PHYSICS CURRICULUM JOURNEY

Together we belong, develop character and achieve excellence.

Curriculum overview

Our Physics curriculum develops pupils' understanding of matter, energy, forces and the physical laws that explain the Universe. It moves from energy, forces, motion, particles, waves, electricity, magnetism and space through increasingly demanding study of fields, materials, radiation, quantum phenomena, thermal physics, mechanics and astrophysics. Across the curriculum, pupils learn to represent physical ideas through models, diagrams, equations and graphs, design and evaluate investigations, apply mathematics accurately and connect abstract principles to technology and everyday life.

BUILDING ON KEY STAGE 2 SCIENCE

- Forces and motion: gravity, air resistance, friction, levers, pulleys and gears, and how forces affect movement.
- Light, sound and electricity: reflection, shadows, vibration, pitch, volume, simple circuits, conductors and insulators.
- Earth and space: the movement of the Earth, Moon and planets, day and night, and the place of the Sun within the solar system.
- Working scientifically: planning enquiries, controlling variables, measuring accurately, recording data, using graphs, drawing conclusions and using evidence to explain observations.

How the curriculum builds from these foundations

Key Stage 3	Key Stage 4	Key Stage 5
Pupils develop quantitative models of energy, forces and motion; particle explanations of matter and pressure; wave behaviour; electricity and magnetism; and the Earth and space. Practical work strengthens measurement, graphing, data interpretation and evaluation.	Pupils apply equations and mathematical reasoning to energy, electricity, particles, atomic structure, forces, waves and magnetism. They connect models across topics and complete increasingly rigorous required-practical and evaluative work.	Pupils integrate mechanics, materials, electricity, waves, particles, radiation, thermal physics, fields, nuclear physics and astrophysics. They analyse complex data, derive and apply equations and evaluate experimental evidence in unfamiliar contexts.

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

Year	Semester	Scheme of Learning	Powerful Knowledge / Threshold Concept links	Composites and their components	Word Revolution
7	1	Energy and Matter	Energy stores – understand that energy stores are the foundation for describing energy in different scenarios from year 7 to 11 and is cornerstone of understanding the conservation of energy. Energy resources – understand how each energy resources work to produce energy. Understand how ‘energy’ ‘electricity’ is generated (not created) which will aid in students’ ability to understand the national grid and the generator effect in year 10. – real world links (climate change, bill costs)	Composite: to understand how energy is generated, transferred and used Components: Identify energy stores Describe different energy resources Explain why resources are renewable and non-renewable. Describe how energy is generated from these resources and calculate their associated costs	Energy store Generate Conservation of energy Resource Transfer Fossil fuel Biomass Wind Wave Solar Renewable Non-renewable Power
7	2	Forces and Motion	Introduction of mathematical skills – speed calculations and graph interpretation skills. Identification of forces and application of that to motion of objects (direction and speed). Understand how contend and non-contact forces impact the motion of objects such as friction, air resistance etc. understand that a moment is a turning force about a pivot (this is built on in greater depth in tripled physics y10). Link to Newton’s laws of motions in year 10 which describes how forces affect the motion of objects.	Composite: identify forces and their effects on an objects’ motion. Components: Identify and label forces Use the equation for speed Describe a simple journey using a distance-time graph Investigate the speed of sound Describe how friction, drag and air resistance arise. Investigate the relationship between force and extension of an object. Explain the effects of having balanced and unbalanced forces and link to moments.	Speed Distance Constant Friction Air resistance Drag Extension Force Moment Pivot Lever Gravity Magnetism Newton Balanced Unbalanced Lift Reaction Weight
		Earth and Beyond	Link to triple physics – space physics in year 11, however no links to combined GCSE. Link to year 13 Astrophysics optional 6C topic. On national curriculum and is one of the more engaging topics for students. Students will understand the impact of gravity on objects in the solar system (this will aid in their understanding of the life cycle of a star in y11 triple phsyics), the composition and order of the solar system, how the Earth’s rotation is linked to days/nights and seasons. Linking more to skills rather than just content e.g. data handling, research and comprehension. Key terms: season, day, night, solar system, planet, star, gravity Keywords: contact, non-contact, force,	Composite: understand the composition of the solar system and why days, nights and seasons arise. Components: Describe what force is and the effect it has on masses. Compare weight and mass Compare the strengths of gravity on different planets Describe the composition of our solar system and beyond. Explain why days and nights arise Explain what causes the seasons.	Force Gravity Attract Mass Weight Gravitational field strength Solar system

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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			speed, pressure, friction, moment		Galaxy Light year Orbit Planet Star Asteroid Day Night Rotation Season Hemisphere Axis
8	**1**	**General**	Throughout year 8 each new topic begins with roughly 3 lessons of recap of closely related y7 content e.g. forces and motion for 3 lessons was covered before starting the particle model topic. So that there is a constant iterative process during year 8 from the years previous teaching. Understand what a wave is, the difference between transverse and longitudinal waves, the properties of a wave and key terminologies such as wavelength, frequency, amplitude – linked to triple physics and A-Level topics. Understand the differences between reflection and refraction and how each phenomena arises.		
		Waves	Reflection – link to triple Physics and A-Level, Refraction – link to combined, triple and A-level. To understand how the eye can detect light, how light travels and why objects appear different colours. Colour is linked to triple only. To understand how sound is produced, detected by the ear and used in every day life such as ultrasound imaging.	Composite: to understand what a wave is and how and where it can appear in nature. Components: Be able to describe water, light and sound waves. Be able to describe how we see and perceive light an sound waves. Describe the processes of reflection and refraction Describe the uses of waves in the real world.	Transverse Longitudinal Vibration Undulation Luminous Non-luminous Ray diagram Refraction Reflection Ultrasound Pitch Frequency Amplitude Energy echo
8	**2**	**Particle Model**	Understand the link and differences between heat and temperature. Understand how energy is transferred in Conduction, convection and radiation, linked to GCSE required practical in triple and combined. Radiation links to waves. Also, linked	Composite: to understand how particles are responsible for pressure and how energy is transferred from particle to particle. Components:	Conduction Convection Radiation Pressure Atmosphere

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

Year	Semester	Scheme of Learning	Powerful Knowledge / Threshold Concept links	Composites and their components	Word Revolution
			to year 7 chemistry, particle model (solids, liquids and gases). Understand what pressure is and factors that affect it and understand how pressure changes in the atmosphere and within a liquid. Pressure – links with density in gcse and in triple physics (see above for links). Keywords y8 – density (new), conduction/convection radiation (y7) pressure (new)	Describe how energy is transferred via conduction, convection and radiation. Compare heat and temperature Describe and calculate pressure. Describe how pressure changes in a liquid and in the atmosphere. Explain why substance sink or float.	Energy transfer Heat Temperature Force Buoyancy
		Electricity and Magnetism	Understand how to construct basic circuits and represent them in diagram form, collecting and analysing data on current, potential difference and resistance – links to GCSE, triple and A-Level physics. Understand how static electricity arises and links to the movement of electrons in y8 topics in chemistry, links to charges in y10 chemistry. Covered in more depth in triple (y10). Understand what a magnet is, what a pole is, how magnets attract and repel, understand how to construct an electromagnet and how to increase its strength and their uses. Links to GCSE and A-Level. Keywords y8: current, potential difference, resistance, static electricity (new), magnet (new), electromagnet (new)	Composite: to explore the fundamentals of electricity and magnetism. Components: To construct basic circuits To describe basic circuit properties such as current, resistance and potential difference Identify, construct and describe series and parallel circuits. Describe what static electricity is Describe the basic properties of a permanent magnet and electromagnet. Describe how we can modify an electromagnet and their uses	Current Resistance Potential difference Series Parallel Static electricity Electromagnet Solenoid Magnetic field North pole South pole Electric field Positive charge Negative charge

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

Year	Semester	Scheme of Learning	Powerful Knowledge / Threshold Concept links	Composites and their components	Word Revolution
9	1	**Energy**	Understand that energy can be transferred from store to store and which path they take and how this is linked to the conservation of energy. Energy stores and transfers are linked back to year 7 and are applied to real world scenarios. Energy resources now need to be compared and evaluated rather than just describing. Understand how the National Grid is linked to stores, transfers and resources, this will aid future learning of the importance of step-up and step-down transformers and efficiency in transferring energy in year 10/11. (as well as electricity). At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice.	Composite: describe how energy can be usefully transferred between stores. Components: Identify and describe the 8 energy stores Describe the conservation of energy Calculate efficiency Describe how energy is efficiently transferred through the national grid.	Kinetic Thermal Gravitational potential Elastic potential Chemical Nuclear Electrostatic Magnetic National grid Efficiency Transformer Conservation of energy
		Particle Model of Matter	Density recap from y8, introduction of calculations and experimental skills. Understand how to investigate the density of regular and irregular objects as well as liquids. To understand kinetic theory – to know the properties of solids, liquids and gases, give similarities and differences of the states of matter. (new) understand how heating curves show and help explain changes of state and relate to energy transfers this aids in the understanding of specific latent heat in year 10 - linking to particle model from KS3 chem. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice. Circuit basics revisited from y7, understanding how circuits are to be constructed and the relationship between current, potential difference and resistance. One new concept of charge calculations. Links with y12	Composite: to appreciate how the arrangement of particles affects the density of a substance and its state of matter. Components: Describe how you would find the density for a range of substances.. Apply the density equation Describe the properties of each state of matter Describe the changes that happen during changes of state.	Solid Liquid Gas State of matter Arrangement Particle

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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			physics. Keywords (7) – current, potential difference, resistance (9) – charge, series, parallel At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information. Building on y9 topic 1 chemistry atoms and isotopes. Theory of atomic structure, crossover with chemistry y8 and y9. Understand how the model of that atom has changed over time, what isotopes and nuclear radiation is, the properties, dangers and uses off nuclear radiation. Links with triple (nuclear fission/fusion and background radiation and y13 nuclear physics. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information.	Composite: to construct, draw and describe basic properties found in a circuit, Components: Identify and describe the role of circuit components. Describe how charge and current are linked What is potential difference and its role in the circuit, Compare how series and parallel circuits are different.	Regular Irregular Randomly Temperature Heat Kinetic theory Density Mass Volume Sublimation Evaporation Condensation Freezing Melting
		Electricity		Composite: describe how our understanding of the atom has changed over time and how nuclear radiation is produced. **Composite**: Describe the structure of an atom and the process that occur within the nucleus. Components: • Describe the current model of the atom • Describe how the model of the atom has changed over time. • Explain how Rutherford's alpha particle scattering experiment lead to the nuclear model of the atom. • Describe the properties and uses of nuclear radiation.	Series Parallel Circuit Component Charge Current Potential difference Resistance

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

Year	Semester	Scheme of Learning	Powerful Knowledge / Threshold Concept links	Composites and their components	Word Revolution
		Atomic Structure			Isotope Ionising radiation Ionising power Penetrating power Alpha Beta Gamma Radioactive decay Plum pudding Alpha scattering Proton Neutron Charge Gamma
9	**2**	**Forces**	New concepts of, identifying values as scalar or vector quantities. Understand how to calculate Speed and how to calculate acceleration and displacement from velocity-time graphs which builds on KS3 d-t graphs, now being applied to journeys rather than instances. Acceleration calculations incorporating new mathematical notation such as 'Δ, change (in velocity)'. Understand the factors that affect the stopping distance of a moving object. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information	**Composite**: use forces to be able to describe and calculate the change in shape and motion of objects Components: • Classify quantities into scalar and vector quantities. • Calculate speed and velocity. • Describe a journey using a d-t graph. • Using gradient of a d-t graph to calculate velocity. • Linking reaction times to stopping distances.	Speed Velocity Distance Time Acceleration Deceleration Braking distance Stopping distance Thinking distance Reaction time Constant
		Waves	Recap of wave basics and properties from y8, applying this knowledge to required practicals where students will understand how to measure and calculate wave speeds and frequencies. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information Recapping of magnets, magnetic fields and basic electromagnets from year 8. Delving deeper into what is a magnetic field, uses of	Composite: to investigate the properties of waves and how this can help to categorise them. Components: Define and compare longitudinal and transverse waves Label and describe different features	Longitudinal Transverse Oscillation Perpendicular

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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			electromagnets. Keywords: magnet (y8), electromagnet (y8), induced (y9). At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information.	of a wave Investigate the speed of a wave in water and air. Composite: To understand how the force of magnetism works across a permanent magnet and electromagnet,. Components: Be able to draw a magnetic field Describe how to find the shape of a magnetic field Describe how a solenoid and electromagnet's magnetic field can be altered. Describe the uses of electromagnets.	Parallel Energy Matter Amplitude Wavelength Crest Trough Displacement Compression Rarefaction Wave speed Frequency Magnetic field Solenoid Electromagnet Current Iron core Permanent magnet Magnetic pole Attract Repel
10	1	**Energy** **Electricity**	Mathematical calculations and equation manipulation (rearranging and unit conversion) are introduced for the energy stores, work done and power. 1-2 retrieval lessons based off the content of year 9 at the beginning of the topic. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice. Electricity in the home, real world applications, and linking this back to the national grid as covered in year 9 energy and ks3. Applying ohm's law to previous circuitry definitions e.g. current. Using V=IR to carry out practicals investigating resistance and its relationship to length of wire, how series and parallel circuits effect it and describing the shapes of I-V characteristic graphs based on their knowledge of resistance. Essential moving forward into A-Level. 1-2 retrieval lessons based off the content of year 9 at the beginning of the topic. At the end of each topic	Composite: to describe and calculate energy transfers between stores. Components: Apply equations and convert between units to calculate quantities when energy is transferred between stores Understand the link between work done and power. Composite: to describe how the rules of a circuit affect different components and how mains electricity is presented in the home. Components: Describe the relationship between resistance and length of wire. Describe the relationship between current and potential difference in different settings. To understand how external conditions affect thermistors and	Energy transferred Work done Power Gravitational potential Kinetic energy Elastic potential Joules Watts Thermal Dissipated Current Potential difference Resistance Thermistor Light intensity

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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			there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice. To understand what is meant by Specific heat capacity and specific latent heat, how they are different and how these new concepts are closely linked to both the particle model and energy from years 7-9 especially changes of state and energy transfers. Being aware of mathematical notations and using equations. Carrying out scientific investigations, analysing data and graphs and forming conclusions. Pressure is built upon from previous years (y8). 1-2 retrieval lessons based off the content of year 9 at the beginning of the topic. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice. To be able to calculate the half-life of radioactive isotopes, using graphical skills and mathematical deduction (y13 nuclear link). Writing nuclear decay equations to show understanding of the nuclear decay process for alpha and beta. These are new concepts and are built on in year 13. No overt links to ks3. 1-2 retrieval lessons based off the content of year 9 at the beginning of the topic. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice.	LDRS. Explain how energy is transferred electrically. Composite: describe the particle model of matter and how it is affected by the transfer of energy. Components: Understand how the properties of a material determine how much energy they can store and when they can change state. Describe the particle model of the states of matter Explain how pressure arises and what factors affect it. **Composite**: Describe the structure of an atom and the process that occur within the nucleus. Components: • Define and calculate half-life from graphs and data. • Apply properties of alpha and beta to write nuclear decay equations. • Compare irradiation and contamination. • Evaluate the dangers of nuclear radiation. • **Triple:** • Describe the processes of	Temperature Power Work done Charge Ohm’s Law Frequency Alternating current Live Earth Neutral Direct current Transformer National grid Step-up Step-down Efficiency Solid Liquid Gas Evaporation Condensation Freezing Sublimation Melting Internal energy Random Kinetic Vibration Specific heat capacity Temperature change Specific laten heat Specific latent heat of fusion Specific latent heat of vaporiation Energy transferred Thermal energy Pressure Force Collisions
		Particle Model of Matter			

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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		Atomic Structure		nuclear fission and fusion and their applications in energy production. • Identify sources of background radiation.	Nuclear radiation Nuclear decay Activity Alpha Beta Gamma Irradiation Contamination Atomic number Mass number Charge hazards
10	2	**Forces** Electromagnetic waves	Newton's Laws of motions (and momentum)– build upon the ideas talked about in years 7 and 9. Pivotal for all physics going into A-Level. Newton's laws come up any time a force is acting on an object. Mathematical, graphical and data handling skills are built upon heavily in this topic. To understand that there is a link between energy and forces (work done, Hooke's law). 1-2 retrieval lessons based off the content of year 9 at the beginning of the topic. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice. Electromagnetic waves – link together the basics of waves and energy. To understand the properties and uses of EM waves are essential knowledge (built upon again in y12 waves and y13 astrophysics) Building on y8 waves. Experimental skills such as measurement, data analysis and conclusion forming is built upon. Understanding the process of refraction and being able to describe why it happens. 1-2 retrieval lessons based off the content of year 9 at the beginning of	**Composite**: use forces to be able to describe and calculate the change in shape and motion of objects Components: Newton's Laws of motion How work and energy transferred results from a force interacting Apply equations to calculate various quantities. Composite: How do the properties of waves affect their uses. Components: Uses of electromagnetic waves How reflection works (T) How and why refraction happens	Stationary Acceleration Deceleration Velocity Equilibrium Balanced Momentum Inertia Extension Work done Scalar Vector Weight Mass Uniform Electromagnetic

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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		Waves	the topic. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice. To understand: what a magnetic field is, how it can be observed, what an electromagnet is, how it can be modified. To understand the end result of magnetic field interactions using right and left hand rules – (this is built upon in the magnetic and electric field section of y13). 1-2 retrieval lessons based off the content of year 9 at the beginning of the topic. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice.	Composite: to describe how electromagnets work and their uses. Components: Apply the right and left hand rule to current and magnetic field interactions. Describe how the motor effect works.	Reflection Refraction Specular Diffuse Wavefront Absorption Emission Spectrum Boundary Normal Incidence Density
		Magnetism & Electromagnetism			Solenoid Current Magnetic field Magnetic flux density Motor Fleming’s LHR
11	**1**	**Energy, particle model of matter, electricity, atomic structure**	Year 11 all of the powerful knowledge mentioned in year 9 and 10 is revisited and reinforced throughout the year by revisiting key areas such as required practicals, areas highlighted in QLAs etc. Throughout the year regular low stakes testing on previously used equations and core principles. By the end of the year students should be able to identify how forces and energy are linked, be able to apply mathematical equations to solve problems, evaluate data (numerical, tabular or graphical). Students should be proficient in hands on scientific skills and should be able to compare, describe, and evaluate.	**Atomic Structure composite:** Describe the structure of an atom and the process that occur within the nucleus. **Components:** Application of: • the current model of the atom • how the model of the atom has changed over time. • Rutherford’s alpha particle scattering experiment. • Describe the properties and uses of nuclear radiation.	

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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			At the beginning of recapping each topic 1-2 retrieval lessons based off the content of year 9 and 10 is re-covered allowing for greater recall opportunities and equation practice. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice.		
11	**2**	**forces, waves and magnetism**	Year 11 all of the powerful knowledge mentioned in year 9 and 10 is revisited and reinforced throughout the year by revisiting key areas such as required practicals, areas highlighted in QLAs etc. Throughout the year regular low stakes testing on previously used equations and core principles. By the end of the year students should be able to identify how forces and energy are linked, be able to apply mathematical equations to solve problems, evaluate data (numerical, tabular or graphical). Students should be proficient in hands on scientific skills and should be able to compare, describe, and evaluate. At the beginning of recapping each topic 1-2 retrieval lessons based off the content of year 9 and 10 is re-covered allowing for greater recall opportunities and equation practice. At the end of each topic there is opportunity to practice exam rubric questions again covering key recall information and mathematical practice.		
12	**1**	**Measurements and their errors**	A working knowledge of fundamental units is vital. Practical work needs to be underpinned by the awareness of the nature of measurement errors and of their numerical treatment. The ability to carry through reasonable estimations is a skill required throughout both years and beyond. Building on KS4 Introduction of fundamental properties of matter and to electromagnetic radiation and quantum phenomena. Students will appreciate the ways ideas develop and evolve through time and the importance of international collaboration to the scientific process.	Composite: to be able to analyse data. Components: 1. Identify origins of errors and uncertainties 2. Estimate approximate values. Composite: to understand how forces, matter and electromagnetic radiation interact and how this leads to phenomena.	Absolute uncertainty Control variable Dependent variable Independent variable Continuous data Discrete data Anomalous Evidence Fair test Reproducible Repeatable Peer review Systematic error Random error Zero error Validation

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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		Particles and Radiation	Links to atomic structure in years 9 and 10. Mild link to EM waves in year 10.	Components. 1. State the properties of the model of the atom. 2. Describe the roles of the 4 fundamental forces and their roles in interactions. 3. Apply the conservation of energy to interactions. 4. Draw simple diagrams showing interactions. 5. Classify particles based on quantum properties. 6. Properties of quarks 7. Explain the process of the photoelectric effect. 8. Interpret line spectra 9. To describe diffraction and explain how its results support other phenomena. Composite: To be able to describe and explain the properties, characteristics and applications of waves. Components: 1. Describe the properties, characteristics and applications of progressive waves 2. Describe the properties, characteristics and applications of longitudinal and transverse waves. 3. Describe the Principle of superposition of waves and formation of stationary waves. 4. Explain the phenomena of refraction, diffraction and interference.	Work function Weak interaction Wave-particle duality Virtual particle Quark Boson Hadron Lepton Meson Quantum number Specific charge Quantum number Photoelectric effect Stopping potential Pair production Annihilation Ground station Line emission spectrum Ionisation Intensity Fundamental particle Electron volt Excitation Exchange particle Antiparticle
		Waves	GCSE studies of wave phenomena are extended through a development of knowledge of the characteristics, properties and applications of travelling waves and stationary waves. The basics are previously met in years 8, 9 and 10. **Required practical 1:** Investigation into the variation of the frequency of stationary waves on a string with length, tension and mass per unit length of the string. **Required practical 2:** Investigation of interference effects to include the Young's slit experiment and interference by a diffraction grating.		Node Antinode Absorption Reflection Refraction Dispersion Diffraction Coherence Angle of incidence/refraction First harmonic Interference Frequency Wavelength Amplitude Period Phase

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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					Monochromatic polarisation Path difference Progressive wave Pulse broadening Stationary wave Resonant frequency Signal degradation Superposition Refractive index Transverse Longitudinal
12	**2**	**Mechanics and Materials** Required practical 3: Determination of g by a freefall method. Required practical 4: Determination of the Young modulus by a simple method This builds on and develops earlier study of these phenomena from GCSE (and year 8) (circuit components, series, parallel, mathematical equations and practicals). It provides opportunities for the development of practical skills at an early stage in the	Following on from the student's knowledge of forces, energy and momentum (year 7-11) it is imperative to understand how they link together and how the world around is dependent on these. Materials is based upon the understanding of physical properties of objects and how they are applicable to their real world use.	**Composite**: To explore Vectors and their treatment and understanding of forces, energy and momentum. As well as a study of materials considered in terms of their bulk properties and tensile strength. Components: 1. Identifying scalars and vectors 2. Describing motion along a straight line 3. Apply the principle of moments 4. Apply equations to projectile motion problems. 5. Apply Newton's 3 Laws of motion. 6. Apply the conservation of energy to problems including work done, power and efficiency. 7. Calculate density 8. Investigate Hooke's Law 9. Describe how properties of a material change under stress. 10. Calculate Young's Modulus. Composite: Apply electrical laws to solve and investigate circuit related problems. Components: 1. Understand the	Acceleration Brittle Breaking stress Brittle fracture Compressive force Displacement Equilibrium Efficiency Elastic Freefall Friction Density Gravitational potential energy Kinetic energy Hooke's Law Limit of proportionality Moment Lever Couple Momentum Projectile motion Conservation of energy Newton's Laws Stress Strain Scalar Vector Stiffness Terminal speed Ultimate tensile stress Velocity Work Yield point Young modulus

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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		Electricity	course and lays the groundwork for later study (electric fields, capacitors etc in year 13 and electrical applications important to society. Required practical 5: Determination of resistivity of a wire using a micrometer, ammeter and voltmeter. Required practical 6: Investigation of the emf and internal resistance of electric cells and batteries by measuring the variation of the terminal pd of the cell with current in it.	concept of resistivity 2. Students can construct circuits with various component configurations and measure currents and potential differences 3. investigate the behaviour of a potential divider circuit. 4. Describe how the electromotive force and internal resistance are linked.	Potential difference Current Resistance Resistivity Potential divider Superconductor Internal resistance Lost volts
13	**1**	**Further mechanics and thermal physics**	The earlier study of mechanics is further advanced through a consideration of circular and simple harmonic motion. Thermal properties of materials, the properties and nature of ideal gases and the molecular kinetic theory to be studied in more depth (basics covered in y7, 9 and 10) Required practical 7: Investigation into simple harmonic motion using a mass–spring system and a simple pendulum. Required practical 8: Investigation of Boyle's law (constant temperature) and Charles's law (constant pressure) for a gas.	Composite: to understand how forces impact circular and simple harmonic motion. To understand the thermal dynamics of particles under different conditions. Components: Describe thermal energy transfers in systems. State and apply the Gas Laws. Describe molecular kinetic theory Derive and apply equations. Calculate quantities involved in centripetal force situations that involve rotation. Interpret graphs and equations related to simple harmonic motion. Understand how forced vibrations and resonance are linked to SHM.	Absolute zero Adiabatic Angular speed Angular momentum Brownian motion Boyle's law Boltzmann constant Centripetal force Charles' law Elastic collision Heat sink Ideal gas Inelastic Isothermal Isotropic Kinetic Moment of inertia Natural frequency Radian Root mean square speed Simple harmonic motion Resonance damping
		Fields and their consequences	The concept of field is one of the great unifying ideas in physics. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction. These topics have	Composite: to understand how key fundamental forces such as gravitational, electric and magnetism can interact and affect other materials. Component: Concept of a force field as a region in which a body experiences a non-contact force. Students should recognise that a force field can be represented as a vector, the direction of which must be determined by inspection. Force fields arise from the interaction of mass, of static charge,	

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

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			considerable impact on modern society. (gravity is brought up in y7 earth and beyond, y9 and y10 forces, magnetism in y8,9 and 10 and electrostatic is briefly mention in y9 energy and y9/10 chemistry)	and between moving charges. Similarities and differences between gravitational and electrostatic forces: Similarities: Both have inverse-square force laws that have many characteristics in common, eg use of field lines, use of potential concept, equipotential surfaces etc Differences: masses always attract, but charges may attract or repel	Time constant Transformer Solenoid Root mean square current/p/d. Radial field Permittivity Lenz's law Inverse square law Gravitational field strength/potential/energy Electric field strength/potential/energy e.m.f. eddy current farad faraday's law capacitor capacitance dielectric field lines
13	2	**Nuclear Physics** Fundamental physical principles are applied to the study and interpretation of the Universe. Students gain deeper	This topic builds on the work of Particles and radiation (y12) to link the properties of the nucleus to the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass. Students should become aware of the physics that underpins nuclear energy production and also of the impact that it can have on society. (link to y9/10 atomic structure topic and y9 energy topic) Required practical 12: Investigation of the inverse square law for gamma radiation.	Composite: to apply the properties of nuclei to the dangers and production of energy. Components: Appreciation of how knowledge and understanding of the structure of the nucleus has changed over time. Understand the properties and risks of nuclear radiation To model and quantitatively analyse radioactive decay Interpret graphs of N against Z for unstable nuclei Make order of magnitude calculations of the radius of different atomic nuclei. Appreciation that $E = mc^2$ applies to all energy changes, Describe the process of nuclear fission and safety aspects of a power plant. Composite: To be able to describe how several telescopes are used in observing celestial bodies, how stars are classified and how the universe has evolved.	Avogadro constant Activity Radiation Chain reaction Decay constant Geiger-Muller Tube Half-Life Isotope Mass Defect Fission Fusion Nucleon Nucleus Tracer Source Thermal neutron Binding energy Background radiation

PHYSICS CURRICULUM JOURNEY | YEAR 7 TO YEAR 13

Year	Semester	Scheme of Learning	Powerful Knowledge / Threshold Concept links	Composites and their components	Word Revolution
		Astrophysics	insight into the behaviour of objects at great distances from Earth and discover the ways in which information from these objects can be gathered. The underlying physical principles of the devices used are covered and some indication is given of the new information gained by the use of radio astronomy. The discovery of exoplanets is an example of the way in which new information is gained by astronomers. Touched on in y7 the earth and beyond and in triple physics 'space physics'.	Components: Draw and explain ray diagrams for different types of telescopes and describe how celestial bodies are observed. Calculating angles, distances and resolution. Apply apparent and absolute magnitude equations Be able to describe black body radiation Interpret Hertzsprung-Russell diagrams. Describe the life cycle of stars. Describe and explain the evolution of the universe.	White Dwarf Supernova Electron degeneracy pressure Supermassive blackhole Stefan's Law Spherical aberration Spectral class Special resolution Schwarzschild radius Satellite Resolving power Refraction Reflection Red shift Red giant Recessional velocity Real image Rayleigh criterion Ray diagram Quasar Principal axis/focus Parallax Parsec Nebula Main sequence Luminosity Light year Hubble's Law Geostationary Escape velocity Event horizon Exoplanet Doppler effect Cosmological principle Converging Chromatic aberration Absolute magnitude Apparent magnitude

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					Magnification Brightness Blue shift