Physics - What is taught :

Year 9	Topics taught
	Topic 3- Energy Energy Stores, Energy transfers, Kinetic energy calculations, Gravitational Energy calculations, Power, Efficiency, Non-renewable energy resources, Renewable energy resources. **Topic 4 – Waves** Describing waves, Wave speeds, Refraction, Waves crossing boundaries, Ears, and hearing. Ultrasound, Infrasound **Topic 5 – Light and EM Spectrum** Ray diagrams, Colour , Lenses, EM Waves, The EM Spectrum, Uses and dangers of EM Radiation
Academic End points Students complete Year 9 having a good understanding of the foundation topics for Physics, to continue to build on in Years 10 and 11. They have learned how to apply their working scientifically skills to planning, analysing and evaluation of required practicals.	

Year 10	Topics taught
	Topic 1: Motion and forces Vectors and scalars, Distance time graphs, Acceleration, Velocity time graphs, Resultant forces Newtons laws, Mass, and weight Momentum, Stopping distances, Braking distances and energy, Crash hazards **Topic 8: Forces doing work & Topic 9: Forces affecting each other:** Work and power, Objects affecting each other, Vector diagrams, Rotational forces **Topic 6 Radioactivity** Atomic models, Inside atoms Electrons and orbits, Background radiation, Types of radiation Radioactive decay, Half life Using radioactivity, Dangers of radioactivity, Radioactivity in medicine, Nuclear energy, Nuclear fission, Nuclear fusion **Topic 10: Electricity and Circuits** Electric circuits, Current and potential difference, Current charge and Energy, Resistance, Power, Electrical safety **Topic 11 Static Electricity** Charges and static electricity, Dangers and uses of static electricity, Electric Fields
Academic Endpoints : Students can use their working scientifically skills to confidently plan valid required practicals in different contexts, collect, analyse and evaluate the data. Students have been reassessed on prior learning from Years 9 & 10, and have increased their long-term memory stores. Students have greater resilience for completing longer tasks and attempting 6 mark exam questions.	

Year 11 Combined Science	Topics taught
	Topic 12: Magnetism and the Motor Effect and Topic 13: Electromagnetic Induction: Magnets and magnetic fields, Electromagnetism, Magnetic forces, The national grid, Transformers Transformers and energy **Topic 14: Particle Model** Particles and density, Energy and changes of state, Energy calculations. **Topic 15: Forces and Matter** Bending and stretching, Extension and energy transfers.

Academic Endpoints :

Students can use their working scientifically skills to confidently plan valid required practicals in different contexts, collect, analyse and evaluate the data.

Students are able to critique methods and data analysis by others, and can recommend improvements.

Students have been reassessed on their prior learning across KS4, and have increased their long-term memory stores.

Students have greater resilience for completing longer tasks and attempting 6 mark exam questions.

Students are well prepared for continuing with Physics at KS5, should they choose to.

Students leave school equipped with the scientific knowledge base and skills to support them in an increasingly science-based society

Year 11 Separate Science	Topics taught
	Topic 12: Magnetism and the Motor Effect and Topic 13: Electromagnetic Induction: Magnets and magnetic fields, Electromagnetism, Magnetic forces Electromagnetic induction, The national grid, Transformers Transformers and energy **Topic 14: Particle Model** Particles and density, Energy and changes of state, Energy calculations, Gas temperature and pressure, Gas pressure and volume **Topic 15: Forces and Matter** Bending and stretching, Extension and energy transfers, Pressure in fluids, Pressure and upthrust **Topic 7: Astronomy:** The solar system, Gravity and orbits, Life cycles of stars Red shift, Origin of the universe
Students can use their working scientifically skills to confidently plan valid required practicals in different contexts, collect, analyse and evaluate the data. Students are able to critique methods and data analysis by others, and can recommend improvements. Students have been reassessed on their prior learning across KS4, and have increased their long-term memory stores. Students have greater resilience for completing longer tasks and attempting 6 mark exam questions. Students are well prepared for continuing with Physics at KS5, should they choose to. Students leave school equipped with the scientific knowledge base and skills to support them in an increasingly science-based society	

Year 12	
Teacher A: **Section 5 Mathematical skills** Measurement and errors Standard form Prefixes and Greek letters uncertainty **Section 3 Mechanics and materials** *Forces in equilibrium* Vectors and scalars Balanced forces The principle of moments More on moments Stability Equilibrium rules Static calculations *On the move* Speed and velocity Acceleration Motion along a straight line at constant acceleration Free fall Motion graphs More calculations on motion along a straight line Projectile motion 1 Projectile motion 2 *Newton's laws of motion* Force and acceleration Using F=ma Terminal speed On the road Vehicle safety *Force and momentum* Moment and impulse Impact forces Conservation of momentum Elastic and inelastic collisions Explosions *Work, energy and power* Work and energy Kinetic energy and potential energy Power Energy and efficiency	**Teacher B** **Section 1 Particles and radiation** *Matter and radiation* Inside the atom Stable and unstable nuclei Photons Particles and antiparticles Particle interactions *Quarks and leptons* The particle zoo Particle sorting Leptons at work Quarks and antiquarks Conservation rules **Section 2 Waves and optics** *Waves* Waves and Vibrations Measuring waves Wave properties 1 Wave properties 2 Stationary and progressive waves More about stationary waves on strings Using an oscilloscope *Optics* Refraction of light More about refraction Total internal reflection Double slit interference More about interference Diffraction The diffraction gating **Section 1 Particles and radiation cont.** *Quantum phenomena* The photoelectric effect More about photoelectricity Collisions of electrons with atoms Energy levels in atoms Energy levels and spectra Wave – particle duality **Section 4 Electricity** *Electric current* Current and charge Potential difference and power

Materials Density Springs Deformation of solids More about stress and strain	Resistance Components and their characteristics *DC circuits* Circuit rules More about resistance Electromotive force and internal resistance More about circuit calculations The potential divider
The following topics are usually covered as part of the 'bridging course' at the end of Year 12 : **Section 6 Further mechanics** *Motion in a circle* Uniform circular motion Centripetal acceleration On the road At the fair ground *Simple Harmonic motion* Oscillations The principles of simple harmonic motion More about sine waves Applications of simple harmonic motion Forced vibrations and resonance	**The following topics are usually covered as part of the 'bridging course' at the end of Year 12 :** **Section 7 Fields** *Gravitational fields* Gravitational field strength Gravitational potential Newton's law of gravitation Planetary fields Satellite motion *Electric Fields* Field Patterns Electric Field Strength Electric Potential Coulomb's Law Point charges Comparing Electric and Gravitational Fields

Endpoints:
(What do we want them to know, do and remember at the end of this unit?)

Mathematical skills:
The skills needed to successfully access the physics course are introduced and practised in the mathematical skills module. in this first half term. These include basic lab skills from choosing equipment to maximise the accuracy of readings by considering the effects of errors and the understanding of precision. Maths skills introduced in the summer bridging work (Year 11) are assessed and practised before the content is tackled.

Mechanics:
Following on from the basic mechanics students have met in their previous studies at GCSE and at KS3. They will also extend the topics first encountered in year 9 science to more complex situations in the form of rotational systems. The mechanics that was introduced in the first topic is extended and built upon, studying falling objects, applying this knowledge across a system undergoing freefall, first seen in year 11. The energy topics from year 7 through to year 10 are applied through the analysis of motion in the form of momentum

Materials:
Students are introduced to the fundamentals of matter building on the material they saw in year 10 on atomic structure.
The materials section covered extends topics covered in earlier topics by considering their bulk properties and a materials application in varied engineering applications.
Particles and radiation:
The topics on structure of an atom from KS3 and KS4 are built upon in this module showing the development in the complexity of what type particles are found in the nuclei of atoms and which particles are fundamental or not.

Waves
Students will analyse wave motion applying modelling techniques developed earlier in their school career to explain wave behaviour, for example the formation of a note in a musical instrument. Wave properties are applied to optical systems, recounting and expanding on wave properties covered at GCSE. These are then applied to everyday objects containing optics such as spectacle lenses and fibre optics.

Electricity:
Students build on and develop their earlier study of electrical phenomena from key stages 3 and 4. They apply electrical circuit knowledge. Practical skills are developed throughout this module and allows the study of many electrical applications encountered in everyday life.

Year 13 Introductory Modules on Fields and Further Mechanics
As an introduction to year 13 topics, which are more rigorous in comparison to year 12, a practical investigation on SHM is undertaken. This allows the further development of practical skills and the introduction of mathematical skills needed in year 13. Application of knowledge in questions is practised in preparation for end of year exams.

Year 13	
Teacher A: **Section 6 Thermal Physics and Gases** *Thermal Physics* Internal energy and temperature Specific heat capacity Changes of state Gases Experimental Gas Laws Ideal Gas Law Kinetic Theory of Gases **Section 8: Nuclear Physics** *Radioactivity* Discovery of the nucleus Properties of radiation Dangers of radioactivity Radioactive Decay Radioactive Isotopes Nuclear radius *Nuclear Energy* Energy and Mass Binding Energy Fission and Fusion Thermal nuclear reactor **Section 9 Option A – Astrophysics** Wien's Law, Stefan's Law, and Inverse Square Law Parallax and Parsecs Magnitude Stars as Black bodies Stellar Spectral Classes The Hertzsprung-Russel diagram Evolution of sun-like stars Supernova, neutron stars and black holes **Revision for external examination** Multiple choice practice Mechanics revision Gravitational field revision Recap / review / revise required practicals and practise paper 3 section 1	**Teacher B** **Section 7 Fields cont.** Capacitors Capacitance Energy stored in charged capacitor Charging and discharging of capacitors Dielectrics Magnetic Fields Current carrying conductors in a magnetic field Moving charges in magnetic fields Charged particles moving in circular orbits Electromagnetic Induction Generating Electricity Laws of EM Induction AC Generator AC Current and Power Transformers **Section 9 Option A – Astrophysics** Lenses Optical telescopes Comparing telescopes Non-optical telescopes Doppler Effect and red shift The Big Bang theory Detection of Binary stars, quasars, and exoplanets **Revision for external examination** Multiple choice practice Particles revision Wave revision Electricity revision Recap / review / revise required practicals and practise
Endpoints: (What do we want them to know, do and remember at the end of this unit?)	

Further Mechanics and Thermal Physics

Students build on the topics introduced throughout year 12 in the form of further mechanics, before moving on to thermal physics.

Students reinforce their appreciation of thermal physics by reviewing and deepening their understanding from the topics introduced in year 10. These topics act as an introduction to the more mathematically strenuous areas encountered in this module.

Nuclear Physics:

Revisiting the topic of radioactivity and atomic structure, students will have seen in year 10 nuclear physics combines these topics with particles from year 12 and a more rigorous examination with the skills

developed to date. From the discovery of the nucleus through to the link between mass and energy, students become aware of the physics underpinning nuclear energy and its impact on modern society.

Fields:

The fields module expands the topics first encountered in year 8 and then again in year 11 in terms of fields and interactions.

The concept of fields used to explain phenomena is expanded upon. The unification of gravitation, electrostatics and magnetic fields is discussed and how these concepts are used to describe everyday occurrences. The similarities and differences in these fields are investigated and the fields encountered at GCSE expanded. Amongst these are planetary and satellite motion along with forces on electrical charges leading to the motion in an electrical motor.

Continuing the investigation of field theory started as an introductory unit towards the end of Year 12, the more theoretical aspects are undertaken. These are mathematically more rigorous and demanding, building on the skills developed throughout year 12. The practical applications are discussed and their effects on everyday life examined. This includes the action of capacitors and their appearance in practically every electronic device we use. Also, the impact of electromagnetic induction from generating electricity to the motion of a motor and their considerable impact on modern society

Astrophysics

Key concepts covered throughout a student's progress through GCSE and A level studies are combined in the Astrophysics Module. This develops a student's broader appreciation of the links across topics and deepens their understanding from historical and conceptual viewpoints. Key concepts on space covered at KS3 and in Year 11 are built upon.