Air Resistance • Speed Distance & Time • Speed Calculations • Distance-Time Graphs		P1.4 Earth & Space Broken down knowledge covered: • Space & The Solar System • Mass, Weight & Gravity • Gravity in Space – Orbits & Forces • Moon • Stars Galaxies & the Universe • Light Years & Astronomical Distances • Seasons & Earth's Tilt • NASA Challenge	P1.2 Energy Transfers Broken down knowledge covered: • Energy Stores • Energy Transfers • Mechanical Work • Useful & Wasted Energy • Measuring Temperature • Energy & Temperature • Cooling • Mixing Substances of Different Temperatures • Thermal Conductors • Thermal Insulators
				P1.3 Sound Broken down knowledge covered: • Making Sounds • Waves • Speed of Sound • How We Hear • Hearing Problems • Microphones & Loudspeakers • Ultrasound • Combining Waves
Assessments	End of topic quiz: (20-mark tests created from GCSE past paper questions including short answer, multiple choice and extended questions) • P1.1 Forces & Motion • P1.2 Energy Transfers • P1.3 Sound • P1.4 Earth & Space			
	Internal Assessment: (Created from past KS3 questions including short answer, multiple choice and extended questions) IA1: End of September: Introduction to Science/Skills Assessment IA2: May Core Content Assessment			

POWERFUL IDEAS IN SCIENCE	Domain 1 Net force is needed to change motion (Newtonian mechanics)	Domain 2 Electric current and magnetism: movement of charge	Domain 3 Gravity: universal attraction between particles	Domain 4 Energy conservation and transfer: energy is neither created nor destroyed
Year 8 KS3	P2.2 Forces in Action Broken down knowledge covered: • Effects of Forces • Elastic Forces • Investigating Elastic Forces • Analysing Elastic Forces	P2.1 Electricity & Magnetism Broken down knowledge covered: • Electric Circuits • Electric Current • Calculating Current • Series & Parallel Circuits • Magnetism • Magnetic Fields • Electromagnets & Motors • Investigating Electromagnets		P3.1 Energy in The Home Broken down knowledge covered: • Generating Power • Energy Resources • Comparing Fuels • Power • Energy Transfer • Cost of Electricity
Assessments	End of topic quiz: (20-mark tests created from GCSE past paper questions including short answer, multiple choice and extended questions) • P2.1 Electricity & Magnetism • P2.2 Forces in Action • P3.1 Energy in The Home			
	Internal Assessment: (Created from past KS3 questions including short answer, multiple choice and extended questions) IA1: September Core Content Assessment IA2: May Core Content Assessment			

POWERFUL IDEAS IN SCIENCE	Domain 1 Net force is needed to change motion (Newtonian mechanics)	Domain 2 Electric current and magnetism: movement of charge	Domain 3 Gravity: universal attraction between particles	Domain 4 Energy conservation and transfer: energy is neither created nor destroyed
Year 9 KS3/GCSE (<i>Separate Sciences Only</i>)	P3: Particle Model of Motion Broken down knowledge covered: • Gas Motion • Pressure & Temperature • Pressure & Volume	P3.2: Exploring Electricity Broken down knowledge covered: • Review of Circuits • Potential Difference • Building a Fruit Battery • Potential Difference in Series & Parallel • Resistance • Ohm's Law • Thermistors & LDRs • Effects of Static Electricity • Explaining Static Electricity • Electrical Fields		P2.3: Light Broken down knowledge covered: • Wave Properties • Waves at Boundaries • Reflection • Investigating Reflection • Refraction • Investigating Refraction • Colour • Lenses & The Eye • Cameras & The Eye
				P1a: Energy Stores & Transfers Broken down knowledge covered: • Energy Stores & Transfers • Gravitational Potential Energy • Kinetic Energy • Elastic Potential Energy • Conservation of Energy • Energy & Power • Efficiency & Calculations
				P1b: Thermal Energy & Energy Resources Broken down knowledge covered: • Conduction • Infrared Radiation • Thermal Insulation • Investigating Thermal Insulation • Specific Heat Capacity • Investigating Specific Heat Capacity • Non-Renewable Energy • Energy from Wind & Water • Energy from the Sun & Earth • L10 Energy Demands & Issues
				P3: Particle Model of Motion

				Broken down knowledge covered: • States of Matter • Density • Density Required Practical • Changing State • Internal Energy • Latent Heat
Assessments	End of topic quiz: (20-mark tests created from KS3/GCSE past paper questions including short answer, multiple choice and extended questions) • P2.3 Light • P3.2 Exploring Electricity • P1a: Energy Stores & Transfers • P1b: Thermal Energy & Energy Resources • P3: Particle Model of Motion			
	Internal Assessment: IA1: Core Content Assessment IA2: Core Content Assessment End of Year 10 PPE: Bio/Chem/Phys Paper 1 Suite			

POWERFUL IDEAS IN SCIENCE	Domain 1 Net force is needed to change motion (Newtonian mechanics)	Domain 2 Electric current and magnetism: movement of charge	Domain 3 Gravity: universal attraction between particles	Domain 4 Energy conservation and transfer: energy is neither created nor destroyed
Year 10 GCSE (Separate Sciences Only)	P5a: Motion Broken down knowledge covered: • Scalar and Vector Quantities • Displacement, speed, and velocity • Distance-time graphs • Acceleration • Velocity-time graphs • Equation of motion	P2a: Electricity Broken down knowledge covered: • <i>Static Electricity</i> • Current & Charge • Potential Difference • Resistance • Investigating Resistance • Circuit Components • Investigating Circuit Components • Interpreting Graphs • Series Circuits • Parallel Circuits • Investigating Series & Parallel Circuits		P4 Atomic Structure Broken down knowledge covered: • The Development of the Model of the Atom • Atoms and isotopes • Radioactive decay • Properties of Radioactive Decay • Nuclear equations • Activity and Half-life • Half-life calculations • Radioactive contamination • <i>Nuclear fission and fusion</i> • <i>Nuclear medicine</i> • <i>Background Radiation</i>
		P2b: Electricity in the Home Broken down knowledge covered: • Electricity • Alternating Current • Electrical Safety • Energy Transfer • Electrical Power • Appliances & Efficiency • The National Grid		P6a: Waves Broken down knowledge covered: • Transverse & Longitudinal Waves • Properties of Waves • Wave Speed Calculations • Investigating Wave Speed • <i>Reflection</i> • <i>Refraction</i> • <i>Investigating Refraction</i> • <i>Sound & Ultrasound</i> • <i>Seismic Waves</i>
				P6b: EM Waves Broken down knowledge covered: • EM Waves • EM for Communication • Infrared Radiation • <i>Black Bodies</i> • Ionising EM Waves • Dangers of EM Waves • <i>Light at Boundaries</i> • <i>Colour</i> • <i>Describing Images Convex Lenses</i>

				• <i>Concave Lenses</i>
Assessments	End of topic quiz: (20-mark tests created from GCSE past paper questions including short answer, multiple choice and extended questions) • P4: Atomic Structure • P2a: Electricity • P2b: Electricity in the Home • P5a: Forces & Motion • P6a: Waves • P6b EM Waves			
	Internal Assessment: IA1: Core Content Assessment IA2: Core Content Assessment End of Year 10 PPE: Bio/Chem/Phys Paper 1 Suite			

POWERFUL IDEAS IN SCIENCE	Domain 1 Net force is needed to change motion (Newtonian mechanics)	Domain 2 Electric current and magnetism: movement of charge	Domain 3 Gravity: universal attraction between particles	Domain 4 Energy conservation and transfer: energy is neither created nor destroyed
Year 11 GCSE (Separate Sciences Only)	P5b Forces in Action part 1 • Contact and Non-contact Forces • Parallelogram of Forces • Resolving Forces • Newton's Second Law and Inertia • Investigating Newton's Second Law • Newton's Third Law P5b Forces in Action part 2 • Momentum • <i>Using Conservation of Momentum</i> • Centre of Mass • <i>Moments</i> • <i>Moments in Equilibrium</i> • <i>Gears & Levers</i> • Forces & Elasticity • Investigating Elasticity	P7 Electromagnetism • Magnetism • Magnetic Fields • Induced Magnetic Fields • Electromagnets & Solenoids • <i>Uses of electromagnets</i> • The Motor effect (H) • Calculating the Motor Effect • Electric Motors • <i>Loudspeakers</i> • <i>Induced Potential</i> • <i>Using the Generator Effect</i> • <i>Transformers</i> • <i>Transformer Calculations</i>	P8 Space • <i>The Solar System</i> • <i>Orbits & Satellites</i> • <i>Birth of a Star</i> • <i>Stellar Evolution</i> • <i>Observing the Universe</i> • <i>The Changing Universe</i>	P5b Forces in Action part 2 • Work Done • Stopping Distance • Forces and Breaking
	P5c Pressure • <i>Pressure and surfaces</i> • <i>Pressure in a liquid at rest</i> • <i>Atmospheric pressure</i> • <i>Upthrust and flotation</i>		P5b Forces in Action part 1 • Gravity • Terminal Velocity	
Assessments	End of topic quiz: (20-mark tests created from GCSE past paper questions including short answer, multiple choice and extended questions) • P5b Forces in Action part 1 • P5b Forces in Action part 2 • <i>P5c Pressure</i> • P7 Electromagnetism • <i>P8 Space</i>			
	Internal Assessment: (Past GCSE Papers) PPE1: October (Bio/Chem/Phys Paper 1) PPE2: February (Bio/Chem/Phys Paper 2)			